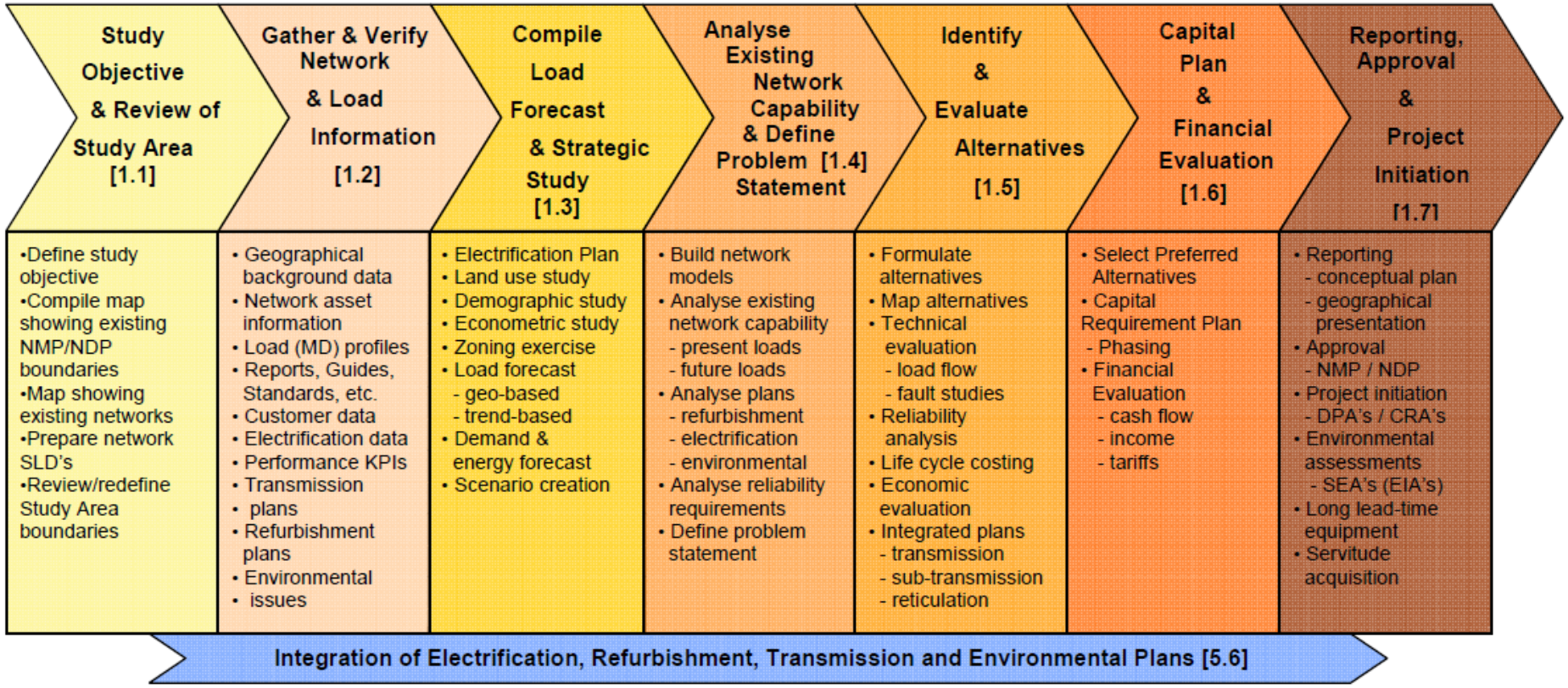
Smart Geospatial Master Planning

Hilton Baartman
GLS Consulting

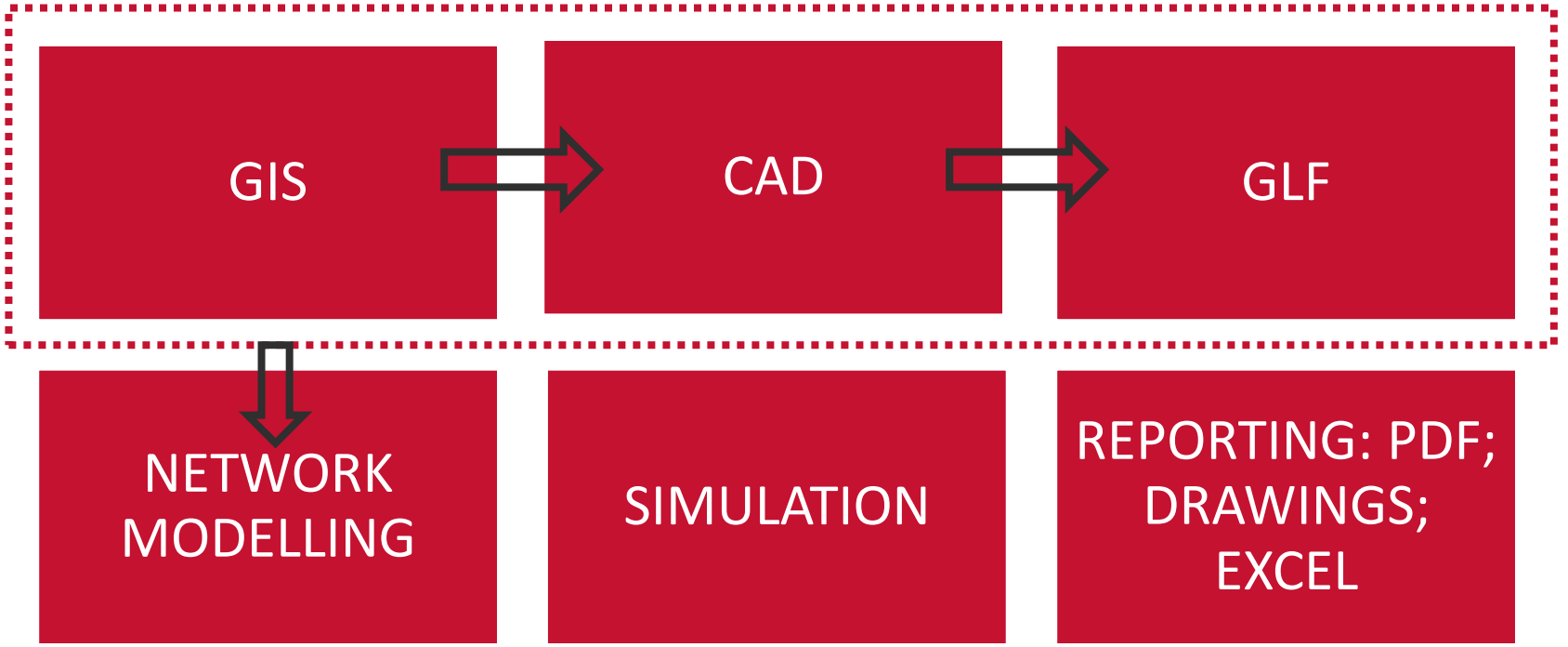
Existing methodology

- Current methodology used widely in Southern Africa
- Several tools used to achieve this

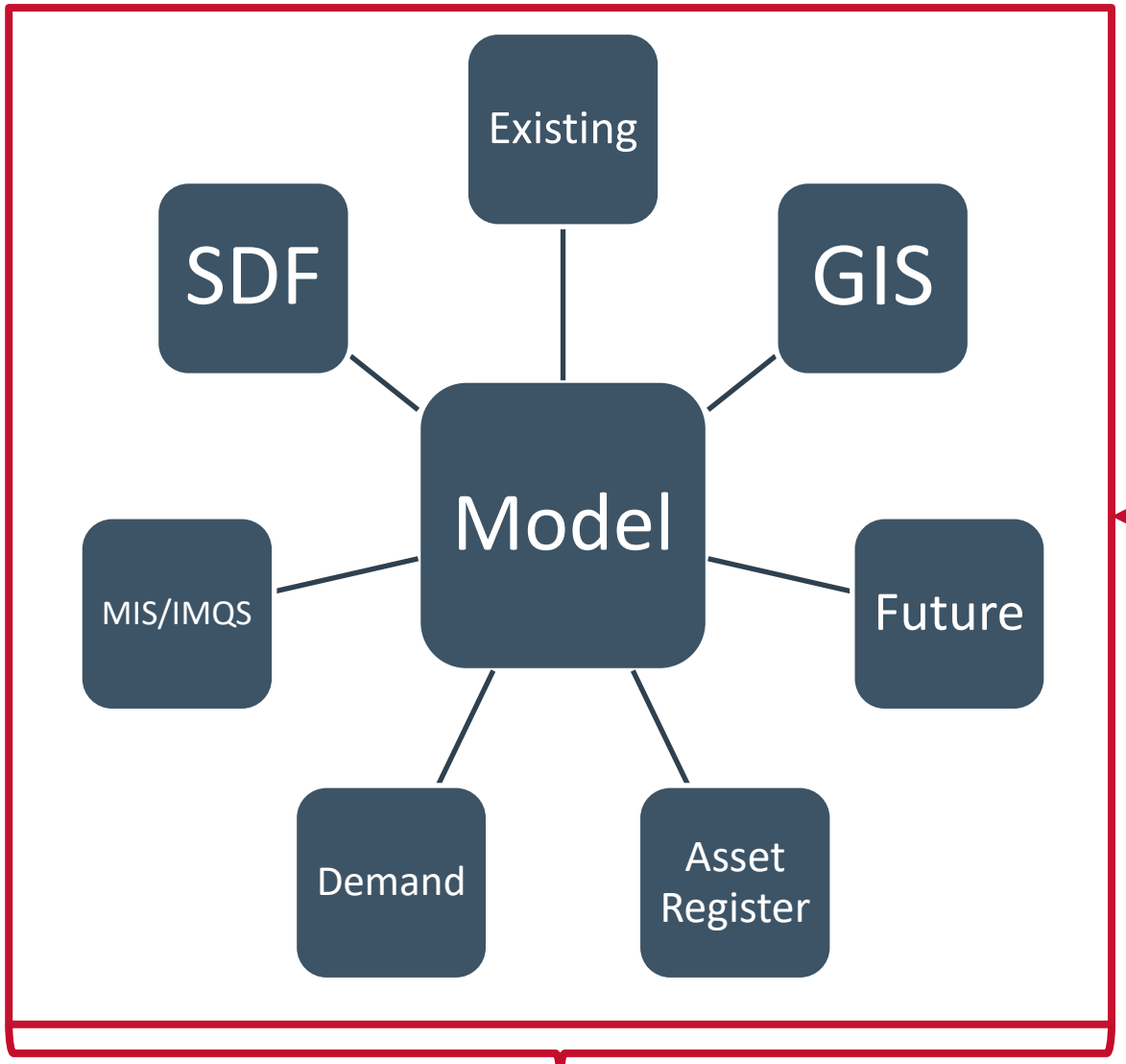


Current Tools used

- Not as optimally integrated
- Engineers spend a lot of time correlating data between different data sets
- Cumbersome reporting over several data sets
- Which data set presents the master data set?

