



## Virtual World Asset Management

# The world is changing faster than ever before.

The world's infrastructure and energy

sources need to adapt to face the

#### Utilities are Looking to Solve BIG Problems

Ensure Reliability, Safety, Reduce Wildfires, Storms, Floods, Regulations, Compliance, Risk Mitigation and Digital Transformation

MOST POPULAR

By Fusiets Martin

Helping To Close The Ocean Data Gap

Ridge Mangeures With Incesuit

upro's Webspersphic Training

#### REDUCING POWER LINE ASSOCIATED WILDFIRE RISKS

#### REDUCING POWER LINE ASSOCIATED WILDFIRE RISKS

Technology and Innovation | 21 June 2018 | By Fugro Media

Managing and maintaining power infrastructure networks is becoming increasingly demanding for utility providers with extreme weather events, such as prolonged doughts, presenting a complexe set of challenges. Fugro's expertise in asset management and innovation has combined to create a unique and comprehensive digital solution to nature's problems.

The challenge of host to manage and marshin critical power influstitucture networks is central both to utilities and the communities they serve. As power cables wind their way across utban and unal environments, hardner's myacit is not exercised just though weather events but in the less dramatic, but just as inventible, spread of natural vegetation.

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# Proven – Reliable – Sustainable – Defensible

Roames service combines innovative mapping techniques with cutting-edge data processing, data analytics and cloud computing capabilities to deliver an accurate and dynamic 4D virtual model of assets.

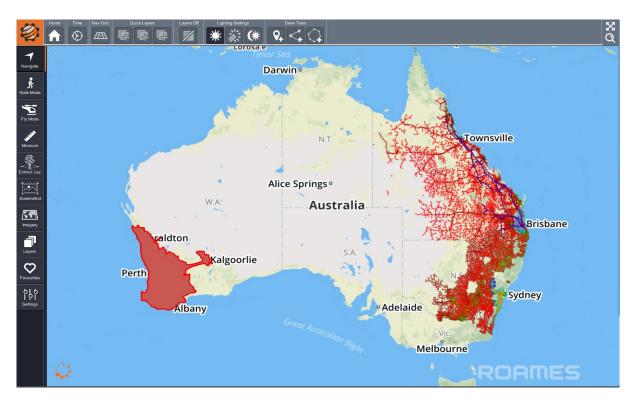




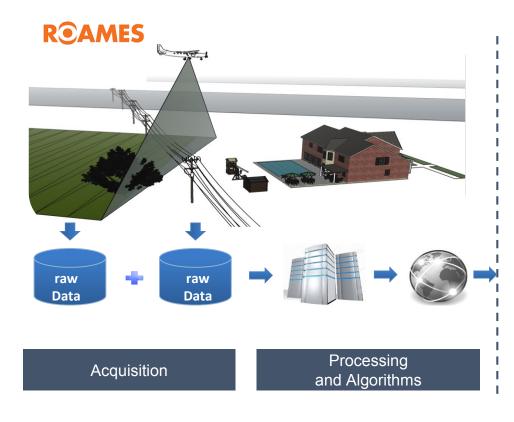
**Over 1.5 Million Networks Miles** 

## Built for a Utility by a Utility

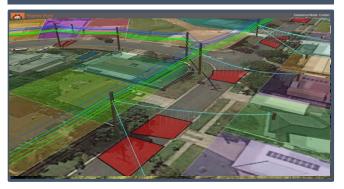
- Bush Fire
- Asset Management
- Vegetation Management
- Risk Management
- Asset Condition
- Tree Specie Solutions
- Disaster Management

