



# BIOMONITORING

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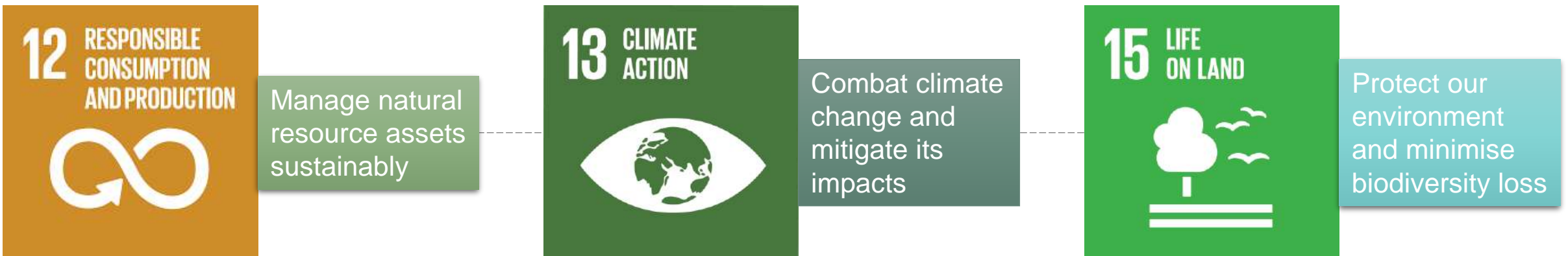


## EXXARO COMMITMENT STATEMENT

Exxaro is committed to environmental excellence, including maintaining a healthy relationship between our operations and the natural environment. The company is actively involved in monitoring the health of wetlands and riverine ecosystems, and in preserving the plants and animals that exist within Exxaro areas of operations.

Biomonitoring is a legal requirement for all water use licences issued by the Department of Water and Sanitation to our operations (Grootegeeluk (GG), Belfast Coal, Matla Coal and Leeuwan Coal). Exxaro partake in aquatic biomonitoring, terrestrial habitat monitoring, species protection program and as well as wetland health monitoring. The company care about protecting biodiversity that is vulnerable to mining (including other land uses adjacent to our operations) activities.

## Related Sustainable Development Goals (SDGs)





# BIOMONITORING



## What is biomonitoring

- Biomonitoring is defined as the act of observing and assessing the state and ongoing changes in ecosystems, components of biodiversity and landscape, including types of habitats, population and species
- Biomonitoring is useful to detect or assess, in living organisms, any potential hazardous exposure and effects to chemicals



## How is biomonitoring conducted at Exxaro

- Biomonitoring is conducted by taking measurement of biological indicators to assess the condition of wetlands, riverine and terrestrial ecosystems
  - This include evaluating the physical and chemical characteristics of an ecosystem
- The state of an ecosystem is described using approved biological indices in South Africa

4.3.5. Pan 15

Table 4-10: Summarised findings for Pan 15

Monitoring Characteristics	Description	Site Images and EcoServices Diagram
PES	<p><b>B</b></p> <p>Pan 15 was also inundated with water. This pan is wooded with various <i>Vachellia</i> and <i>Senegalia</i> species and thus provides excellent habitat for birds. Good basal cover was observed with many grass and sedge species observed. Few impacts were observed aside from evidence of grazing, however these levels appear to be fairly normal.</p>	
EcoServices	<p>The main services provided by Pan 15, and all pans in general in the Limpopo region, are biodiversity maintenance, water provision and grazing. Pans provide point sources of water and food in an otherwise dry habitat thereby increasing species composition and richness. The importance scores for Regulating and Supporting Services were very low to high, Provisioning Services were very low to moderately high and Cultural Services were very low to moderately low.</p>	
EIS	High	Changes (2018-2021) No significant changes →



**MATLA**

# MATLA GRASS OWL PROTECTION PLAN

Section 51(1) (BIODIVERSITY ACT,2004)



## GRASS OWL PROTECTION PLAN

- Matla Coal Mine manages a large area of open grassland that provides a unique opportunity to protect suitable habitat for the African Grass-owl.
- The grass-owl protection plan will create Grass-Owl sanctuaries that would contribute significantly to the conservation of this red-list species in South Africa.
- The plan aims to protect and monitor these species within the Matla Coal Mine surface area.

## REASONS FOR THE GRASS OWL PROTECTION PLAN PROJECT:

- Mining activities such as “short wall mining” causing surface subsidence contribute significantly to destruction of the grass owl's habitat. Mortality rate of the young grass owls also increases as they are unable to escape danger.
- Uncontrolled veld fires by farmers and the local communities, destroys the nests and eggs of the birds.
- Grass-owls are preyed on by predators eg snakes and other animals .

## PROJECT PROCESS FLOW

- Identification and marking of roost site along Mine 2 and Mine 3 grasslands.
- Set up nests to trap grass owls, ring them and have a descriptive record
- Information such as the code on the ring, the location and time of ringing must be included.
- The breeding season must also be taken into consideration and the younger grass owls should be ringed in a careful manner in order not to hurt them
- The active nests search is conducted through walking in transect lines over the identified site in Mine 2 and Mine 3, with numbered pegs to be able to locate area in which the nests have been located.
- Once active nests have been discovered, the captured birds, chicks, or eggs are tagged for count, measurements, and relocation.
- The habitat identified as comparable, should be big enough to sustain the captured birds and chicks along with being able to sustain the possible breeding for new generations.



