

# DEVELOPMENT OF A COMPUTERISED WC/WDM SELF ASSESSMENT REPORTING TOOL WSART

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## BACKGROUND (2012 – 2019)

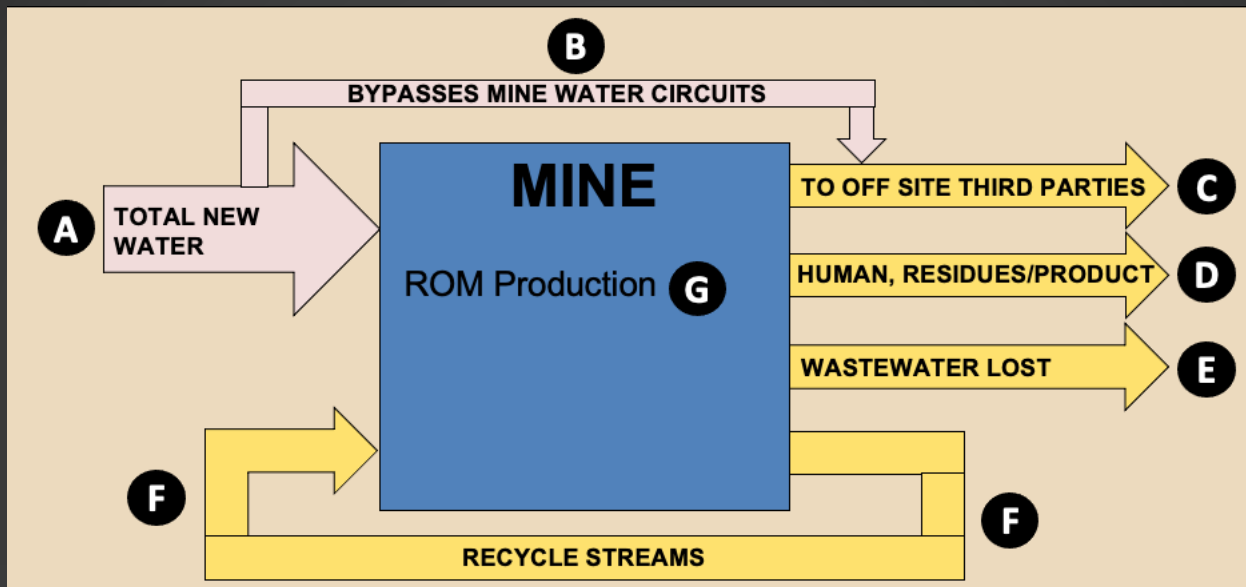
- Survey of South African mining industry undertaken to determine benchmark values for the identified Water Use Efficiency Indicators
- Definition of WUE indicators, benchmarks and targets
- Development of a guideline for the preparation of WCWDM plans for the South African mining industry
- Development of a computerized WCWDM Self Assessment Reporting Tool (WSART) with spreadsheet tool & user manual
- All tools are downloadable from Minerals Council website



# ENVIRONMENTAL RESOURCES

<i>August 19, 2020</i>	<a href="#">WC/WDM user manual, tool and log</a>	<a href="#">ZIP</a>
<i>August 05, 2020</i>	<a href="#">Global Industry Standard on Tailings Management</a>	<a href="#">PDF</a>
<i>July 15, 2020</i>	<a href="#">Water conservation and water demand management self-assessment tool</a>	<a href="#">PDF</a>
<i>June 06, 2018</i>	<a href="#">Guideline for the development and implementation of water conservation and water demand management plans for the mining sector</a>	<a href="#">PDF</a>
<i>June 06, 2018</i>	<a href="#">Benchmarks for water conservation and water demand management (WC/WDM) in the mining sector</a>	<a href="#">PDF</a>

# WUE INDICATORS – (SEE BENCHMARK REPORT)



## VOLUMETRIC INDICATORS

TOTAL WATER USE = **A**

CONSUMPTIVE WATER USE = **A - B - C**

WASTEWATER LOST = **E**

## WUE INDICATORS

TOTAL SPECIFIC WATER USE = **A / G**

CONSUMPTIVE SPECIFIC WATER USE = **(A - B - C) / G**

% WASTEWATER NOT REUSED = **E / (A - B - C + F)**

RECYCLE RATIO = **F / (A + F)**



# WUE BENCHMARKS

**Table 9: National water use efficiency benchmarks and ranges for coal mines**

Coal Mines	Units	Benchmark	Min (1 $\sigma$ )	Max (1 $\sigma$ )
<b>Total Mine</b>				
Total Mine - Total specific water use per ROM ton	m <sup>3</sup> /t	0.70	0.50	0.89
Total Mine - Consumptive specific water use per ROM ton	m <sup>3</sup> /t	0.38	0.20	0.55
Total Mine - % waste water not recycled	%	72%	60%	84%
Total Mine - Water recycle ratio	%	6%	0%	38%

**Table 10: National water use efficiency benchmarks and ranges for gold mines**

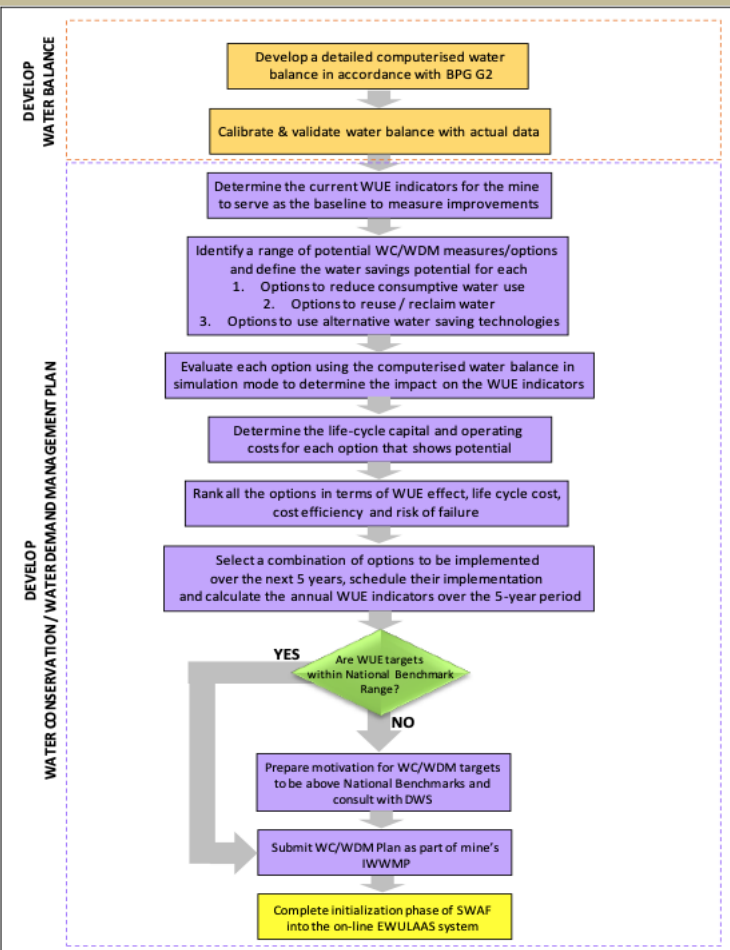
Gold Mines	Units	Benchmark	Min (1 $\sigma$ )	Max (1 $\sigma$ )
<b>Total Mine</b>				
Total Mine - Total specific water use per ROM ton	m <sup>3</sup> /t	2.09	1.60	2.57
Total Mine - Consumptive specific water use per ROM ton	m <sup>3</sup> /t	2.02	1.52	2.51
Total Mine - % waste water not recycled	%	60%	47%	73%
Total Mine - Water recycle ratio	%	18%	0%	50%