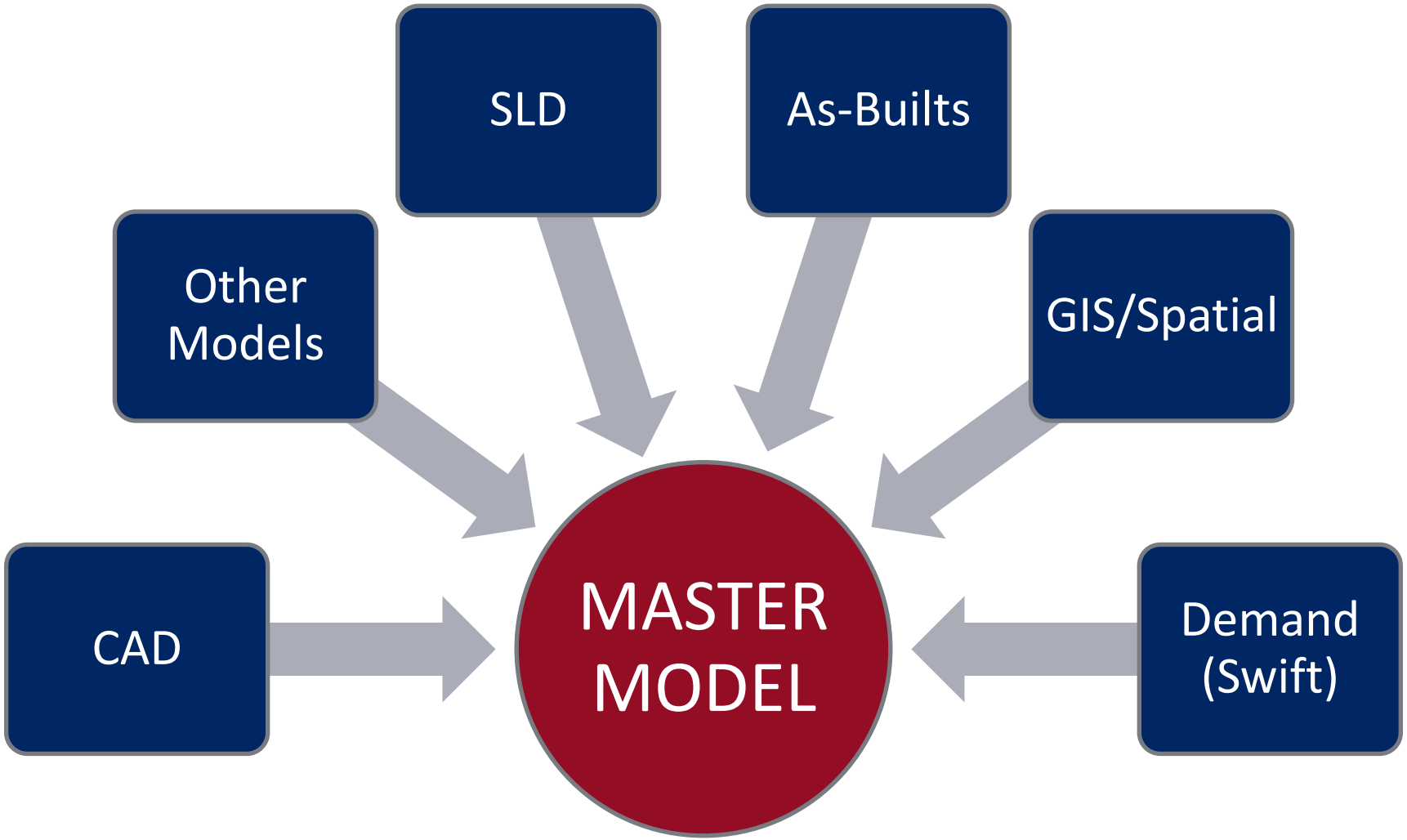


New Solution: The Smart Model



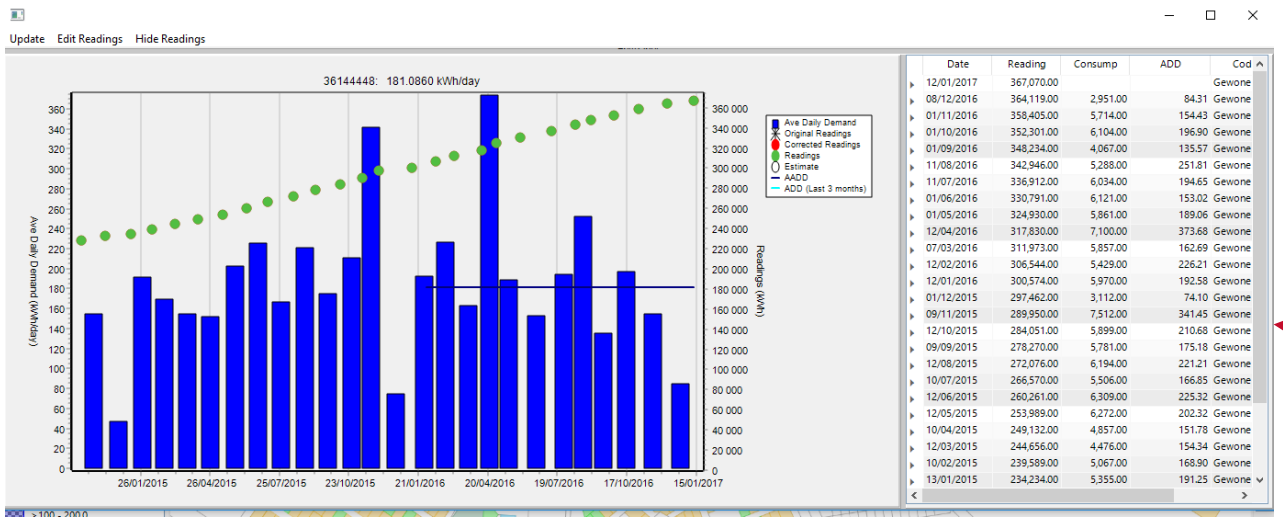
One integrated System

The Master Model



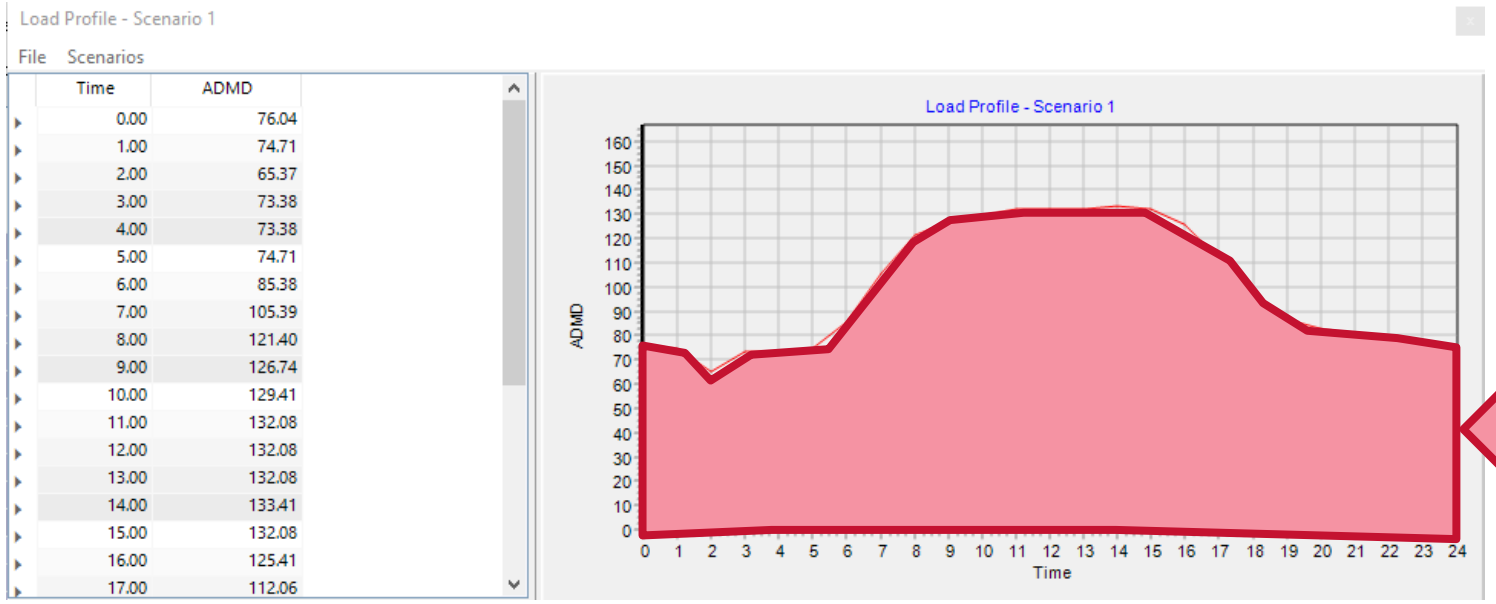
SWIFT & Spatial Demand

- SWIFT Electrical Consumption Analysis
  - Populate the EDISAN electrical simulation model with electricity sales data (Average annual daily consumption [AADC] in kWh)
  - ADMDs calculated on per unit basis for each land category
  - Loss calculations (System Input vs Consumer Supply)
  - Revenue enhancement through, for example, visually identifying unmetered stands
  - Tariff analysis (& Cost of Supply)



ADMD

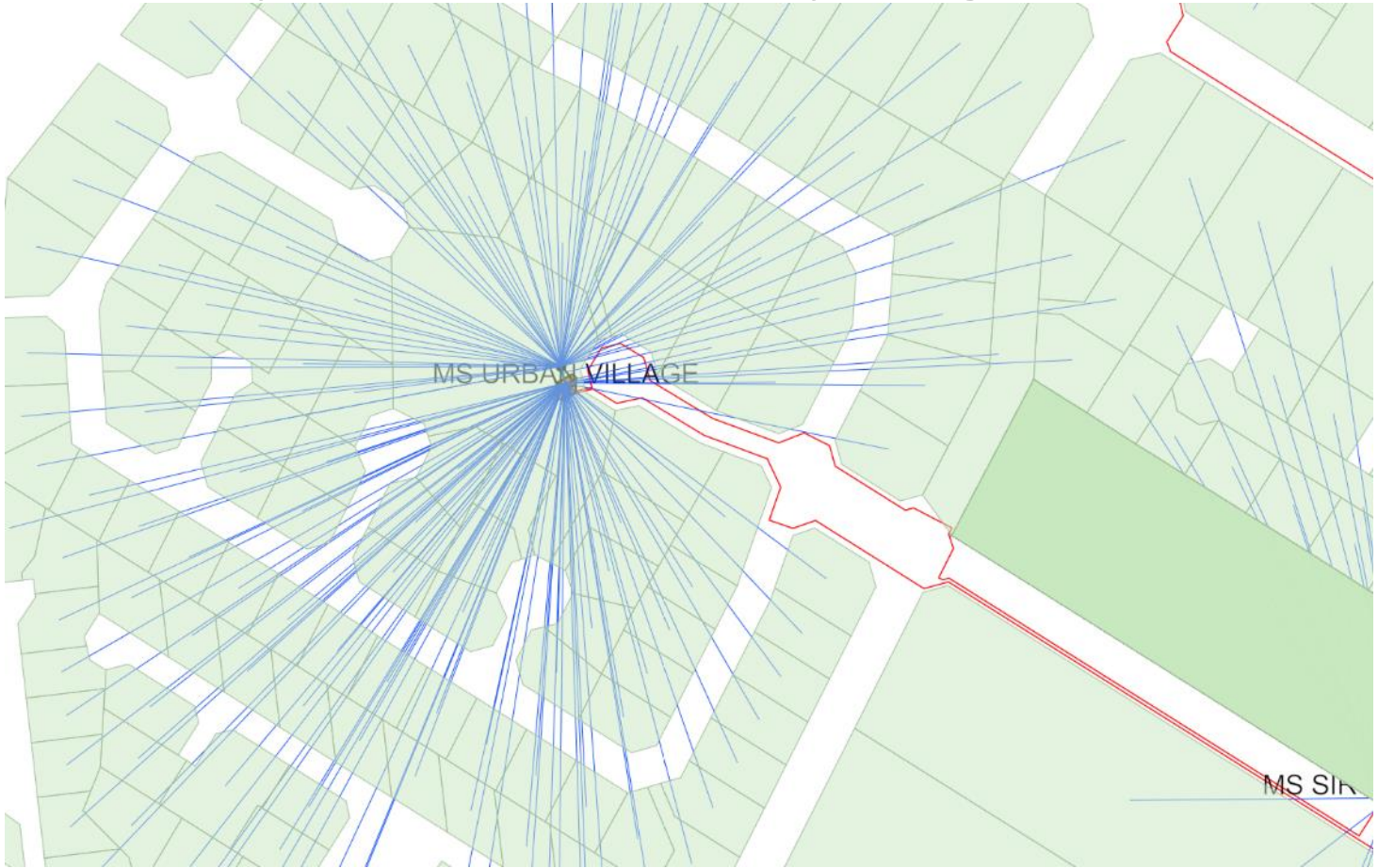
- AADC – expressed in kWh and relates to energy consumption of user
- ADMD – expressed as kVA and relates to peak demand or load from the user
- ADMD derived through a process of using AADC & load shapes (over 24 hour period)
- ADMD data thus related to actual current customer data
- Calibration