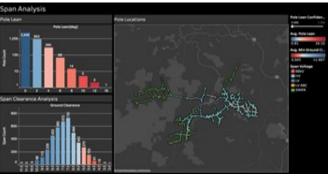


### 4D Virtual World Asset Management – Digital Utility



#### Asset Analytics and Visualization



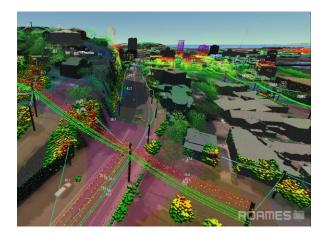


## Asset Matching

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Substation(s	Circuit Id	Captured Date	Pole Height (m)	Pole Lean	Confidence	Pole Voltages	Pole Confidence	Depot	Pole ENID	Confidence	Match Distance (m)	Material	Category	Condition Task	Description	
7 8 Uanbedrog	* * MW84102	15-7-2015	8.13	-		LV ABC	0.93	* North Wales	81172027	0.983	5.24	Wood	0.10	¥		
9 Llanbedrog	MW84101	10-7-2015	9,18			LV		North Wales	81165363	0,999		Wood				
10 Llanbedrog	MW84102	10-7-2015	9,39	0,67	0,99	LV ABC	1	North Wales	81145122	0,997	0,99	Wood				
11 Uanbedrog	MW84103	10-7-2015	8,32			LV ABC		North Wales	81144118	0,999		Wood				
12 Llanbedrog	MW84103	10-7-2015	8,47	3,35	1	LV	1	North Wales	81144115	1		Wood				
13 Llanbedrog 14 Llanbedrog	MW84101 MW84101	10-7-2015	8.73	0,55	0.00	LV ABC		North Wales North Wales	81133467 81133464	0,995		Wood				
14 Uanbedrog 15 Uanbedrog	MW84101 MW84101	10-7-2015	8,75			LV ABC		North Wales	81133464 81133462	0,995		Wood				
16 Uanbedrog	MW84101	10-7-2015	8,7			LV ABC		North Wales	81133457	0,558		Wood				
17 Llanbedrog	MW84101	10-7-2015	8,99	1,76	1	LV ABC	1	North Wales	81133456	1	2,46	Wood				
18 Llanbedrog	MW84101	10-7-2015	8,61			LV ABC		North Wales	81133455	1		Wood				
19 Uanbedrog	MW84101	10-7-2015	8,68			LV ABC		North Wales	81133453	1		Wood				
20 Llanbedrog	MW84101	10-7-2015	8,78			LV ABC		North Wales	81133448	0,998		Wood				
21 Uanbedrog	MW84101	10-7-2015	9,16	0,16	1	LV ABC		North Wales North Wales	81109386 81109385			Wood				
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o		99				11kV		North Wales	81108315	0,989		Wood				
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TER A	1.100		The second			11kV		North Wales	81108243	0,998		Wood				
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### Risk Management