**Table 11: National water use efficiency benchmarks and ranges for platinum mines**

Platinum Mines	Units	Benchmark	Min (1 $\sigma$ )	Max (1 $\sigma$ )
<b>Total Mine</b>				
Total Mine - Total specific water use per ROM ton	m <sup>3</sup> /t	1.85	1.64	2.07
Total Mine - Consumptive specific water use per ROM ton	m <sup>3</sup> /t	1.82	1.60	2.04
Total Mine - % waste water not recycled	%	65%	42%	78%
Total Mine - Water recycle ratio	%	39%	2%	76%

# WCWDM METHODOLOGY – (SEE IMPLEMENTATION GUIDELINE)

## GUIDELINE METHODOLOGY



## PRACTICAL PHASED APPROACH

### PHASE 1: WC/WDM MANAGEMENT OPTIONS REPORT

- Undertake site assessment
- Develop water balance basis of design
- Determine baseline water use efficiency indicators
- Identify WC/WDM options to be considered in Phase 2

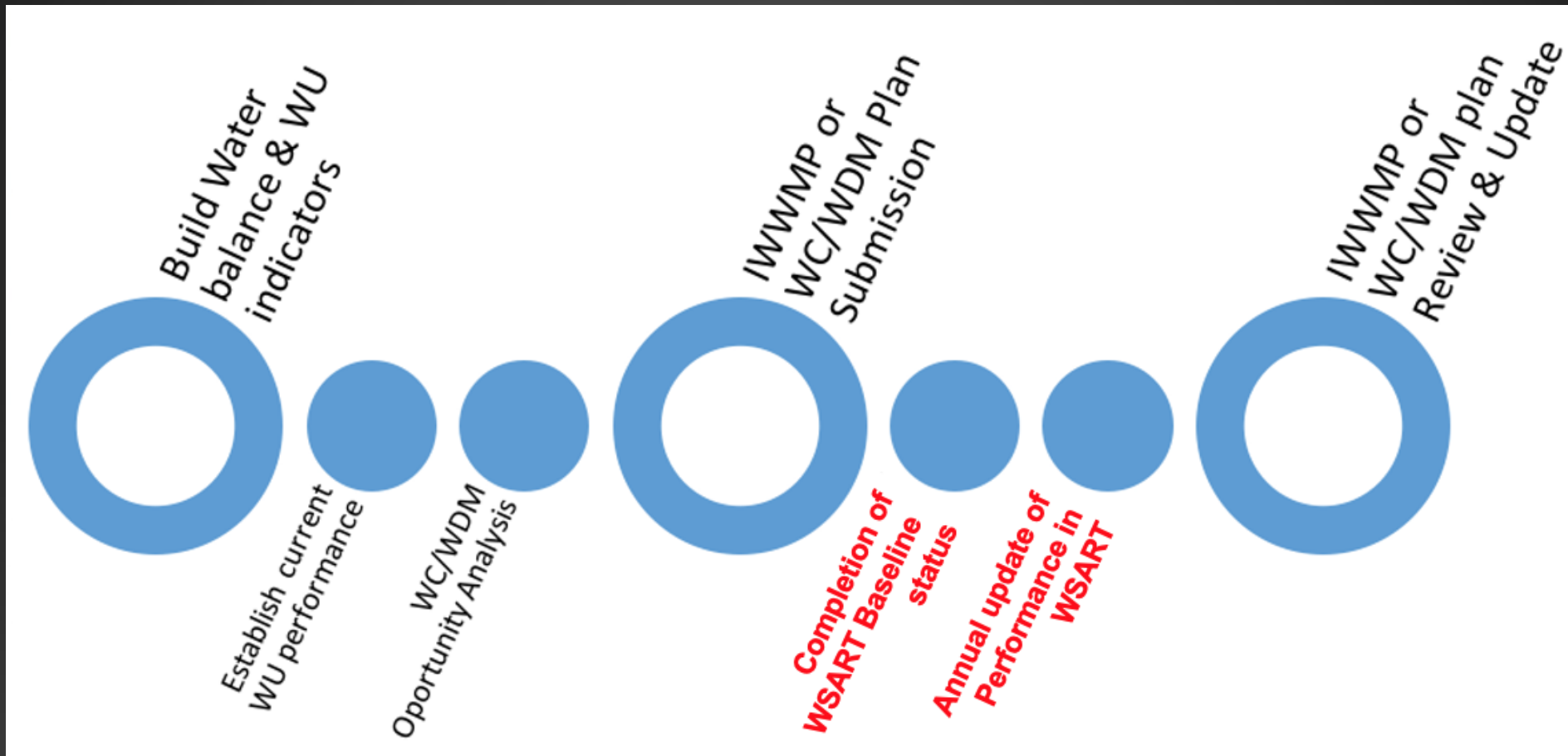
### PHASE 2: PRELIMINARY WC/WDM PLAN

- Develop a detailed computerised predictive water balance
- Use water balance to simulate and provide data on water use efficiency (WUE) improvements that can be achieved with each management option
- Develop first order cost assessments of potential options
- Rate and rank options to choose which to take to Phase 3

### PHASE 3: FINAL WC/WDM PLAN

- Undertake process engineering evaluations of preferred management options to develop capital and operating costs.
- Based on budget constraints and WUE improvements – select and schedule options to include in final WC/WDM Plan
- Prepare final WC/WDM plan
- Prepare SWAF reporting documentation