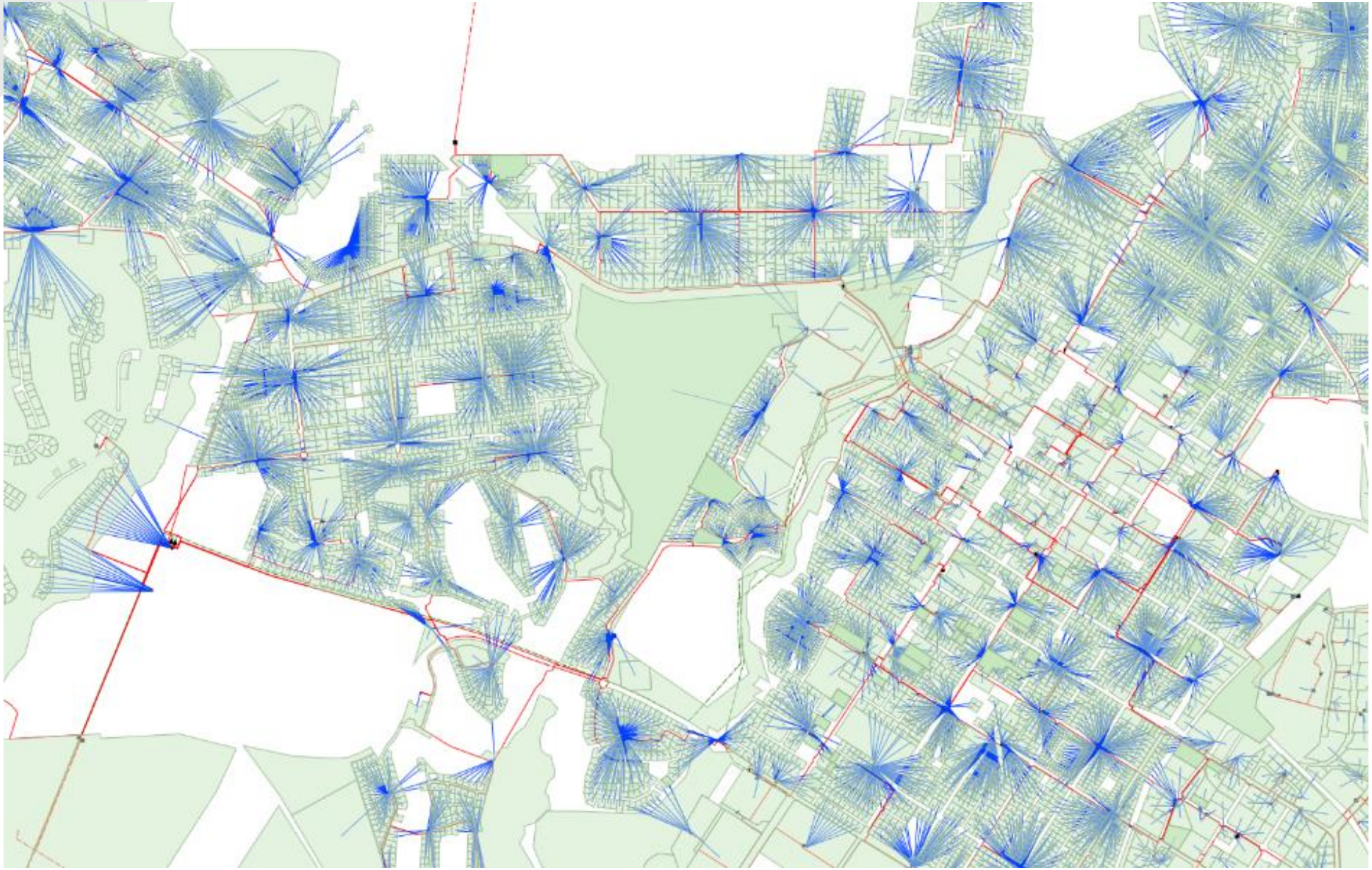
Area under curve is kVAh = kWh/powerfactor

Load mix per minisub

- Spatially tie stand to closest minisub
- Ability to model 400V network if available from ‘as-builts’
- Get AADC through minisub then ADMD and roll up
- Identify customers affected by outages

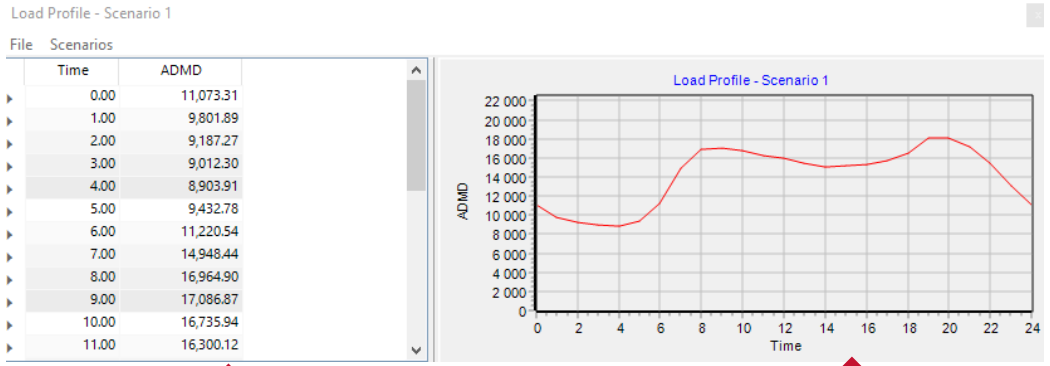


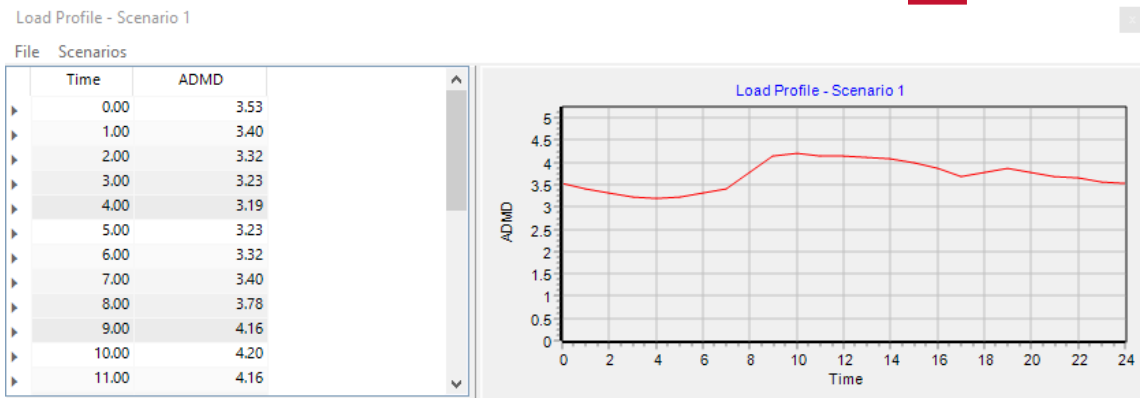
Load mix per minisub

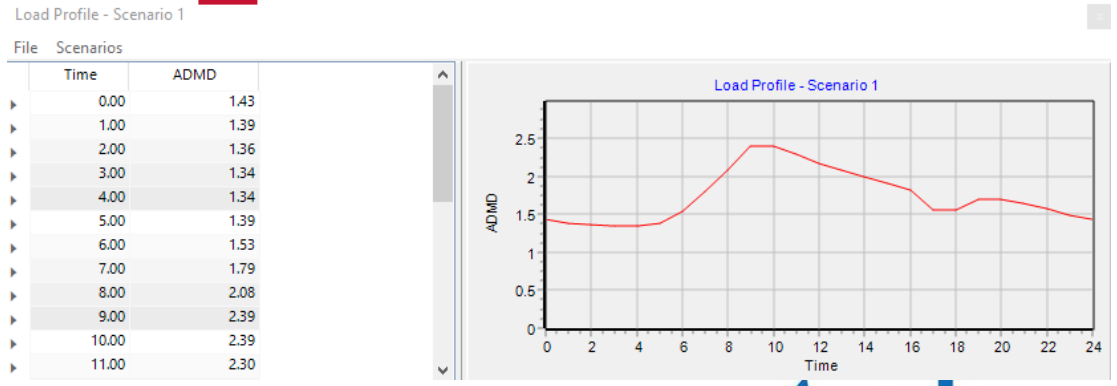


Spatial correlation of stand to minisub

- Load profiles – standard or customizable
- Substation/Load Zone profile is a sum of all profiles within substation or load zone







Load Forecasting & Future Network

- All future development captured in a geospatial shape file with the size of the development & the anticipated Land Use/Zoning of the development
- These developments are based on the SDF, IDP, House Plans etc. Workshopped with town planners & electrical departments
- Priority – When the development will happen
- Growth Curve – Linear, Step, Custom or S-Curve

