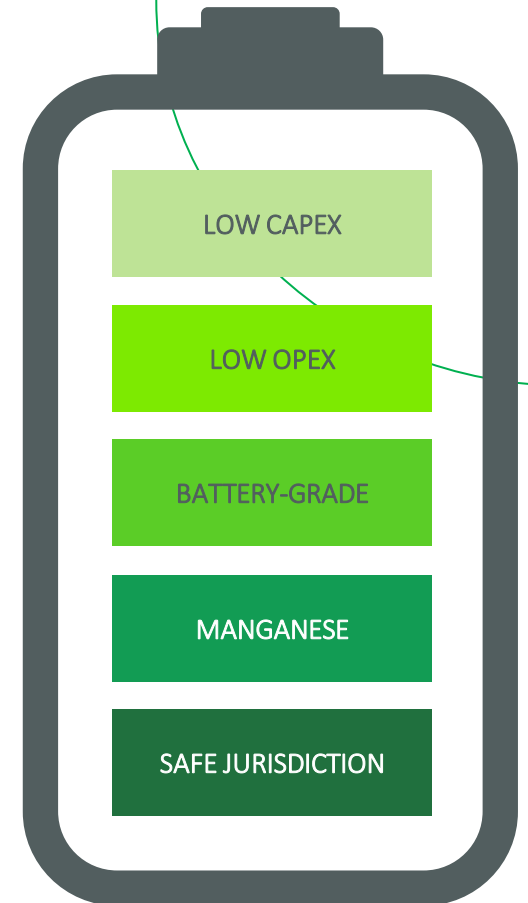


# GIYANI METALS CORP.

## HIGH PURITY MANGANESE DEVELOPMENT OPPORTUNITY

December 2020

TSX.V:EMM



# CAUTIONARY NOTE



## Forward Looking Statements

This presentation contains forward-looking statements and factual information that are current as of the date the presentation was originally delivered. When used in this presentation, words such as “may”, “would”, “could”, “will”, “expect”, “anticipate”, “estimate”, “believe”, “contemplate”, “intend”, “budget” “plan” and other similar expressions are intended to identify forward-looking statements. Forward-looking statements include, but are not limited to, statements with respect to the timing and amount of estimated future exploration, success of exploration activities, expenditures, permitting, and requirements for additional capital and access to data. Forward-looking statements involve known and unknown risks, uncertainties, and other factors which may cause the actual results, performance or achievements of Giyani Metals Corp. (the “Company”) to be materially different from any future results, performance or achievements expressed or implied by the forward-looking statements. Such factors include, among others, risks related to actual results of current exploration activities; changes in project parameters as plans continue to be refined; the ability to enter into joint ventures or to acquire or dispose of properties; future prices of commodities; fluctuations in currency markets; operating or technical difficulties in relation to the speculative nature of exploration and development; accidents, employee relations (including labour disputes) and other risks of the gold industry; ability to obtain financing; changes in costs and estimates associated with the Company’s projects; legislative, political or economic developments in the jurisdictions in which the Company carries on business; requirements for additional capital; and regulatory restrictions including delays in obtaining governmental approvals. Although the Company has attempted to identify important factors that could cause actual results to differ materially from those contained in forward-looking statements, there may be other factors that cause results not to be as anticipated, estimated or expected. The Company disclaims any intention or obligation to update or revise any forward-looking statements, whether as a result of new information, future events or otherwise except as required by applicable law.

# COMPLIANCE STATEMENT



## Qualified Persons

The scientific, technical, and economic information contained in this presentation relating to the K.Hill Manganese Project are based upon a technical report prepared by Mr. Michael John Beare BEng, CEng, MIOM3, Ms. Lucy Roberts BSc (Hons), MSc, PhD, MAusIMM(CP), both of SRK Consulting, and Mr. Ian Flint Ph.D., P. Eng. of Lab 4 Inc., and entitled "Kgwakgwe Hill Manganese Project Independent Technical Report" having an effective date of February 20, 2020 (release date April 28, 2020) (the "NI-43-101 Technical Report"). The NI-43-101 Technical Report was filed on SEDAR at [www.sedar.com](http://www.sedar.com) on April 30, 2020. Mr. Beare, Ms. Roberts, and Mr. Flint are "Qualified Persons" under NI 43-101, and have each consented to the inclusion in this presentation of such scientific, technical, and economic information. Mr. Beare, Ms. Roberts, and Mr. Flint are "independent" within the meaning of NI 43-101.

