

# ENDANGERED WILDLIFE TRUST

## Wildlife and Energy interactions: A South African perspective -2



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STRATEGIC PARTNERSHIP



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9/12/2011 8:25 AM

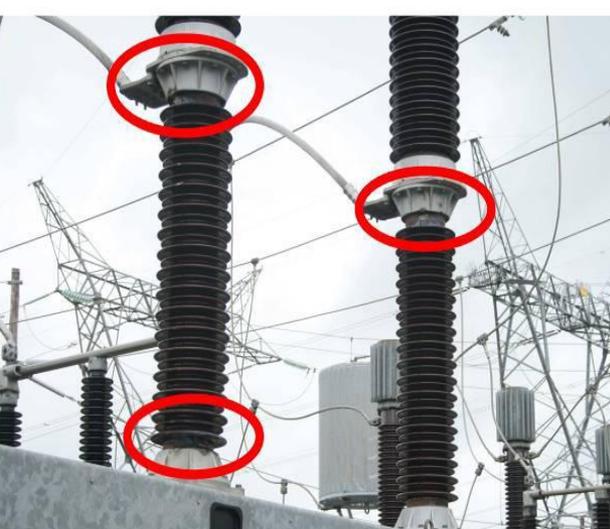






STRATEGIC PARTNERSHIP





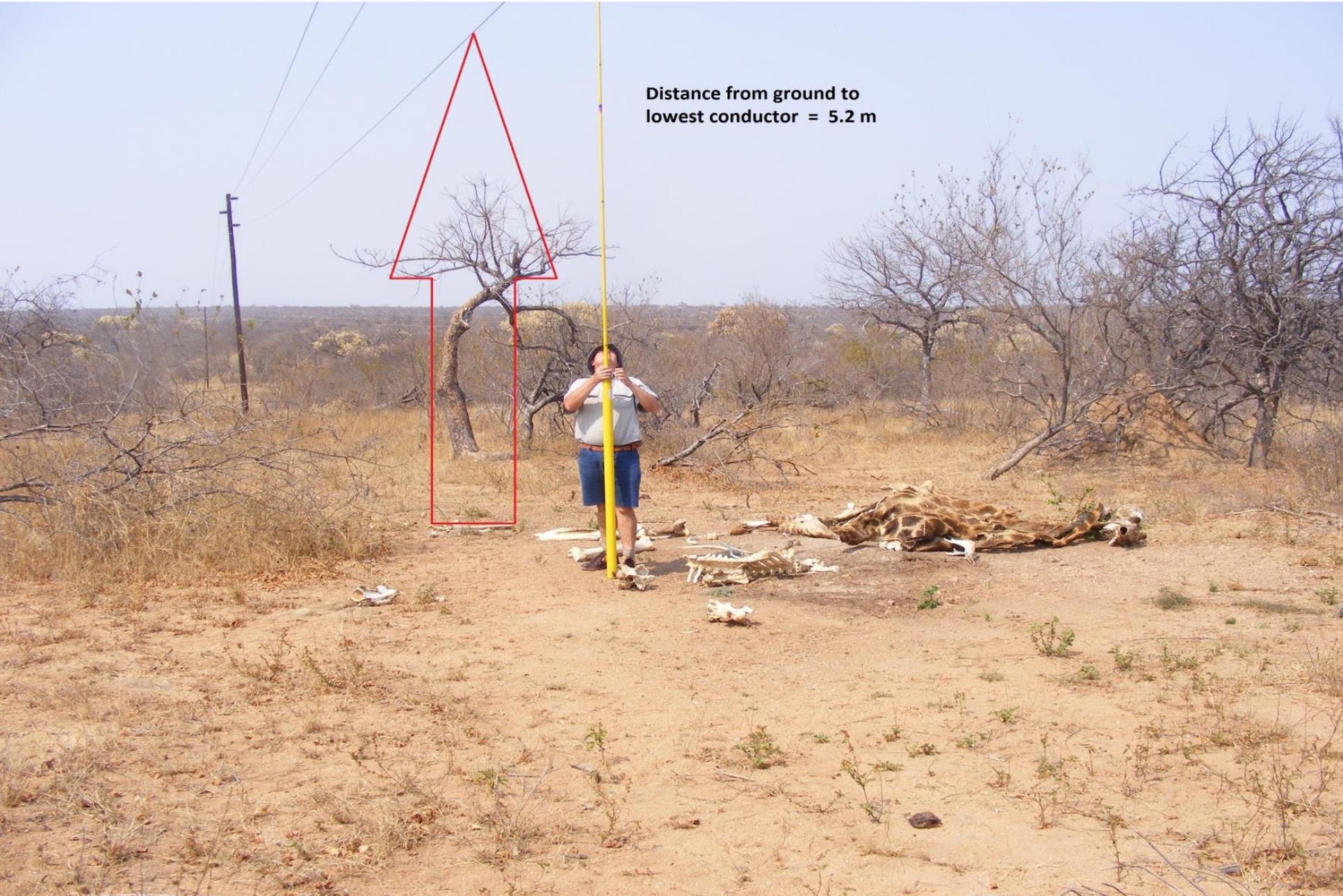




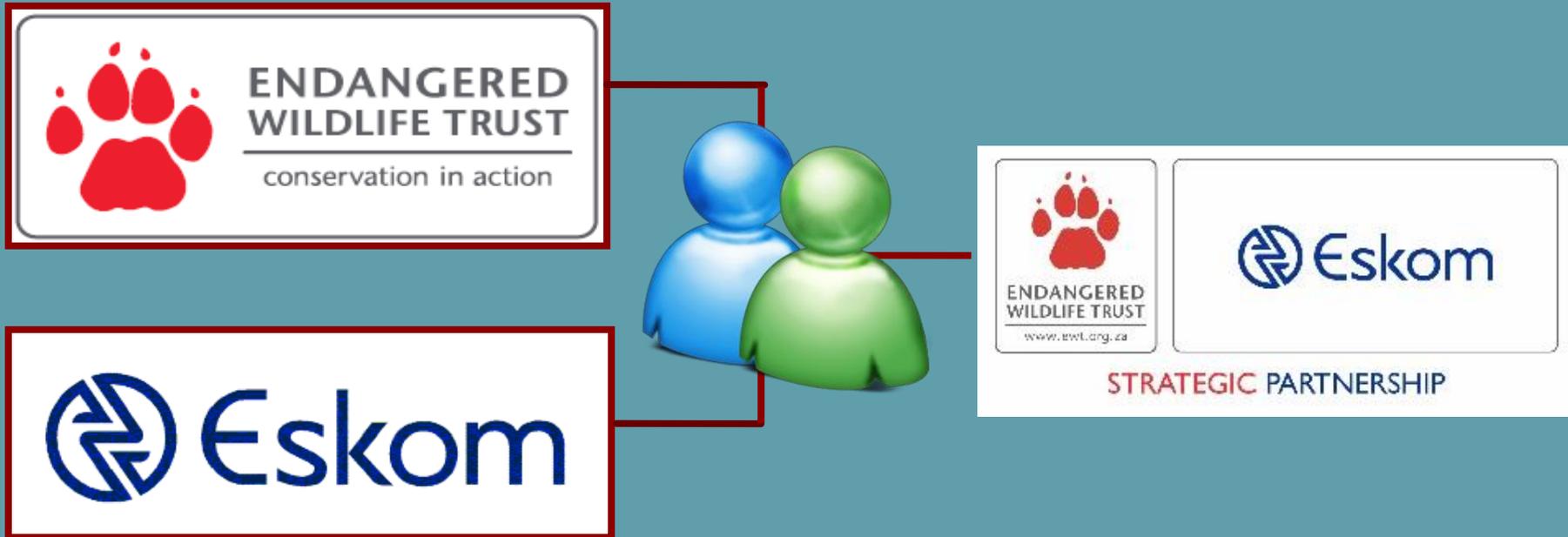
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**Distance from ground to  
lowest conductor = 5.2 m**



# Where it all began...



Unique partnership between conservationists & industry

Spirit of mutual trust and cooperation since 1996

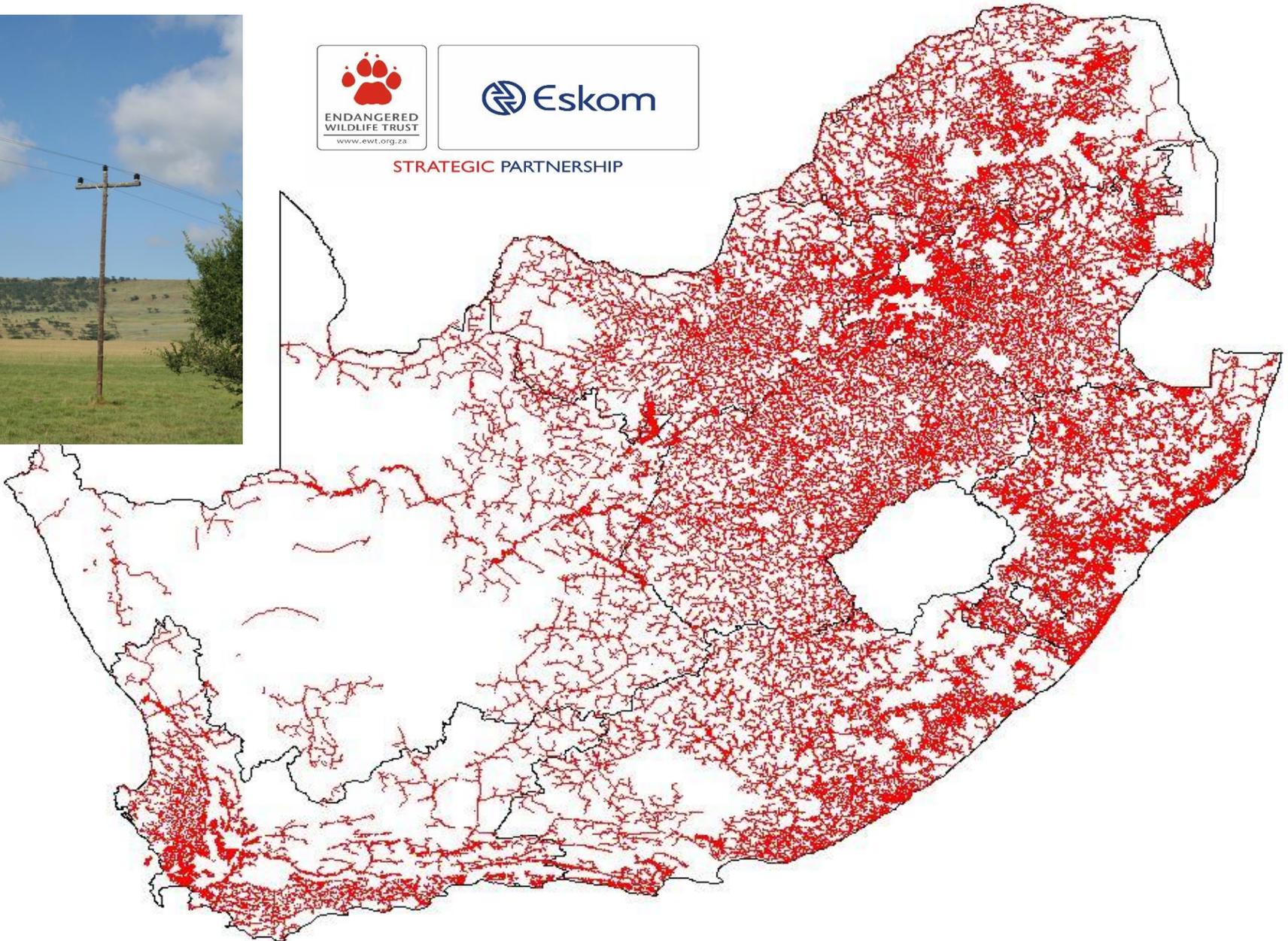
Integration of engineering & ornithological skills to develop & implement solutions



# Distribution Network



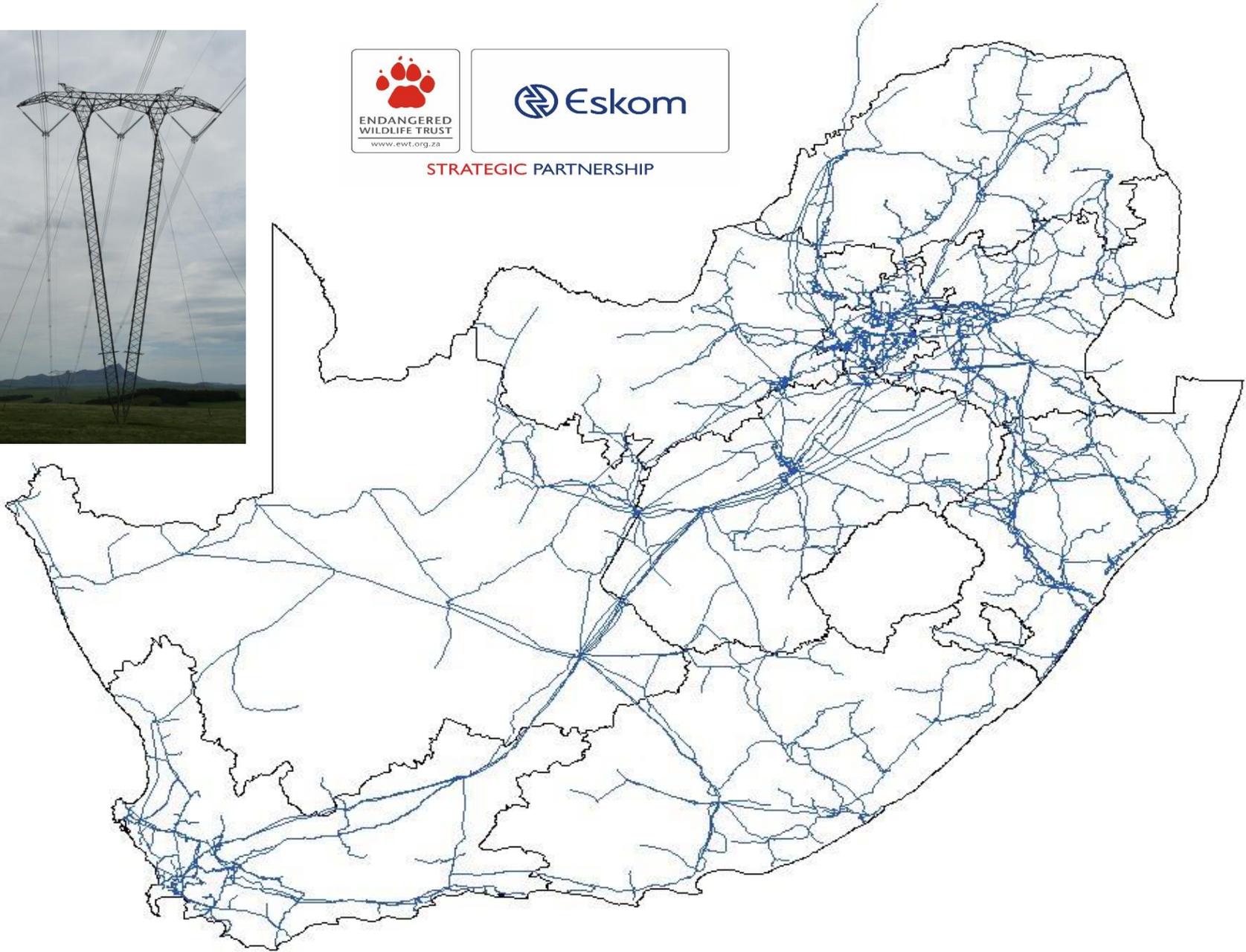
STRATEGIC PARTNERSHIP



# Transmission Network



STRATEGIC PARTNERSHIP





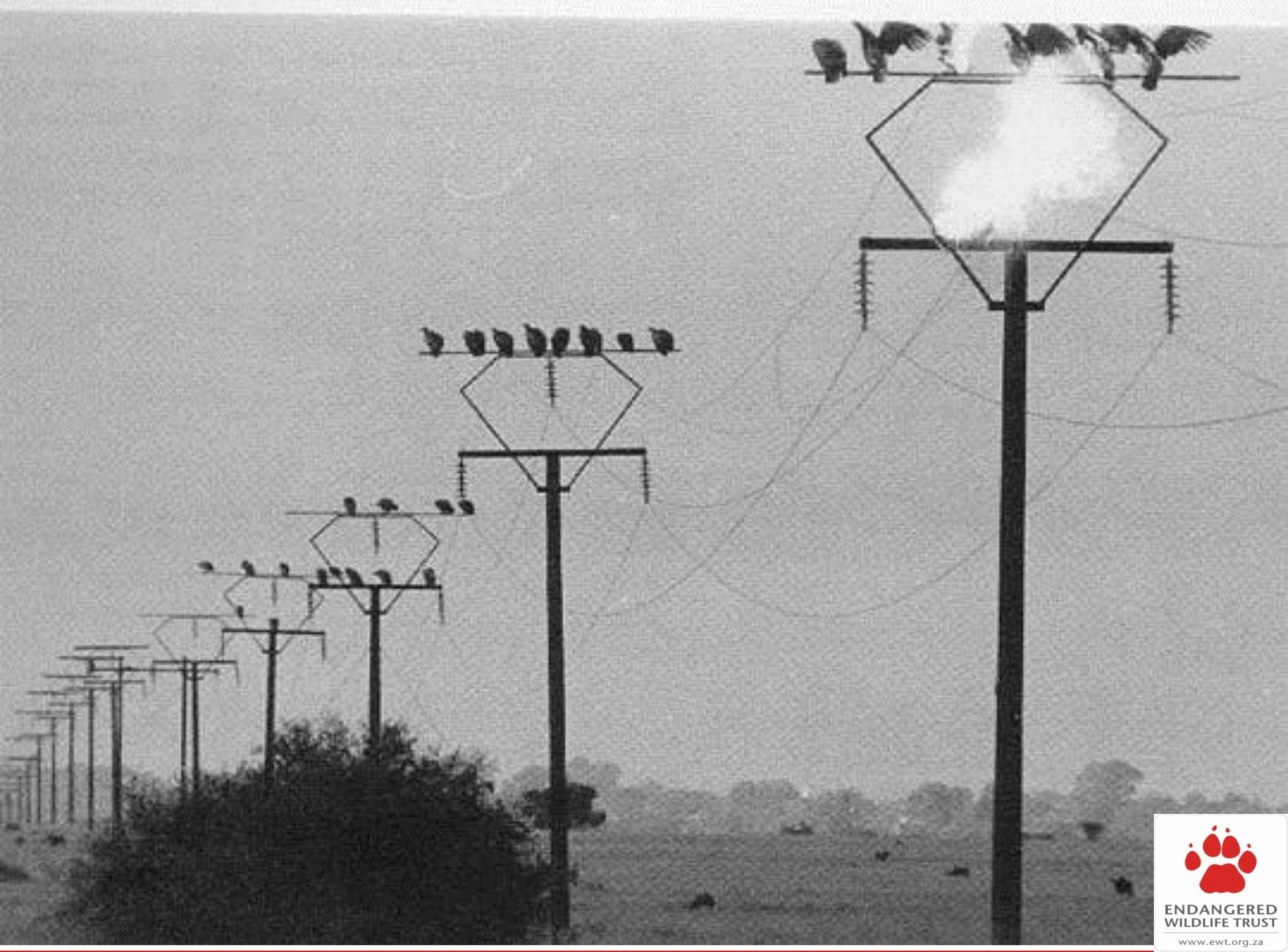
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# Central Incident Register