Dawid_Kruiper_Future_Areas_Elec.Future_Areas

File Edit Utilities Table Configure Execute SQL

Layer: Dawid_Kruiper_Future_Areas_Elec.Future_Areas

Layout: Default Layout

1 of 252 records selected

Display: Bad Cells

Synchronize Selection with CAD: Both Ways & Change Layer

Show Selected Only More Optior

Index	Geometry	DESCR	IMQS ID	DISTRICT	REGION	AREA HA	LANDUSE	DENSITY	NO UNITS	PRIORITY	UED TYPE	FA RATIO	UED	AADC EXCL	LOSSES	AADC INC	AADC EXIST	AADC NET	COMMENT
1	Polygon	Florapark F01				3.51	Group Housing (medium density)	40.00	176.00	5	area net		15.00	84.20	28.07	112.27	0.00	2,640.00	SDF Residential Areas
2	Polygon	Augrabies Park F02				1.69	Residential (medium density)	11.86	20.00	0	unit		30.00	30.00	10.00	40.00	0.00	600.00	y SDF Mixed Use Development Areas
3	Polygon	SEZ Phase 1C1		SEZ		13.22	Industrial	2.00	34.00	0	area net		120.00	94.16	31.39	125.55	0.00	4,080.00	SEZ Industrial Light
4	Polygon	Sunset Valley F03				2.51	Business/Commercial	2.00	6.00	5	area gross		195.00	12.81	4.27	17.08	0.00	1,170.00	SDF SMME Incubators
5	Polygon	Airport F01				38.27	Industrial	1.41	54.00	0	unit		120.00	192.38	64.13	256.50	0.00	6,480.00	SDF Airport & Infrastructure
6	Polygon	Keidebees F01				0.72	Residential (high density)	24.88	18.00	5	unit		15.00	13.50	4.50	18.00	0.00	270.00	SDF Residential Areas
7	Polygon	Lemoendraai F04				13.11	Affordable Housing (medium density)	9.08	119.00	5	unit		20.00	133.88	44.63	178.50	0.00	2,380.00	SDF Residential Areas
8	Polygon	SEZ Phase 2G		SEZ		51.33	Institutional	1.00	65.00	5	area net		115.00	769.89	256.63	1,026.53	0.00	7,475.00	SEZ Training
9	Polygon	SEZ Phase 6D		SEZ		1.55	Services	5.00	10.00	15	area net		80.00	29.10	9.70	38.79	0.00	800.00	SEZ Services
10	Polygon	SEZ Phase 7C		SEZ		11.47	Industrial	2.00	29.00	15	area net		120.00	81.75	27.25	109.00	0.00	3,480.00	SEZ Industrial Medium
11	Polygon	SEZ Phase 7D		SEZ		8.14	Industrial	2.00	21.00	15	area net		120.00	57.99	19.33	77.32	0.00	2,520.00	SEZ Industrial Heavy
12	Polygon	SEZ Phase 7E		SEZ		2.79	Services	5.00	18.00	15	area net		80.00	52.38	17.46	69.84	0.00	1,440.00	SEZ Services
13	Polygon	SEZ Phase 7B		SEZ		6.16	Business/Commercial	2.00	16.00	15	area net		195.00	39.25	13.08	52.33	0.00	3,120.00	SEZ Office-Business-Retail
14	Polygon	SEZ Phase 7A		SEZ		4.17	Business/Commercial	2.00	11.00	15	area net		195.00	26.59	8.86	35.45	0.00	2,145.00	SEZ Office-Business-Retail
15	Polygon	SEZ Phase 5B		SEZ		13.69	Industrial	2.00	35.00	10	area net		120.00	97.55	32.52	130.06	0.00	4,200.00	SEZ Industrial Light
16	Polygon	SEZ Phase 5C		SEZ		34.14	Industrial	2.00	86.00	10	area net		120.00	243.26	81.09	324.34	0.00	10,320.00	SEZ Industrial Medium
17	Polygon	SEZ Phase 3A		SEZ		6.75	Industrial	2.00	17.00	5	area net		120.00	48.11	16.04	64.14	0.00	2,040.00	SEZ Industrial Heavy
18	Polygon	SEZ Phase 3B		SEZ		6.13	Industrial	2.00	16.00	5	area net		120.00	43.64	14.55	58.19	0.00	1,920.00	SEZ Industrial Medium
19	Polygon	SEZ Phase 3C		SEZ		2.91	Services	5.00	19.00	5	area net		80.00	54.54	18.18	72.71	0.00	1,520.00	SEZ Services
20	Polygon	SEZ Phase 3D		SEZ		6.55	Institutional	1.00	9.00	5	area net		115.00	98.24	32.75	130.98	0.00	1,035.00	SEZ University
21	Polygon	SEZ Phase 3E		SEZ		3.33	Hotel	2.00	9.00	5	area net		100.00	50.00	16.67	66.67	0.00	900.00	SEZ Hotel
22	Polygon	SEZ Phase 4A		SEZ		8.00	Industrial	2.00	20.00	10	area net		120.00	56.99	19.00	75.99	0.00	2,400.00	SEZ Industrial Light
23	Polygon	SEZ Phase 4B		SEZ		5.79	Industrial	2.00	15.00	10	area net		120.00	41.28	13.76	55.04	0.00	1,800.00	SEZ Industrial Medium
24	Polygon	SEZ Phase 4C		SEZ		9.96	Industrial	2.00	25.00	10	area net		120.00	70.96	23.65	94.62	0.00	3,000.00	SEZ Industrial Light
25	Polygon	SEZ Phase 5A		SEZ		3.70	Business/Commercial	2.00	10.00	10	area net		195.00	23.62	7.87	31.49	0.00	1,950.00	SEZ Office-Business-Retail
26	Polygon	SEZ Phase 2D		SEZ		8.02	Institutional	1.00	11.00	0	area net		115.00	120.25	40.08	160.33	0.00	1,265.00	SEZ University
27	Polygon	SEZ Phase 2E		SEZ		8.32	Sports fields	1.00	9.00	0	area gross		100.00	93.59	31.20	124.79	0.00	900.00	SEZ Sport
28	Polygon	Augrabies Park F01				0.88	Residential (high density)	20.00	22.00	5	area net		15.00	13.18	4.39	17.57	0.00	330.00	SDF Residential Areas
29	Polygon	Kameelmond F01				10.94	Cemeteries	1.00	11.00	20	area gross		5.00	16.40	5.47	21.87	0.00	55.00	SDF Cemeteries
30	Polygon	Kameelmond F05				1.74	Open areas	0.00	0.00	20	area gross		0.00	0.00	0.00	0.00	0.00	0.00	x SDF Authority Areas
31	Polygon	Keidebees F02				1.08	Residential (high density)	20.00	27.00	5	area net		15.00	16.20	5.40	21.60	0.00	405.00	SDF Residential Areas
32	Polygon	Vaal Koppies F12				1.20	Agricultural Holdings	5.00	6.00	15	unit		45.00	15.75	5.25	21.00	0.00	270.00	SDF Farmsteads & Outbuildings
33	Polygon	Olyvenhoutsdrift F...				18.76	Multipurpose	2.00	38.00	20	area gross		80.00	112.54	37.51	150.05	0.00	3,040.00	SDF Mixed Use Development Areas
34	Polygon	Olyvenhoutsdrift F...				5.33	Institutional	1.00	7.00	10	area net		115.00	79.90	26.63	106.54	0.00	805.00	SDF Institutional Areas
35	Polygon	Olyvenhoutsdrift F...				6.73	Agricultural Land	0.00	0.00	10	area gross		0.00	0.00	0.00	0.00	0.00	0.00	SDF Intensive Agriculture
36	Polygon	Olyvenhoutsdrift F...				3.17	Industrial	2.00	7.00	10	area gross		120.00	18.07	6.02	24.10	0.00	840.00	SDF Light Industry
37	Polygon	Olyvenhoutsdrift F...				6.25	Industrial	2.00	13.00	5	area gross		120.00	35.61	11.87	47.47	0.00	1,560.00	SDF Light Industry

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Dawid_Kruiper_Future_Areas_Elec.Future_Areas

File Edit Utilities Table Configure Execute SQL

Layer: Dawid_Kruiper_Future_Areas_Elec.Future_Areas

Layout: Default Layout

UED	AADC EXCL	LOSSES	AADC INC	AADC EXIST	AADC NET	COMMENT	OPERATION	IGNORE	ELEC ZONE	LAND CAT E	DURATION	CURVE TP	CURVE SN	CURVE SP	kVA Demand
15.00	84.20	28.07	112.27	0.00	2,640.00	SDF Residential Areas	Rural		Upington	RES	3	S-CURVE	5	0	275.00
30.00	30.00	10.00	40.00	0.00	600.00	y SDF Mixed Use Development Areas	Rural		Upington	RES	1	S-CURVE	5	0	63.00
120.00	94.16	31.39	125.55	0.00	4,080.00	SEZ Industrial Light	Rural		Upington	BCI	3	S-CURVE	5	0	486.00
195.00	12.81	4.27	17.08	0.00	1,170.00	SDF SMME Incubators	Rural		Upington	BCI	0	STEP	5	0	109.00
120.00	192.38	64.13	256.50	0.00	6,480.00	SDF Airport & Infrastructure	Rural		Upington	BCI	4	S-CURVE	5	0	772.00
15.00	13.50	4.50	18.00	0.00	270.00	SDF Residential Areas	Rural		Upington	RES	0	STEP	5	0	29.00
20.00	133.88	44.63	178.50	0.00	2,380.00	SDF Residential Areas	Rural	ADD_LENGTH	Upington	AFH	3	S-CURVE	5	0	248.00
115.00	769.89	256.63	1,026.53	0.00	7,475.00	SEZ Training	Rural		Upington	OTHER	5	S-CURVE	5	0	693.00
80.00	29.10	9.70	38.79	0.00	800.00	SEZ Services	Rural		Upington	BCI	1	S-CURVE	5	0	84.00
120.00	81.75	27.25	109.00	0.00	3,480.00	SEZ Industrial Medium	Rural		Upington	BCI	3	S-CURVE	5	0	415.00
120.00	57.99	19.33	77.32	0.00	2,520.00	SEZ Industrial Heavy	Rural		Upington	BCI	2	S-CURVE	5	0	300.00
80.00	52.38	17.46	69.84	0.00	1,440.00	SEZ Services	Rural		Upington	BCI	2	S-CURVE	5	0	150.00
195.00	39.25	13.08	52.33	0.00	3,120.00	SEZ Office-Business-Retail	Rural		Upington	BCI	2	S-CURVE	5	0	289.00
195.00	26.59	8.86	35.45	0.00	2,145.00	SEZ Office-Business-Retail	Rural		Upington	BCI	1	S-CURVE	5	0	199.00
120.00	97.55	32.52	130.06	0.00	4,200.00	SEZ Industrial Light	Rural		Upington	BCI	3	S-CURVE	5	0	500.00
120.00	243.26	81.09	324.34	0.00	10,320.00	SEZ Industrial Medium	Rural		Upington	BCI	4	S-CURVE	5	0	1,229.00
120.00	48.11	16.04	64.14	0.00	2,040.00	SEZ Industrial Heavy	Rural		Upington	BCI	2	S-CURVE	5	0	243.00
120.00	43.64	14.55	58.19	0.00	1,920.00	SEZ Industrial Medium	Rural		Upington	BCI	2	S-CURVE	5	0	229.00
80.00	54.54	18.18	72.71	0.00	1,520.00	SEZ Services	Rural		Upington	BCI	2	S-CURVE	5	0	159.00
115.00	98.24	32.75	130.98	0.00	1,035.00	SEZ University	Rural		Upington	OTHER	3	S-CURVE	5	0	96.00
100.00	50.00	16.67	66.67	0.00	900.00	SEZ Hotel	Rural		Upington	OTHER	2	S-CURVE	5	0	94.00
120.00	56.99	19.00	75.99	0.00	2,400.00	SEZ Industrial Light	Rural		Upington	BCI	2	S-CURVE	5	0	286.00
120.00	41.28	13.76	55.04	0.00	1,800.00	SEZ Industrial Medium	Rural		Upington	BCI	2	S-CURVE	5	0	215.00
120.00	70.96	23.65	94.62	0.00	3,000.00	SEZ Industrial Light	Rural		Upington	BCI	2	S-CURVE	5	0	358.00
195.00	23.62	7.87	31.49	0.00	1,950.00	SEZ Office-Business-Retail	Rural		Upington	BCI	1	S-CURVE	5	0	181.00
115.00	120.25	40.08	160.33	0.00	1,265.00	SEZ University	Rural		Upington	OTHER	3	S-CURVE	5	0	118.00
100.00	93.59	31.20	124.79	0.00	900.00	SEZ Sport	Parks		Upington	POS	3	S-CURVE	5	0	94.00
15.00	13.18	4.39	17.57	0.00	330.00	SDF Residential Areas	Rural		Upington	RES	0	STEP	5	0	35.00
5.00	16.40	5.47	21.87	0.00	55.00	SDF Cemeteries	Parks		Upington	POS	1	S-CURVE	5	0	6.00
0.00	0.00	0.00	0.00	0.00	0.00	x SDF Authority Areas	None		Upington	NONE	0	STEP	5	0	0.00
15.00	16.20	5.40	21.60	0.00	405.00	SDF Residential Areas	Rural		Upington	RES	1	S-CURVE	5	0	43.00
45.00	15.75	5.25	21.00	0.00	270.00	SDF Farmsteads & Outbuildings	Rural		Upington	FARM	1	S-CURVE	5	0	23.00
80.00	112.54	37.51	150.05	0.00	3,040.00	SDF Mixed Use Development Areas	Rural		Upington	BCI	3	S-CURVE	5	0	317.00
115.00	79.90	26.63	106.54	0.00	805.00	SDF Institutional Areas	Rural		Upington	OTHER	3	S-CURVE	5	0	75.00
0.00	0.00	0.00	0.00	0.00	0.00	SDF Intensive Agriculture	None		Upington	NONE	0	STEP	5	0	0.00
120.00	18.07	6.02	24.10	0.00	840.00	SDF Light Industry	Rural		Upington	BCI	1	S-CURVE	5	0	100.00
120.00	35.61	11.87	47.47	0.00	1,560.00	SDF Light Industry	Rural		Upington	BCI	1	S-CURVE	5	0	186.00
30.00	70.99	23.66	94.66	0.00	1,800.00	SDF Residential Areas	Rural		Upington	RES	2	S-CURVE	5	0	188.00