Giyani's disclosure of mineral resource information is governed by NI 43-101 under the guidelines set out in the Canadian Institute of Mining, Metallurgy and Petroleum (the "CIM") Standards on Mineral Resources and Mineral Reserves, adopted by the CIM Council, as may be amended from time to time by the CIM ("CIM Standards"). There can be no assurance that those portions of mineral resources that are not mineral reserves will ultimately be converted into mineral reserves.

# INVESTMENT SUMMARY

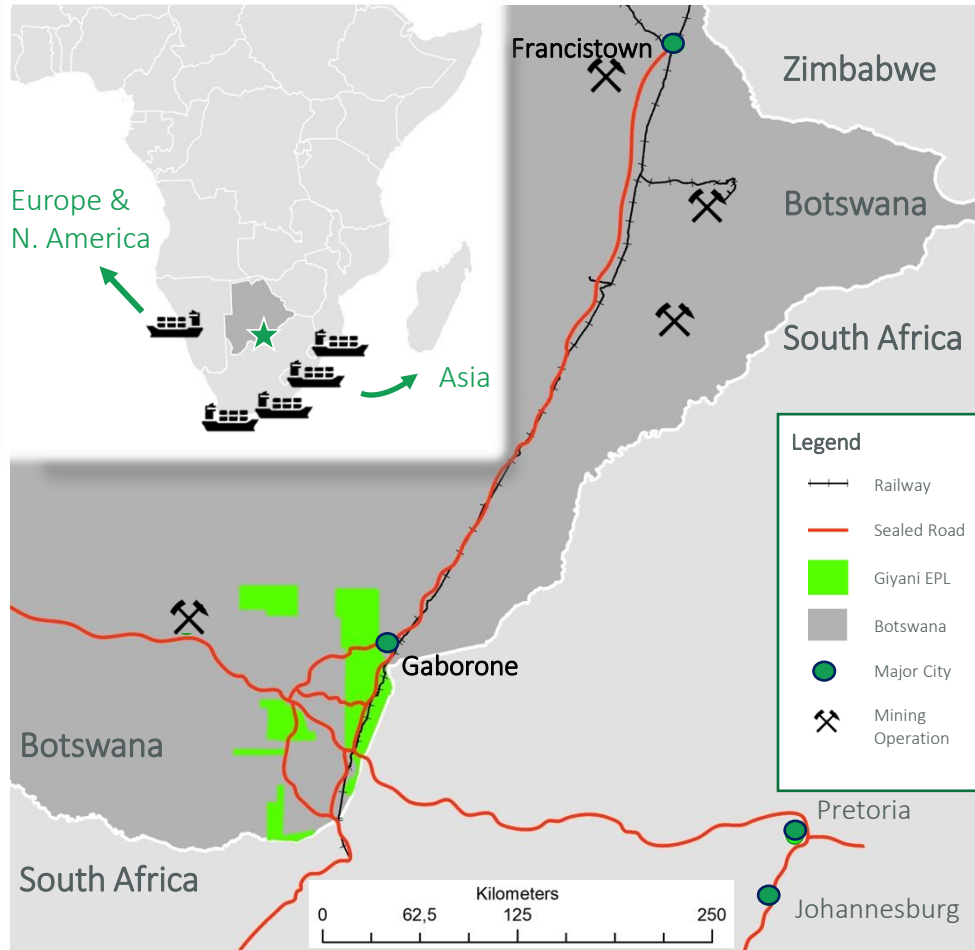
## Highlights

- Manganese oxide deposit in Botswana, a supportive mining investment jurisdiction
- Robust project economics: 82% IRR and C\$389M Post tax NPV<sup>10</sup>
- Low project capex of C\$155M
- Feasibility Study due H1 2021
- Experienced management and board with a track record of successful project delivery
- Well positioned to leverage the growth in the battery electric vehicle market



# PROJECT PORTFOLIO

## Land Package in a Favourable Jurisdiction



### OWNERSHIP

100%<sup>1</sup> interest in an extensive land package covering 2,641km<sup>2</sup> in south-eastern Botswana

### PROJECT PIPELINE

3 battery-amenable manganese Prospects (K.Hill, Otse & Lobatse), as well as several additional targets, provides optionality for increasing the overall resource size and extending the project life

### INFRASTRUCTURE

The K.Hill Project is located near the 45,000-inhabitant town of Kanye, which hosts good rail and road connections, sufficient water supply, a 167-bed hospital and reliable power connectivity

### ROUTE TO MARKET

5 seaports accessible by rail and road with cost effective shipping to Asia, Europe and North America