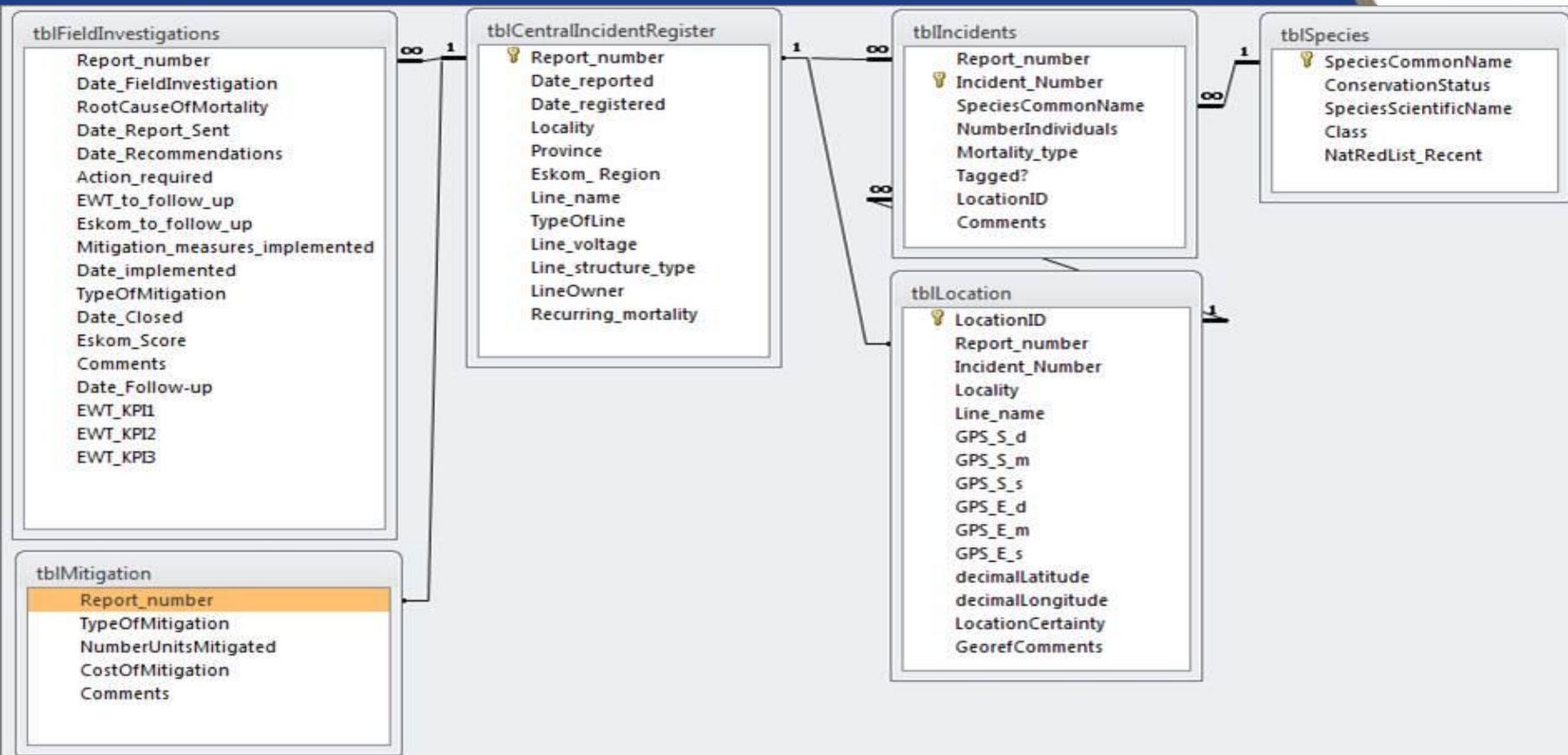
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[www.ewt.org](http://www.ewt.org)

# CIR Database



STRATEGIC PARTNERSHIP

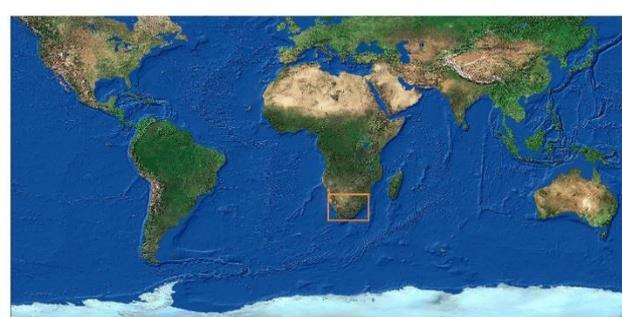


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In support of [www.ewt.org.za](http://www.ewt.org.za)

I'm part of the 49M Initiative!

REMEMBER YOUR POWER 49M

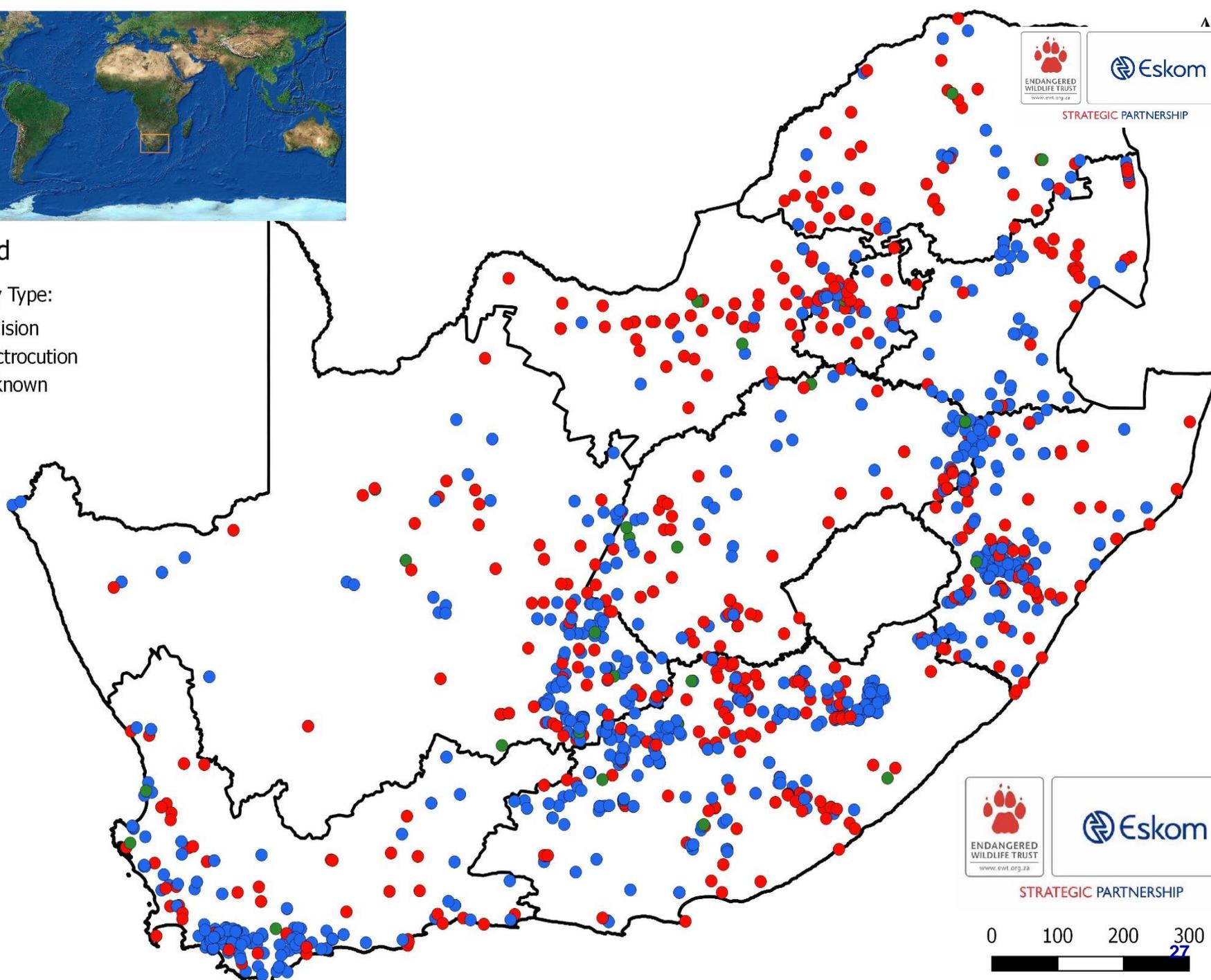


STRATEGIC PARTNERSHIP

## Legend

Mortality Type:

- Collision
- Electrocution
- Unknown



STRATEGIC PARTNERSHIP

0 100 200 300 km

# Top 10 Species

NUMBER

2000

1500

1000

500

0

-  Collision
-  Electrocutation
-  Unknown



Blue Crane

Cape Griffon

Ludwig's Bustard

White Stork

White-backed Vulture

Unknown

Grey Crowned Crane

Greater Flamingo

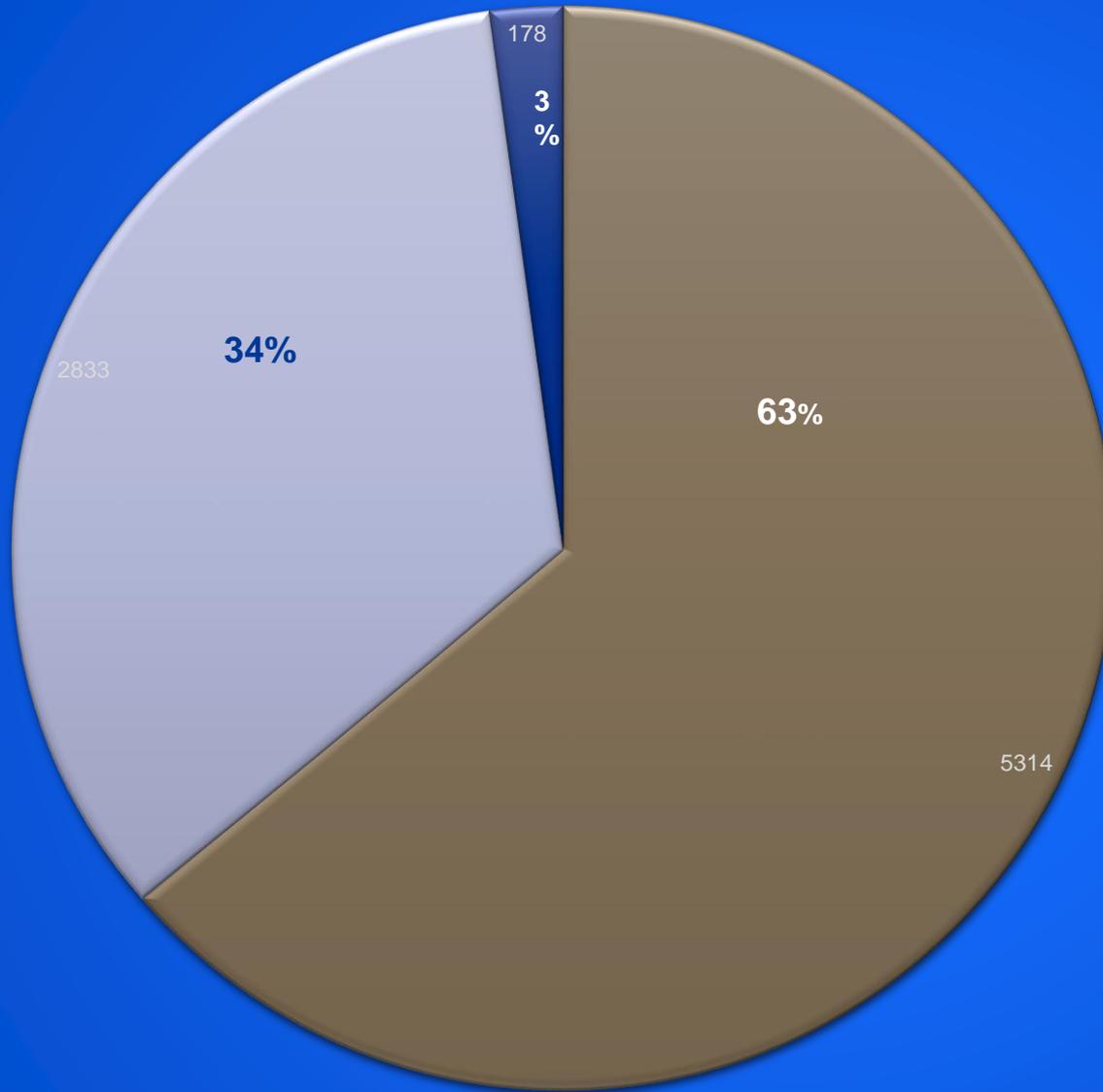
Lesser Flamingo

Unknown Vulture



# Mortality Types

**Total  
mortalities :  
8325**



■ Collision

■ Electrocutation

■ Unknown



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**Re-active  
management  
of wildlife  
incidents:**



# Incident Report Form

Completed reports to be sent to:  
Megan Diamond  
Email: [megand@cwet.orca.za](mailto:megand@cwet.orca.za)  
Wildlife Energy & Interaction Group  
Tel: (011) 486 1102 Fax: (011) 486 1506



Field Investigator: \_\_\_\_\_  
Contact telephone number: \_\_\_\_\_  
Date of report: \_\_\_\_\_

## INCIDENT DATA REPORT FORM

Approximate date and time that the incident occurred Month \_\_\_\_\_ Year \_\_\_\_\_ Time \_\_\_\_\_  
\*Tick appropriate field \*ELECTROCUTION  \*COLLISION

### GENERAL INFORMATION

Landowner Name	What were the weather conditions at the time of the incident	Indicate the habitat on both sides of the line/structure. Please describe specific features e.g. dams, wetlands, vleis, koppies, cliffs, roads etc.
Contact telephone number	Sunny	Mixed woodland
Nearest town	Overcast	Namib Desert
Property name	Fog	Karoo Shrubland
Eskom contact person telephone number and email address for subsequent enquiries	Snow	Moist woodland
Global Positioning System (GPS) coordinates	Calm	Afro-montane
	Light wind	Kalahari Savanna
	Strong wind	Forest
	Rain	Highveld Grassland
	Unknown	Fynbos
		Agricultural land
		Industrial

ELECTRICAL INFRASTRUCTURE		Species Data
Line name		INJURIES TO CARCASS:
Type of structures and line voltage (e.g. 11kV T-structures)		Adult
Eskom pole identification number(s)		Juvenile
Number of spans inspected	Inspect at least a 20m wide corridor on both sides of the line	Age uncertain
Are the conductors or earth wire obscured against a dark background? If so please describe		Species uncertain
What is the altitude of the structure/span where the electrocution/collision happened	Higher Same altitude Lower	<b>Behavior:</b> Breeding Flocking
		Line crossing between roosting and feeding
		Feeding in surrounding habitat
		Available roosts in vicinity Yes No
		Contributing factors Please expand on above where necessary (e.g. flight path through mountains, dam etc.)
		Farm buildings Valley
		Animal carcass River
		Wetland Disturbance
		Dam Mountains Roads

### Additional information

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### Recommendations:

Please provide detailed recommendations regarding the number of structures that will require mitigation (i.e. at which pole the mitigation should begin and at which pole the mitigation should end)

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Please draw a sketch plan of the terrain, indicating:

- the position of the carcasses in relation to the electricity structure (note pole numbers)
- prominent features such as dams, agricultural fields, buildings, roost sites, feeding areas, nests, flight paths
- indicate those spans of power line that will require mitigation
- interview the landowner for any relevant information



**PLEASE TAKE DETAILED PHOTOGRAPHS OF ELECTRICAL STRUCTURES, SURROUNDING ENVIRONMENT AND THE CARCASS/ES.**

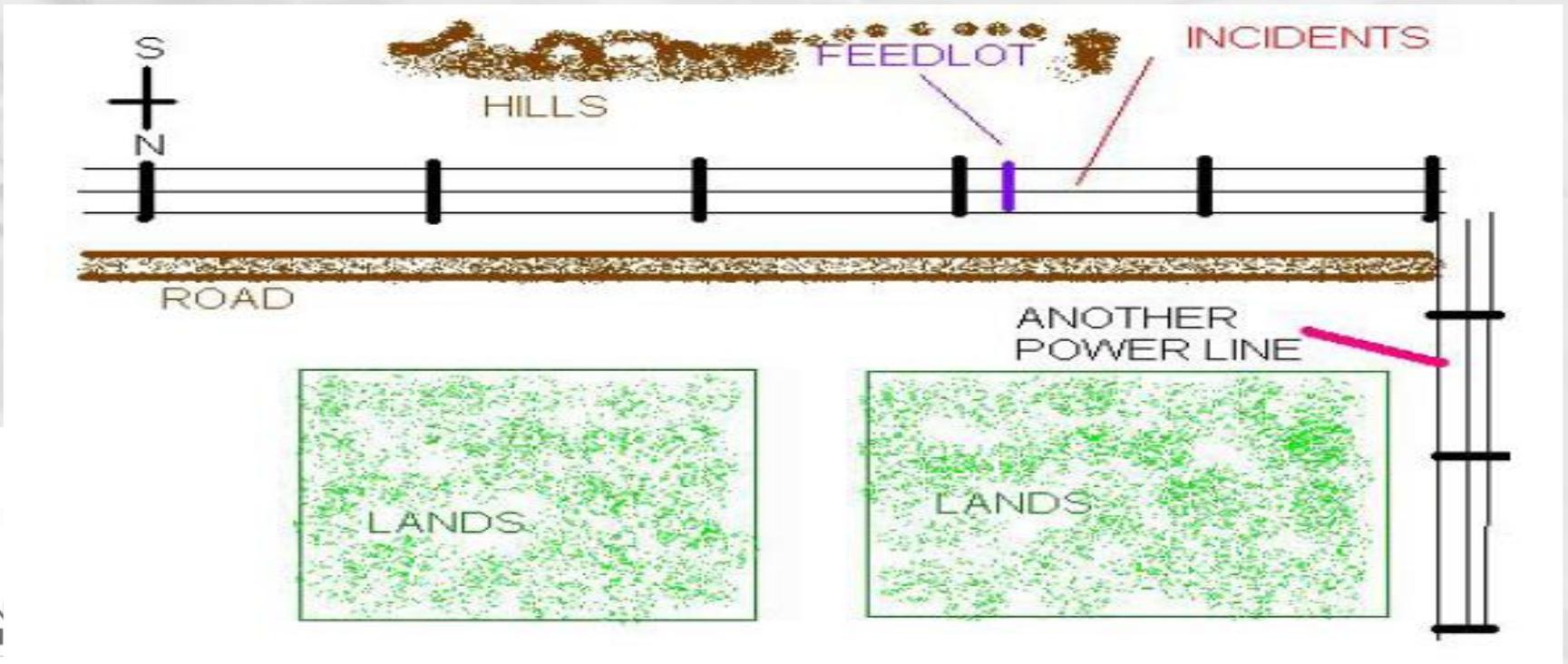
# Photographs

## Structure Type



# Recommendations

- **“...RECOMMEND THAT ALL THE POWER LINES ON THE FARM BE MARKED WITH FLAPPERS, AS THERE ARE MORE POWER LINES SURROUNDING THE FARM.”**





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**RPL** PREFORMED LINE PRODUCTS  
The connection you can count on.