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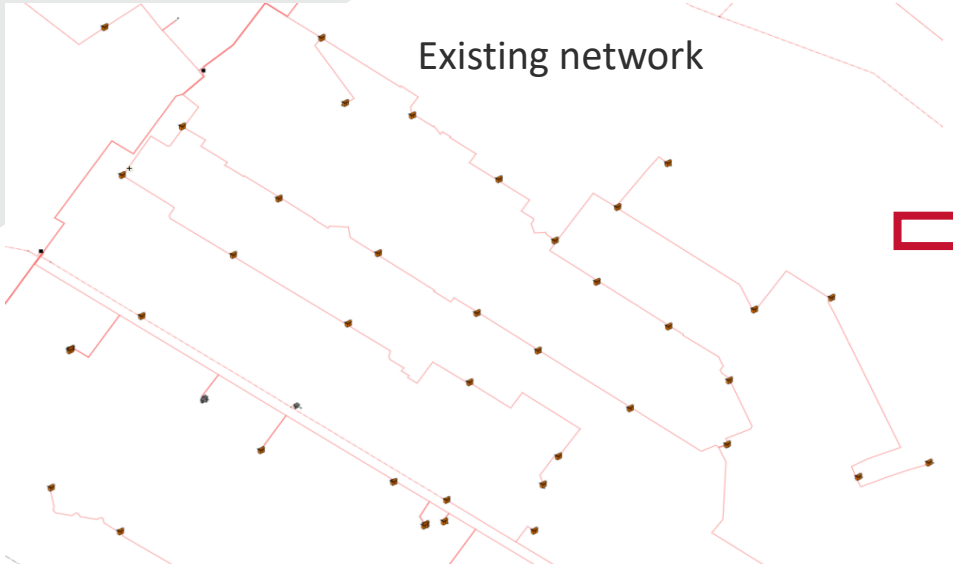
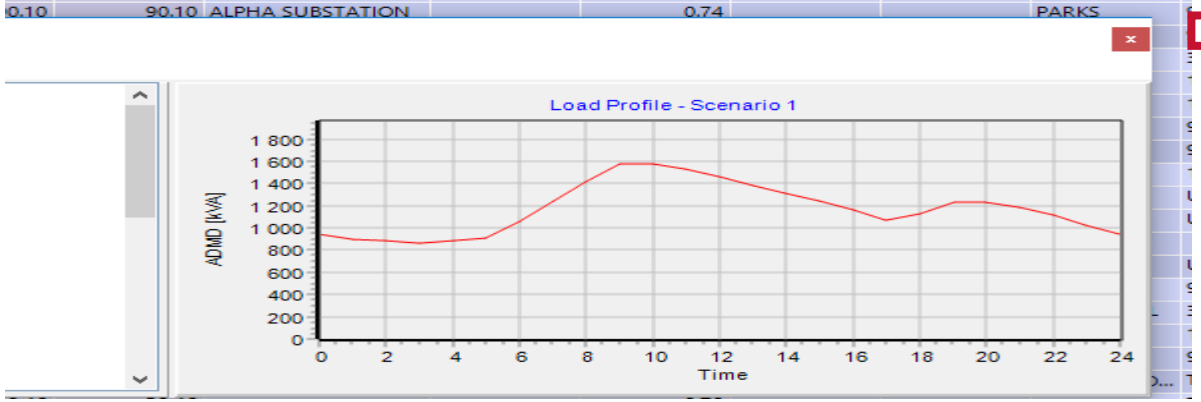
Load Forecasting & Future Network

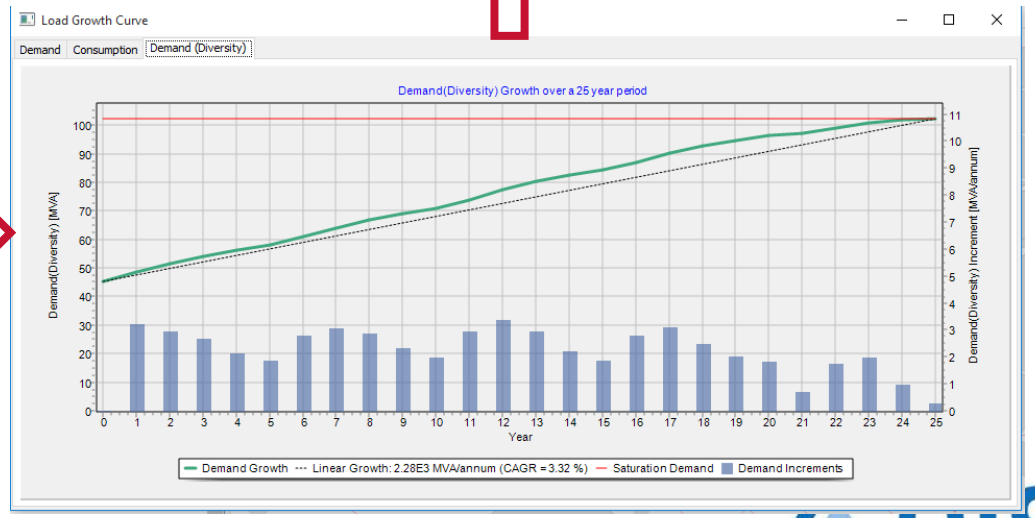
Existing network



Future (SDF overlay)

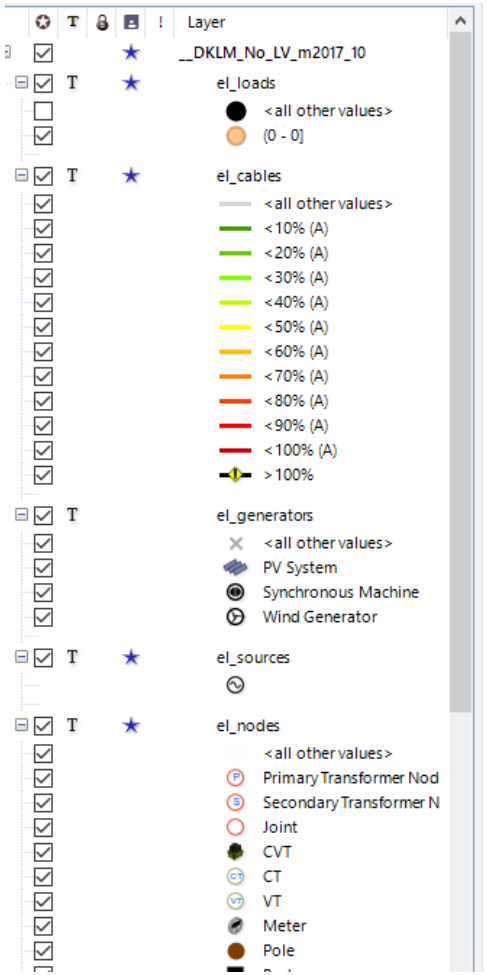
AADC Scenario5 [kWh]	Demand Zones	Future Demand Zones	Load Factor	Load Factor Category	Adjust Factor	Land Use Category
100.00	DELTA SUBSTATION		0.50			
395.30	ALPHA SUBSTATION		0.50			FARM_AH
254.06	ALPHA SUBSTATION		0.52			EDUCATION
90.10	ALPHA SUBSTATION		0.74			PARKS