# PROCESS FOR DEVELOPMENT & IMPLEMENTATION OF WCWDM PLAN

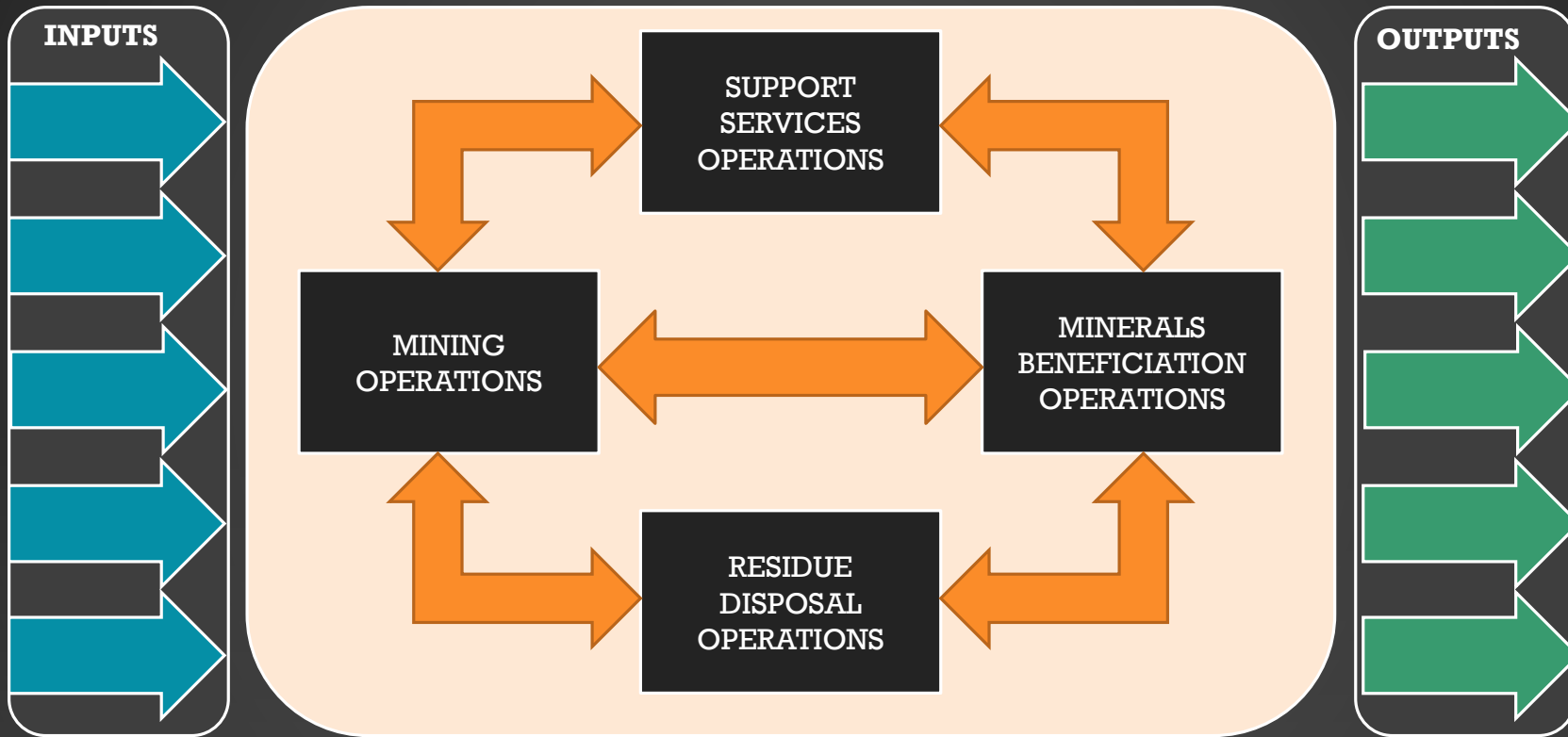


# WSART - PRIMARY PROJECT OBJECTIVES

- Development of a computerised self-assessment reporting tool (WSART) for the implementation and management of WC/WDM within the mining industry in accordance with principles in DWS guidelines
- Development of a User Manual for the mining industry to give practical guidance in using and applying the self assessment reporting tool
- Holding of training workshops, with case studies, to train personnel in the use of the self assessment reporting tool



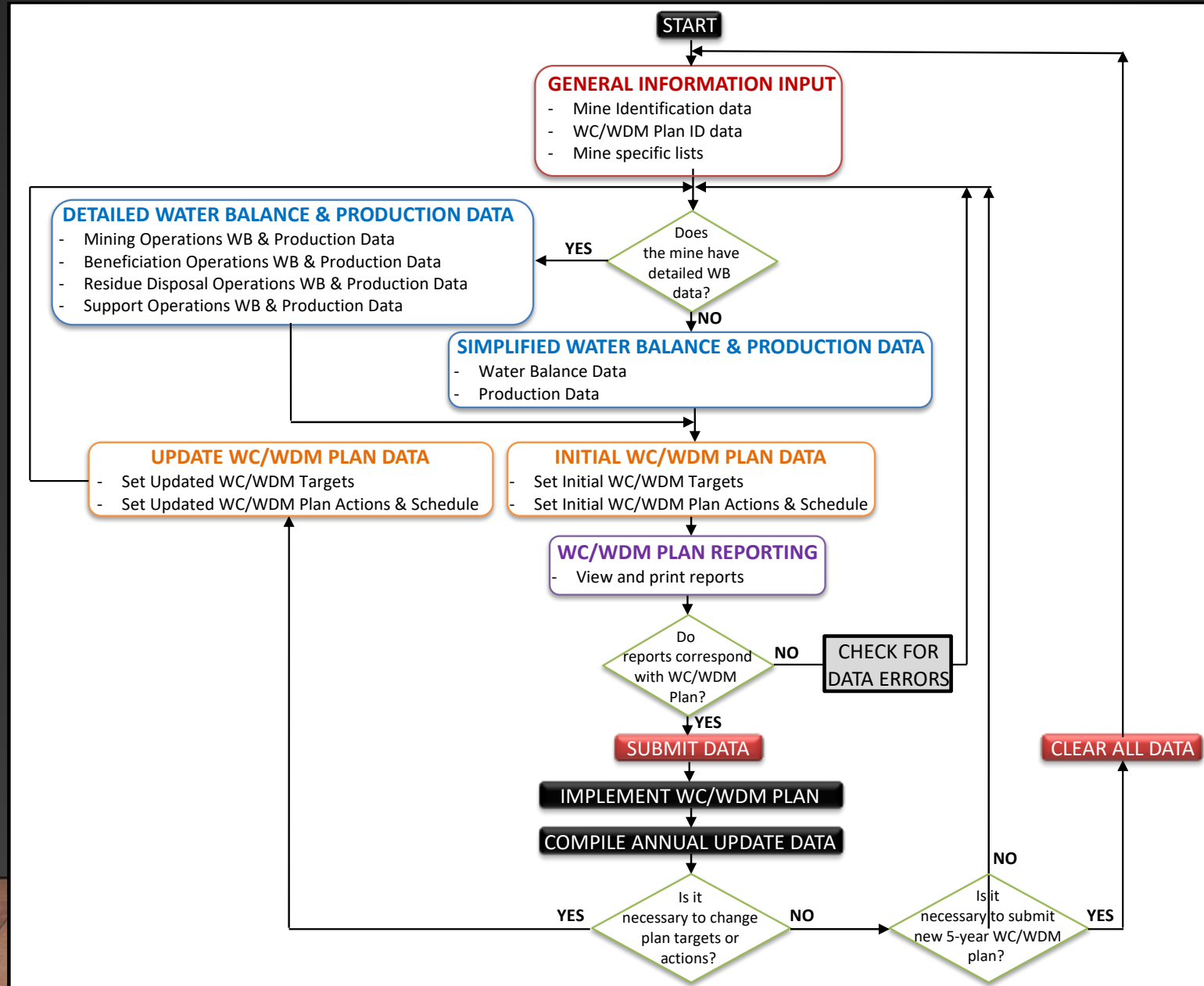
# WATER BALANCE REPORTING STRUCTURE



# USER MANUAL STRUCTURE

- Structure of the WSART User Manual – **Chapter 1.**
- Quick overview of the structure of the WSART – **Chapter 2.**
- WSART data input section that makes provision for three broad categories of data entry into the system. The entry of general information is discussed in **Chapter 3.**
- The entry of the detailed water balance and production data is presented and discussed in **Chapter 4.**
- The entry of the water use efficiency targets and the actual WC/WDM action plan and schedule is presented and discussed in **Chapter 5.**
- Reporting section that indicates the type of reports that can be produced and how they should be interpreted and used – **Chapter 6.**
- A worked case study for a relatively simplified mining operation – **Chapter 7**