## RAPTOR™ Protector

SA PATENT NO. 029560



The RAPTOR™ PROTECTOR is intended to permanently cover an emergency condition as a support pin is solely for the purpose of preventing accidental contact with the conductors by birds, as they perch on the support points of the structure. IT SHOULD NOT BE CONSIDERED AS A COMPLETELY VISIBLE AFD COVERING AND SHOULD NOT BE USED AS A COVER UP DEVICE TO PROTECT HUMANS FROM ELECTRICAL SHOCK.

The RAPTOR™ PROTECTOR consists of:

- One finished aluminum product approximately 2 000 mm in length;
- Automatic clipping device for securing the component onto the insulator and conductor.

This complete product will fit over all types of distribution insulators currently in use, and conductors up to and including 16 mm OD.

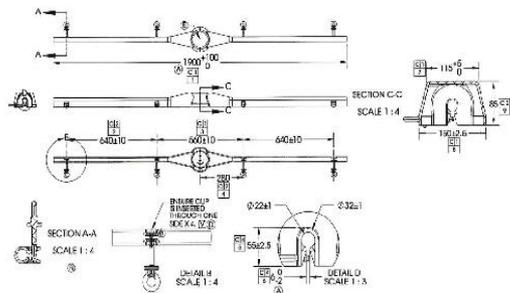
Catalogue No.: RPL 03

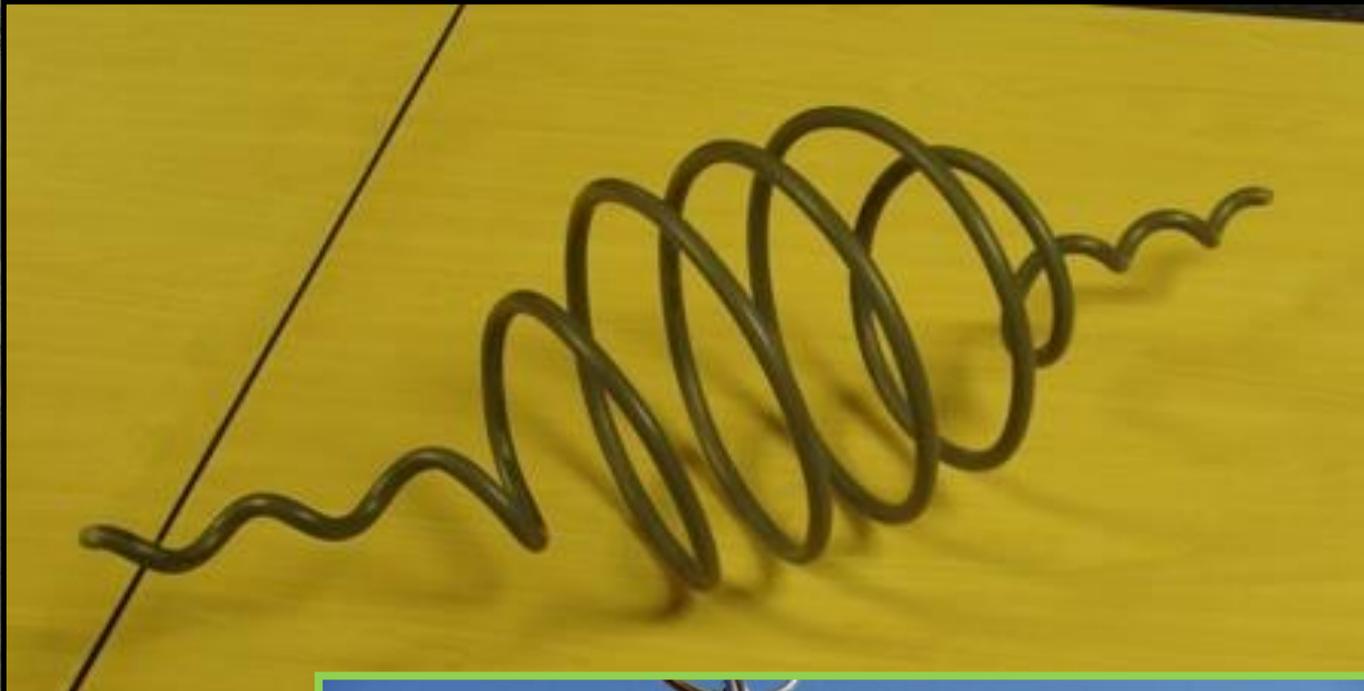
Material: Flow Molded Alkathene.

Notes: Automatic clipping devices to clamp firmly onto conductor dia. range 8 mm to 16 mm.

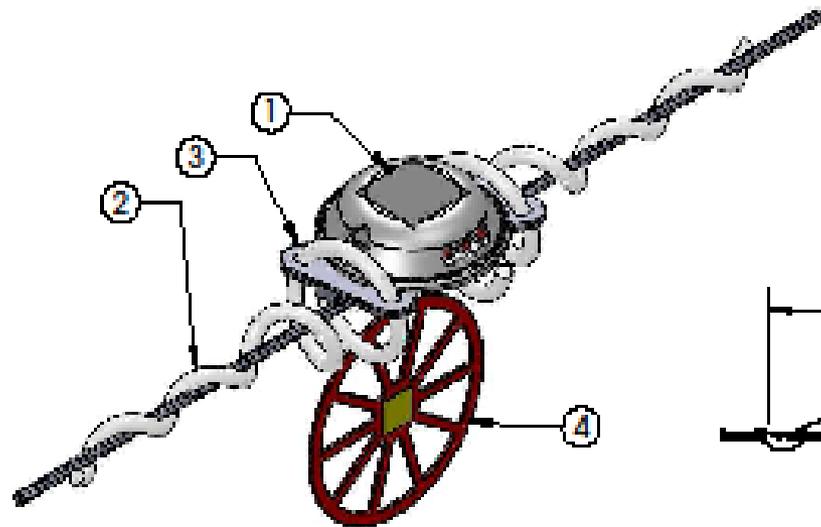


ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	RPL03	Raptor Protector	1
2 R.C	RPL-PIN	Raptor Pin	4

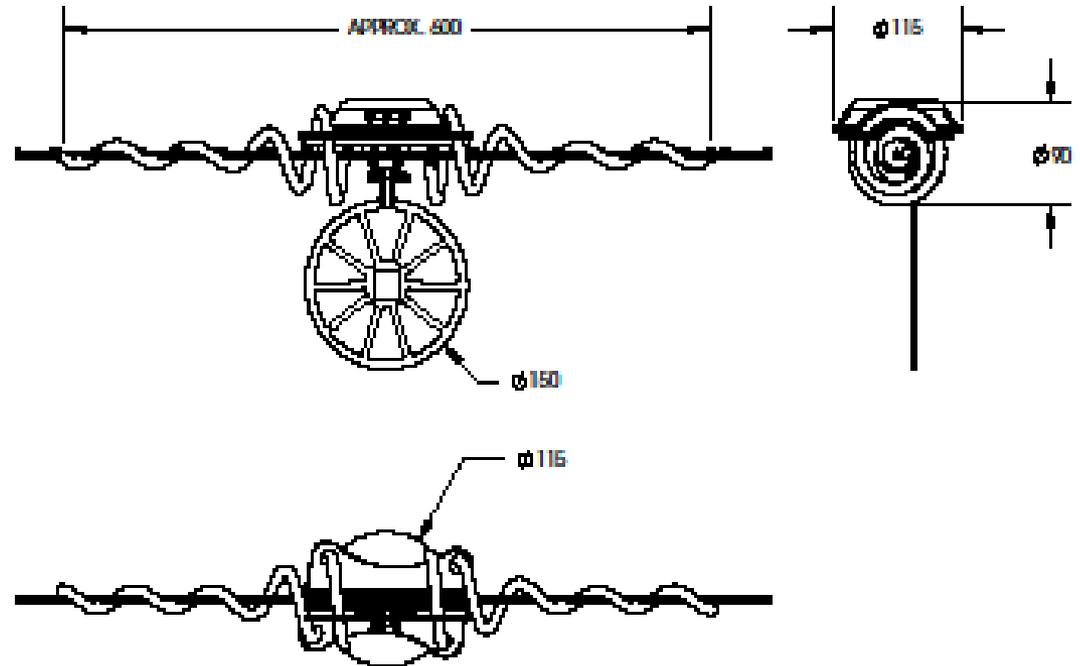








ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	BFOLED-000X	SOLAR LED LIGHT	1
2	BFOLEDL	PVC HELICAL ATTACHMENT	2
3	BFOLED-02	BFOLED NYLON BASE PLATE	1
4	BFL-06	NYLON FLAPPER	1
5	M6X36BT10SSST	M6 X 36 STAINLESS STEEL BOLT 10MM THREAD	1
6	M6NYLUTSST	M6 STAINLESS STEEL NYLOCK NUT	1



**NOTE:**

- CONCEPTUAL DESIGN MAY BE SUBJECT TO ALTERATION
- 5 YEAR BATTERY LIFE ON SOLAR CELLS
- LED WARNING LIGHTS EFFECTIVE AFTER DAY LIGHT HOURS.



**PREFORMED LINE PRODUCTS**

The contractor will verify all dimensions.

(PLP SOUTH AFRICA)

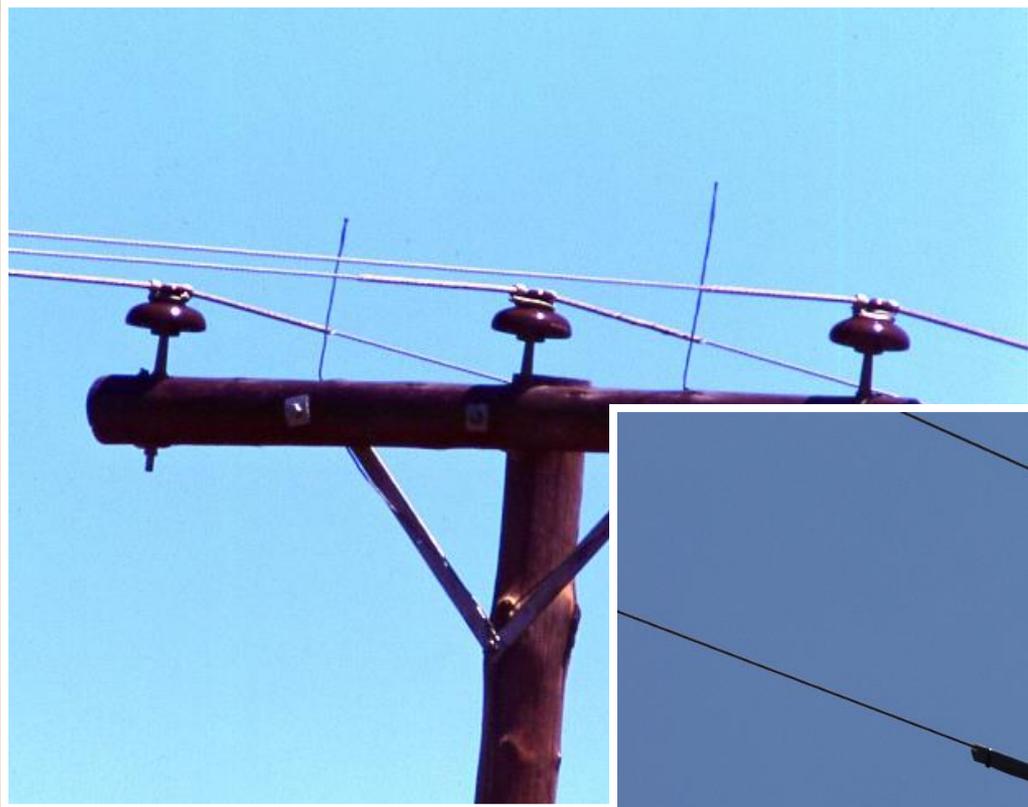
REV.	REV DATE	DRWN	APVD	APVD	DESCRIPTION
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<b>CUSTOMER DRAWING TITLE</b>					<b>TOLERANCES UNLESS NOTED</b> 0.1 0.01 0.25 0.00 0.1 ANGLES ±1°	<b>UNITS</b> mm <b>DO NOT SCALE</b> THIRD ANGLE PROJECTION 
<b>CONCEPTUAL SOLAR LED BIRD FLIGHT DIVERTER</b>						

<b>CONDONAL</b>			
<small>THIS DRAWING IS THE PROPERTY OF PREFORMED LINE PRODUCTS (PLP) AND IS TO BE USED ONLY FOR THE PROJECT AND SITE SPECIFIC TO WHICH IT IS ISSUED.</small>			
DATE: 2013/07/17	PLP ORDER NUMBER:	PLP PART NUMBER:	
DATE:	CUSTOMER I.D. NUMBER:	PLP DRAWING NUMBER:	
DATE:	SCALE: 1:10	SHEET NO.: 1 OF 1	PLP ORDER NUMBER:
DATE:	SCALE:	SHEET NO.:	REV: 0