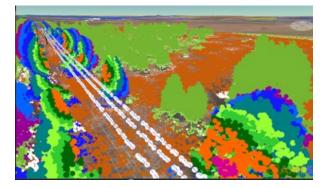
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Substation(s)	Circuit Id	Capture Status	Captured Date	Span Length	Pole A ENID	Pole B ENID	Span Id Span Voltag		Number of Conductors	Total Conductor Length	Intrusion Rating	Intrusion Volume
Llanbedrog	MW84101	Good	15-7-2015	42,74	12541358	12541359	5511335 LV ABC	6,5	1	42,74	0	
Llanbedrog	MW84101	Good	15-7-2015	48,17	81023785	\$1023786	5511352 LV ABC	6,8	1	48,44	37,57	23
Llanbedrog	MW84102	Good	10-7-2015	22,47		14856847	5511366 LV ABC	5,21			24,04	
Llanbedrog	MW84102	Good	15-7-2015	52,93		80123733	5511398 LV ABC	7,35			14,18	
Llanbedrog	MW84102	Good	15-7-2015	53,9		12538521	5511400 LV ABC	7,00			45,66	
Llanbedrog	MW84102	Good	15-7-2015	49,03		12538525	5511401 LV	6,00			38,07	
Llanbedrog	MW84102	Good	15-7-2015	40,23		12538524	5511402 LV ABC	6,45		40,63	0	
Janbedrog	MW84101	Good	10-7-2015	54,93		12538910	5511403 LV ABC	5.83		54,98	0	2
Janbedrog	MW84101	Good	10-7-2015	46,41		12541211	5511404 LV ABC	4,56	1		72,12	
Llanbedrog	MW84101	Good	10-7-2015	40,05		81021773	5511405 LV ABC	6,30			0	1
Llanbedrog	MW84102 MW84101	Good	15-7-2015	43,45		12538690	5511406 LV ABC 5511407 LV ABC	5,60		43,95	10.56	
Llanbedrog	MW84101 MW84102	Good	15-7-2015	40,97		12538690	5511408 LV ABC	5,73			10,56	
Llanbedrog	MW54102 MW54101	Good	10-7-2015	40,97		12541210	5511409 LV ABC	5,04			0	1
Uanbedrog	MW84101	Good	10-7-2015	38.3		12541210	5511410 LV ABC	6.5		40	38.22	
Uanbedrog	MW84102	Good	15-7-2015	50,99		12538714	5511411 LV ABC	5.7			00,22	1.5
Llanbedrog	MW84101	Good	10-7-2015	49.33		(\$2541218	5511412 LV ABC	7.21			10.56	
Llanbedrog	MW84101	Good	10-7-2015	43,81		12541237	5511414 LV ABC	5.64			36,61	
Llanbedrog	MW84101	Good	10-7-2015	36.1		12541217	5511415 LV ABC	7.15			0	1
Llanbedrog	MW84101	Good	10-7-2015	34,18		12541218	5511416 LV ABC	5,87		34,35	10,56	
Llanbedrog	MW84103	Good	10-7-2015	81,83	12536448		5511452 LV	5,25	2	165,04	87,9	26
		1	15-7-2015	72,54	12536541	81091947	5511453 LV ABC	5,18	1	72,52	27,19	
	11100	the second	10-7-2015	60,04	12536523	12536524	5511454 LV ABC	6,43	1	60,66	0	
					12536735	12536446	5511455 LV	5,98		120,95	13.2	4
		1-1 1-1	10-7-2015	60,36								
		and the	10-7-2015 10-7-2015	60,36		81091902	5511456 LV ABC	5,90	1		13,2	
					12536529			5,90 6 6,81	1			11

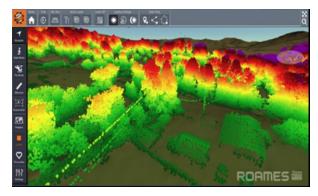




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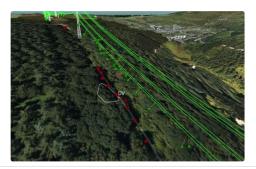
### **Vegetation Management**