# MATLA GRASS OWL PROTECTION PLAN



## PROJECT TIMING

- Grass owls breed from August to December but mainly between February to April. It is important that more attention is given to the monitoring plan during these times as most of them will be around their habitat



## OBJECTIVES

- To add value to biodiversity conservation of the Grass-owl within Matla.
- Protect grass owl habitats against anthropogenic activities.
- To restore the endangered grass owl's habitat to its original form.
- To Continuously monitor the status of the grass owls





# GROOTEGELUK



Seasonal pans identified as part of the monitoring plan are monitored annually as of Jan 2021.

15 Pans out of the 63 to be impacted over the next 20 years.

Water Quality

In Situ

Toxicity

Aquatic Invertebrate Assessments

Biotopes Sampled

Aquatic Macro Invertebrates Sampled

Maintain the Current PES (Present Ecological Status of the Pans).

As of 2022 – Created Pans will also be sampled to Determine their Success.

Same Parameters comparing it to the Baseline Data at the Harvested Pans

B Class - PES



# MONITORING POINTS


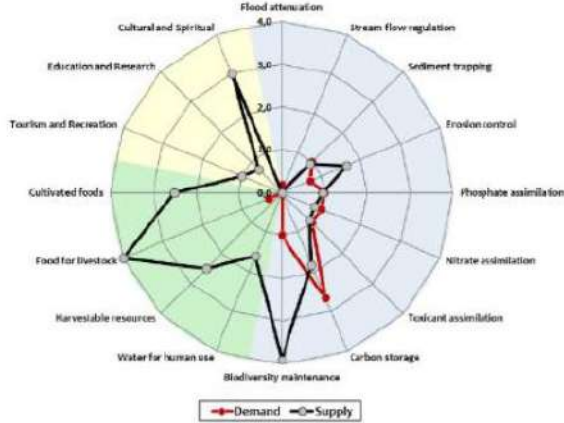


# MONITORING POINTS



## 4.3.5. Pan 15

Table 4-10: Summarised findings for Pan 15

Monitoring Characteristics	Description	Site Images and EcoServices Diagram	
PES	<p style="text-align: center; background-color: green; color: white; font-weight: bold; padding: 5px;">B</p> <p>Pan 15 was also inundated with water. This pan is wooded with various <i>Vachellia</i> and <i>Senegalia</i> species and thus provides excellent habitat for birds. Good basal cover was observed with many grass and sedge species observed. Few impacts were observed aside from evidence of grazing, however these levels appear to be fairly normal.</p>		
EcoServices	<p>The main services provided by Pan 15, and all pans in general in the Limpopo region, are biodiversity maintenance, water provision and grazing. Pans provide point sources of water and food in an otherwise dry habitat thereby increasing species composition and richness. The importance scores for Regulating and Supporting Services were very low to high, Provisioning Services were very low to moderately high and Cultural Services were very low to moderately low.</p>		
EIS	High	Changes (2018-2021)	No significant changes. →

# BIODIVERSITY MANAGEMENT



## **Invasive Plan Control**

Physical control as per the Phase 1 Plan to be implemented in 2022

## **Protected Tree Species:**

Donation of Trees to DFFE as per the License Conditions. (Ratio 3:1)

200 Trees (Pit Expansion)

645 Trees (Road Widening)

Ensuring impact areas are minimized

Ensure that no Vegetation is removed without either an Internal Permit or DFFE License.

## **Rescue & Relocation:**

Survey and relocation of Baboon spiders (c&i WUL requirement)

As of 2022 the Intent is to include other Spp. of concern.

Annually as GGC pit expands.

TOPS Permits to be in place for this.

## **Erosion Control:**

Annual Erosion Assessment

Capital Project – Erosion Control Program

## **Offset Management:**

Rehab of seasonal pans within the Manketti Property area as ID in the Offset Report submitted to DWS.

Consider Service Level Agreement with Manketti.