# WSART STRUCTURE & LOGIC







# GENERAL INFORMATION INPUT

WC/WDM SELF ASSESSMENT REPORTING TOOL						
WCWDM PROGRESS CURRENT STATUS:	2019	2020	2021	2022	2023	<div>COMPLETED WCWDM FOR THE YEAR</div> <div>STILL TO COMPLETE WCWDM FOR THE YEAR</div>
WC/WDM PLAN INITIALIZATION DATA INPUT						Section of the self assessment tool to be used for entry of all data associated with the initial WC/WDM Plan.
GENERAL INFORMATION INPUT						Section of the self assessment tool where general mine and WC/WDM plan information is entered.
Mine Identification data					Go	Section of the self assessment tool where all general information relating to the mine, such as name, owner, geographic location, catchment location, etc. are added.
WC/WDM Plan Identification Data					Go	Section of the self assessment tool where specific information relevant to this WC/WDM Plan is entered. This includes information such as date and version of the WC/WDM Plan, when it was updated, units of measurement used, etc.
Mine-specific list data					Go	Section of the self assessment tool where the mine user is able to customize the information contained in the lists for water source and water treatment for every input and output stream shown in the water balance.



# WATER BALANCE & PRODUCTION DATA INPUT

<b>INITIAL WC/WDM PLAN DATA INPUT: 2021</b>		Section of the self assessment tool where the initial water balance, production data, WUE Targets and WC/WDM Action Plan is entered.
<b>WATER BALANCE DATA</b>		Section of the self assessment tool where water balance and production data for the base case situation are entered.
<input type="radio"/> Simple data entry <input checked="" type="radio"/> Detailed data entry		
Mining Operations		All water balance input and output data and all production data for the <u>mining operations</u> are entered here with maximum level of detail. This includes water source, water quality class, water treatment type, measurement type and notes.
Beneficiation Operations		All water balance input and output data and all production data for the <u>minerals beneficiation</u> operations are entered here with maximum level of detail. This includes water source, water quality class, water treatment type, measurement type and notes.
Residue Disposal Operations		All water balance input and output data and all production data for the <u>residue disposal</u> operations are entered here with maximum level of detail. This includes water source, water quality class, water treatment type, measurement type and notes.
Support Operations		All water balance input and output data and all production data for the <u>support services</u> operations are entered here with maximum level of detail. This includes water source, water quality class, water treatment type, measurement type and notes.





# WC/WDM PLAN DATA INPUT

WC/WDM PLAN DATA		Section of the self assessment tool where WUE Targets, WC/WDM Action plans and schedules are entered.
Set Initial WC/WDM Targets	Go	Set WC/WDM targets for the specific operation. Once submitted, the targets can only be updated once.
Set Updated WC/WDM Targets	Go	Set WC/WDM targets for the specific operation. Once submitted, the targets can only be updated once.
Set Initial WC/WDM Plan Actions & Schedule	Go	This data input form is for the entry of the WC/WDM Actions that are intended to achieve the WUE Targets entered as part of the base case WC/WDM Plan for each of the five years of the plan.
Set Update WC/WDM Plan Actions & Schedule	Go	This data input form is for the entry of the WC/WDM Actions that are intended to achieve the WUE Targets entered as part of the base case WC/WDM Plan for each of the five years of the plan.

# REPORTING AND SUBMISSION OF DATA

REPORTING		Section of the self assessment tool where WUE Targets, WC/WDM Action plans and schedules are entered.
View, Print & Export Reports	<a href="#">Go</a>	Provides access to a range of selectable reports that can be viewed, printed and exported as a .xls file for further processing by the User.
SAVE WC/WDM DATA FOR 2019:		<a href="#">SAVE PROGRESS</a>
SUBMIT WC/WDM DATA FOR 2019:		<a href="#">SUBMIT</a>
<b>CLEAR DATA:</b>	<a href="#">CLEAR CURRENT YEAR</a>	<a href="#">CLEAR DATABASES</a>
		<a href="#">CLEAR ALL DATA</a>

# WATER BALANCE & PRODUCTION DATA INPUT

<b>INITIAL WC/WDM PLAN DATA INPUT: 2021</b>		Section of the self assessment tool where the initial water balance, production data, WUE Targets and WC/WDM Action Plan is entered.
<b>WATER BALANCE DATA</b>		Section of the self assessment tool where water balance and production data for the base case situation are entered.
<input type="radio"/> Simple data entry <input checked="" type="radio"/> Detailed data entry		
Mining Operations		All water balance input and output data and all production data for the <u>mining operations</u> are entered here with maximum level of detail. This includes water source, water quality class, water treatment type, measurement type and notes.
Beneficiation Operations		All water balance input and output data and all production data for the <u>minerals beneficiation</u> operations are entered here with maximum level of detail. This includes water source, water quality class, water treatment type, measurement type and notes.
Residue Disposal Operations		All water balance input and output data and all production data for the <u>residue disposal</u> operations are entered here with maximum level of detail. This includes water source, water quality class, water treatment type, measurement type and notes.
Support Operations		All water balance input and output data and all production data for the <u>support services</u> operations are entered here with maximum level of detail. This includes water source, water quality class, water treatment type, measurement type and notes.