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Substation(s)	Circuit Id	Capture Status	Closest Pole ENID	Closest Pole	Span Length Span V	oltage Intrusion Id	Voltage	Captured Date	Conductor 🗸	Distance .	Distance _	Centreline											
	MW84103 G	Good		3.18	16.56 LV	144846156	IV.	10-7-2015	6,14	-6.1	1.6	3.5											
		Sood		2,75	16,56 LV	144846152		10-7-2015	3,59	-1,9	3,1	3,2											
		Sood		0.2	16.56 LV	144846144		10-7-2015	6.52	-2.5	6.1	6.1											
1 Uanbedrog 1	MW84103 G	Sood		0.63	16,56 LV	144846143	LV	10-7-2015	7,55	-4.6	6.1	6,1											
		Sood		3.38	28.06 Service	144846141		10-7-2015	3,86	1.8	3,4	3.5											
3 Uanbedrog 1	MW84103 G	Sood	1253345	6.11	16,56 LV	144846140	LV	10-7-2015	4,84	-4,8	0.5	0,4											
4 Llanbedrog 1	MW84103 G	Sood		6,12	28,06 Service	144846138	Service	10-7-2015	2,21	0,6	2,1	2											
5 Llanbedrog 1	MW84103 G	Sood	1253345	3 2,28	16,56 LV	144846137	LV	10-7-2015	2,9	-2,8	0,8	0,6											
		Sood	1253653		28,06 Service	144846136	Service	10-7-2015	4,21	-3,9	0,8	2,5											
7 Uanbedrog 1	MW84103 G	Sood	1253653	6 0,64	28,06 Service	144846131	Service	10-7-2015	1,35	-1,4	0,1	0,1											
		Sood	1253349		7,98 Service	144846123	Service	10-7-2015	5,03	-1,3	4,9	5,1											
		Sood		2,18	7,98 Service	144846118		10-7-2015	3,5	0,4	2,7	3,6											
		Good	1253349		7,98 Service	144846115		10-7-2015	5,1	-5,1	1,6	2											
		Sood	1253656		23,08 LV	144846106		10-7-2015	2,14	0	2,2	2,1											
		Sood		10,79	23,08 LV	144846103		10-7-2015	3,89	-2,5	3	3											
		Sood		6,98	23,08 LV	144846101		10-7-2015	5,01	-4,2	2,7	2,9											
		Sood		10,89	31,63 Service	144846100		10-7-2015	5,15	-1,9	4,8	4,7											
		300d 300d		6,91	23,08 LV Q	144846099 144846097		10-7-2015	2,51	-0,3	0,2	7,7											
		sood Sood		2,3	17.11 Service	144846097		10-7-2015	2,51 2.61	-1.5	2.1	2,5											
6 Uanbedrog 1	10494102			5,24	23,08 LV	144846092		10-7-2015	2,01 R.4	-1,5	2,1	8,1											
6 Uanbedrog 1 7 Uanbedrog 1		head				144846090		10-7-2015	3,04	-3	0,6	0,5											
6 Uanbedrog 1 7 Uanbedrog 1 8 Uanbedrog 1	MW84103 G	Sood			14.97 Service																		
6 Uanbedrog 1 7 Uanbedrog 1 8 Uanbedrog 1 9 Uanbedrog 1	MW84103 G MW84103 G	Sood Sood Sood	8114411	6,4	14,97 Service 31.63 Service	144846088		10-7-2015	2.53	-2.6	0,6	0.1											
6 Uanbedrog 1 7 Uanbedrog 1 8 Uanbedrog 1 9 Uanbedrog 1 0 Uanbedrog 1	MW84103 G MW84103 G MW84103 G	Sood		6,4 5 13,84	31,63 Service		Service	10-7-2015	2,53	-2,6		0,1											
6 Uanbedrog 1 7 Uanbedrog 1 8 Uanbedrog 1 9 Uanbedrog 1 0 Uanbedrog 1 1 Uanbedrog 1	MW84103 G MW84103 G MW84103 G MW84103 G	Sood	8114411 1253656	6,4 5 13,84		144846088	Service LV				0,1												
6 Uanbedrog 1 7 Uanbedrog 1 8 Uanbedrog 1 9 Uanbedrog 1 0 Uanbedrog 1 1 Uanbedrog 1 2 Uanbedrog 1	MW84103 G MW84103 G MW84103 G MW84103 G MW84103 G	Sood Sood		6,4 5 13,84 8 1,33 4,14	31,63 Service 23,08 LV	144846088 144846087	Service LV Service	10-7-2015 10-7-2015	2,53	-2,6 -3,9	0,1	0,1											
6 Uanbedrog 1 27 Uanbedrog 1 28 Uanbedrog 1 29 Uanbedrog 1 20 Uanbedrog 1 11 Uanbedrog 1 21 Uanbedrog 1 31 Uanbedrog 1	MW84103 G MW84103 G MW84103 G MW84103 G MW84103 G MW84103 G	Seed Seed Seed Seed	1253656	6,4 5 13,84 8 1,33 4,14 2 10,93	31,63 Service 23,08 LV 14,97 Service	144846083 144846087 144846086	Service LV Service LV ABC	10-7-2015 10-7-2015 10-7-2015	2,53 3,88 4,1	-2,6 -3,9 -2,6	0,1 0,6 3,1	0,1 0,5 3											