**BELFAST**



# PURPOSE

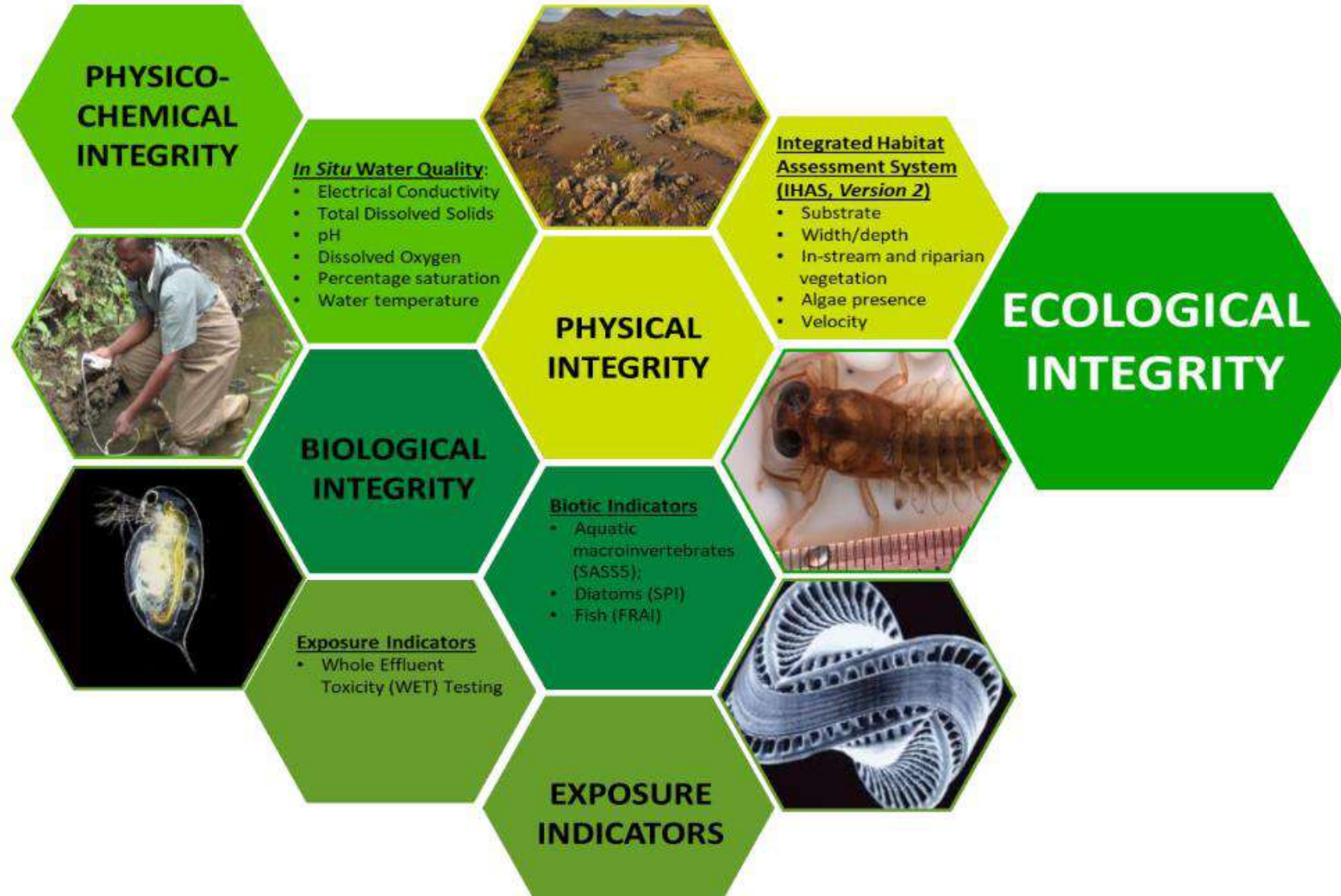


- 3.6. An Aquatic Scientist approved by the Provincial Head must establish a monitoring programme for the following indices: Invertebrate Habitat Assessment System (IHAS) and the latest SASS (South African Scoring System). Sampling must be done once during summer season and once during winter season, to reflect the status of the river upstream and downstream of the activities.
- 5.2 A comprehensive and appropriate environmental assessment and monitoring programme (including bio-monitoring, ecotoxicology and sediment sampling) to determine the impact, change, deterioration and improvement of the aquatic system associated with the activities listed under Appendix IV as well as compliance to these water use licence conditions must be developed and submitted to the Provincial Head for written approval before commencement and must subsequently be implemented as directed.
- 5.3 Six (6) monthly monitoring reports must be submitted to the Responsible Authority until otherwise agreed in writing with the Provincial Head.

*“Biomonitoring is defined as the act of observing and assessing the state and ongoing changes in ecosystems, components of biodiversity and landscape, including types of habitats, population and species.”*

Source: Journal of sustainable mining, 2015.