# SIMPLIFIED WB DATA INPUT

**2022 :SIMPLIFIED DATA INPUT SHEET FOR COMPLETE MINE**

WATER INPUT STREAMS			
	STREAM	INPUT	RESULT UNITS
A	Board/Potable Water	<a href="#">SIMPLE DATA</a>	22 kl/day
B	Water abstracted directly from rivers	<a href="#">SIMPLE DATA</a>	38 kl/day
C	Ground / fissure water	<a href="#">SIMPLE DATA</a>	54 kl/day
D	Rain / runoff	<a href="#">SIMPLE DATA</a>	296 kl/day
E	Surface moisture on external ore	<a href="#">SIMPLE DATA</a>	30 kl/day
F	Other off-site sources	<a href="#">SIMPLE DATA</a>	130 kl/day
H	All recycled inputs		2379 kl/day
G	Unspecified sources		1916 kl/day
<b>TOTAL WATER INPUTS</b>			<b>4865 kl/day</b>

**ROM PRODUCTION DATA**  
  

TOTAL ROM

Enter Data

[DATA SHEET](#)  
  

1500

Return to home

tons/annum

WATER OUTPUT STREAMS			
	STREAM	INPUT	RESULT UNITS
I	Dust suppression	<a href="#">SIMPLE DATA</a>	146 kl/day
J	Point discharge to rivers	<a href="#">SIMPLE DATA</a>	162 kl/day
K	Point discharge to aquifers	<a href="#">SIMPLE DATA</a>	178 kl/day
L	Evaporation losses	<a href="#">SIMPLE DATA</a>	404 kl/day
M	Seepage losses	<a href="#">SIMPLE DATA</a>	406 kl/day
N	Irrigation usage	<a href="#">SIMPLE DATA</a>	125 kl/day
O	Water treatment plant residues	<a href="#">SIMPLE DATA</a>	129 kl/day
P	Surface moisture on product	<a href="#">SIMPLE DATA</a>	66 kl/day
Q	Interstitial water in fine residues	<a href="#">SIMPLE DATA</a>	67 kl/day
R	Human consumption (drinking)	<a href="#">SIMPLE DATA</a>	278 kl/day
T	Water diverted directly to off-site third parties	<a href="#">SIMPLE DATA</a>	219 kl/day
U	Water sent to off-site third parties after use	<a href="#">SIMPLE DATA</a>	306 kl/day
H	All recycled outputs	<a href="#">SIMPLE DATA</a>	2379 kl/day
S	Unspecified sinks		0 kl/day
<b>TOTAL WATER OUTPUTS</b>			<b>4865.00 kl/day</b>

C GROUNDWATER / FISSURE WATER			
	Stream	Value	Unit
C3	Ground water to mining operations	12	kl/day
C35	Ground water to minerals beneficiation operations	13	kl/day
C65	Ground water to residue disposal operations	14	kl/day
C90	Ground water to support services operations	15	kl/day
<b>TOTAL</b>		<b>54</b>	<b>kl/day</b>

# DETAILED WB DATA INPUT

## 2022: DATA INPUT SHEET FOR MINING OPERATIONS

WATER INPUT STREAMS			
STREAM	INPUT	RESULT	UNITS
"NEW" WATER INPUTS			
1 Board/Potable Water	Mining WB'	0	kl/day
2 Water abstracted directly from rivers	Mining WB'	233	kl/day
3 Ground / fissure water	Mining WB'	4301	kl/day
4 Direct rainfall onto surface dams	Mining WB'	176	kl/day
5 Direct rainfall into mine workings	Mining WB'	323	kl/day
6 Rain runoff into surface dams	Mining WB'	1694	kl/day
7 Rain runoff into mine workings	Mining WB'	413	kl/day
8 Other off-site sources	Mining WB'	4660	kl/day
"RECYCLED" WATER INPUTS			
9 Water from mining operations		716	kl/day
10 Water from beneficiation operations		630	kl/day
11 Water from residue disposal operations		610	kl/day
12 Water from support operations		1700	kl/day
"CALCULATED" WATER INPUTS			
13 Unspecified sources		0	kl/day
TOTAL WATER INPUTS			
		15456	kl/day

MINING PRODUCTION DATA			
PRODUCTION UNIT	INPUT	RESULT	UNITS
Ore from underground mining	Mining Proc	7093	tons/annum
Moisture content of ore from underground mining	Mining Proc	5.02	%
Waste rock from underground mining	Mining Proc	1273	tons/annum
Moisture content of waste from underground mining	Mining Proc	4.42	%
Ore from surface mining	Mining Proc	7289	tons/annum
Moisture content of ore from surface mining	Mining Proc	3.21	%
Waste rock from surface mining	Mining Proc	6634	tons/annum
Moisture content of waste from Return to home hg	Mining Proc	3.24	%
Slurry from mine settlers	Mining Proc	47	tons/annum
Average slurry water content	Mining Proc	0.61	m3/ton
Re-mined residues	Mining Proc	3020	tons/annum
Average re-mined residues water content	Mining Proc	1.11	m3/ton
Average annual mining workforce	Mining Proc	1742	shifts/day
Average daily consumptive potable water use	Mining Proc	2.79	l/person/day
TOTAL ROM (U/G, Surface, Slurry, Residues)		17449	tons/annum

WATER OUTPUT STREAMS			
STREAM	INPUT	RESULT	UNITS
"CONSUMPTIVE" WATER USERS			
Dust suppression in mining area	Mining WB'	1706	kl/day
Point discharge to river	Mining WB'	260	kl/day
Point discharge to aquifers	Mining WB'	215	kl/day
Ventilation air losses	Mining WB'	103	kl/day
Evaporation from surface dams	Mining WB'	117	kl/day
Seepage from surface dams	Mining WB'	108	kl/day
Evaporation from mine workings	Mining WB'	12	kl/day
"NON-CONSUMPTIVE" WATER USES			
Water diverted directly to off-site third parties	Mining WB'	1920	kl/day
Water sent to off-site third parties after use	Mining WB'	1700	kl/day
"RECYCLED" OUTPUTS			
Moisture content of ROM ore		589.69	kl/day
Moisture content of waste		271.01	kl/day
Water in slurry from settlers		28.61	kl/day
Water in re-mined residues		3348.00	kl/day
Sewage to treatment plant	Mining WB'	816	kl/day
Water supplied to mining operations	Mining WB'	716	kl/day
Water supplied to support operations	Mining WB'	610	kl/day
Water supplied to beneficiation operations	Mining WB'	630	kl/day
Water supplied to residue disposal operations	Mining WB'	368	kl/day
"CALCULATED" WATER OUTPUTS			
Human consumption		4.87	kl/day
Unspecified sinks		1932.829	kl/day
TOTAL WATER OUTPUTS		15456.00	kl/day

# DETAILED WB DATA INPUT FORM

STREAM 003 - GROUND / FISSURE WATER TO MINING OPERATIONS								
No	Type of source	Description/Name	kl/day	Treated	Treatment Type	Quality	Measurement Method	Notes
1	Concentrated aquifer inflows entering r	Shaft 3 level 56 fissure	1045	No	None	Class 3	Measured	
2	Dewatering boreholes around mine wo	Borehole 12	235	Yes	Disinfection	Class 2	Measured	
3	Dewatering boreholes around mine wo	Borehole 13	456	Yes	Disinfection	Class 3	Calculated	
4	Dewatering boreholes around mine wo	Borehole 15	789	Yes	Disinfection	Class 3	Measured	
5	Diffuse aquifer inflows entering mine v	Shaft 9 level 14 fissure	1208	No	None	Class 2	Calculated	
6	Concentrated aquifer inflows entering r	Shaft 8 level 12 fissure	568	No	None	Class 1	Calculated	
7								
8								
49								
50								
<b>TOTALS:</b>			<b>4301</b>					
Total Class 1			568	Percentage Class 1		13.2		
Total Class 2			1443	Percentage Class 2		33.6		
Total Class 3			2290	Percentage Class 3		53.2		
Total Measured			2069	Percentage Measured		48.1		
Total Modelled			0	Percentage Modelled		0.0		
Total Calculated			2232	Percentage Calculated		51.9		
Total Estimated			0	Percentage Estimated		0.0		