Code	Classification Description		Red		
2	Ground		201	93	
5	Vegetation greater than 2 metres		118	181	
6	Vegetation ground to 2 metres		148	208	1
8	Model key points		201	93	
41	Unknown feature code		255	255	2
50	Offending vegetation class A1	Red	255	50	
51	Offending vegetation class A2	Dark Red	204	0	
52	Offending vegetation class A3	Violet	214	0	1
63	Offending vegetation class A4	Orange	255	102	
54	Class 1 - Vegetation beyond the minimum vegetation clearance by between 0 and 0.5m.	Dark Green	0	102	
55	Class 2 – Vegetation beyond the minimum vegetation clearance by between 0.5m and 1.0m.	Green	51	204	1
56	Class 3 – Vegetation beyond the minimum vegetation clearance by between 1.0m and 1.5m.	Light Green	163	255	1
67	Class 4 – Vegetation beyond the minimum vegetation clearance by between 1.5m and 2.5m.	Teal	0	128	1
58	Class 5 – Vegetation beyond the minimum vegetation clearance by between 2.5m and 3.5m.	Blue	25	25	2
59	Class 6 – Vegetation beyond the minimum vegetation clearance by between 3.5m and 4.5m.	Light Blue	0	102	2
60	Class 7 – Vegetation beyond the minimum vegetation clearance by between 4.5m and 5.5m.	Purple	153	0	1

#### **Asset Condition Assessment**



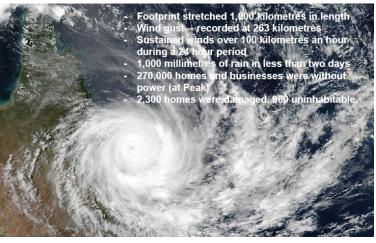
REVENDING MARKUP AND VALIDATE ALL COMPONENTS AND DEFECTS

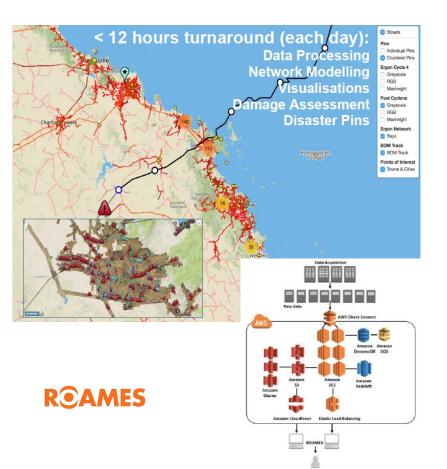
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+ Group Reports		-30.280019	152.669953	8987062	1539982	47312	*hyperlink(".1.:Aeria/%20PhotosiPole%20Topi8987082_approach.jpg ", "8987082_approach.jpg")		<pre>shyperlink("Aerial%20PhotosiPole%20To ", "8987062_depart.jpg")</pre>
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+ PoleTop Capture Reports for AIM Capture		-30,279115	152.668112	8987064	1539738	47310	+hyperlink("Vaerial%20PhotosiPole%20Topi8987064_approach.jpg ", "8987064_approach.jpg")		<pre>whyperlink(*.1. \Aerial%20PhotosiPtile%20To; *, "8987064_depart.jpg")</pre>
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#### **Disaster Management Solutions**