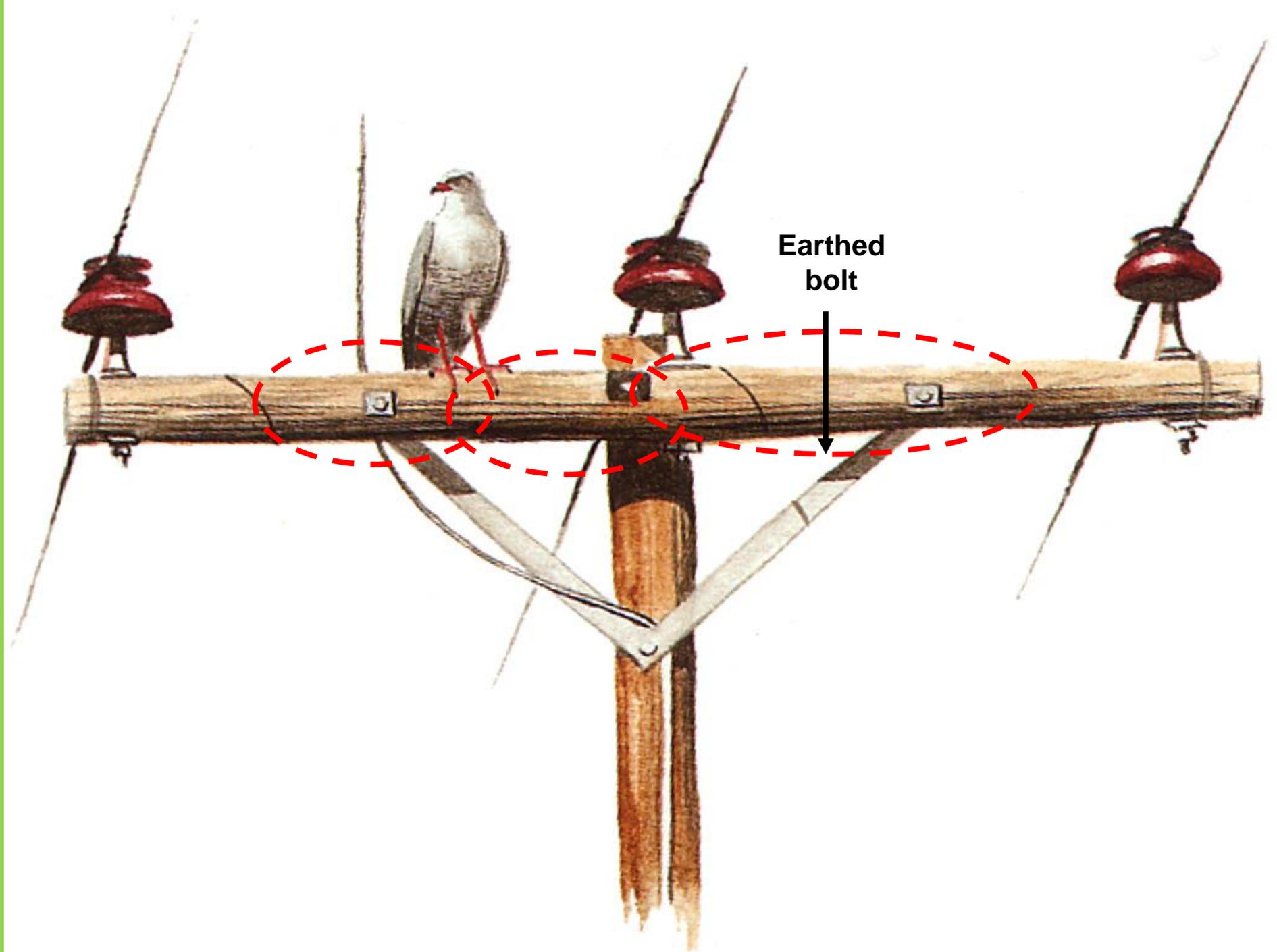
INTERNAL USE ONLY PLEASE DO NOT SCALE





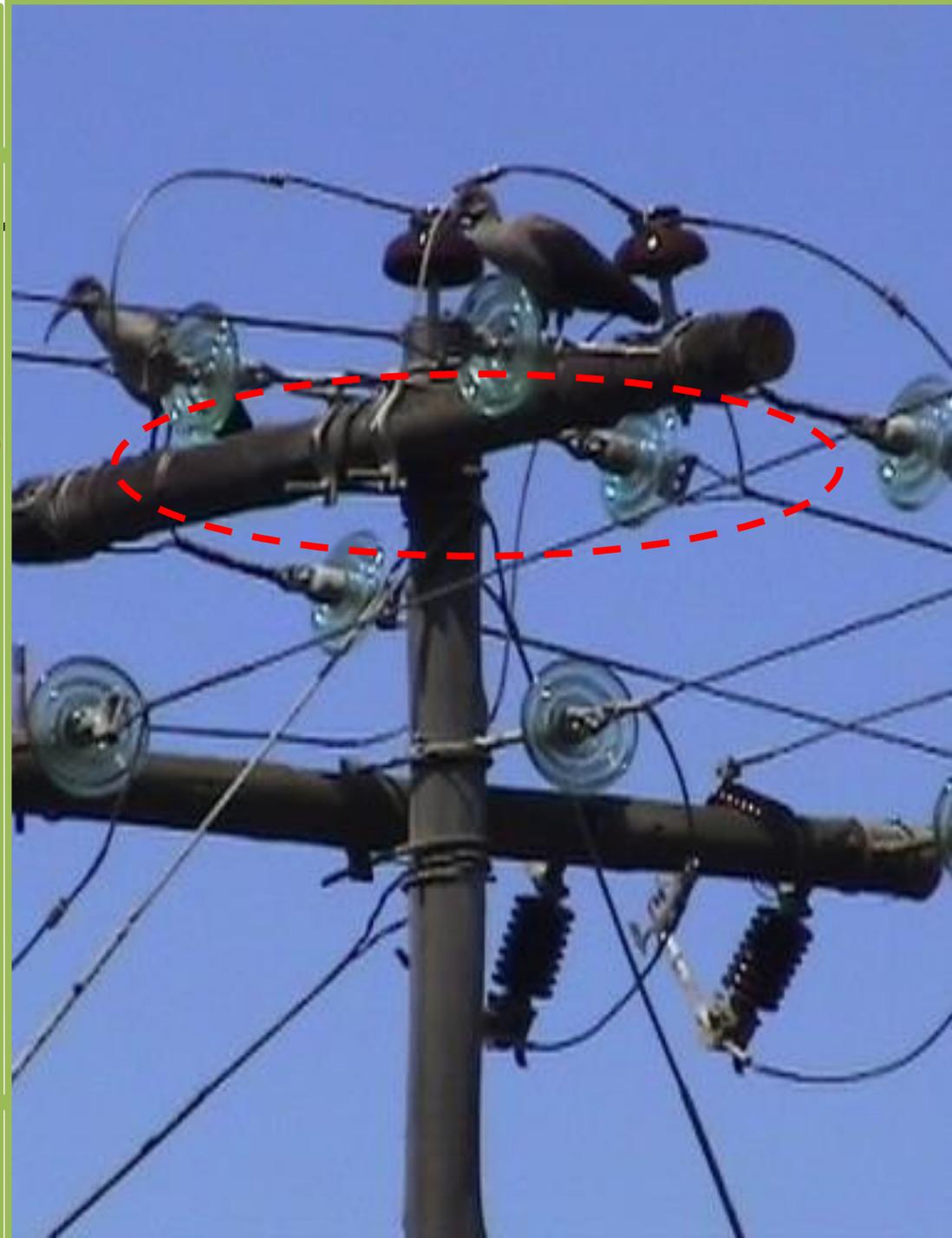
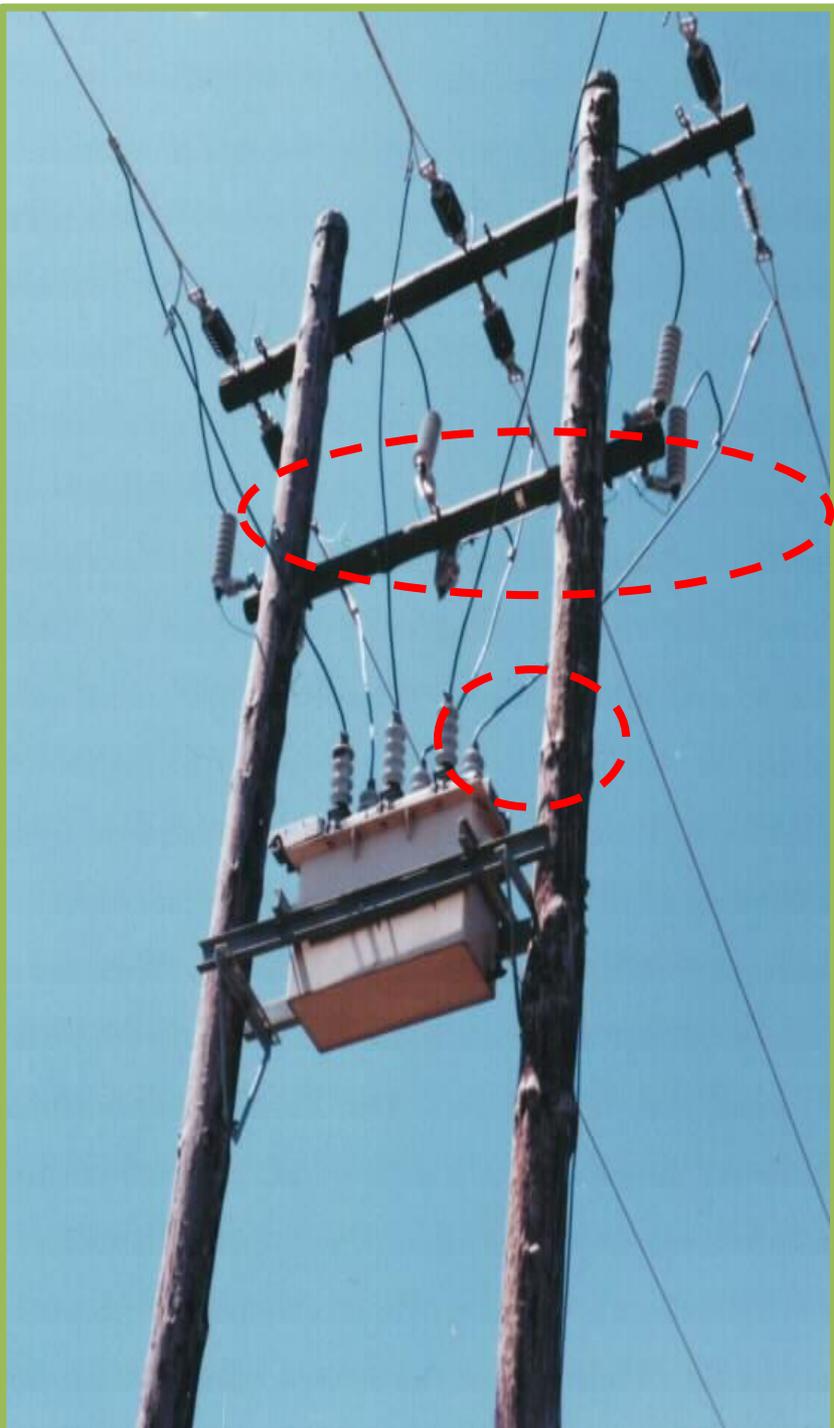
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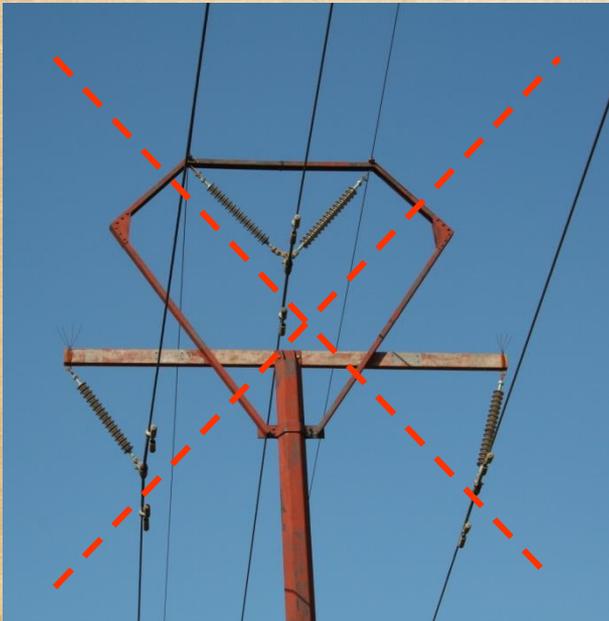
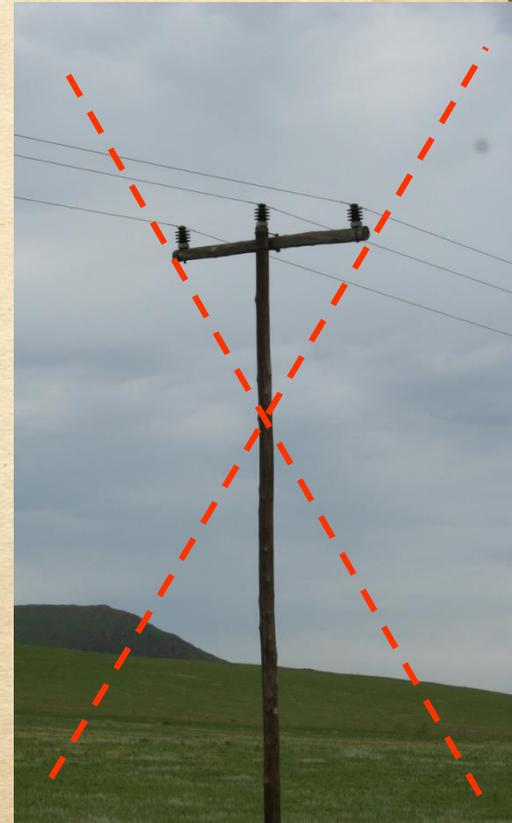
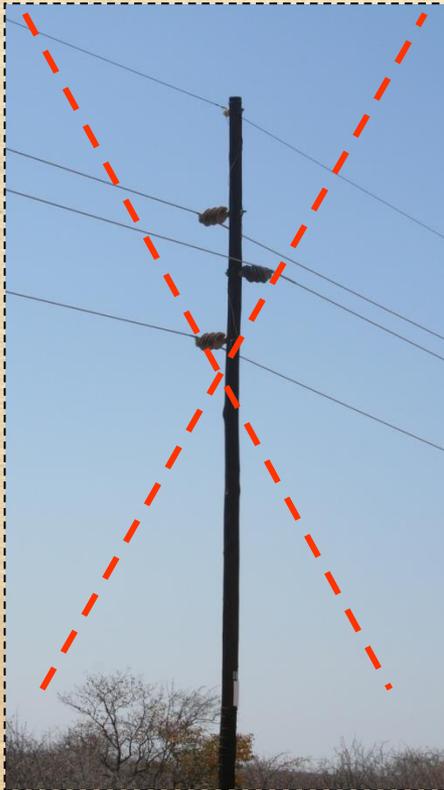


Earthed  
bolt



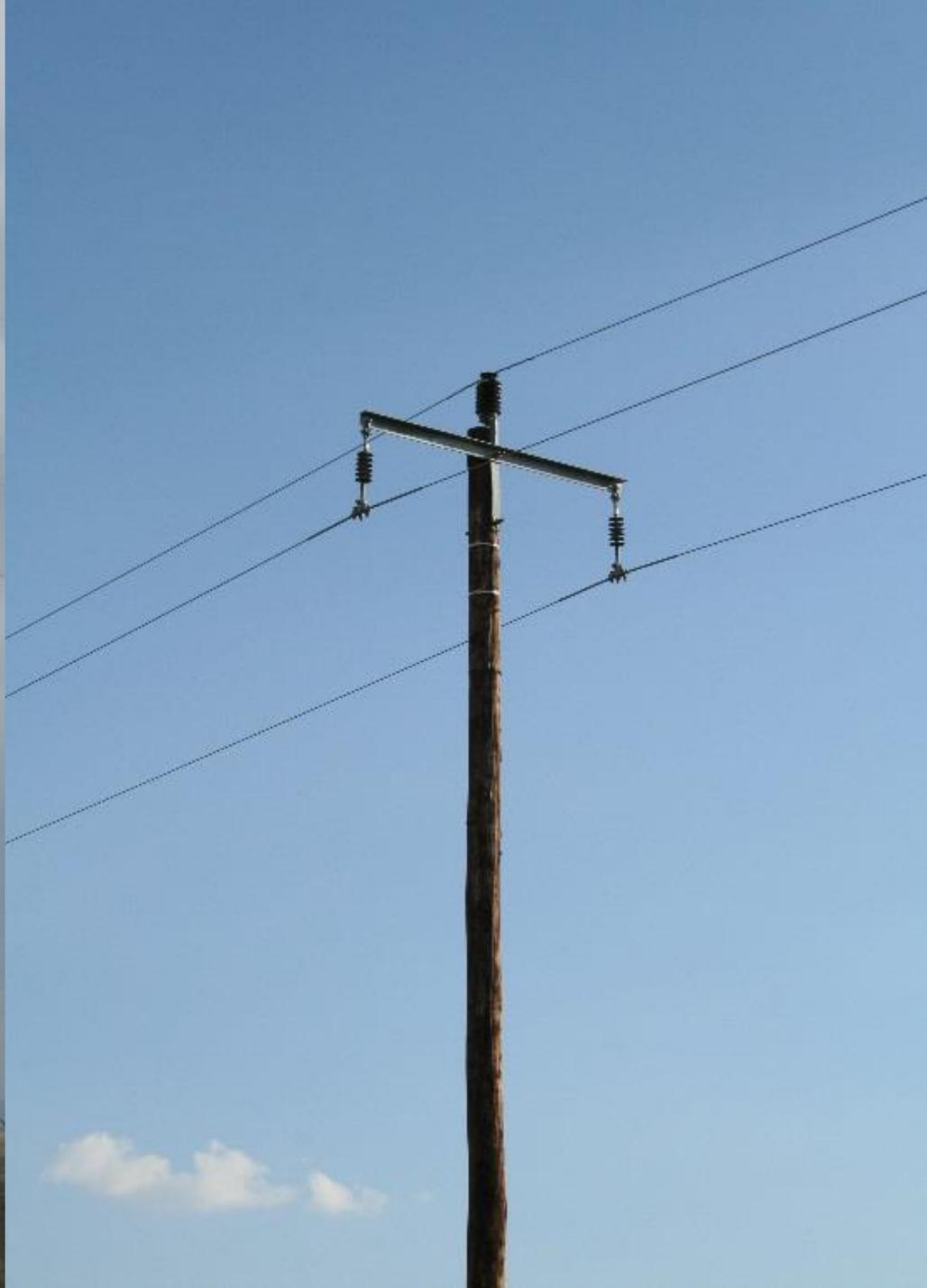


# Line design



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# Vulture Anatomy

- Wide – Wingspan of up to 2.8 m



Fortunately not all of the wing is conductive, dry feathers have very high resistance. (Beutel, McLaren, Hoogstad et al)

# Impedance testing



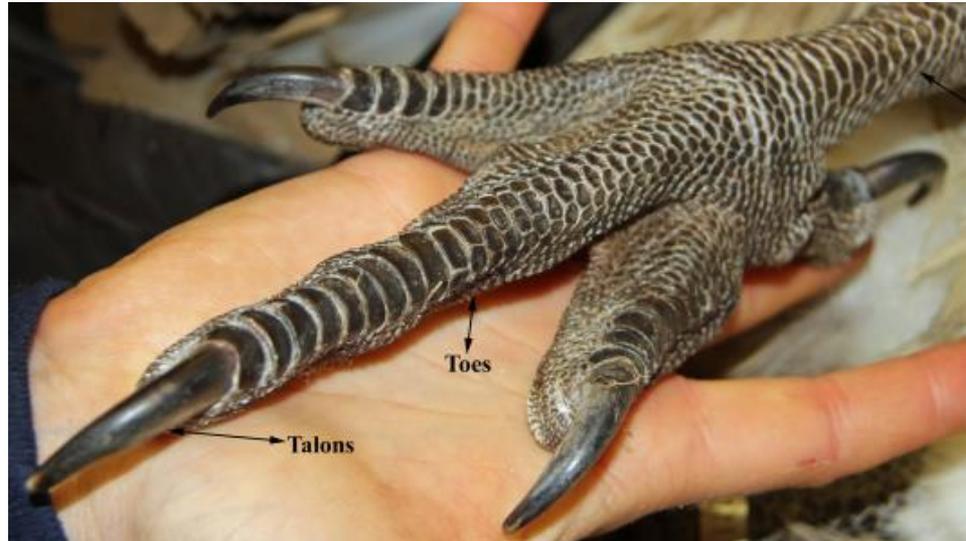
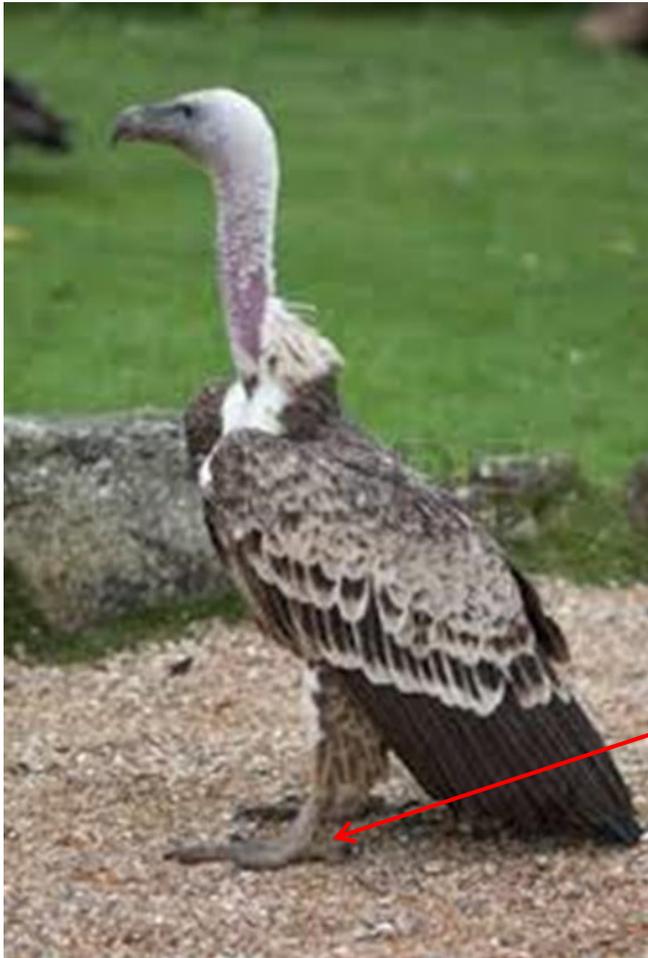
- Wingspan adds to 'height'



Action when taking off and landing make the bird very vulnerable to flashovers in restricted spaces.

# Vulture Anatomy

- High – Tall when stretching – can reach up to 1.1m



Big feet with relatively small claws – designed more for walking on the ground than gripping branches (conductors)

Makes it clumsy when trying to perch.

- Gregarious – Particularly near a food source

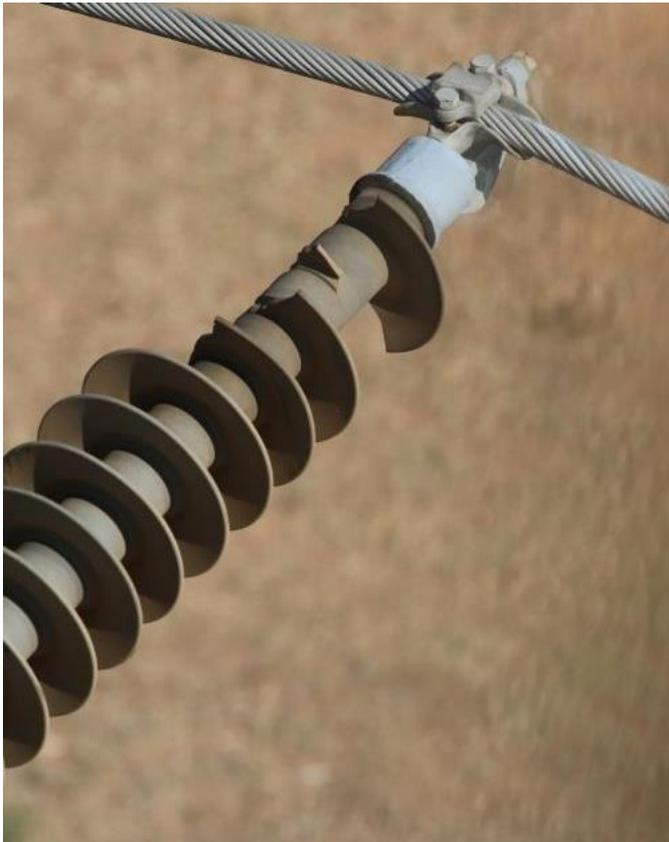


Once food is available, there is no telling how many are going to arrive.

And like our weddings and funerals last ones to arrive get the worst seats.