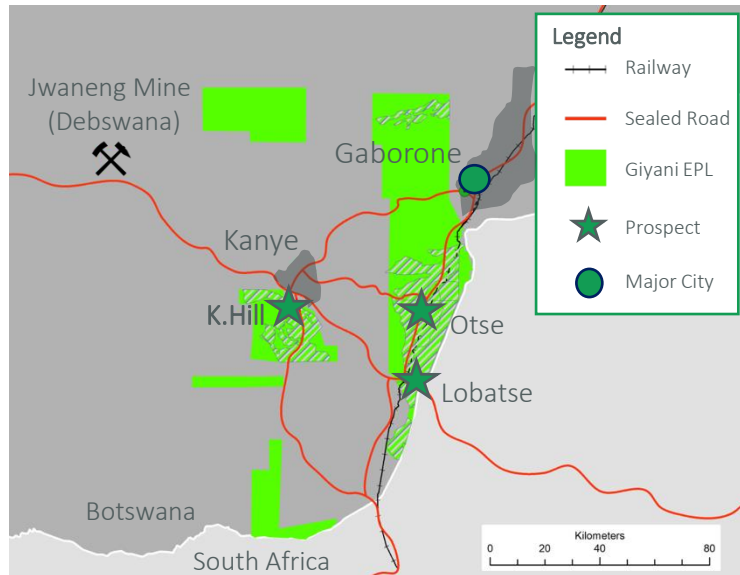
### JURISDICTION

Botswana is consistently rated as one of the most attractive African countries for supporting investment in mining<sup>2</sup>, due to favourable tax regulations and efficient government processes

1. Staged payments against milestones with previous owner  
2. Fraser Institute, Survey of Mining Companies 2019

# PROJECT PORTFOLIO

## K.Hill, Otse & Lobatse: Battery-Grade Manganese Oxide Deposits



### K.HILL

- Adjacent to the town of Kanye – 45,000 inhabitants
- 5km from Trans Kalahari highway connecting South Africa and Namibia
- Historical open pit DSO operation 1950 – 1970
- Remnants of processing facilities and discarded material still available
- ~166kt of high grade Mn-Ore sold

### OTSE

- 2km from A1 tarmac sealed road and the North-South railway
- Historically mined for high grade, low iron content manganese ore
- Supergene manganese mineralisation hosted in a chert breccia

### LOBATSE

- Also adjacent to the A1 highway and 1km from the RSA border
- Mineralization hosted a siliceous shale/sandstone



Rail connection to South Africa



167-bed hospital in Kanye



Kanye sub-station



A1 sealed highway

# MILESTONES ACHIEVED



## Highlights

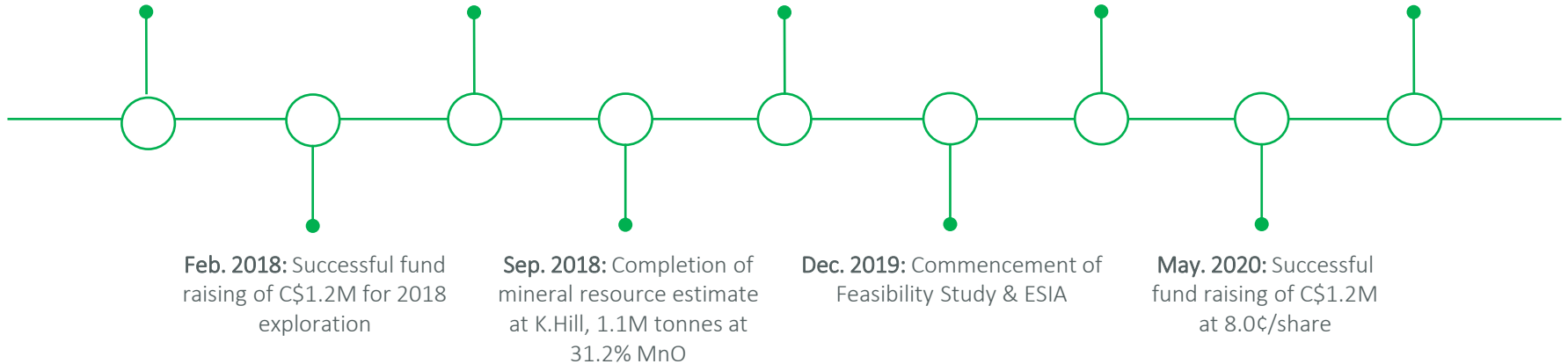
**Dec. 2017:** Appointment of Mr. Robin Birchall as CEO & Director

**Sep. 2018:** Completion of ground geophysics at K.Hill & Otse, resource drilling at K.Hill & exploration drilling at Otse & Lobatse