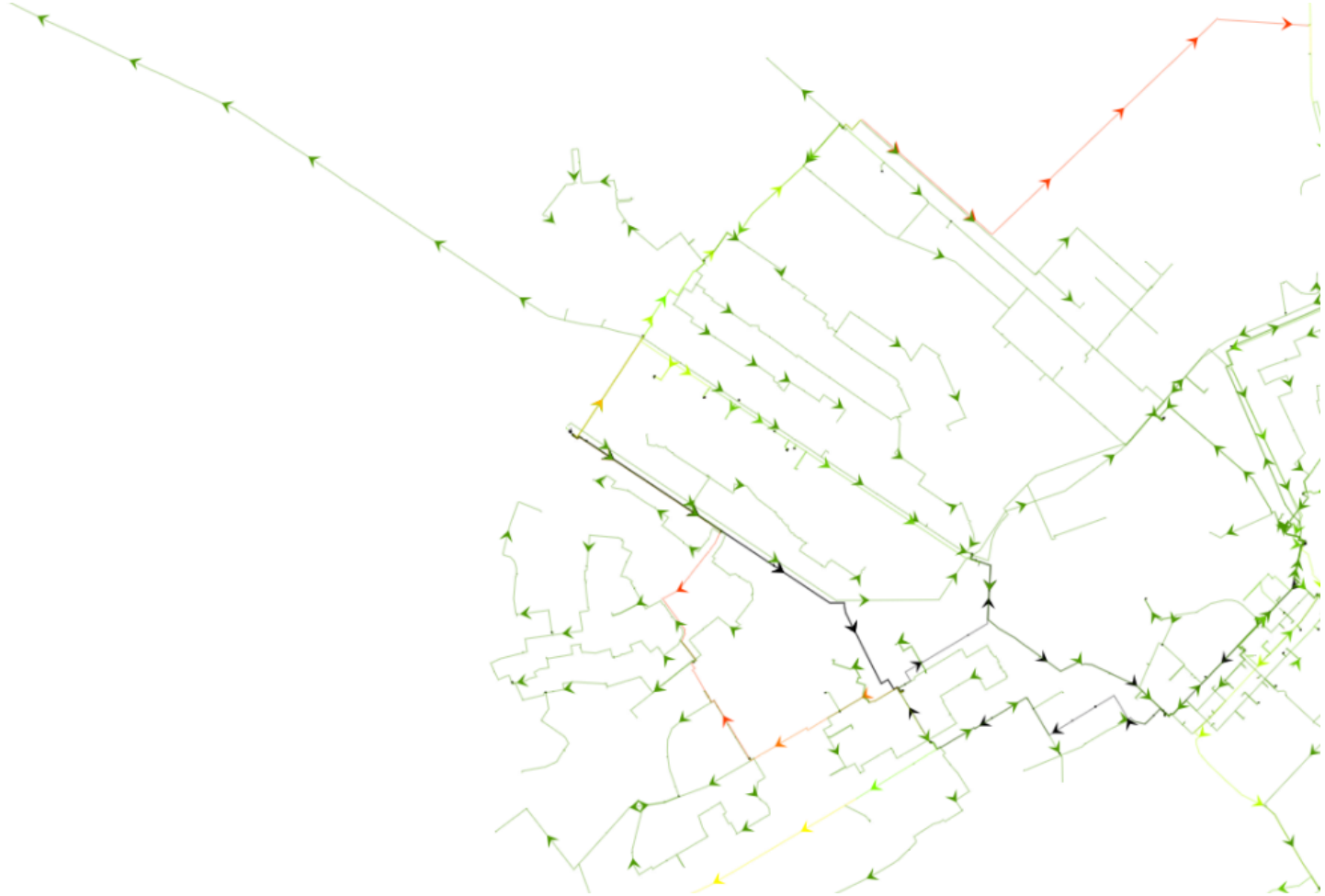




Analysis engines

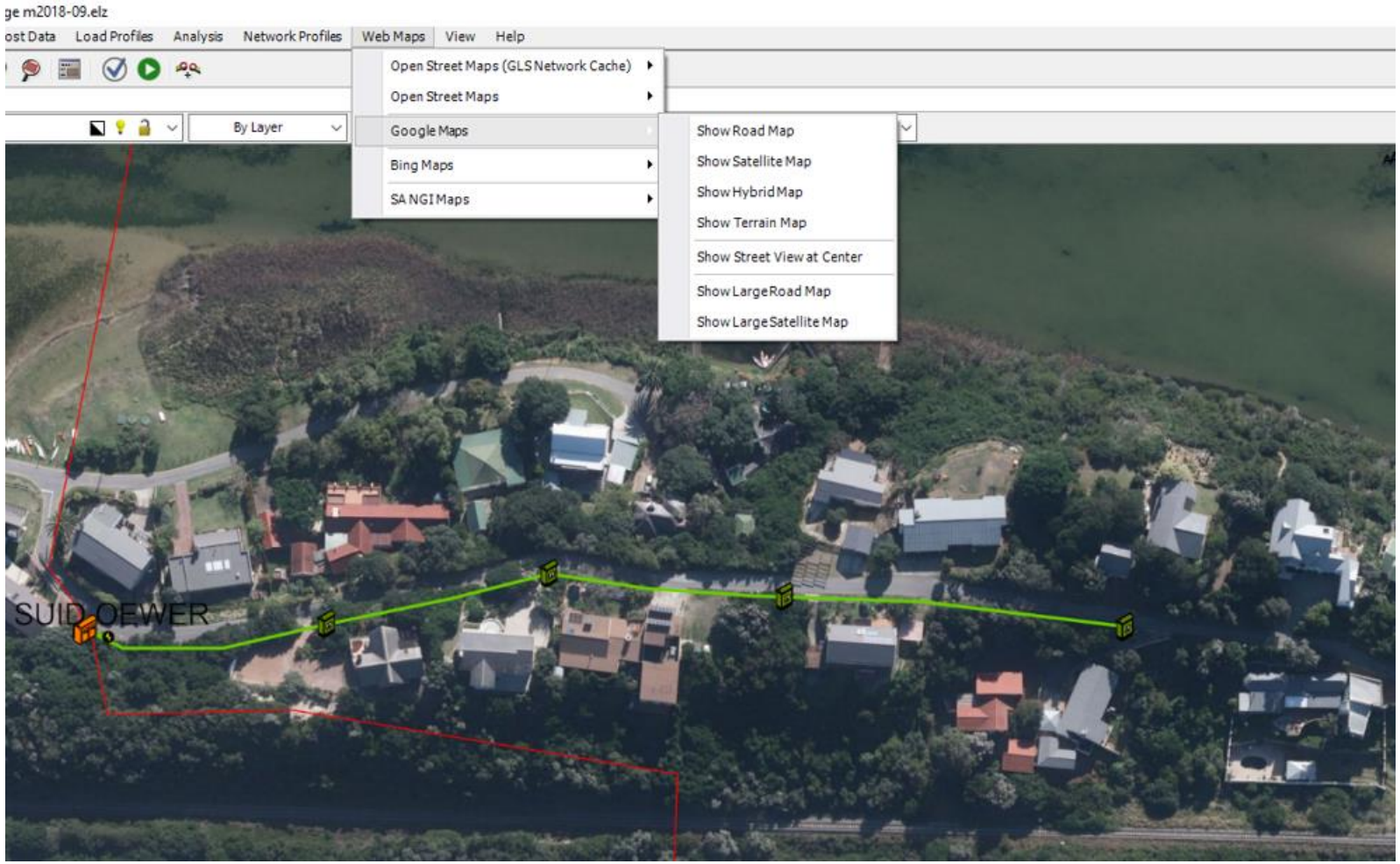
- EPRI's OpenDSS used for on-board load flow analysis
- Can run Reticmaster & Digsilent PowerFacotry in engine mode
- Fault simulations



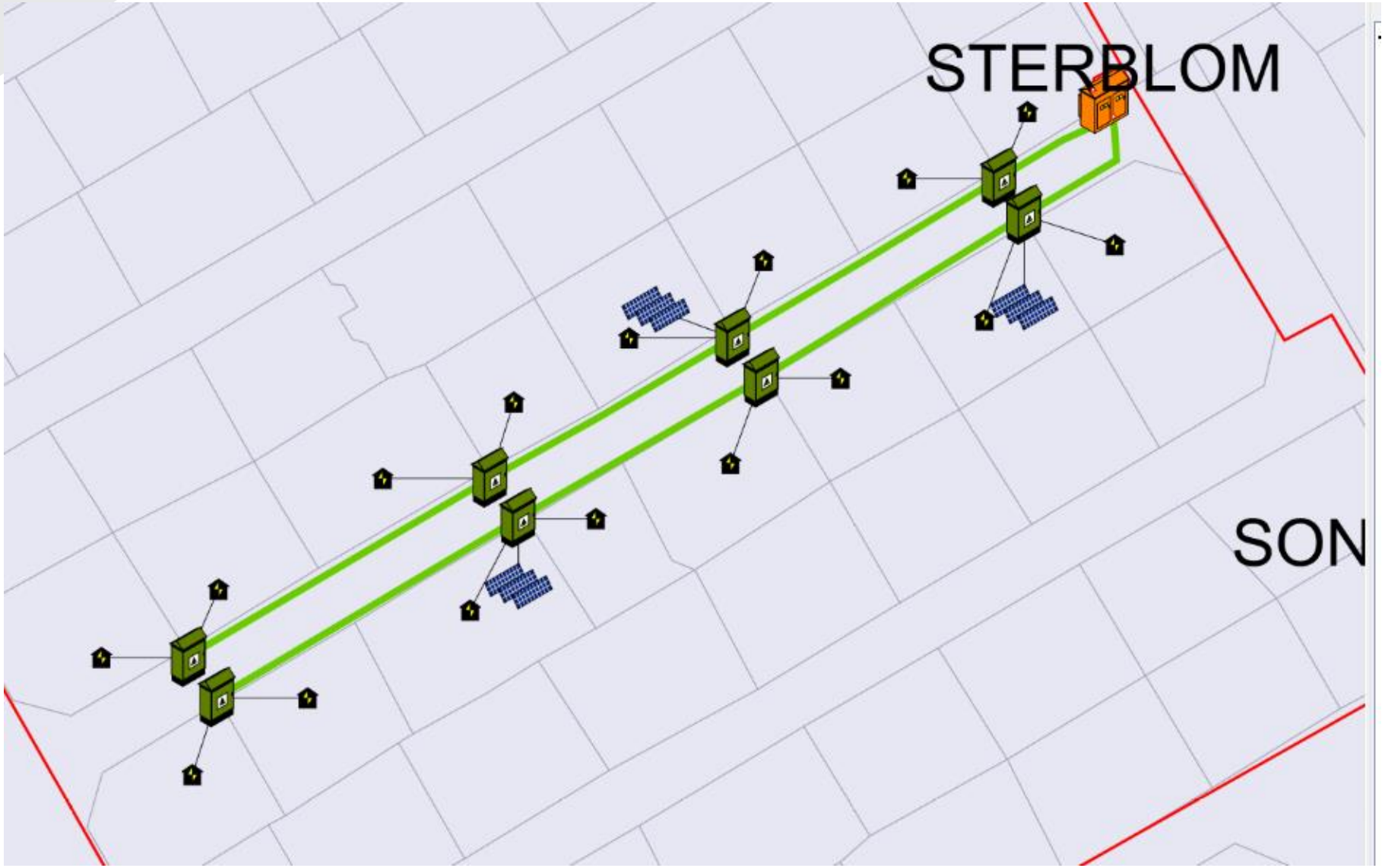


Easy Network Design

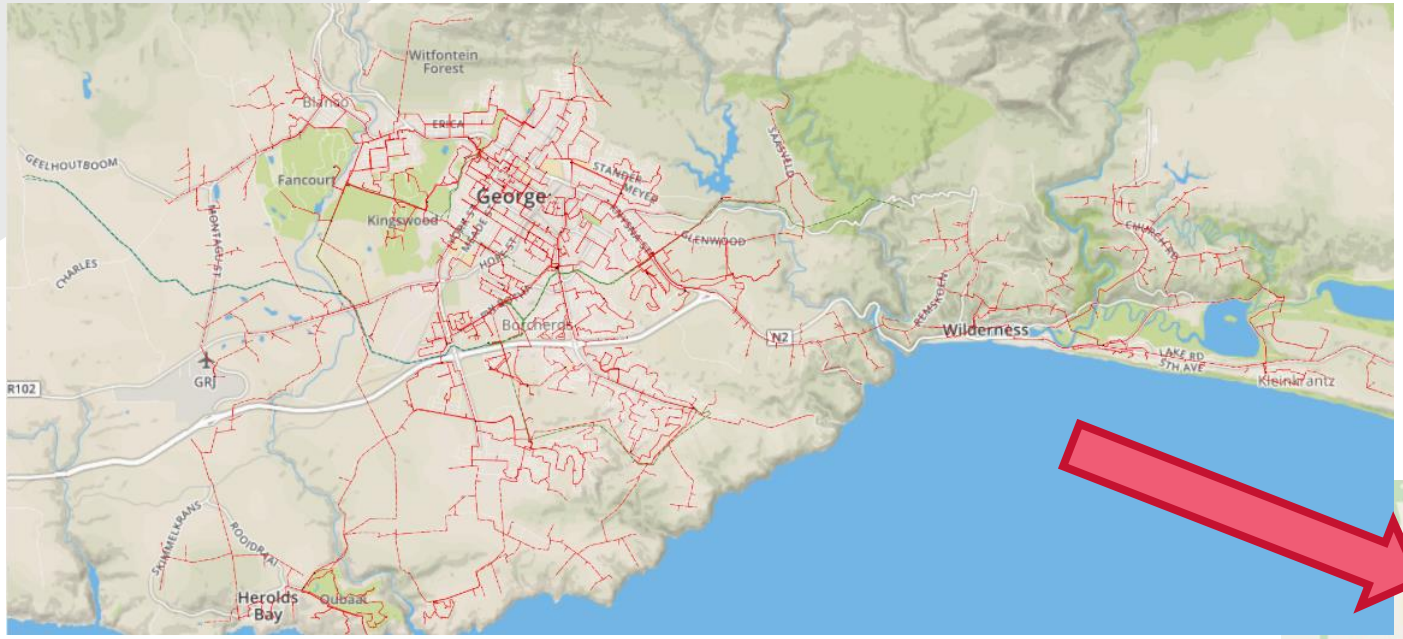
- Use of aerial photographs or
- Google Maps, OpenStreet View maps online