No	Type of source	Description/Name
1	Concentrated aquifer inflows entering r	Shaft 3 level 56 fissure
2	Diffuse aquifer inflows entering mine workings	
3	Concentrated aquifer inflows entering mine workings	
4	Dewatering boreholes around mine workings	
5	Water supply boreholes inside mine lease area	
6	Water supply boreholes outside mine lease area	
7	Other sources of groundwater	
8		
9	0	
10	0	
11	0	
12	0	
13	0	
14	0	
15		

# WATER QUALITY CLASSES

Parameter	Units	CATEGORY 1 Water that can be reused at the mine without treatment	CATEGORY 2 Water that can be reused with simple treatment	CATEGORY 3 Water that may require extensive & costly treatment
<b>Physical</b>				
<b>Conductivity</b>	mS/m	< 300	300-700	>700
<b>pH</b>		5.5 – 8.5	<5.5 or >8.5	ns
<b>Suspended Solids</b>	mg/l	< 50	> 50	ns
<b>Chemical</b>				
<b>Alkalinity</b>	mg/l	10 - 200	<10 or >200	ns
<b>TDS</b>	mg/l	< 2000	2000- 5000	>5000
<b>Calcium</b>	mg/l	< 250	250-500	>500
<b>Magnesium</b>	mg/l	< 200	200-400	>400
<b>Sodium</b>	mg/l	< 200	200-400	>400
<b>Potassium</b>	mg/l	< 200	200-400	>400
<b>Sulphate</b>	mg/l	<1000	1000-2000	>2000
<b>Chloride</b>	mg/l	<200	200-500	>500
<b>LSI*</b>		0 – 0.5	<0 or >0.5	ns



# MEASUREMENT METHOD

Each data entry point must also indicate how the value was determined. Available options are:

- **measured** (examples are flows measured by way of flow meters or any accurate measurement device) – assumed accuracy 95%;
- **modelled** (examples are flows that are modelled such as rainfall runoff, ground water ingress, evaporation, seepage) – assumed accuracy 80%;
- **calculated** (examples are human consumption calculated as number of people multiplied by average water consumption per person, or water in fine residues based on calculations from measured SG, calculations of losses in ventilation air, flows calculated from pump hours multiplied by an assumed pump performance taken from a pump curve, or calculations of unspecified sources or sinks to balance inputs and outputs) – assumed accuracy 60%; and
- **estimated** (examples are, values based on “gut” feel) – assumed accuracy 40%.

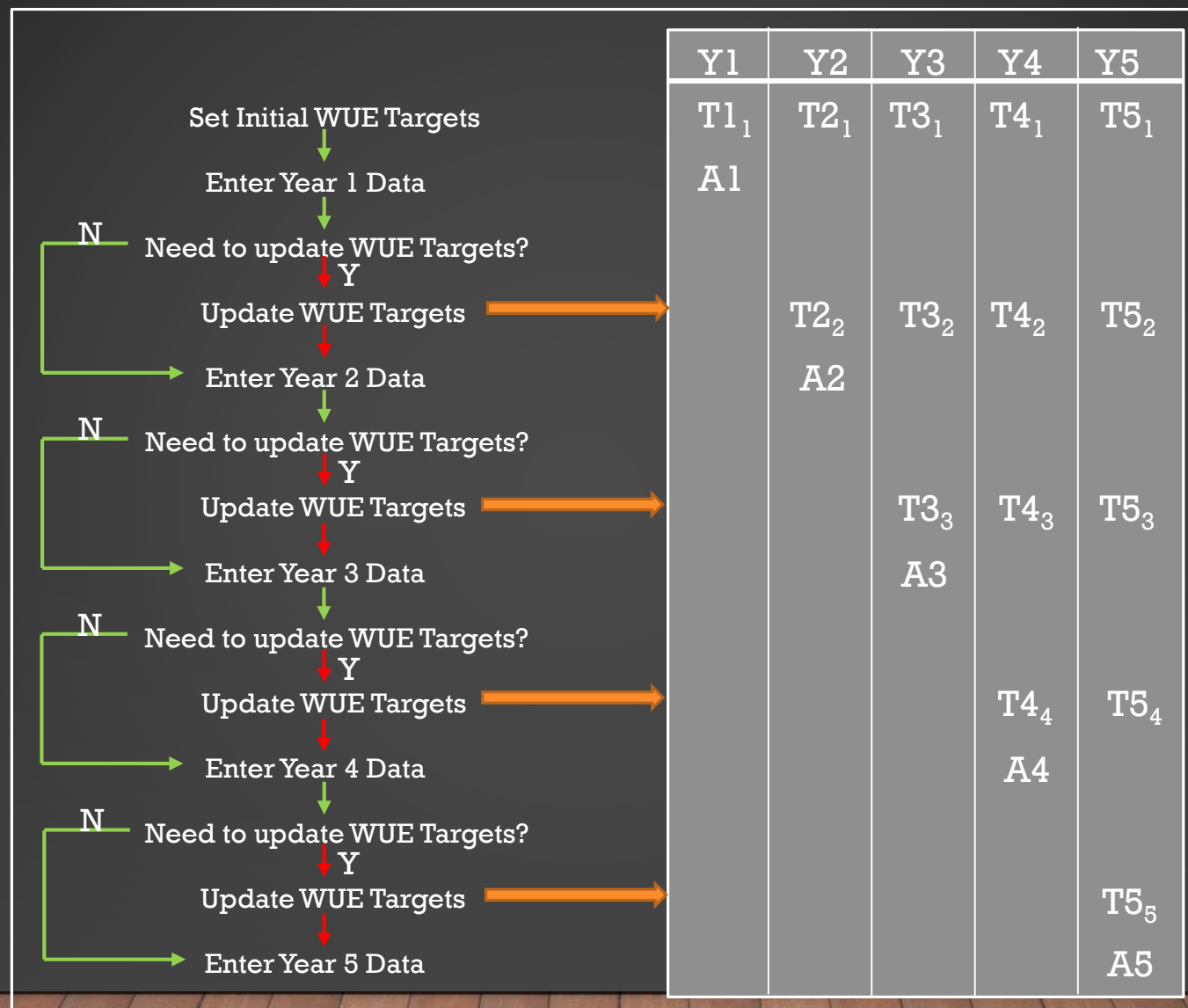
# DETAILED PRODUCTION DATA INPUT

200/201	ORE FROM UNDERGROUND MINING			
	Production Stream	tons/day	Moisture (%)	kl/day
1	Shaft 1	3412	5	170.6
2	Shaft 2	1256	4.5	56.52
3	Shaft 3	746	6	44.76
4	Shaft 4	1679	5	83.95
5				0
6				0
7				0
8				0
9				0
10				0
11				0
12				0
13				0
15				0
16				0
17				0
18				0
19				0
20				0
	<b>TOTAL</b>	<b>7093</b>	<b>5.02</b>	<b>355.83</b>