# PROCESS FOLLOWED FOR AQUATIC BIOMONITORING



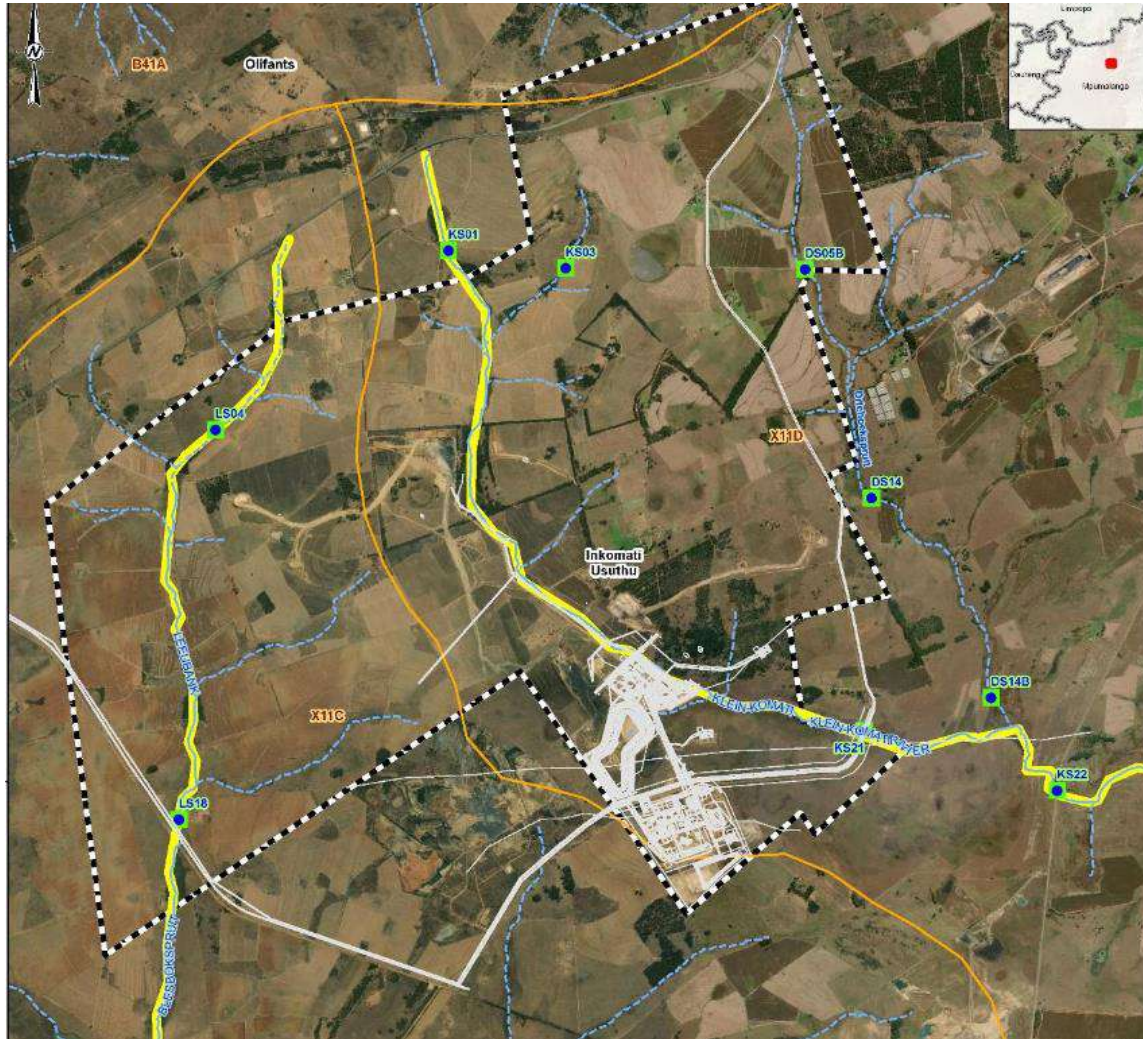
# BIOMONITORING REPORTS



- ✓ Aquatics Biomonitoring
- ✓ Terrestrial Ecology Monitoring
- ✓ Wetland Health Monitoring
  
- External Independent service provider is Golder & Associates
- Monitoring takes place during the wet and dry season.



# AQUATIC BIOMONITORING



## Latest Assessment:

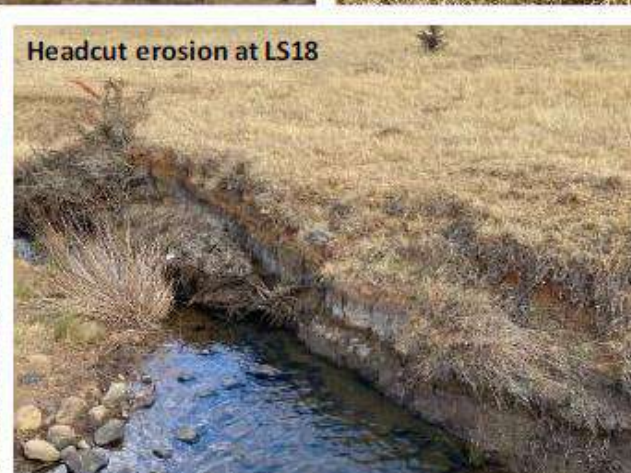
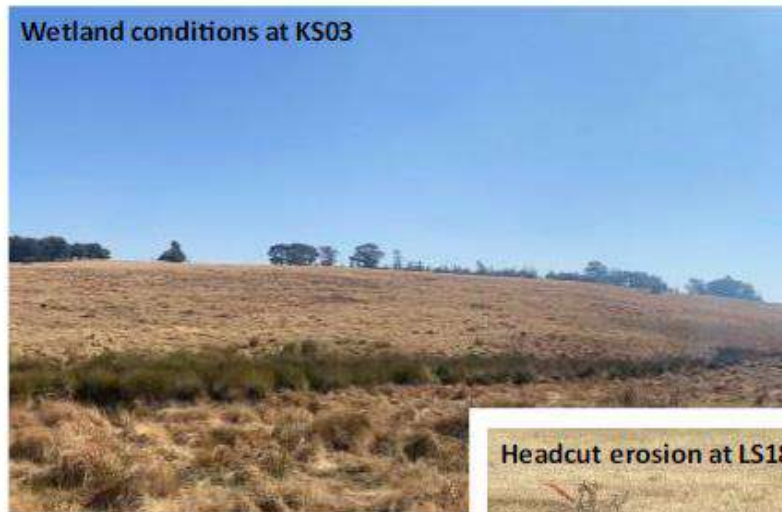
- Water quality measurements recorded during the Dry season survey ranged from those within acceptable values
- and those that fell outside the acceptable range generally within the TWQR for all parameters, particularly for
- TDS which recorded an acceptable value for all sites.
- pH and DO , recorded values that were outside the prescribed TWQR at some of the monitored sites. These values were generally consistent with historical values that have shown to fluctuate both spatially and temporally since the commencement of the monitoring survey.
- The fluctuation of water quality measurement has been seen at both upstream and downstream systems as well as sites within the Leeubankspruit which is located outside the mining operations



# INTERGRATED HABITAT ASSESSMENT SCORING



- The IHAS results obtained during the dry monitoring showed KS22 to have good habitat availability
- Areas of concern are KS03, KS21 and LS18.