There can be bickering and jockeying for position.

- Curious with a strong bite. Will 'test' anything within reach.



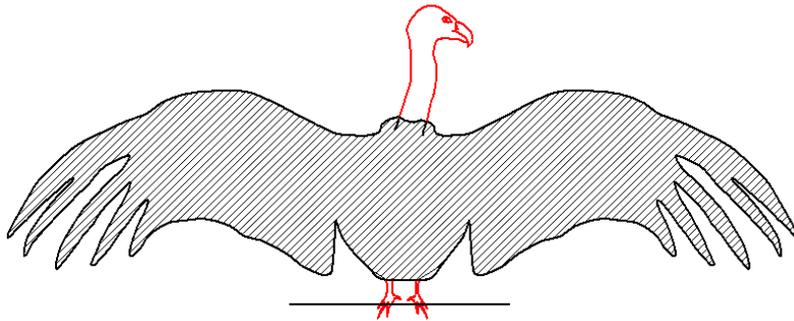
# Bird impact insulators



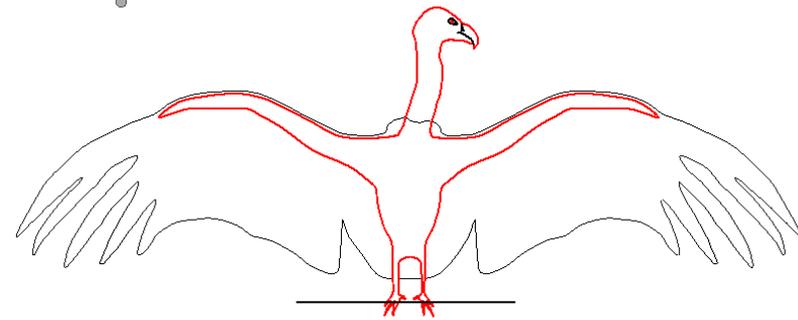
STRATEGIC PARTNERSHIP



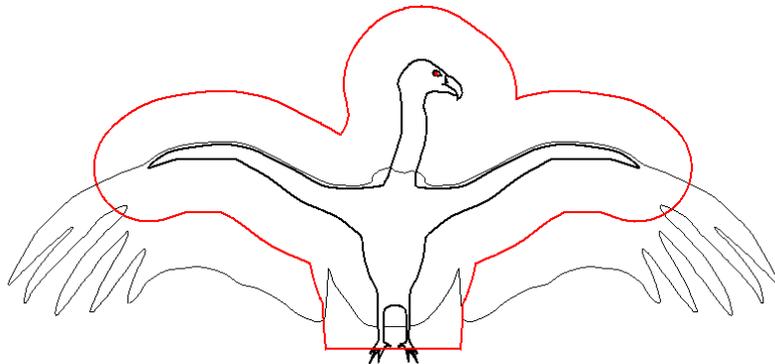
# Clearance Test Methodology 'Turkey Test'



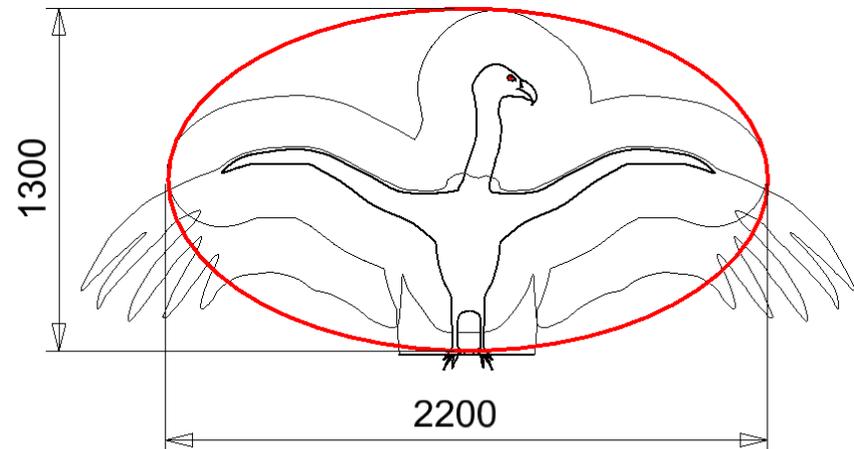
'DRESSED' BIRD



'UNDRESSED' BIRD



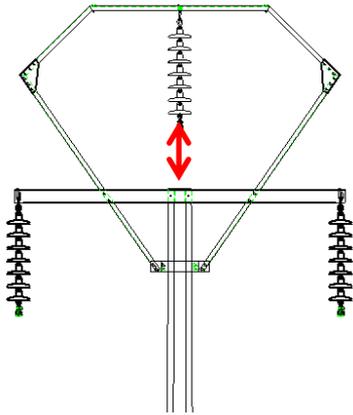
88KV SAFETY ZONE



GEOMETRIC SHAPE SAFETY ZONE

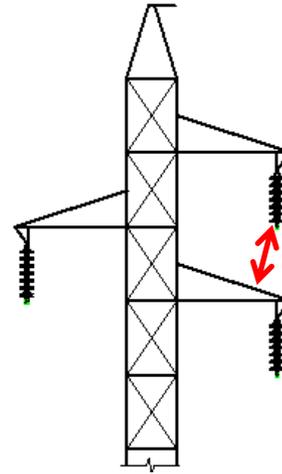


# The most offending duo + a 'Newby'



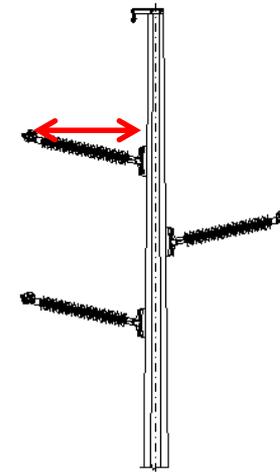
66/88kV Kite structure

'Window' too small



66/88kV Suspension

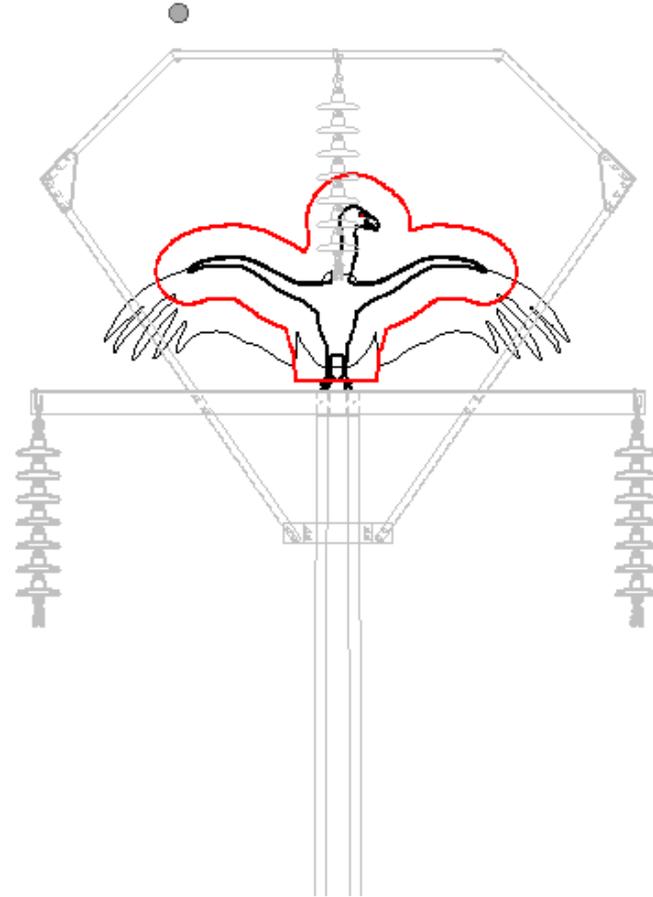
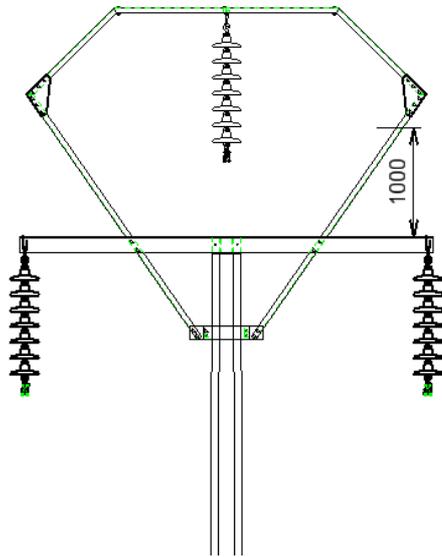
Bot. x-arm to top  
phase too small



132kV DT 7611 Int.

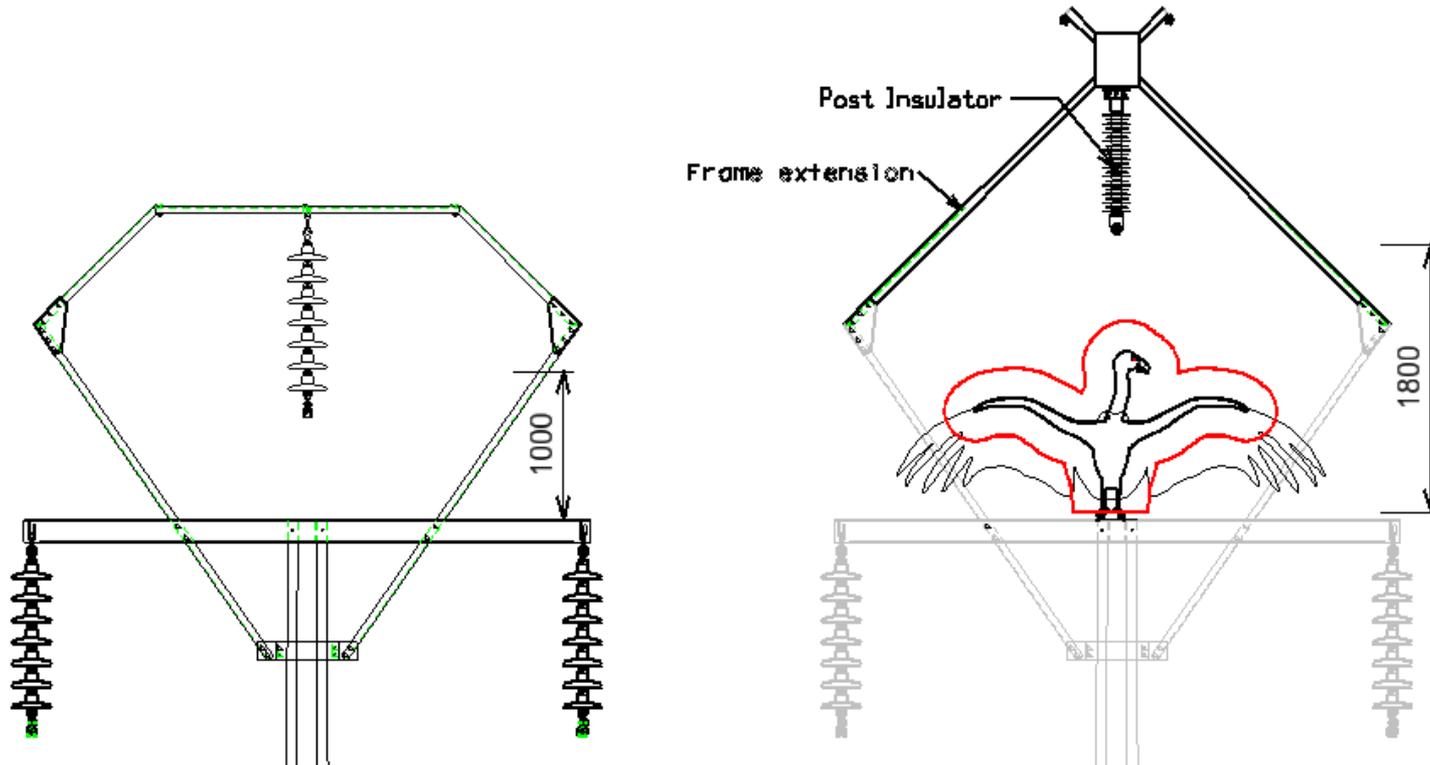
New problem.  
Multiple Birds?

# 66/88KV Kite Frame – Turkey Test



- The kite frame fails the 'Turkey Test' miserably.
- Even if phase is insulated the bird can chew the insulation.
- Conductor needs to be raised

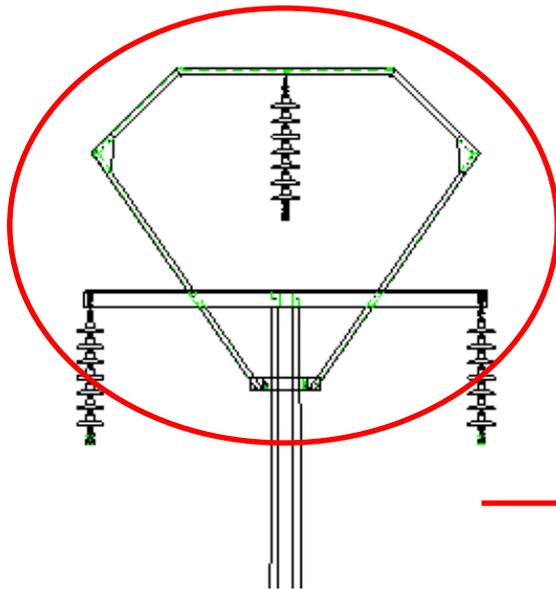
# 66/88kV Kite Frame Modification



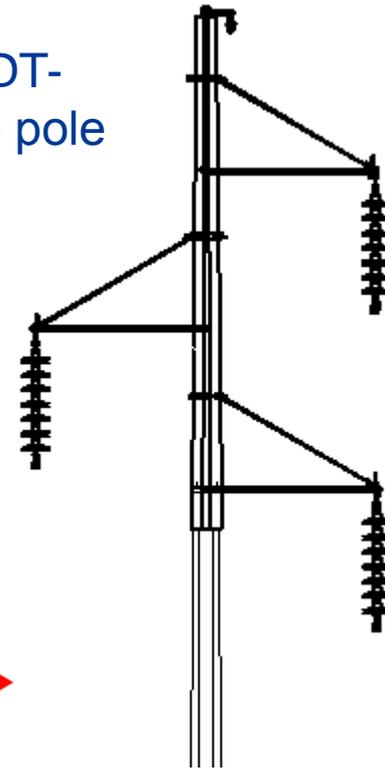
- New top frame extension with inverted post insulator
- Passes 'Turkey Test' easily – if it does not sit on conductor!
- Composite x-arm frame extension being considered

# 66/88kV Kite Frame Replacement

This whole kite  
frame is removed

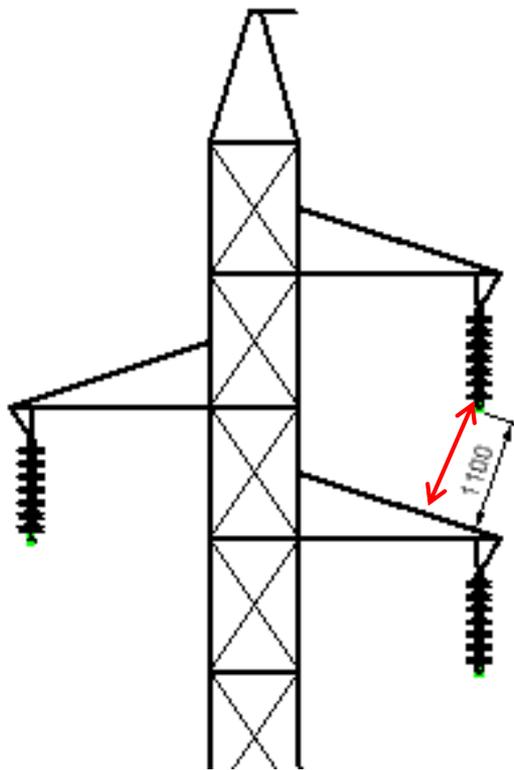


Replaced with 'D-DT-  
7649' top on same pole

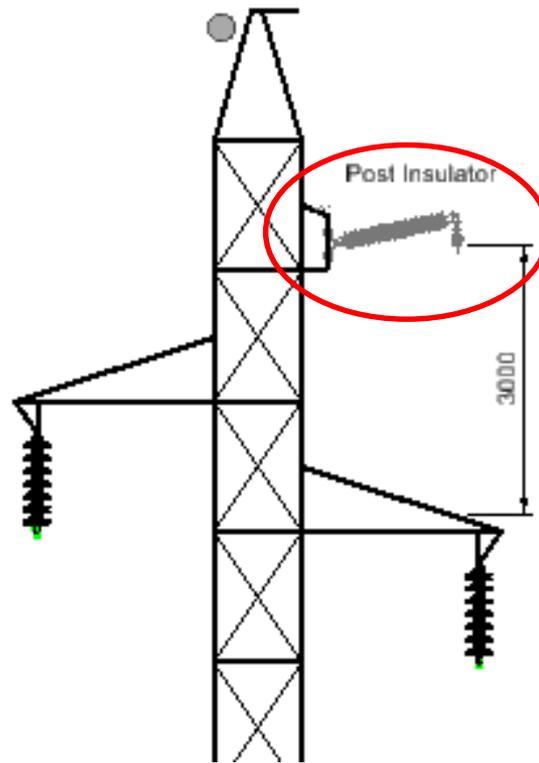


- This method to become compulsory if restringing kites in vulture areas

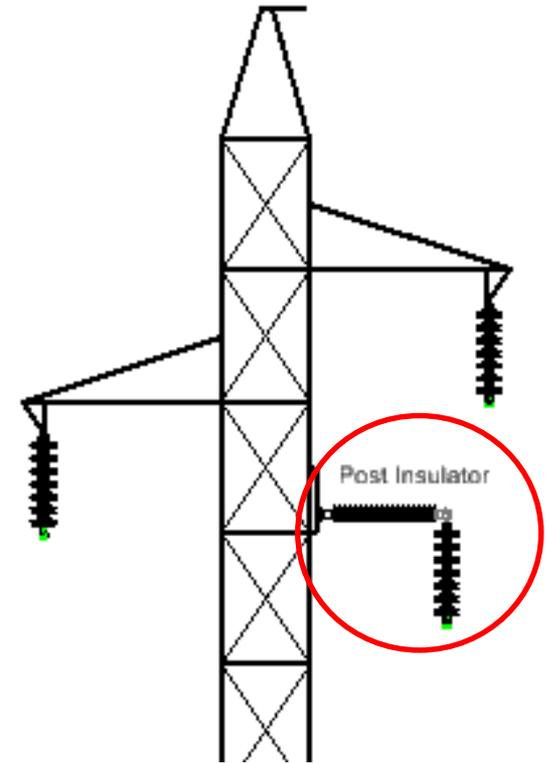
# 66/88kV Lattice Suspension Modification