# SUBMISSION OF WC/WDM PLAN

WC/WDM PLAN DATA		Section of the self assessment tool where WUE Targets, WC/WDM Action plans and schedules are entered.
Set Initial WC/WDM Targets	Go	Set WC/WDM targets for the specific operation. Once submitted, the targets can only be updated once.
Set Updated WC/WDM Targets	Go	Set WC/WDM targets for the specific operation. Once submitted, the targets can only be updated once.
Set Initial WC/WDM Plan Actions & Schedule	Go	This data input form is for the entry of the WC/WDM Actions that are intended to achieve the WUE Targets entered as part of the base case WC/WDM Plan for each of the five years of the plan.
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# WATER USE EFFICIENCY TARGETS





# WATER USE EFFICIENCY TARGETS

Set WC/WDM Targets

Set initial targets

2020

2021

2022

2023

2024

Total water use:

Consumptive water

Volume of waste water lost:

Total specific water use:

Total consumptive water

Percentage of total waste water not

Recycle ratio:

Submit

Close

WATER USE EFFICIENCY TARGETS IN WC/WDM PLAN																							
DWS BENCHMARK		USER BENCHMARK	BASELINE	2020		2021		2022				2023					2024						
WUE INDICATOR	UNIT			Target	Actual	Target	2021 Update	Actual	Target	2021 Update	2022 Update	Actual	Target	2021 Update	2022 Update	2023 Update	Actual	Target	2021 Update	2022 Update	2023 Update	2024 Update	Actual
Total water use	kl/day		45258	45000	44273	40000		42368	35000		37000		30000		35000			28000		29000			
Consumptive water use	kl/day		32478	30000	29567	28000		28256	25000		26500		22000		25000			20000		21000			
Volume of waste water lost	kl/day		30266	25000	25785	23000		24012	21000		22000		20000		21000			18000		19000			
Total specific water use	kl/ton	2.09		2.14	2	2.03	1.8		1.86	1.6		1.7		1.5		1.6			1.4		1.45		
Total consumptive water use	kl/ton	2.02		1.54	1.5	1.54	1.45		1.48	1.4		1.45		1.35		1.42			1.3		1.35		
Percentage of total waste water not reused	%	60		82.37	75	75.86	70		71.54	65		68		60		65			58		60		
Recycle ratio	%	18		8.61	15	14.34	20		18.76	25		23		30		25			27		28		



# WC/WDM PLAN ACTIONS & SCHEDULE

Action No	Management Action Short Name	Description	Type of action	Budget (R000's)	Estimated start date	Estimated completion date
1	PC DAM 003	Construct new pollution control dam at Shaft 9	Prevention	12000	Mar-20	Nov-20
2	RWD DAM TDF6	Construct new RWD at Tailings Disposal Facility 6 to accommodate enlargement	Prevention	144000	Jul-20	Feb-22
3	ROPLANT1	Construct new RO desalination plant at Shaft 9 to treat water from PC Dam 003	Reuse	120000	Jan-21	Dec-22
4	TDF PIPE REPLACE	Progressively replace pipelines from RWD 1 to plant with new pipelines	Prevention	30000	Jan-20	Dec-23
5						
6						

[illegible]

# REPORTING OUTPUTS

DATA INPUT REPORTS	
Mine Identification Data	<a href="#">Go</a>
WC/WDM Plan Identification Data	<a href="#">Go</a>
Mine-specific list data	<a href="#">Go</a>
Complete water balance inputs - detailed data entry	<a href="#">Go</a>
Complete water balance inputs - simplified data entry	<a href="#">Go</a>
Production data inputs - detailed data entry	<a href="#">Go</a>
WC/WDM Targets & Benchmarks	<a href="#">Go</a>
WC/WDM Action Plan & Schedule	<a href="#">Go</a>

WSART OUTPUT REPORTS	
Water Balance Diagram for Mining Operations	<a href="#">Go</a>
Water Balance Diagram for Minerals Beneficiation Operations	<a href="#">Go</a>
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Water Balance Diagram for Support Services Operations	<a href="#">Go</a>
Simplified Water Balance	<a href="#">Go</a>
Total Mine Water Balance	<a href="#">Go</a>
Calculated WUE and GRI Indicators	<a href="#">Go</a>
Calculated Water Balance Accuracy Statement	<a href="#">Go</a>
Calculated Ease of Reuse Statement	<a href="#">Go</a>

DATA TREND REPORTS	
Complete Production & Water Balance Data	<a href="#">Go</a>
Summary Water Balance, Production & WUE/GRI Indicators	<a href="#">Go</a>
Water Balance Accuracy Trends	<a href="#">Go</a>
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WC/WDM Action Plan Progress	<a href="#">Go</a>

# EXAMPLE OF DATA INPUT REPORT

## COMPLETE WATER BALANCE INPUTS - DETAILED DATA ENTRY REPORT

STREAM 001 - BOARD/POTABLE WATER TO MINING OPERATIONS								
No	Type of source	Description/Name	kl/day	Treated	Treatment Type	Quality	Measurement Method	Notes
1	Board water	RWB Meter 008	450	No	None	Class 1	Measured	
2	Board water	RWB Meter 023	532	No	None	Class 1	Measured	
3	Board water	Fan meter 56	23	No	None	Class 1	Measured	
4	Board water	Changehouse meter 232	98	No	None	Class 1	Measured	
5	Board water	Farmer Brown meter	7	No	None	Class 1	Measured	
6	Board water	Fred's house meter	8	No	None	Class 1	Measured	
<b>TOTALS:</b>			<b>1118</b>					
Total Class 1			1118		Percentage Class 1	100.0		
Total Class 2			0		Percentage Class 2	0.0		
Total Class 3			0		Percentage Class 3	0.0		
Total Measured			1118		Percentage Measured	100.0		
Total Modelled			0		Percentage Modelled	0.0		
Total Calculated			0		Percentage Calculated	0.0		
Total Estimated			0		Percentage Estimated	0.0		
STREAM 002 - WATER ABSTRACTED DIRECTLY FROM RIVERS FOR MINING OPERATIONS								
No	Type of source	Description/Name	kl/day	Treated	Treatment Type	Quality	Measurement Method	Notes
1	Pumped from river	Piet se pump	67	Yes	Sedimentation	Class 1	Calculated	
2	In-stream dam	Boundary dam	34	Yes	Filtration	Class 1	Calculated	
3	In-stream dam	Fishing dam	23	Yes	Sedimentation	Class 1	Estimated	
4	Channel from river	Panama canal	56	No	None	Class 1	Measured	
5	Pumped from river	Fred's pumphouse	43	Yes	Combined treatment	Class 2	Measured	
6	Pumped from river	Pump 009	10	Yes	Combined treatment	Class 2	Calculated	
<b>TOTALS:</b>			<b>233</b>					
Total Class 1			180		Percentage Class 1	77.3		
Total Class 2			53		Percentage Class 2	22.7		
Total Class 3			0		Percentage Class 3	0.0		
Total Measured			99		Percentage Measured	42.5		
Total Modelled			0		Percentage Modelled	0.0		
Total Calculated			111		Percentage Calculated	47.6		
Total Estimated			23		Percentage Estimated	9.9		