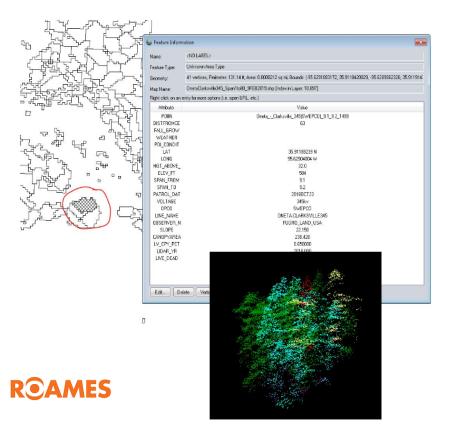
#### FUGRO'S ROAMES SOLUTION SUPPORTS ERGON ENERGY'S RESPONSE TO CYCLONE DEBBIE

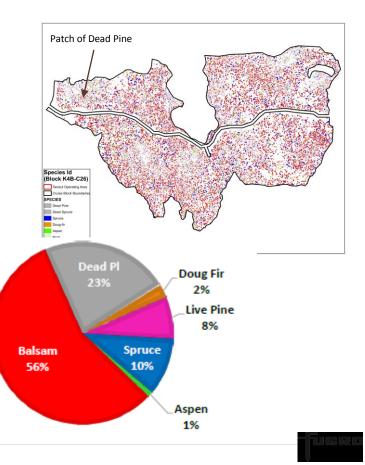
Soon after Tropical Cyclone Debbie struck Queensland, Australia, Fugro deployed its Roames solution to detect the damage to the electricity distribution network and support Ergon Energy's recovery efforts. Brisbane, Australia 07 Apr 2017