The clearance from top phase to bottom x-arm is too small

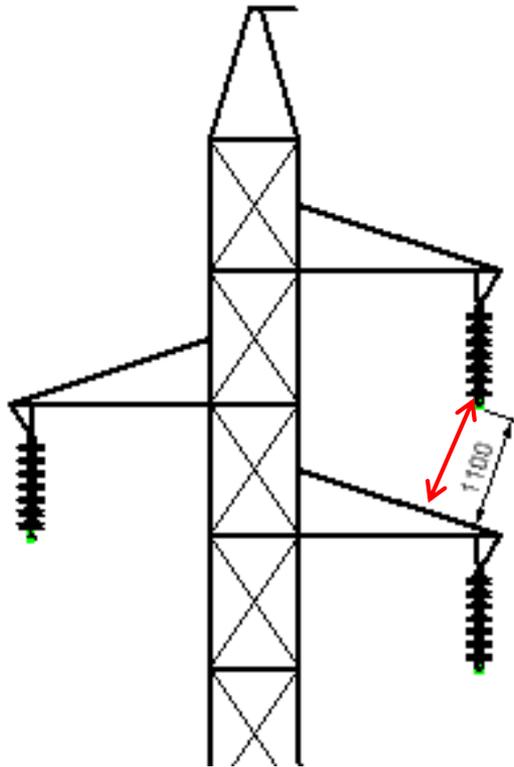


The top phase may be supported by a post insulator

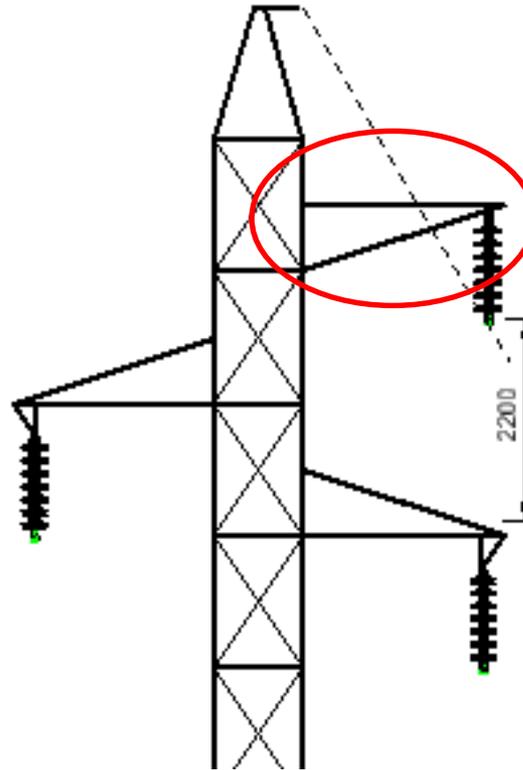


The bottom phase may be supported by a post insulator

# 66/88kV Lattice Suspension Modification



The clearance from top phase to bottom x-arm is too small



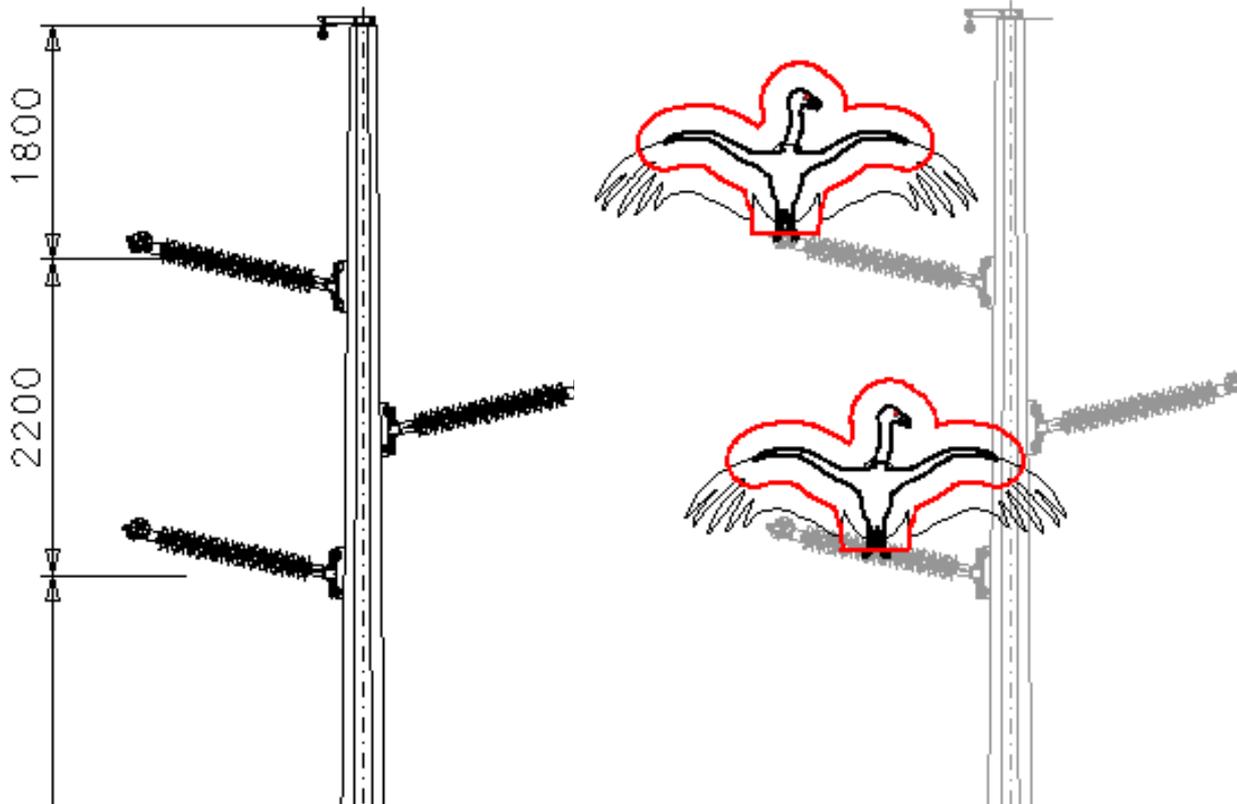
The top X-arm may be changed and 'hook' removed

In this case the removal of the hook alone may be adequate for a perching bird but not a landing one. Will differ between structure types.

# D-DT-7611 Clearance Problem - Turkey Test



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In the area where this occurred there is a very high density of vultures and it may well have been more than one bird trying to sit on the same insulator.

D-DT-7611 has been used for many years with no reported incidents. BUT..Polokwane fatalities

Turkey Test: Perching on the trunnion clamp is safe, but perching on the insulator is not.

# D-DT-7611 Flashover



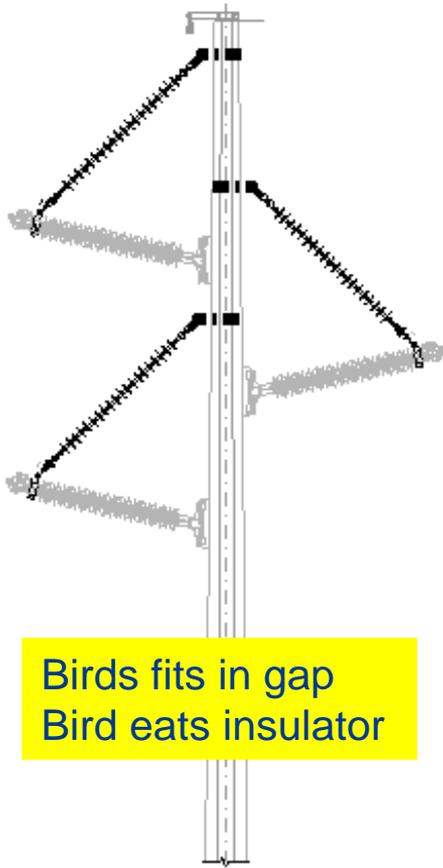
STRATEGIC PARTNERSHIP



Dead bird below tower

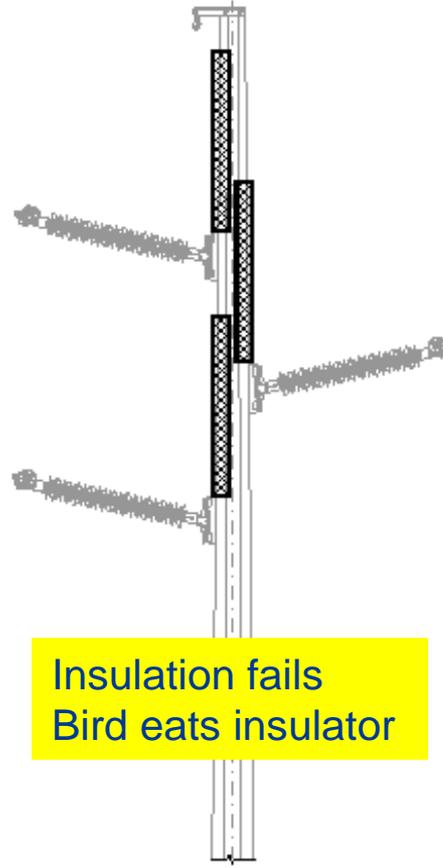
Apparent evidence of a flash to the tower while bird was on insulator

# Possible D-DT-7611 Mitigations



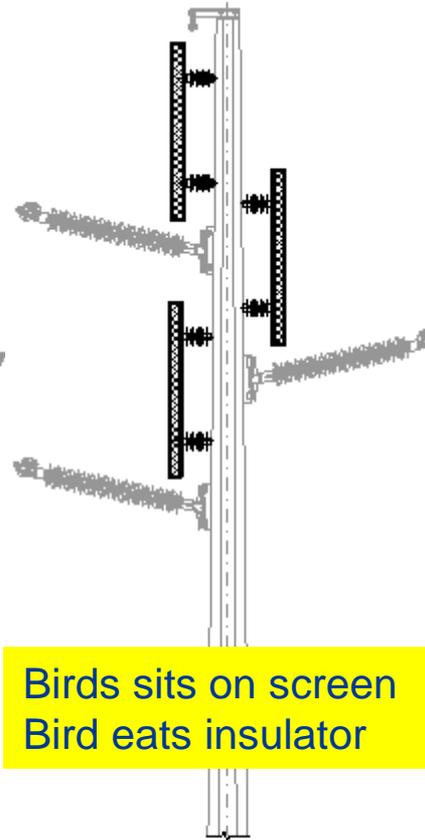
Birds fits in gap  
Bird eats insulator

ADD 'BRACE' INSULATOR



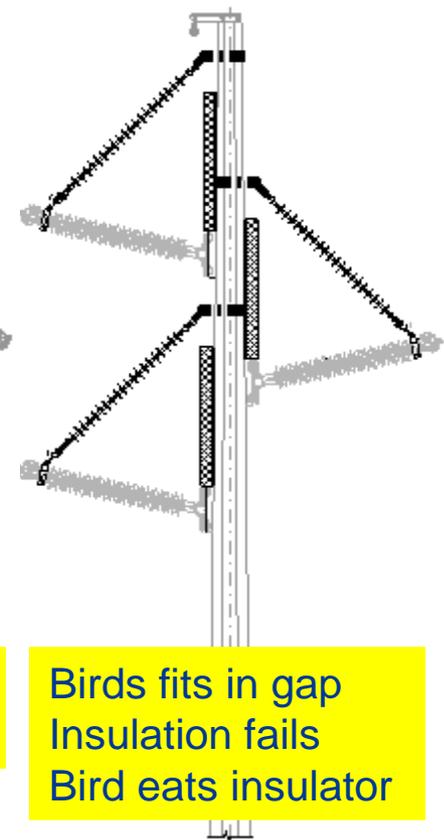
Insulation fails  
Bird eats insulator

ADD POLE INSULATION



Birds sits on screen  
Bird eats insulator

ADD BARRIER  
ON POST INSULATORS

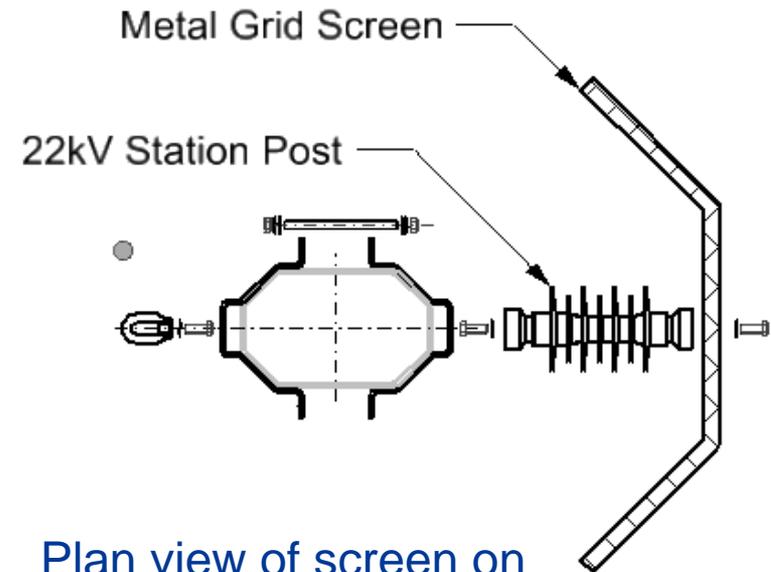
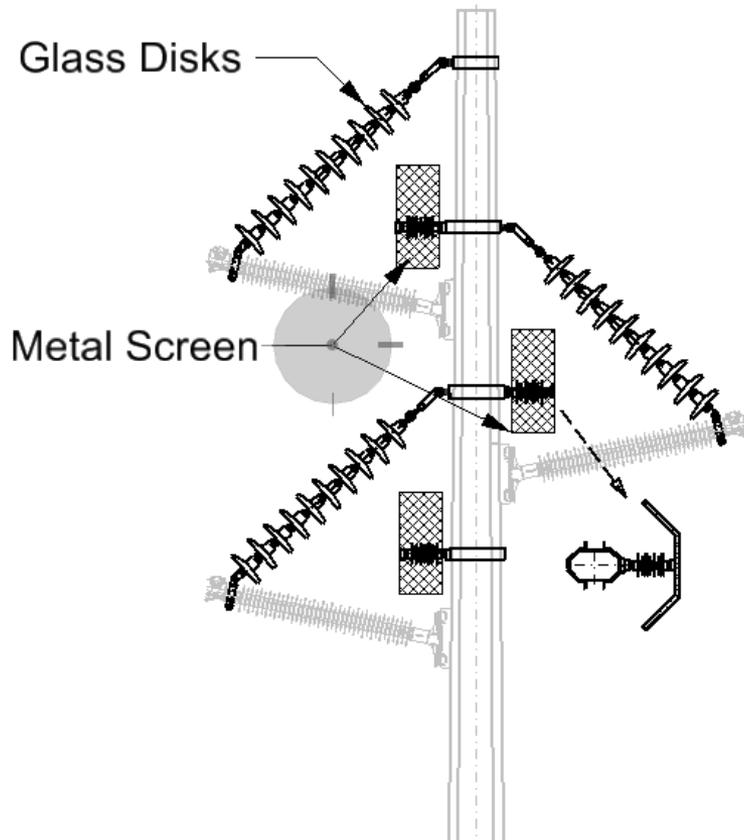


Birds fits in gap  
Insulation fails  
Bird eats insulator

ADD 'BRACE' INSULATOR +  
ADD POLE INSULATION

In all cases there is a potential for something to go wrong

# D-DT-7611 Mitigation. Belts and Braces ☺



Plan view of screen on  
22kV post Insulator

Bird cannot eat insulator, fit in gap or sit on screen but: **Too much 'Stuff'?**

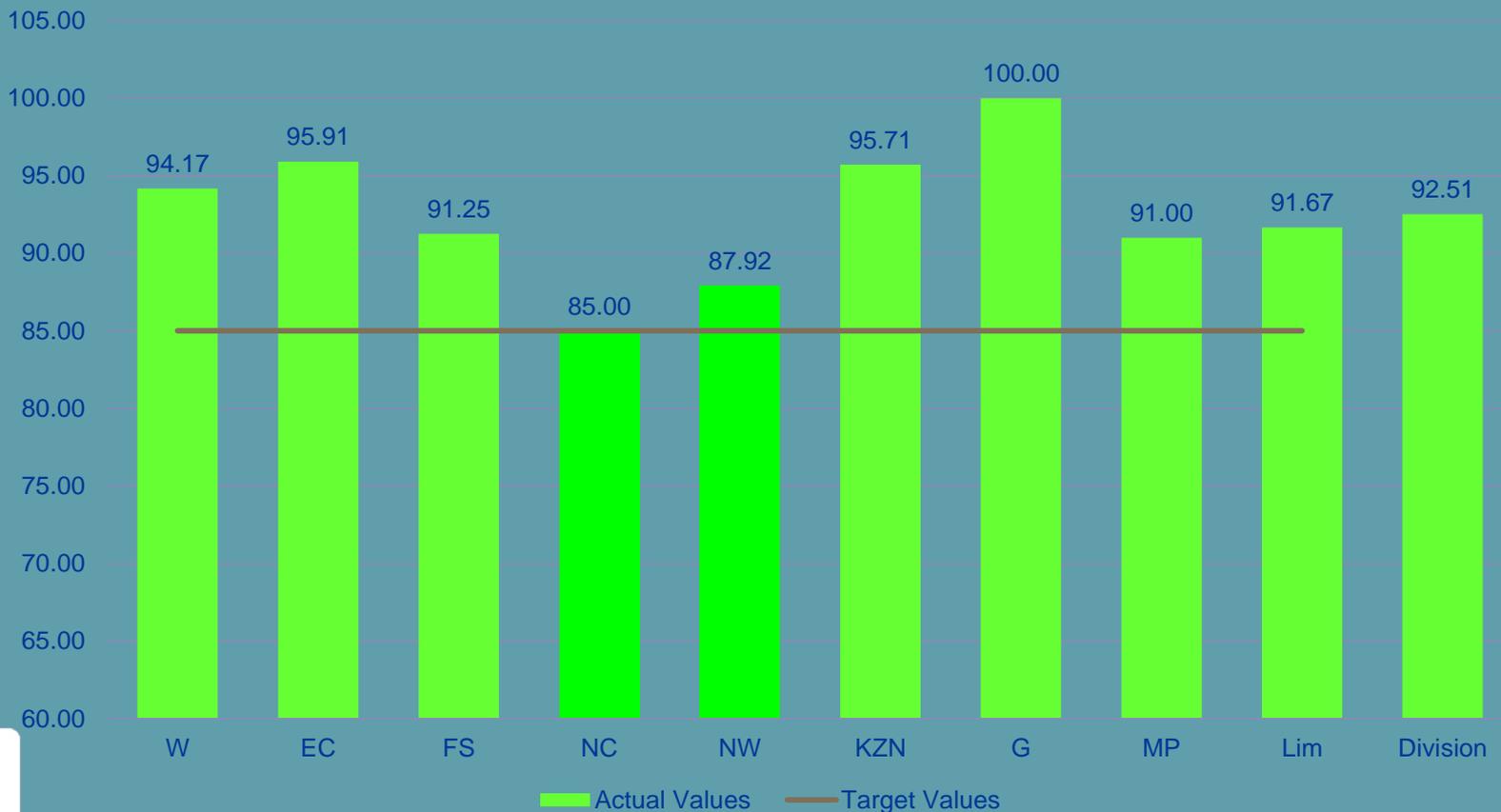
**Please share ideas and thoughts with me.**

# Management information extracted from incident register



STRATEGIC PARTNERSHIP

## 5. Percentage of Wildlife Interactions mitigated < 4 months



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## Red-Listed Species: 1 April 2016 to 31 March 2017