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# EXAMPLE OF WSART OUTPUT REPORT

## WUE AND GRI INDICATORS - 2019

WATER USE EFFICIENCY INDICATORS		
	Value	Units
TOTAL WATER USE	46376.37	kl/day
TOTAL CONSUMPTIVE WATER USE	33596.37	kl/day
VOLUME OF WASTEWATER LOST	31384.05	kl/day
TOTAL PRODUCTION	21107	tons/day
TOTAL SPECIFIC WATER USE	2.20	kl/ton
CONSUMPTIVE SPECIFIC WATER USE	1.59	kl/ton
PERCENTAGE OF WASTEWATER NOT REUSED	82.89	%
RECYCLE RATIO	8.42	%
GRI INDICATORS		
G4-EN8 Total Water Use	46376.37	kl/day
G4-EN10a Total volume of water recycled and reused	4265.92	kl/day
G4-EN10b Total volume of water recycled and reused as percentage of total water withdrawal	9.20	%
G4-EN22 Total water discharge by quality and destination	46048.39	kl/day

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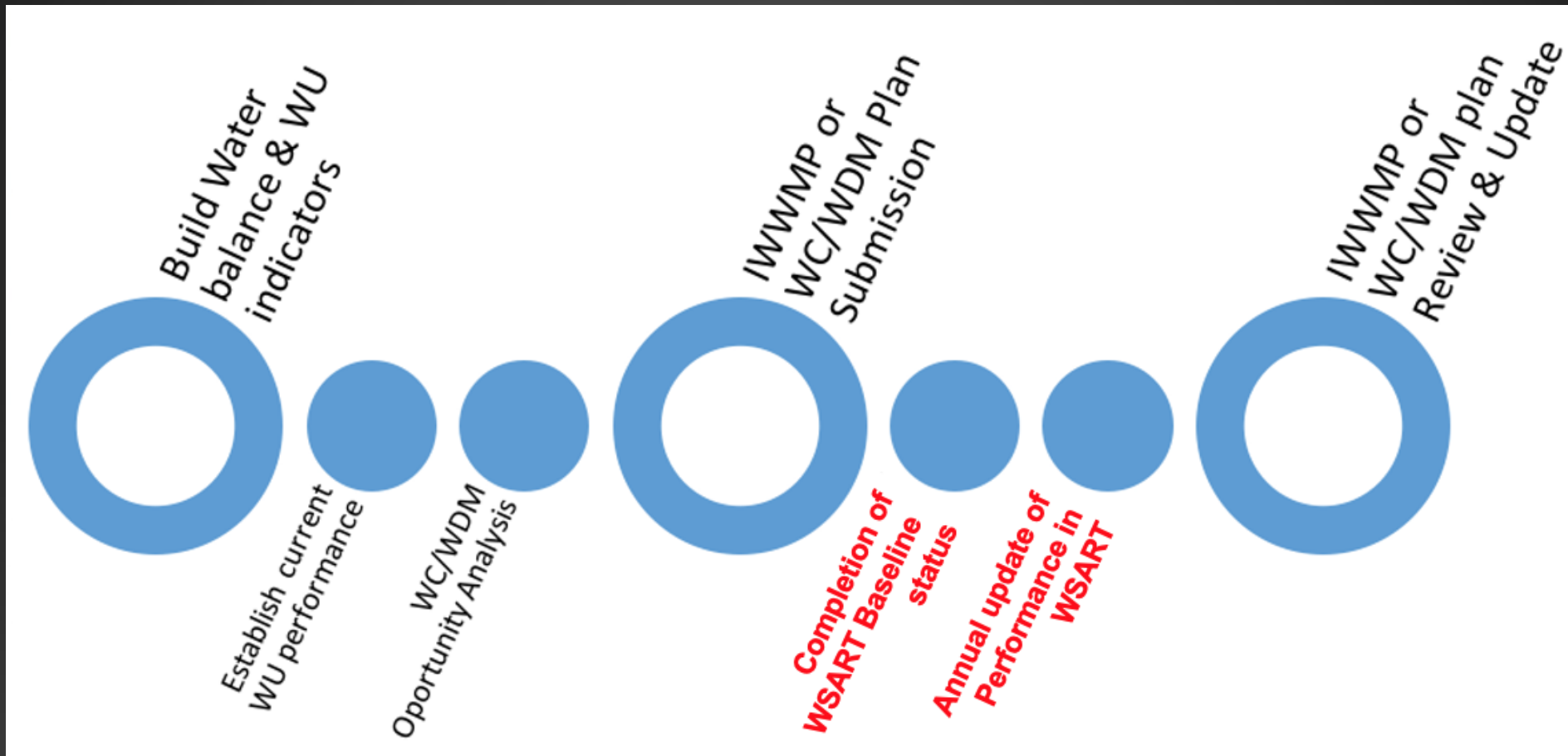
# TOTAL MINE WATER BALANCE

2019 TOTAL MINE WATER BALANCE"									
INFLOWS				TOTAL MINE	OUTFLOWS				
BOARD/POTABLE WATER	3354	kl/ day	A		DUST SUPPRESSION	8072	kl/ day		
RIVER WATER	932	kl/ day	B		POINT DISCHARGE TO RIVER	2486	kl/ day		
GROUND WATER	17204	kl/ day	C		POINT DISCHARGE TO AQUIFER	905	kl/ day		
RAIN/RUNOFF	7904	kl/ day	D		EVAPORATIVE LOSSES	644	kl/ day		
SURFACE MOISTURE ON EXTERNAL ORE	190.37	kl/ day	E		SEEPAGE LOSSES	2485	kl/ day		
OTHER OFF-SITE SOURCES	15674	kl/ day	F		IRRIGATION LOSSES	2037	kl/ day		
UNSPECIFIED SOURCES	0	kl/ day	G		WATER TREATMENT PLANT RESIDUES	120	kl/ day		
					SURFACE MOISTURE ON PRODUCT	318.62	kl/ day		
					INTERSTITIAL WATER IN FINE RESIDUES	1884.34	kl/ day		
					HUMAN CONSUMPTION	9.36	kl/ day		
					UNSPECIFIED SINKS	13517.054	kl/ day		
					WATER DIVERTED DIRECTLY TO OFF-SITE THIRD PARTIES	5760	kl/ day		
					WATER SENT TO OFF-SITE THIRD PARTIES AFTER USE	7020	kl/ day		
RECYCLED INPUTS	4265.92	kl/ day	H		RECYCLED OUTPUTS	4265.92	kl/ day		
TOTAL	49524.28				TOTAL	49524.28			

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# PROCESS FOR DEVELOPMENT & IMPLEMENTATION OF WCWDM PLAN



THANK YOU