### **Tree Specie Solutions**





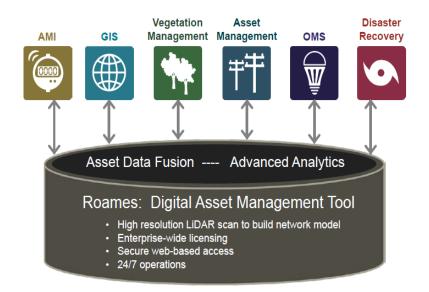
### Big Data and Predictive Analytics

Current	t Cycle All Cycles Nat	igation: O Intrusions	Bays				Default	- (	0	<b>T D (</b>	)											
Q Client -	VZ Program Type •	Region • Sub Region •	Depot • VZ No	VZ Name      Cycle N	io <del>~</del>																	
Select V	/egetation Zone /Z No	Z Name	Cycle No	Bio Region	VZ EQ Bay Count	VZ Capt Bay Count	V	Z Capt Pole Count	VZ C	aptured Network	K KDM											
			6	SOUTHEAST QLD	125	116	11		5.47		î											
		laglan allemondah, Clinton, New A	6	BRIGALOW BELT NORTH SOUTHEAST QLD	34 1776	38 1530	42	: 19	1.7 66.18													
		enaraby,Calliope,Mt Larco		BRIGALOW BELT SOUTH		1015		153	49.67													
		arwun	6	BRIGALOW BELT SOUTH	70	38	38		1.99		_											
		ladstone City	6	SOUTHEAST QLD	800	882		/96	30.42													
		lest Gladstone	6	SOUTHEAST QLD	1389	1334		163	51.52													
		th Gladstone,Barney Point,	6	SOUTHEAST QLD	1291	1384		516	52.87													
		in Kora, Telina, SunVly, Toolo		SOUTHEAST QLD	1502	-fucen	5	<b>D B</b>														
		ioyne Island	6	SOUTHEAST QLD	573					***	*										1	Matthew Cole
	/Z-1000393 T	annum Sands	6	SOUTHEAST QLD	791	Home	Files	Drive Repo	orts Insight	Assets	Data										4	
	/Z-1000394 A	gnes Waters, 1770, Lowmead	6	SOUTHEAST QLD	629	In state	~	Region	Туре						Heat Map				• 2	• 2		2
	/Z-1000399	firiam Vale, Bororen, Turkey	6	SOUTHEAST QLD	770	Insight	×	Central, M	* Rural	- Cur	rent Program		- ( <del>+</del> )		Scenario .						16	
		uilyan,Many Peaks	6	SOUTHEAST QLD	109											0		2	4	8	10	
		V201 Miriam Vale SWERs	6	SOUTHEAST QLD	957	search	Q)	Chart	Summary				difference in Cost : \$	-2,467,336	-			Chan of	2000			
-		L202 Mt Larcom SWERs		BRIGALOW BELT NORTH							Current Cost	Scenario Cost			+	9						
		P105/PC~CP105 Calliope PC		BRIGALOW BELT NORTH	1290	+ Network Maintenen		\$23,000,00							-		Hel and					
		V201/PC~MV201 Miriam V		SOUTHEAST QLD SOUTHEAST QLD	3197 717	+ Old		\$22,000,00	0					1		0.54			5			
		C108/PC-FC108 New Targ P103/PC-CP103 Beecher		SOUTHEAST QLD	258	+ Oid		\$21,000,00	0 //					12		12 1		Th	00.3			
_		C108 New Targinnie SWERs		SOUTHEAST QLD	258 288	+ Other		\$20,000,00								1		TORD	0			
		V202 Bororen SWERs	6	SOUTHEAST QLD	456			S \$19,000.00					/	/	and			A.				
		R108/PC-BR108 Benaraby	6	SOUTHEAST QLD	505	+ Vegetation			1									[1]2]	A CONTRACT			
		IS105/PC~GS105 South GI		SOUTHEAST QLD	406	- Applications		\$18,000,00	• /									Ne	Barrie			
0	C						_	\$17,000,00	0								Australia	- SW	5175			
Viewing 0	0 - 90 of 2,689 rows					VZ MST Optimisation VZ MS7 Optimisation Tool	=	\$16.000.00										- 14	ELC-C	ie .		
							_			FY 18/19	FY 19/20	FY 20/21	FY 21/22	FY 22/23								Leaflet
								Nameplate							Roan	nes Fli Sce	nario Progra	m				
								Vz No	VZ Name			Program	Region Customers	B. 0	ost LL	LL / km Gro	th Rate	Scenario Cycle	Scenario RBD	Scenario LL	Pred LL/KM	Status
								□ VZ-100078		ACCA SWER		Rural	Southern 63	516 5		0 Med			31/03/2021	7	0	-
								□ VZ-100079	0 013D-REDG	SUM SWER		Rural	Southern 68	368 1	8.071	0 Med	ium 6	0		0	0	
								VZ-100079	1 328~Wundar	u & SWERs		Rural	Central 755	1.540 1	09,139 20	0.1 Med	um 6	0	22/12/2020	184	0.2	
								□ VZ-1000793				Rural	Northern 215		40.093 3			10		52	0.2	
								□ VZ-1000795				Rural	Central 150		9.080 4					25	0.1	
								VZ-100079				Rural	Northern 56	264 6		0 Mec				6	0.1	
								VZ-100079			EK	Rural	Northern 57		8,046 6					27	0.1	
								□ VZ-100080				Rural	Northern 42		4,532 1					11	0	
								□ VZ-100080				Rural	Central 162		6,165 12					39	0.1	
								VZ-1000803				Rural	Central 505	1,290 1	58,516 3	0 Med	ium 6	10	20/08/2020	10	0	
AM								U VZ-1000805	5 2TT2.FC~TU	JLLY TOWN N	0.2	Rural	Northern 23	15 3	558	0 Med	ium 6	10	27/08/2020	0	0	
								□ VZ-1000806	KL-C-A-KL-C	C FDR COMP		Rural	Southern 3	16 3	468	0 Med	ium 3	16	24/11/2017	0	0	
								U VZ-100081	2TAR~Tarzal	i SWERs		Rural	Northern 201	504 4	6,235 3	0 Med	ium 4	8	24/12/2018	6	0.1	
																> Mar			24/07/2019	0	0.1	

#### **Realized Benefits**

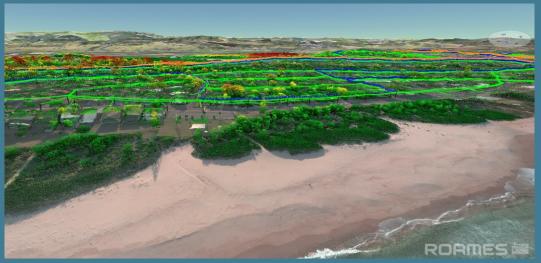
# ROAMES

- Increase Reliability
- Increase Safety
- Reduce Risks
- Reduce Costs
- Deliver at Scale
- Annual Audit of Network



#### Creates a Single Version of Truth for the Enterprise

# **QUESTIONS / DISCUSSION**



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