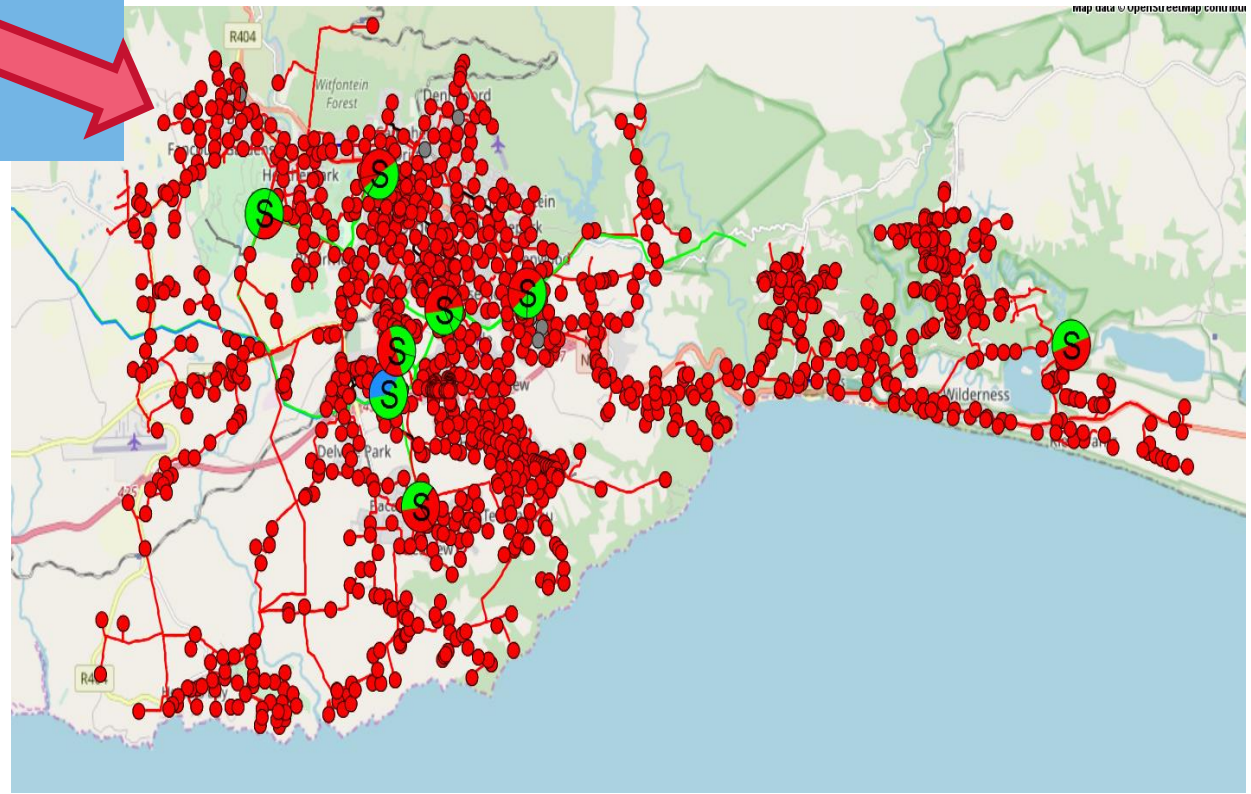


Renewable energy modelling down to LV network



PowerFactory Model Expert





- Run loadflow in Edisan or
- Export to PowerFactory and run loadflows there
- Loadprofiles with growth exported with it

Asset Information & Data Integrity

- Store asset information such as asset condition scores, criticality etc.
- Replacement values
- Where did we source data from?

AM Condition Grading	AM Condition Grading Confidence	AM Criticality Confidence Grading	AM Criticality Grading	AM RUL	AM RUL(scaled)	AM Utilisation Confidence Grading	
2	5	3	4	20	20	2	3
2	5	3	4	7	7	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	7	7	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	7	7	2	3
2	5	3	4	7	7	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3
2	5	3	4	20	20	2	3

Locality Integrity	Specification Integrity	Phase Connection Integrity	Year	Year Integrity	Drawing No	ID
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	6C502A7
GIS	SLD	OPS	1,975	EST	CAD 132KV SLD AMEND 15.pd...	6C502A7
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	6C502A8
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	6C502A8
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	6C502A8
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	6C502A8
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	6C502A8
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	6C502A9
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	6C502A9
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	6C502A9
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	6C502A9
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	6C502A9
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	6C502AF
GIS	SCH	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	B3CF08A
GIS	SCH	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	B3CF08A
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	830770A
GIS	SLD	OPS	1,988	EST	CAD 132KV SLD AMEND 15.pd...	A53DA8
EST	EST	OPS	1,975	EST		CA1A85
EST	EST	OPS	1,988	EST		F8C9536
EST	EST	OPS	1,988	EST		F8C9536
EST	EST	OPS	1,975	EST		15DD48
EST	EST	OPS	1,975	EST		15DD48
EST	EST	OPS	1,988	EST		BF5B4B8
EST	EST	OPS	1,988	EST		BF5B4B8
EST	EST	OPS	1,988	EST		FB28D17
EST	EST	OPS	1,988	EST		024F87E
EST	EST	OPS	1,988	EST		024F87E
EST	EST	OPS	1,988	EST		024F87E
EST	EST	OPS	1,988	EST		0A95B9E

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The Process

1. Data Collection
- Electrical
- Spatial
- Demand

2. **Analyse Current Electricity Consumption and demands**
- Ingest billing data
- Calculate statistics
- Aggregate by land-use etc.
- Balance with sources

3. **Model existing network**
- Spatial topology
- Electrical Topology
- Demand distribution
- Calibrate demand

5. Set up plan books in GIS

4. **Assign loads to electrical model**
- Assign loads to distribution zones
- Assign loads (ADMDs and load shapes) to applicable network level

6. **Agree on Evaluation Criteria and Unit Rates**
- Thermal loading
- Fault currents
- Voltage standards
- Contingency Requirements (scenario analysis)

7. **Evaluate existing network**
- Thermal loading
- Fault currents
- Voltage standards
- Contingency Requirements (scenario analysis)

8. Do Demand Forecast
- Align to SDF
- Workshop / review with town planners and electrical department
- Choose level of electricity demand forecast
- Develop scenarios

9. Future network models and master plan
- Develop distribution network model in line with SDF and demand forecast - spatial, electrical
- Model/plan required expansion and strengthening to accommodate future developments
- Merge future designs with existing network model
- Finalise distribution zones design
- Label all master plan items and compile master plan table with implementation years and cost estimates
- Produce master plan report

Adobe Acrobat Document

Adobe Acrobat Document

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IMQS

- Web viewer of master data set
- Link all technical models to asset register, maintenance management & project control


Assets


Electricity

Electricity Demand


Maintenance Management


PCS


Roads


Sewer


Sewer PRP


Stormwater


Water

Water Demand


Water PRP

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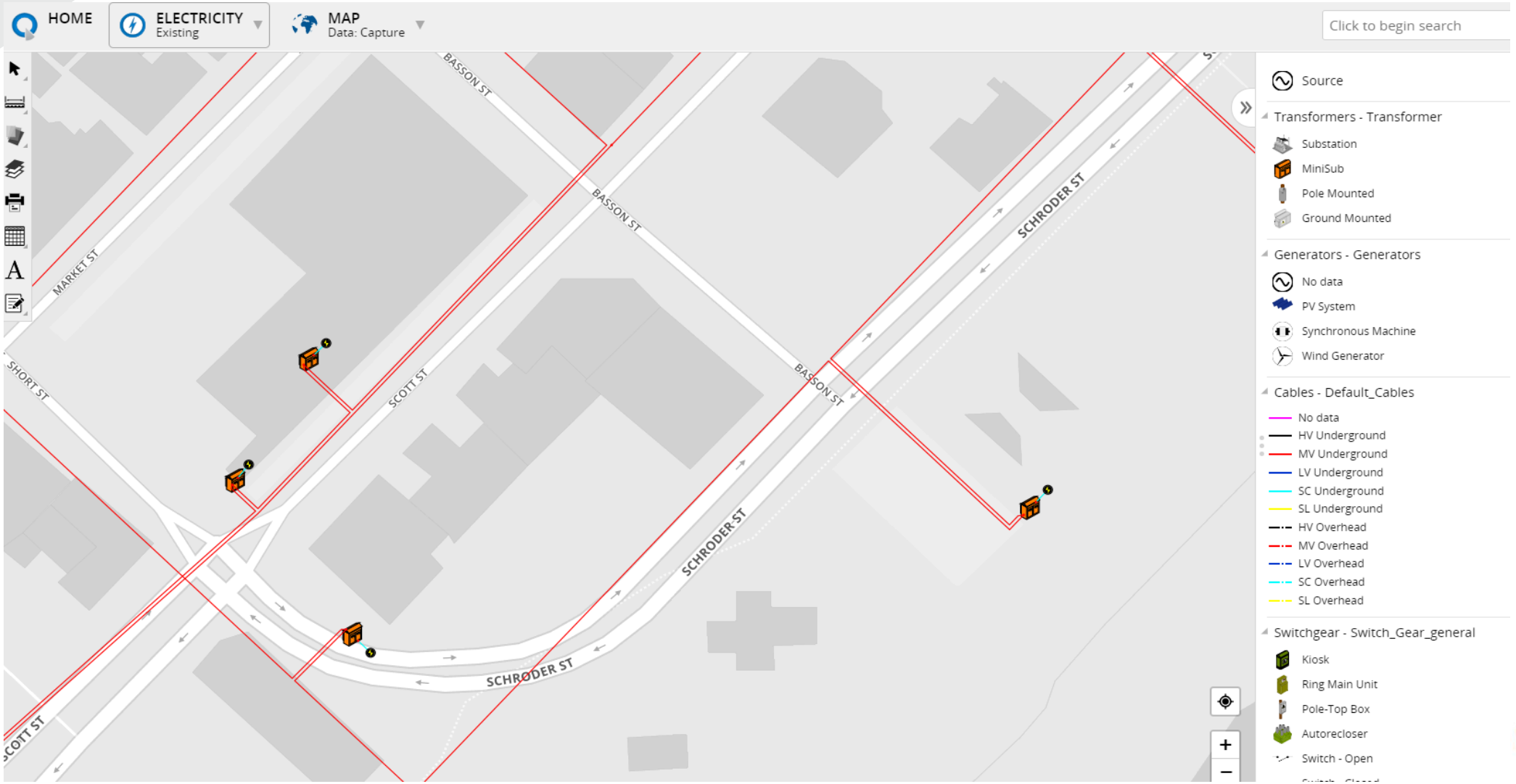
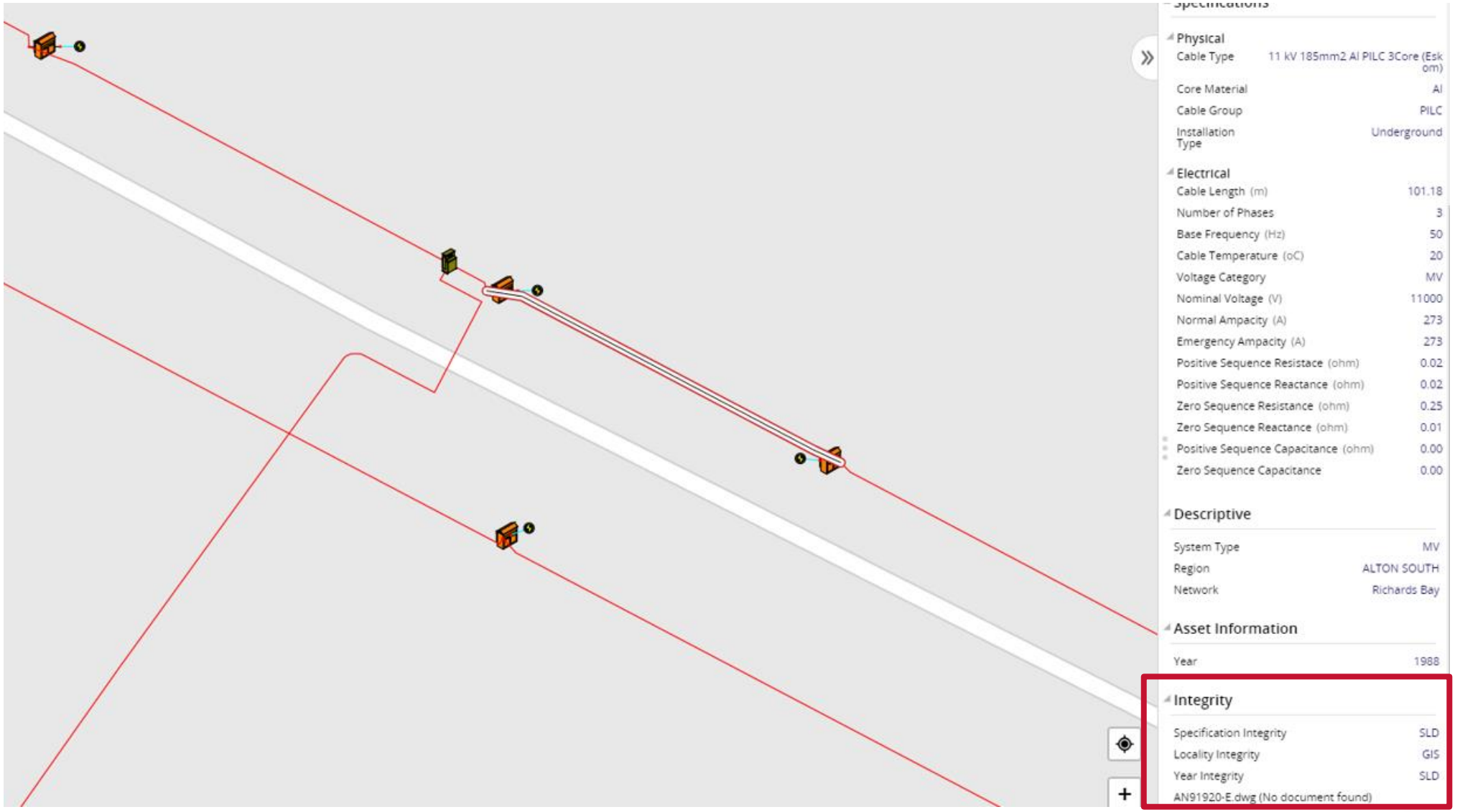
IMQS