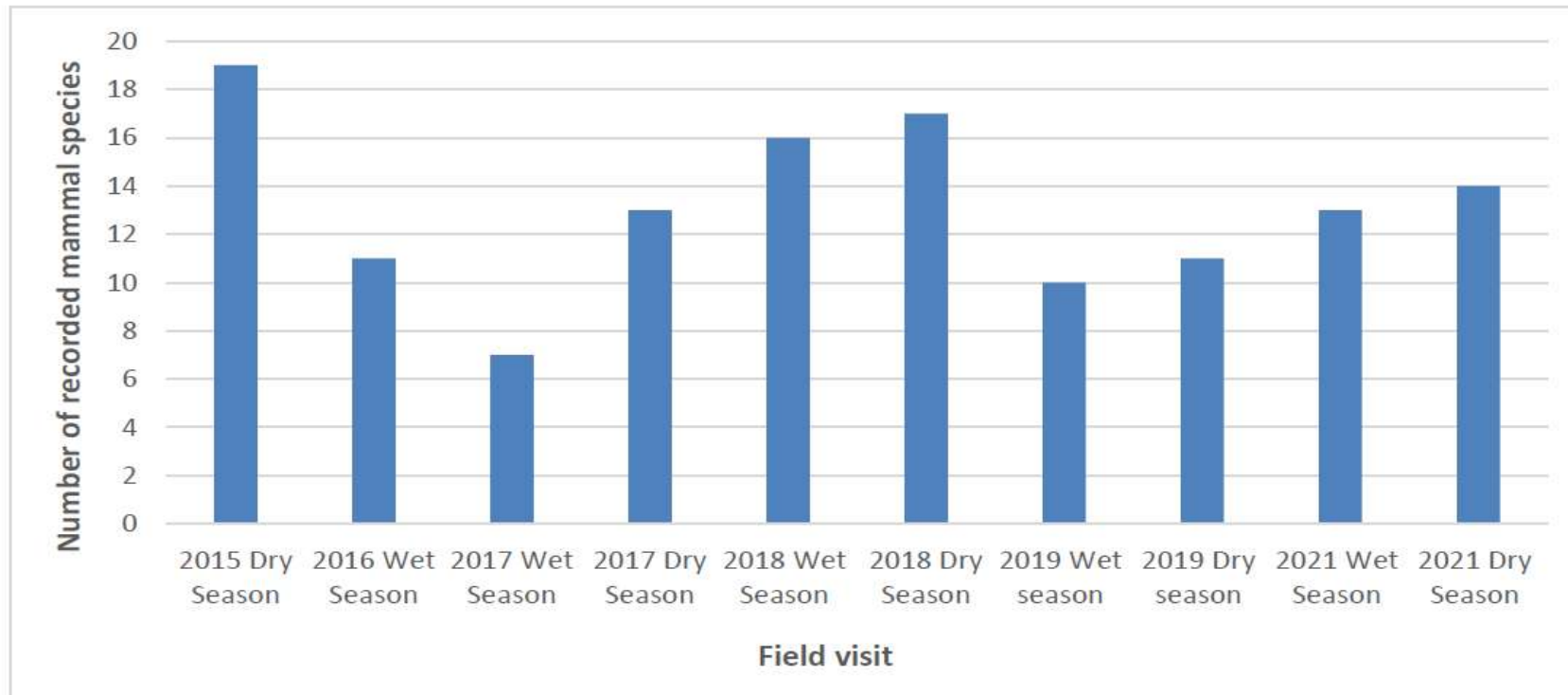
# PROCESS FOLLOWED FOR TERRESTRIAL ECOLOGY MONITORING



- Camera traps were placed at five monitoring points. The traps were operational continuously for the 24-hour cycle of each day of the survey (four consecutive nights).
- Passive sampling aimed to record mammals of all sizes and included direct observations (opportunistic encounters) and indirect observations (identifying tracks, faeces and burrows).
- Birds were sampled using 15-minute point-scans and ongoing opportunistic observations:

Point scans were conducted at dams/pans in the study area; Opportunistic observations were also recorded while driving and walking around the study area; and Visual cues and bird calls were used to identify species. Data were recorded on the BirdLasser App. using an Android cell phone.

# NUMBER OF MAMMAL SPECIES RECORDED 2015-2021



- The total number of mammals of conservation importance confirmed in the study area is nine.