### DISTRIBUTION

Species	KZNOU	NCOU	WCOU	ECOU	NWOU	GOU	LOU	MOU	FSOU	Total
Abdim's Stork		1								1
Blue Crane	3	21	5	10						39
Cape Griffon	1	1	5	33	9	1	14		56	120
Grey Crowned Crane	6			4				1		11
Kori Bustard		1		1					1	3
Lappet-faced Vulture		1								1
Lesser Flamingo								1		1
Ludwig's Bustard		2	1	1						4
Martial Eagle			2	1					1	4
Secretarybird					1					1
Unknown Vulture		8				6	5		10	29
Verreauxs' Eagle		5	1	1						7
White-backed Vulture	1	6			8	1	2	1	2	21
	11	46	14	51	18	8	21	3	70	242



STRATEGIC PARTNERSHIP

**WILDLIFE INDEX SCORES FOR TX GRIDS - OCTOBER 2016**

WIS 1: Ground Patrol Sheets Submitted		WIS 2: Staff training of lines and servitude staff					WIS 3: Emergency Mitigation Implemented			
	WIS Score		Total Staff	Total Trained	Total Untrained	WIS Score		Emergency Mitigation Recommendations	Completed	WIS Score
Free State Grid	95%	Free State Grid	13	11	2	85%	Free State Grid	1	In progress	NA
North Grid	75%	North Grid	**	**	15	90%	North Grid			NA
North East Grid	87%	North East Grid	43	28	15	65%	North East Grid			NA
Northern Cape Grid	93%	Northern Cape Grid	23	0	23	65%	Northern Cape Grid			NA
North West Grid	76%	North West Grid	15	12	3	80%	North West Grid	2	2	100%
West Grid	73%	West Grid	27	0	27	0%	West Grid			NA
South Grid	77%	South Grid	18	13	5	72%	South Grid			NA
East Grid	100%	East Grid	43	0	43	0%	East Grid			NA
Central Grid	83%	Central Grid	13	10	3	77%	Central Grid			NA
Apollo Grid	97%	Apollo Grid	13	0	13	0%	Apollo Grid	1	In progress	NA

\*\*\*\* Missing information from grids

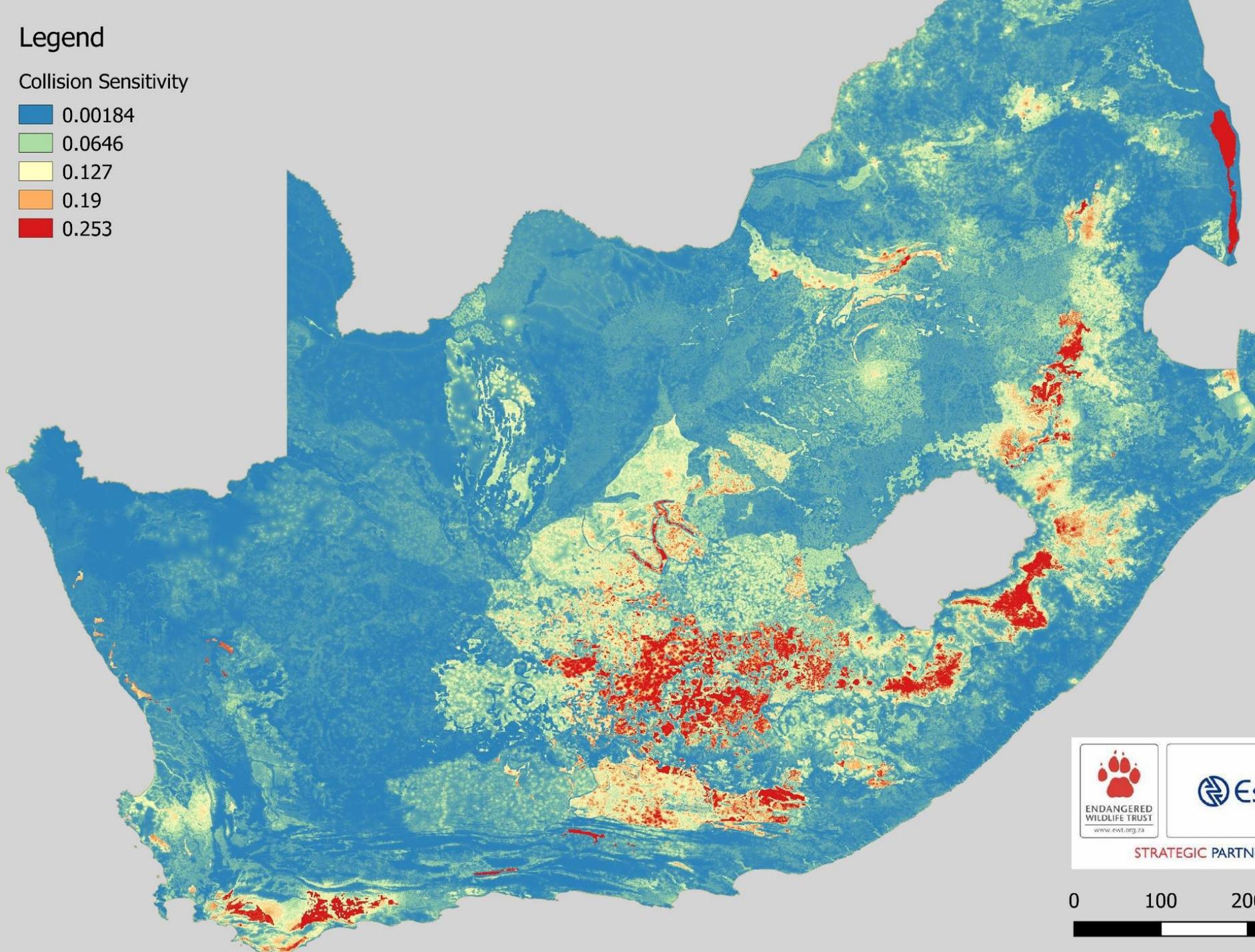
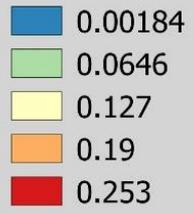
Grid	Average WIS for Sept
Free State Grid	90%
North Grid	83%
North East Grid	76%
Northern Cape Grid	79%
North West Grid	78%
West Grid	37%
South Grid	75%
East Grid	50%
Central Grid	80%
Apollo Grid	49%

Pro-active management of incidents: Eskom/EWT partnership



# Legend

## Collision Sensitivity



STRATEGIC PARTN





## Legend

★ North East Incidents

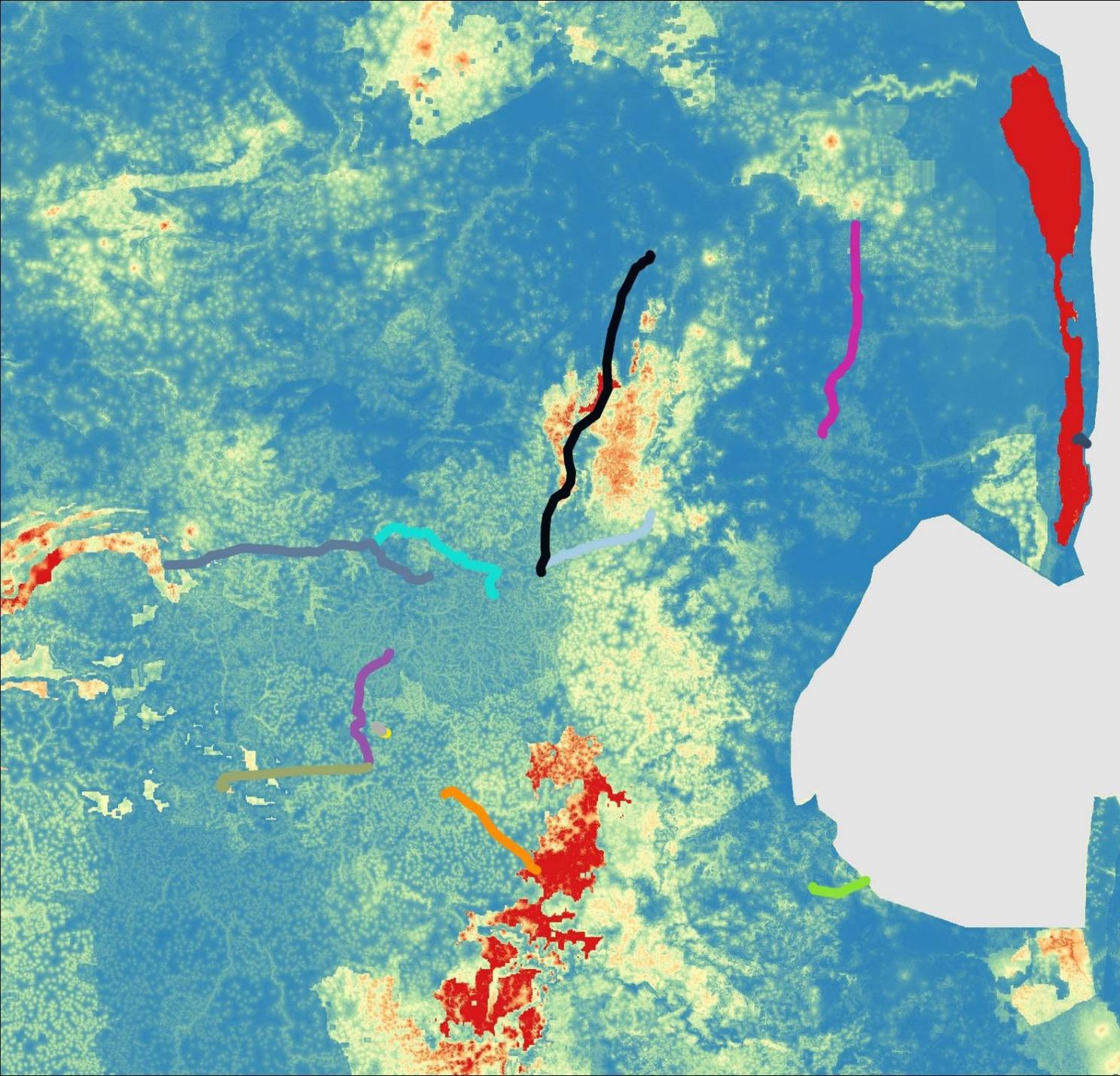
### North East Grid

- █ Acornhoek Marathon 2
- █ Arnot Merensky 1
- █ Arnot Prairie 1
- █ Arnot Prairie 2
- █ Arnot Simplon
- █ Duvha Apollo1
- █ Grootvlei Zeus
- █ Hendrina Vulcan 1
- █ Kriel Zeus 1
- █ Majuba Alpha 1
- █ Normandi Mahamba 1
- █ Sol Sasol 2 No 1
- █ Sol Sasol 2 No 2
- █ Sol Sasol 3 No 1
- █ Sol Sasol 3 No 2

0 35 70 105 km



STRATEGIC PARTNERSHIP



## Legend

### Collision Sensitivity

- 0.00184
- 0.0646
- 0.127
- 0.19
- 0.253

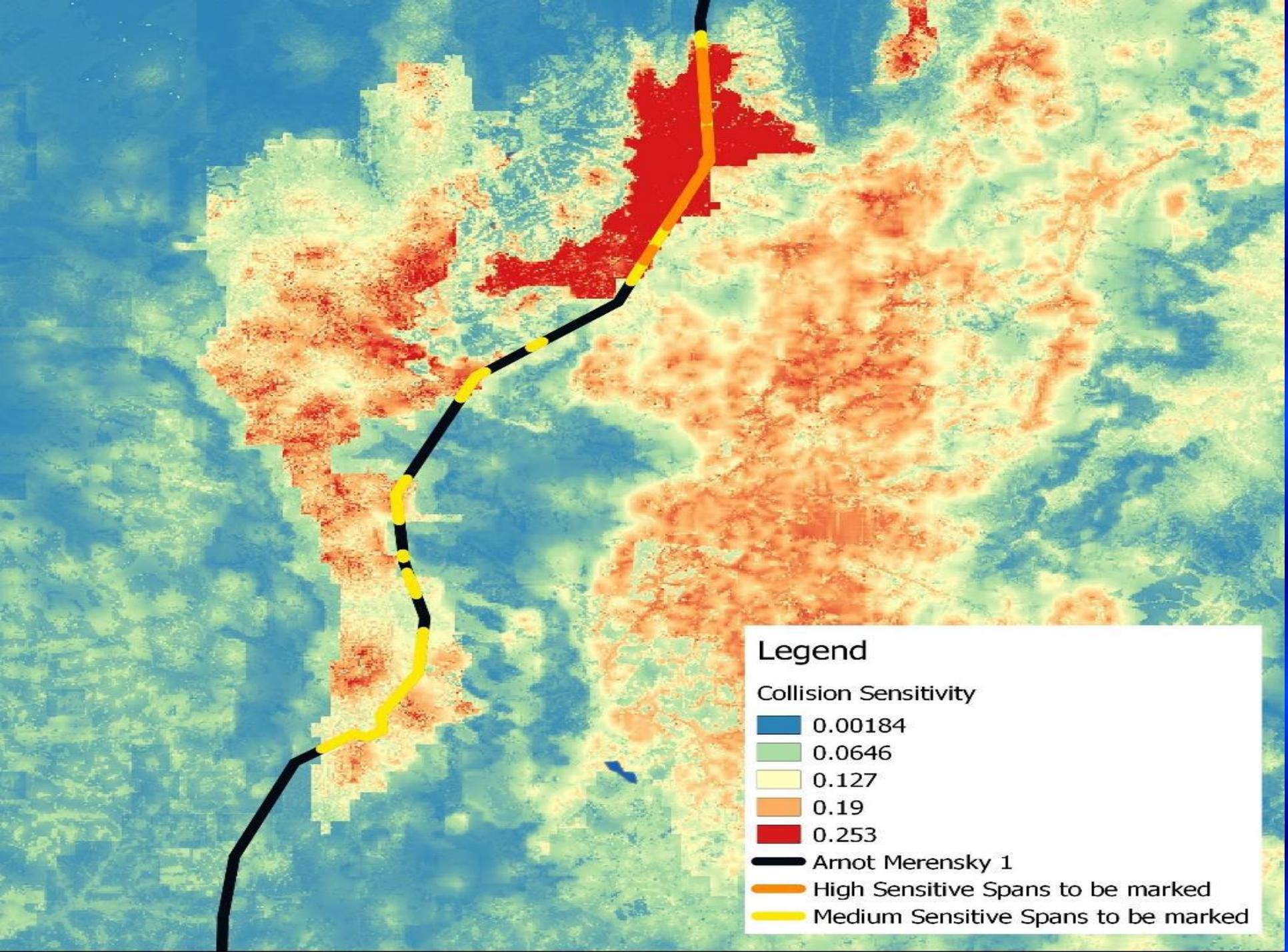
### North East Grid

- Acornhoek Marathon 2
- Arnot Merensky 1
- Arnot Prairie 1
- Arnot Prairie 2
- Arnot Simplon
- Duvha Apollo1
- Grootvlei Zeus
- Hendrina Vulcan 1
- Komatipoort Rassona Garcia
- Kriel Zeus 1
- Majuba Alpha 1
- Normandi Mahamba 1
- Sol Sasol 2 No 1
- Sol Sasol 2 No 2
- Sol Sasol 3 No 1
- Sol Sasol 3 No 2



STRATEGIC PARTNERSHIP

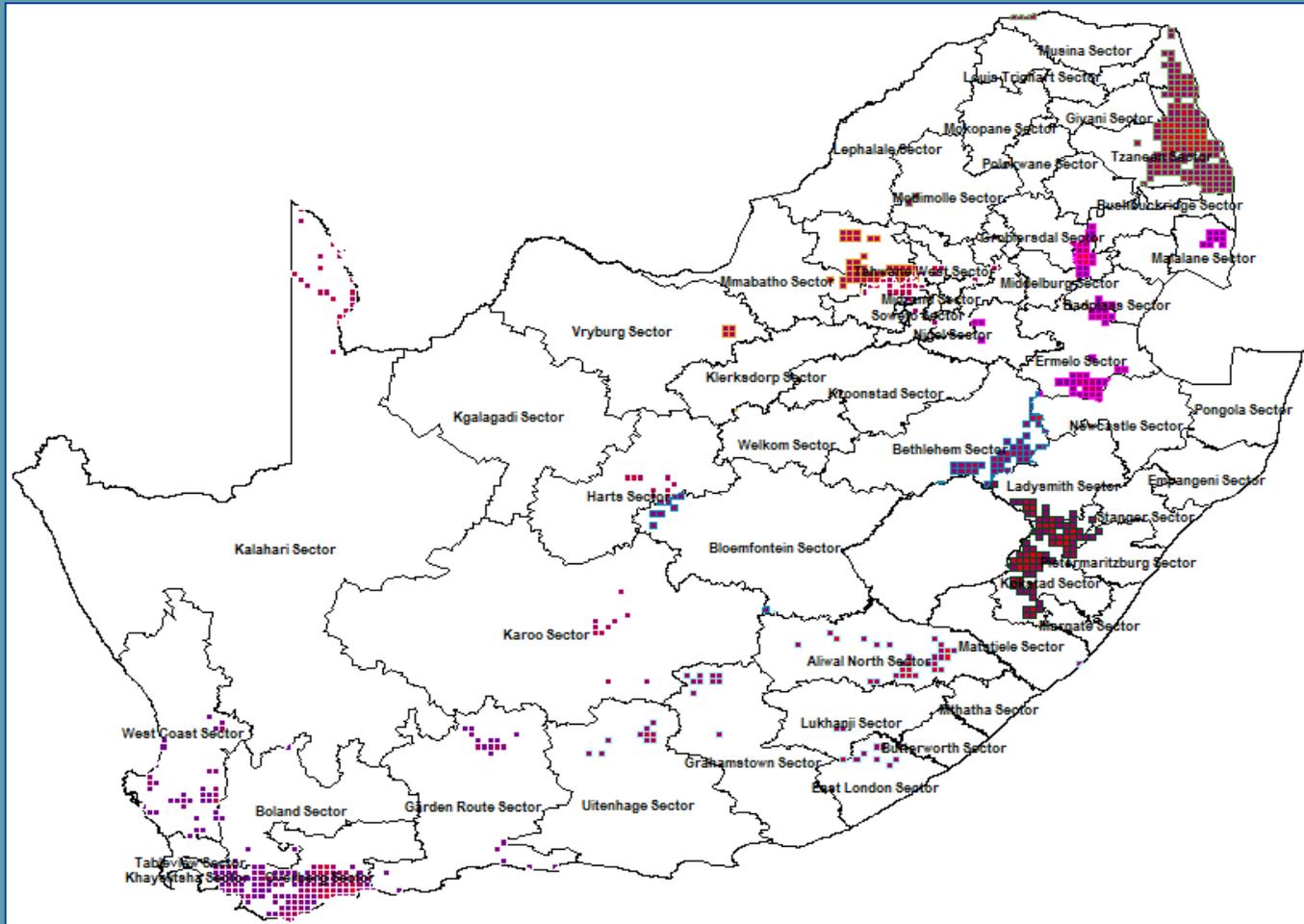




# Eskom/EWT research identified Sensitive areas



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Bird Sensitivity Map indicating Hot Spots for immediate attention