- Electricity Module on IMQS8
- Electricity Demand Module on IMQS8

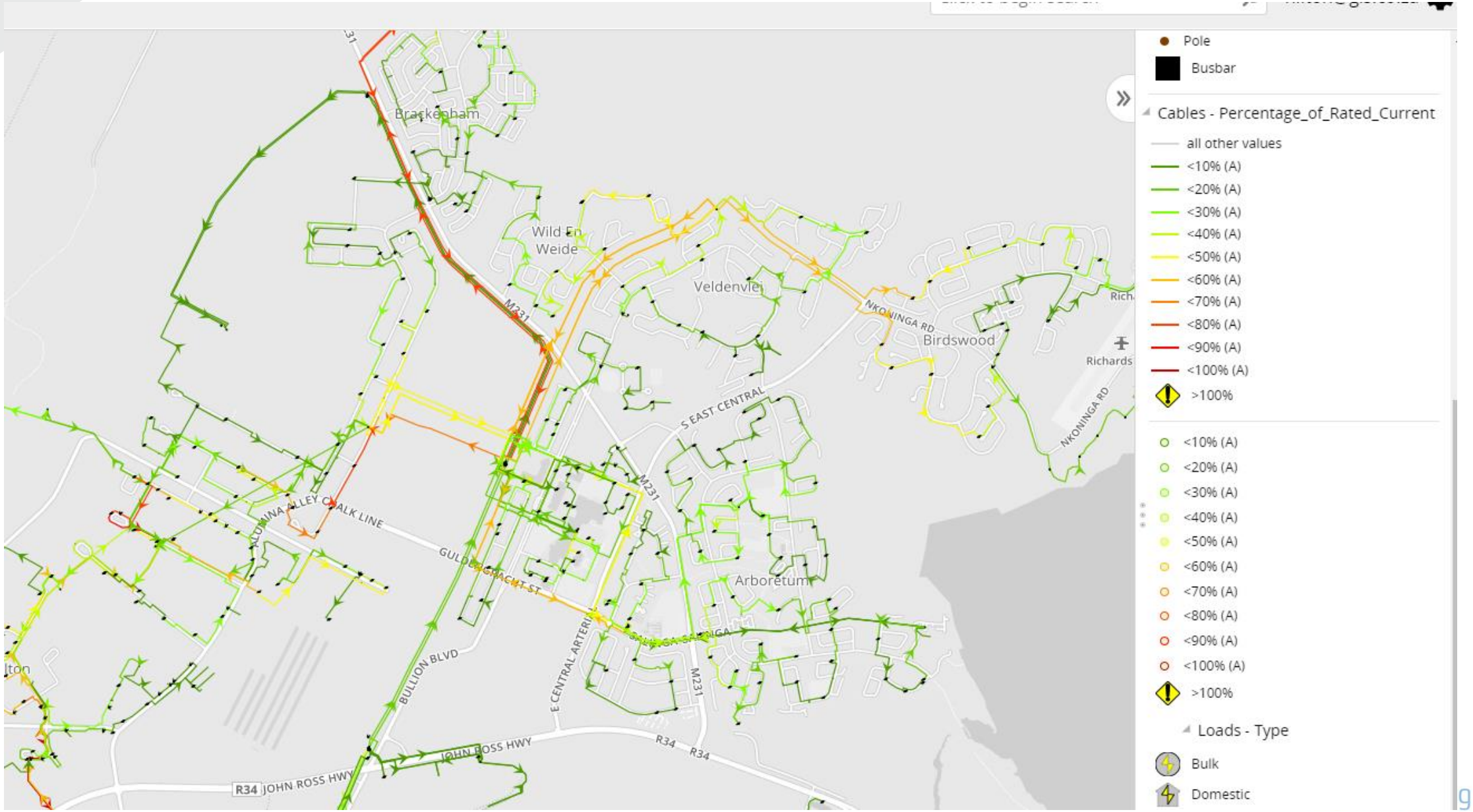


IMQS

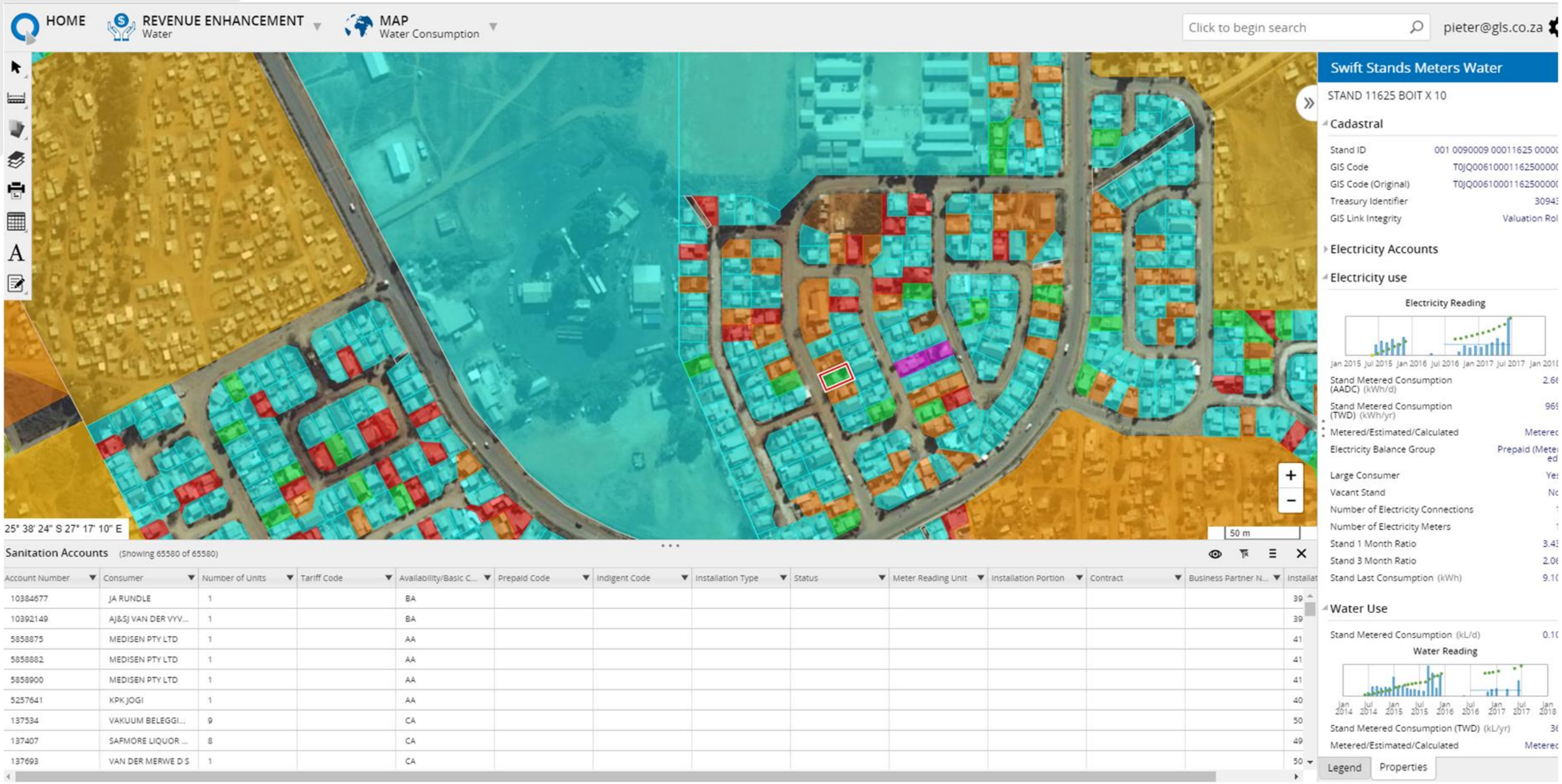
- View attributes
- Data integrity



IMQS


Pole
Busbar
Cables - Percentage_of_Rated_Current
all other values
<10% (A)
<20% (A)
<30% (A)
<40% (A)
<50% (A)
<60% (A)
<70% (A)
<80% (A)
<90% (A)
<100% (A)
>100%
Loads - Type
Bulk
Domestic
Brackenham
Wild En Weide
Veldenvlei
Birdswood
Richards
Arboretum
M231
NKONINGA RD
S EAST CENTRAL
BULLION BLVD
E CENTRAL ARTERIAL
JOHN ROSS HWY
R34

IMQS – Revenue Enhancement



Master Model

System benefits

- Data centralization
- Link Masterplanning to Operational & Maintenance planning
- Granular load forecasting
- Own ADMDs
- Planning & design of electricity distribution networks
- Convert between GIS, CAD & Model spaces easily
- Publishing data to the IMQS Web platform or other MIS
- Electricity Infrastructure Asset Management (with IMQS)
- Model maintenance to ensure current information
- Ad hoc queries and analysis
- Embedded generation impact analysis
- Full distribution models in Digsilent PowerFactory format
- Design of LV networks using Reticmaster as engine or our onboard Herman Beta engine

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Development Roadmap

- Interface with Telemetry/IoT Data (both Desktop and IMQS)
- 'What if' scenario analysis for load forecasting
  - SSEG penetration
  - Energy efficiency impacts
  - Economic growth impacts
  - Weather
- Full annual load profiles per load
- Historical load trend analysis & fitting
- Auto calibration of load profiles according to known metrics such as
  - MV/LV transformer size
  - kWh usage
  - Max kVA
  - Actual load data from Scada or smart meters
- Replacement Prioritization/Refurbishment plan
  - Use asset health information to list refurbishment projects in priority order
  - Substations, transformers, cables

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