# NUMBER OF MAMMAL SPECIES RECORDED 2015-2021



Figure 1: *Yellow mongoose*



Figure 2: Black- Backed Jackal



Figure 3: *Leptailurus serval*



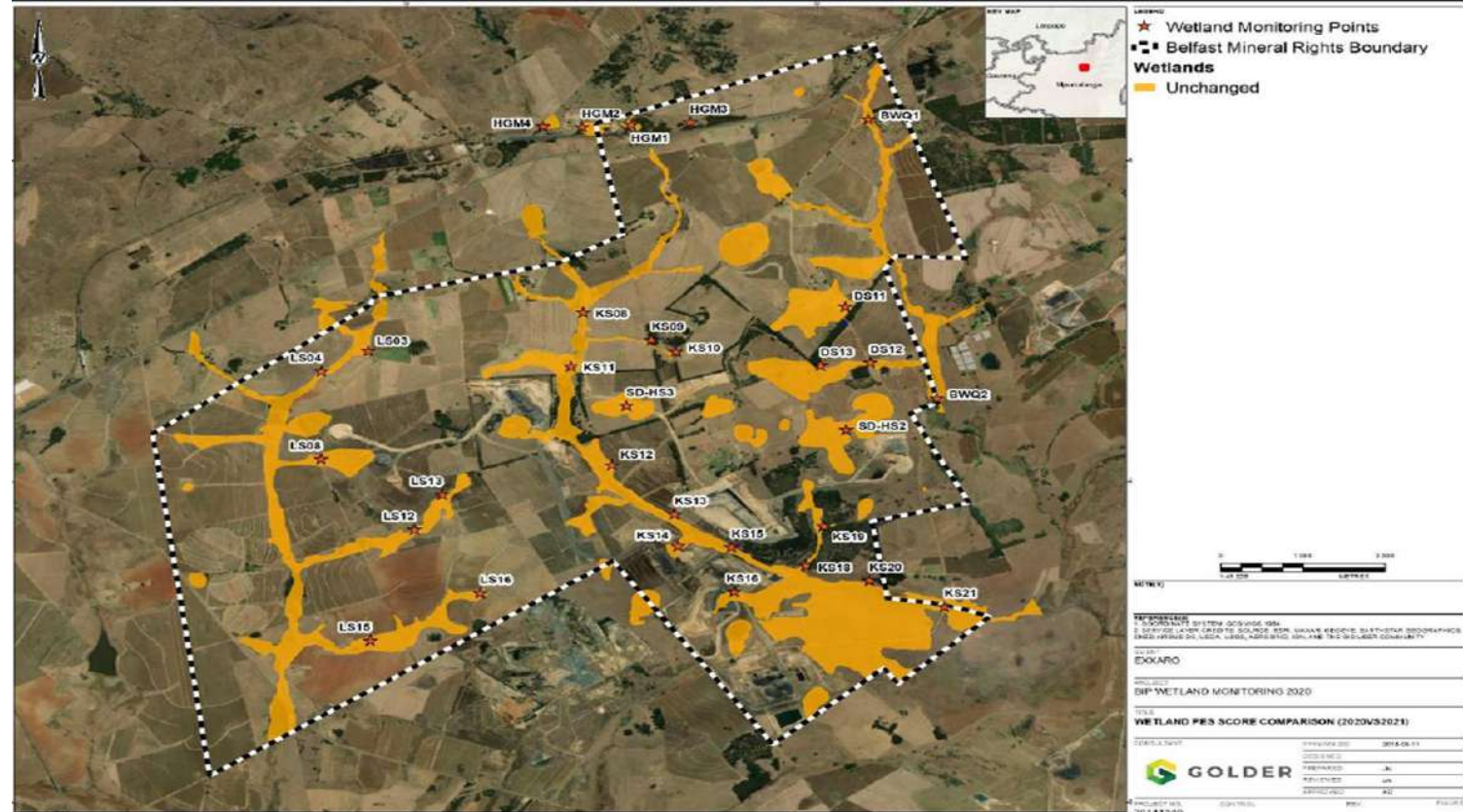


# WETLAND MONITORING



## Ecological Importance and Sensitivity (EIS)

- Construction and operational activities such as vegetation and topsoil removal, and increased hardened surfaces within the MRA have resulted in some changes in the ecological importance and sensitivity of the wetlands on site, particularly wetlands along the KS system, the central LS system, and the SD-HS3 wetland system.
- The overall EIS score for most of the monitored wetland sites remained unchanged from those obtained in the 2021 wet season survey as well as previous years monitoring surveys.



# CONCLUSION: MANAGEMENT MEASURES



- Appointed independent specialists that conduct the monitoring
- A monitoring schedule is in place
- Observations during scheduled inspections
- Environmental Awareness
- Impacts are identified the and the consultant gives recommendations
- Recommendations are compiled into an action register
- The action register is communicated to the relevant stakeholders and tracked



# LEEUIWPAN OVERVIEW



## Physical location

- Delmas, Mpumalanga Province - 75km from Pretoria

## Employment

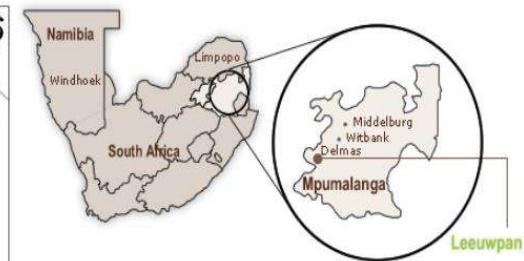
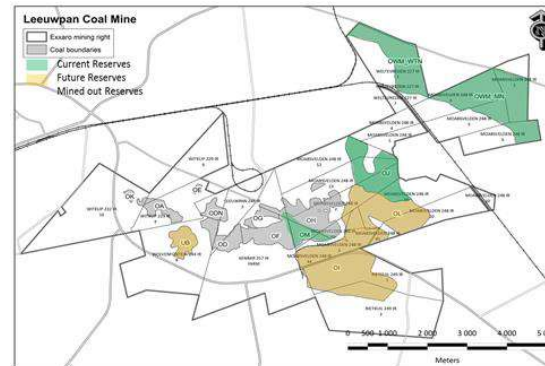
- 533 permanent positions
- 610 permanent contractors (Maksimum, Road Science Tech, Lomez, Plantcor, Entlearolo, Fraser Alexander, etc)
- 464 other contractors (Shut-downs, and other once off)