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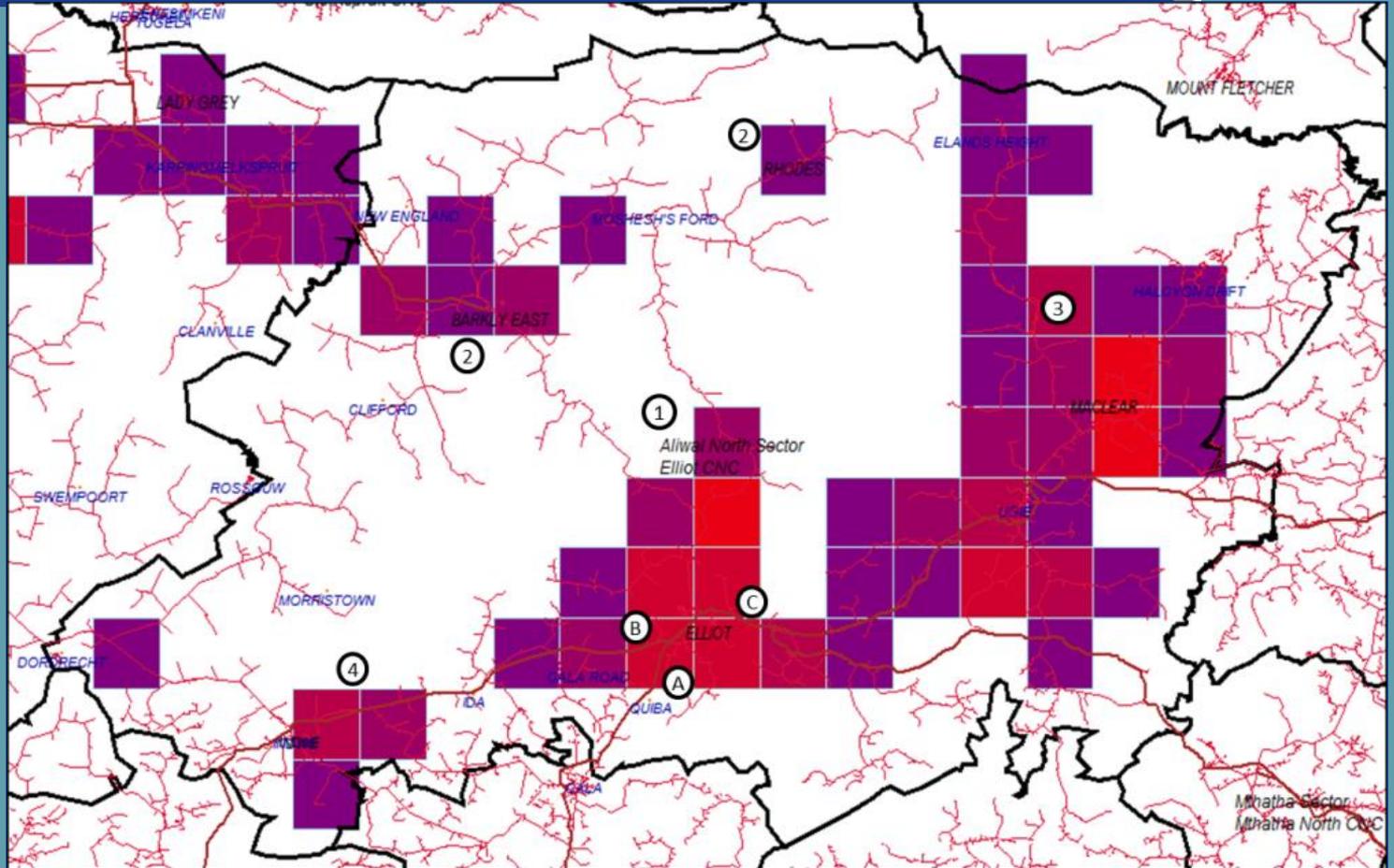
# Pro-active mitigation: Network identification within Sensitive Areas



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Elliot CNC sensitivity pentads overlaid with the HV and MV power lines



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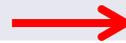
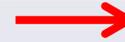


# Conclusions from EWT: Focus CNC's



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Operating Unit	Zone	Sector	Customer Network Centre	Ranking
Limpopo	Tzaneen	Tzaneen	Selati	1
Limpopo	Thohoyandou	Thohoyandou	Malamulele	2
Northern Cape	Upington	Kalahari	Upington	3
Limpopo	Tzaneen	Tzaneen	Hoedspruit	4
Kwa Zulu Natal	Pietermaritzburg	Kokstad	Underberg	5
Kwa Zulu Natal	Pietermaritzburg	Kokstad	Nottingham Road	6
Kwa Zulu Natal	Pietermaritzburg	Kokstad	Kokstad	7
Freestate	Bethlehem	Bethlehem	Harrismith	8
Kwa Zulu Natal	Newcastle	Ladysmith	Estcourt	9
Northern Cape	Kimberly	Karoo	De Aar	10
North West	Platinum	Mmabthaho	Koster	11
Gauteng	Vaal	Randfontein	Magalies	12
Western Cape	Protea	Overberg	Swellendam	13
Northern Cape	Kimberley	Harts	Kimberley	14
North West	Platinum	Rustenburg	Hennops	15
Mpumalanga	Emalahleni	Middelburg	Machadodorp	16
Western Cape	Protea	Overberg	Bredasdorp	17
Eastern Cape	Aliwal North	Aliwal	Elliot	18
Mpumalanga	Ermelo	Ermelo	Volkstrust	19
Gauteng	Pretoria	Tshwane West	Ga Rankuwa	20
Kwa Zulu Natal	Newcastle	Ladysmith	Bergville	21









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# Problems associated with nests

## Streamers & Pollution

If a nest is located above a critical area (conductor) a flashover can result.

If nest is situated above an insulator string the disks may become polluted over time

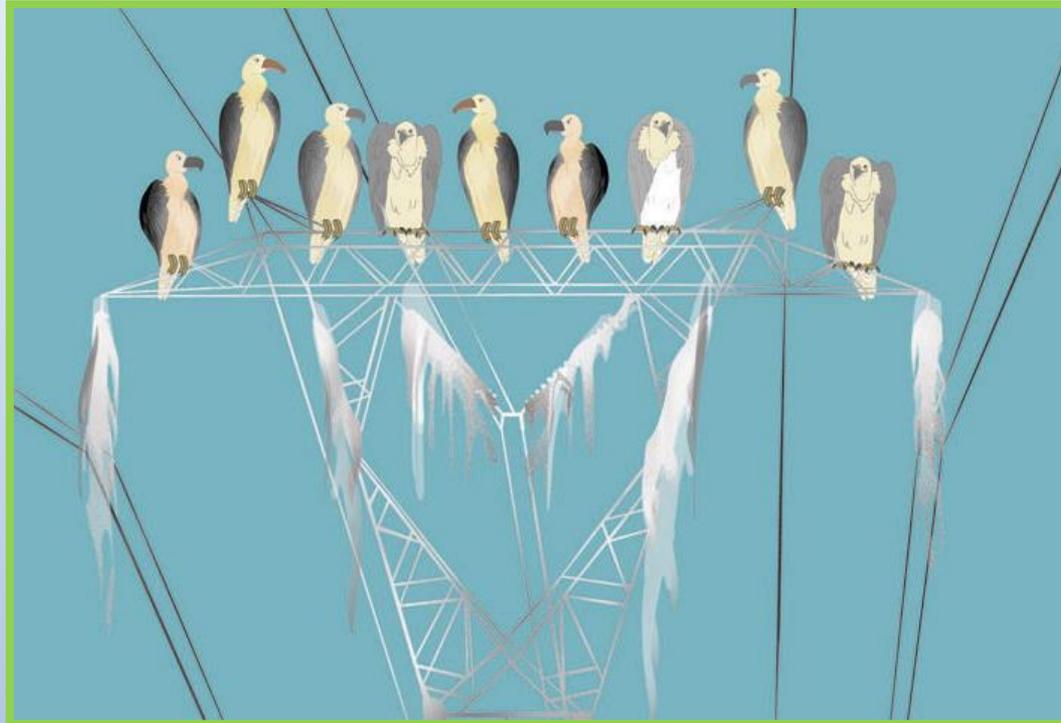




# Birds



# Bird Pollution



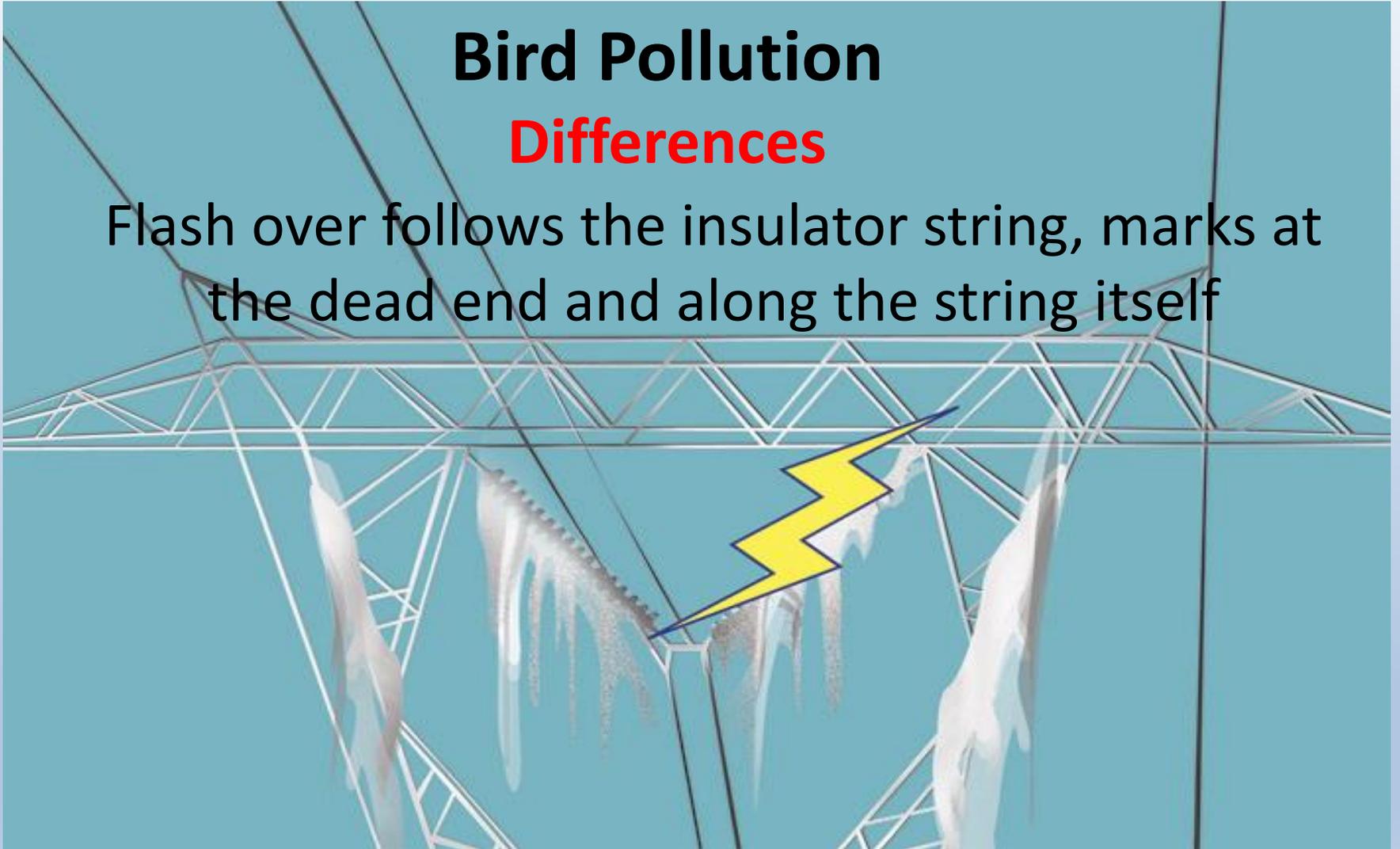
Repeated pre-deposition of excreta on insulators coupled with moisture



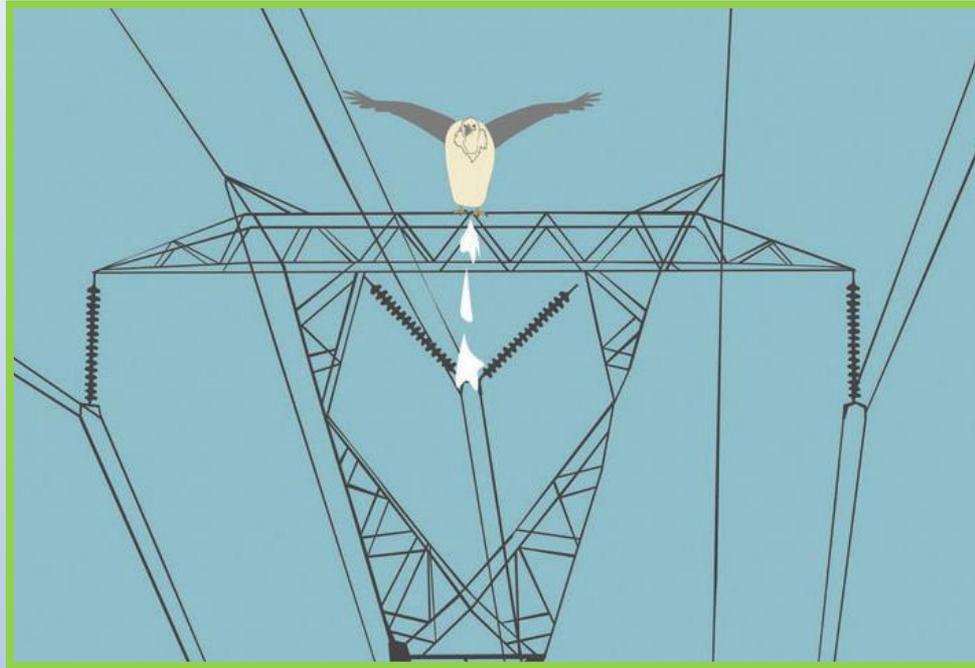
# Bird Pollution

## Differences

Flash over follows the insulator string, marks at the dead end and along the string itself



# Bird Steamer



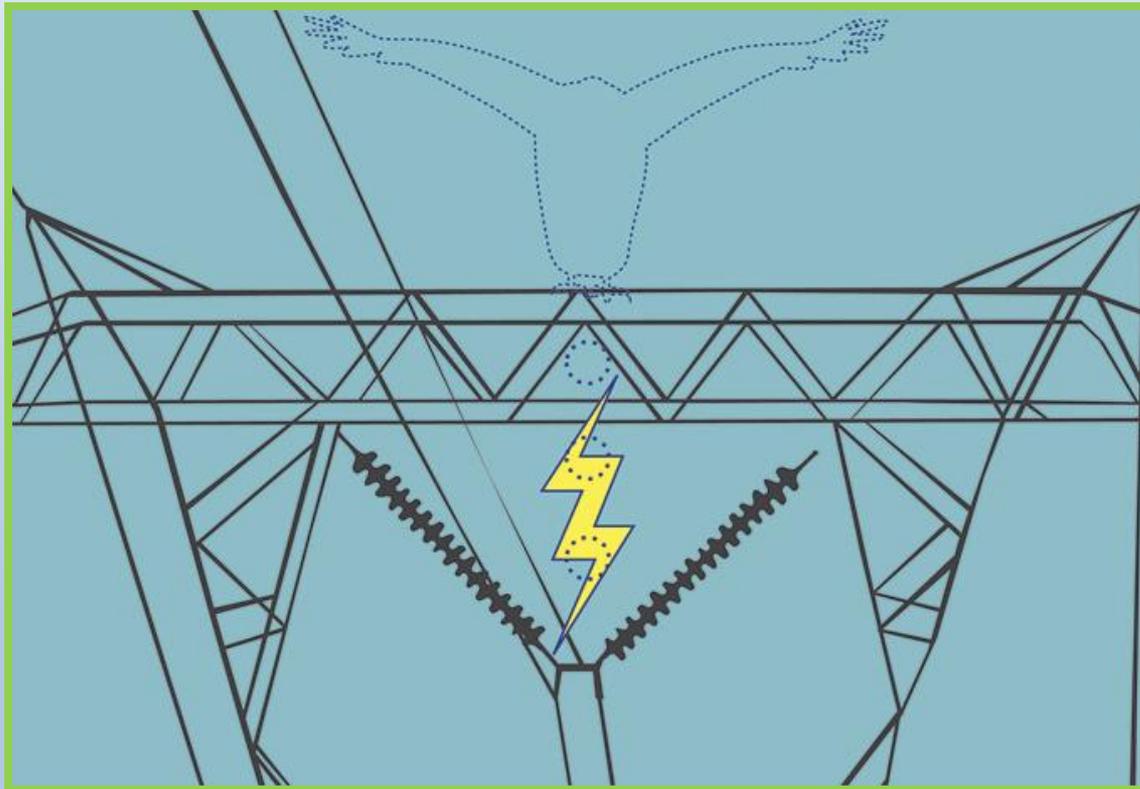
Bridging of the air insulation by means of a continuous long ejected streamer of electrically conductive excreta



**BIRD STREAMER**

# Indicators of Bird Streamer Faulting

Position of the flash marks

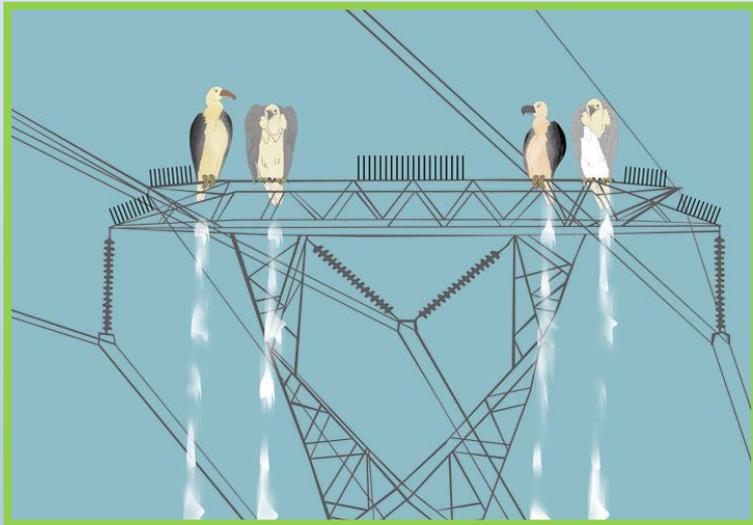


# Streamers : Flash Marks



# Mitigation

## Bird Guards



- Installed in a zone at least 1m on either side of the conductor bundle
- Landing plates on strain towers
- V and I string configurations
- Areas inside the boat









A large, lattice-structured electricity pylon stands prominently on the left side of the image, silhouetted against a vibrant sunset sky. The sky transitions from a deep orange at the bottom to a lighter yellow at the top. Several power lines extend from the pylon across the frame. The overall mood is one of gratitude and appreciation for the power industry.

**THANK – YOU!**

**Eskom – EWT Strategic Partnership**

**Constant Hoogstad**

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