## Market Segments

- Steel: AMSA (Peas)
- Domestic: Zarbon (PSC)
- Eskom: Pending CSA finalization
- Exports: RBCT (5300kcal)

## The mine has three Beneficiation processes:

- Dense Medium Separation Plant, (DMS) with 2 modules 240 per tons per hour per module
- Fraser Alexander DMS Plant 350 tons per hour
- Crush and Stack Plant 300 tons per hour
- New discard washing plant completed end January 2022 (Processing 300 tons per hour)



# BIOMONITORING



- Exxaro Leeuwpan appointed Environmental Assurance to conduct biannual monitoring since 2019 as per the approved Water Use License.
- The scope of work is to conduct biomonitoring, toxicity testing, diatom analysis and wetland assessment at sites in and around the existing Leeuwpan Colliery during the wet and dry season assessment periods.
- The contract is expiring June 2022, the wet season monitoring will be done during the start of the new contract.
- Due to divestment new contract appointments are put on hold until further communication be it compliance or operational.

## **The assessment is conducted according to the relevant legislation:**

- Conservation of Agricultural Resource Act (CARA) No. 43 of 1983
- South African Constitution (Act no. 108 of 1996)
- DWS General Notice 509 Government Gazette no. 40229 (2016)
- National Environmental Management Act (NEMA): EIA Regulations (2014, as amended in 2017)
- National Water Act (NWA) (Act no. 36 of 1998)
- National Environmental Management Act: Biodiversity Act (NEM:BA) (Act No. 10 of 2004)

# BIOMONITORING POINTS



## Monitoring Sites:



- The primary objective of this aquatic biomonitoring assessment is to gather results from the potentially at-risk aquatic systems in the vicinity of the Leeuwan Colliery to ascertain whether the production and associated activities have had an impact on the Present Ecological State (PES) of the systems



# BIOMONITORING WATER QUALITY RESULTS



SAMPLE POINT	DRY SEASON	pH	CONDUCTIVITY mS/m	TDS (Mg/l)	DO (Mg/l)	DO (%)	TEMP. (°C)
TWQR	YEAR	6.5-9.0	<70	<100 mg/l	>5.00	80-120	5-30
<b>BIOMONITORING SITES</b>							
LP-BS-US (upstream)	2021	8.31	41.10	267.00	13.81	165.20	15.83
	2020	8.19	61.10	397.00	9.16	112.3	16.85
	2019	DRY/NO FLOW					
LP-BS-DS (downstream)	2021	7.47	223.20	1450.00	7.72	90.50	14.73
	2020	8.39	62.90	408.00	6.26	71.60	13.90
	2019	9.46	45.40	295.00	6.41	75.40	14.90
LP-RK-US (upstream)	2021	7.40	53.20	345.00	8.16	94.90	14.50
	2020	7.54	47.00	305.00	7.45	92.80	17.73
	2019	DRY/NO FLOW					
LP-WEL-DS (downstream)	2021	8.15	57.00	370.00	6.61	76.90	14.70
	2020	7.10	53.80	349.00	6.31	70.20	12.65
	2019	9.88	45.50	297.00	4.17	49.30	14.93
<b>TOXICITY SITE COMPARABLE LAB SAMPLE DATA</b>							
KR01A	2021	7.96	284.00	2665.00	6.75	NA	21.00
LSW09	2021	7.73	297.00	2763.00	6.66	NA	21.00
LSW13	2021	7.88	57.00	269.00	6.78	NA	21.00

# BIOMONITORING TOXICITY ASSESSMENT



Table 19: Acute Toxicity Analysis of the additional water samples that were collected at the relevant sites.

Test spp.	Results	Q1: March 2021			Q2: May 2021		
		LSW09	LSW13	KRA01A	LSW09	LSW13	KRA01A
<i>A. fischeri</i> (Bacteria)	%30min inhibition (-) / stimulation (+) (%)	8	-19	2	-11	-26	-17
	EC/LC20 (30 mins)	*	*	*	*	*	*
	EC/LC50 (30 mins)	*	*	*	*	*	*
	Toxicity unit (TU) / Description	No short-chronic hazard	No short-chronic hazard	No short-chronic hazard	No short-chronic hazard	S.D.O.T.H	No short-chronic hazard
	<i>D. magna</i> (Water Flea)	%48hour mortality rate (-%)	-5	0	0	0	0

Test spp.	Results	Q1: March 2021			Q2: May 2021		
		LSW09	LSW13	KRA01A	LSW09	LSW13	KRA01A
	EC/LC10 (48hours)	*	*	*	*	*	*
	EC/LC50 (48hours)	*	*	*	*	*	*
	Toxicity unit (TU) / Description	No acute hazard	No acute hazard	No acute hazard	No acute hazard	No acute hazard	No acute hazard
<b>Overall classification - Hazard class***</b>		Class I- No acute/short-chronic hazard	Class I- No acute/short-chronic hazard	Class I- No acute/short-chronic hazard	Class I- No acute/short-chronic hazard	Class II- Slight short-chronic hazard	Class I- No acute/short-chronic hazard
<b>Weight (%)</b>		0	0	0	0	25	0



# AQUATIC BIOMONITORING IHAS SCORES



Table ES2: Summary table of the Integrated Habitat Assessment System (IHAS) scores for the Leeuwan Colliery biomonitoring sites during the 2019, 2020 and 2021 field surveys.

BIOMONITORING POINT	DRY SEASON	IHAS SCORE	CATEGORY	CHARACTERISTICS
LP-BS-US (Upstream)	2021	STAGNANT POOL/NO FLOW		
	2020	57 %	Inadequate: Habitat insufficient for supporting a diverse macroinvertebrate community.	<ul style="list-style-type: none"> <li>• Dominating habitat was GSM which consisted predominantly of mud.</li> <li>• Few stones, with 60 % covered in Algae.</li> <li>• Water was damming downstream before the bridge with low flow upstream and downstream thereof.</li> </ul>

BIOMONITORING POINT	DRY SEASON	IHAS SCORE	CATEGORY	CHARACTERISTICS
	2020	59 %	Inadequate: Habitat insufficient for supporting a diverse macroinvertebrate community.	<ul style="list-style-type: none"> <li>• A deep pool with a sand/mud substrate with intermittent stones was sampled.</li> <li>• Algae was present on all stones, aquatic vegetation and on the surface of the remaining substrate.</li> </ul>
	2019	52 %	Inadequate: Habitat insufficient for supporting a diverse macroinvertebrate community.	<ul style="list-style-type: none"> <li>• Stones were covered by a sediment layer.</li> <li>• Vegetation was limited to sedges, reeds and grass interacting with the water body.</li> </ul>

BIOMONITORING POINT	DRY SEASON	IHAS SCORE	CATEGORY	CHARACTERISTICS
	2019	DRY/NO FLOW		
LP-BS-DS (Downstream)	2021	46 %	Inadequate: Habitat insufficient for supporting a diverse macroinvertebrate community.	<ul style="list-style-type: none"> <li>• Some Stones (S) biotope was available for sampling, however the majority was covered by sediment and algae. A stretch of approximately 1 m was sampled.</li> <li>• Deep pools in two areas upstream and downstream of a bridge structure were sampleable.</li> </ul>
	2020	48 %	Inadequate: Habitat insufficient for supporting a diverse macroinvertebrate community.	<ul style="list-style-type: none"> <li>• Riparian vegetation was absent, however fringe vegetation included sedges and grass species.</li> <li>• Reach was dominated by GSM, with sand and mud being the most prominent aspect.</li> </ul>
	2019	44 %	Inadequate: Habitat insufficient for supporting a diverse macroinvertebrate community.	
LP-RK-US (Upstream)	2021	STAGNANT POOL/NO FLOW		
	2020	STAGNANT POOL/NO FLOW		
	2019	DRY/NO FLOW		
LP-WEL-DS (Downstream)	2021	56 %	Inadequate: Habitat insufficient for supporting a diverse macroinvertebrate community.	<ul style="list-style-type: none"> <li>• A single run of approximately 4 m comprised of stones of between 2 and 10 cm was sampled, that were covered by a sediment layer.</li> </ul>



# BIOMONITORING PES SASS5



Table 24: SASS5 results collected and analysed for the sites associated with the Leeuwan Colliery.

SAMPLE POINT	SEASON	NO. OF TAXA	% CHANGE SINCE LAST PERIOD	SASS5 SCORE	% CHANGE SINCE LAST PERIOD	ASPT	% CHANGE SINCE LAST PERIOD	ECOLOGICAL CATEGORY	
<b>LEEUPAN COLLIERY</b>									
LP-BS-US (Upstream)	DRY 2021	STAGNANT/NO FLOW							
	DRY 2020	17	29↑	66	18↑	3.9	13↓	C	
	DRY 2019	DRY/NO FLOW							
	DRY 2018	12	N/A	54	N/A	4.5	N/A	D	
LP-BS-DS (Downstream)	DRY 2021	15	32 ↓	54	36 ↓	3.6	8 ↓	D	
	DRY 2020	22		85		3.9		B	
	DRY 2019	12		46		3.8		E/F	
	DRY 2018	12		46		3.8		E/F	
LP-RK-US (Upstream)	DRY 2021	STAGNANT/NO FLOW							
	DRY 2020	STAGNANT							
	DRY 2019	DRY/NO FLOW							
	DRY 2018	15	N/A	60	N/A	4.00	N/A	D	

SAMPLE POINT	SEASON	NO. OF TAXA	% CHANGE SINCE LAST PERIOD	SASS5 SCORE	% CHANGE SINCE LAST PERIOD	ASPT	% CHANGE SINCE LAST PERIOD	ECOLOGICAL CATEGORY
LP-WEL-DS (Downstream)	DRY 2021	16	16 ↓	66	25 ↓	4.1	11 ↓	Borderline C
	DRY 2020	19		87		4.6		B
	DRY 2019	16		74		4.6		C
	DRY 2018	20		100		5.0		B

KEY: ↓- Decreased since last monitoring period. ↑- Increased since last monitoring period.

# BIOMONITORING AND ALIEN INVADER MANAGEMENT



Years	Hectares covered
2019	172.69
2020	146.05
2021	118.20

- Pampas grass
- Black wattle



# RECOMMENDATION/WAY FORWARD

- Toxicity testing of the pooled water within the mining excavations should be considered.
- Clearing of Invasive Alien Plant Species
- Maintain ongoing monitoring of the aquatic community integrity.
- Review the monitoring points