**Aug. 2019:** Completion of PEA for K.Hill with NPV of C\$379M & IRR of 90%

**April. 2020:** Increase in K.Hill resource & updated NPV of C\$389M & IRR of 82%

**Sept. 2020:** Successful fund raising of C\$1.2M at 12.5¢/share



**Feb. 2018:** Successful fund raising of C\$1.2M for 2018 exploration

**Sep. 2018:** Completion of mineral resource estimate at K.Hill, 1.1M tonnes at 31.2% MnO

**Dec. 2019:** Commencement of Feasibility Study & ESIA

**May. 2020:** Successful fund raising of C\$1.2M at 8.0¢/share

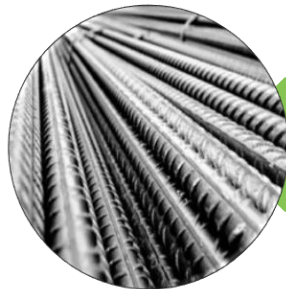
# MANGANESE

## Used in Steel, Specialty Alloys, Fertilizers, Chemicals and Batteries

### MANGANESE ORE AND MANGANESE METAL

- 86% of globally mined manganese ore is used in steel making<sup>1</sup>
- Total global manganese ore consumed in 2018 was 20 Mt<sup>1</sup>
- Refined manganese metal used in EVs is processed into either Electrolytic Manganese Metal (EMM) or Manganese Sulphate Monohydrate (MSM)
  - 8% of mined manganese ore (1.6 Mt)<sup>2</sup> is processed into EMM
  - 1% of mined manganese ore (150 Kt)<sup>2</sup> is processed into MSM
- China accounts for approximately 93% of both global High Purity MSM & EMM production

METALLURGICAL



Steel Making



Alloys



Battery Cathodes



Chemicals & Specialty Products

NON-METALLURGICAL

1. IMnI Report February 2018  
 2. Contained manganese tonnes

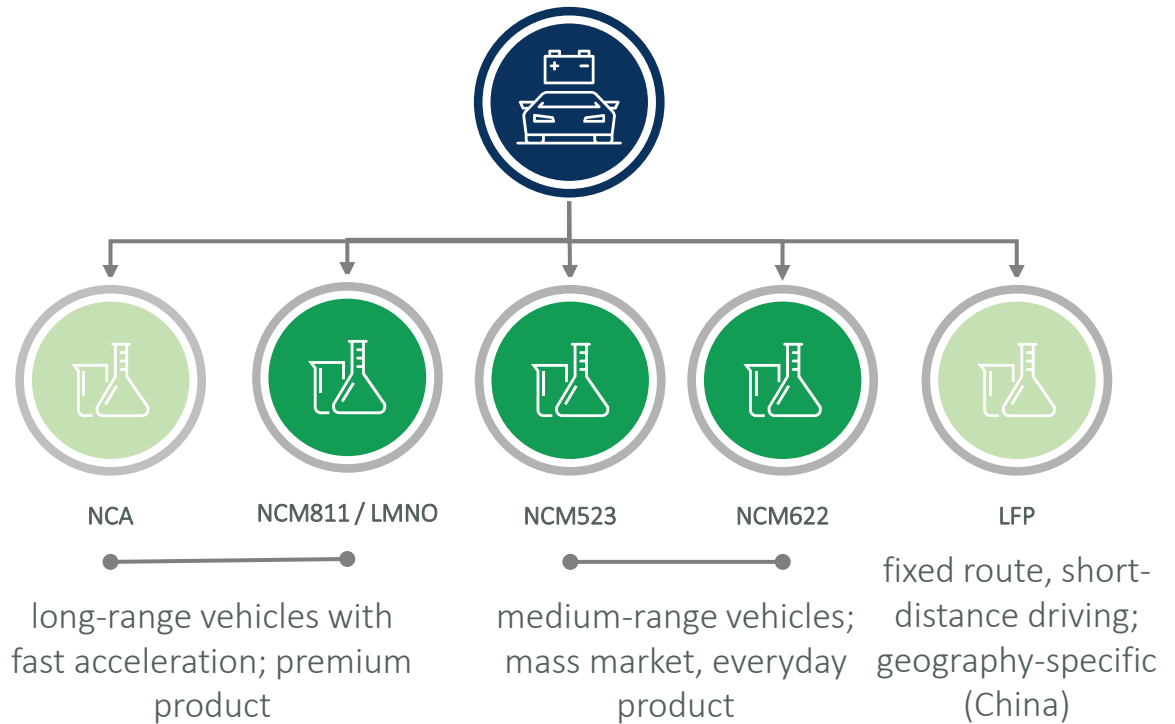


# BATTERY CHEMISTRIES

In The Future Cathode Chemistries Will Be Differentiated By Application

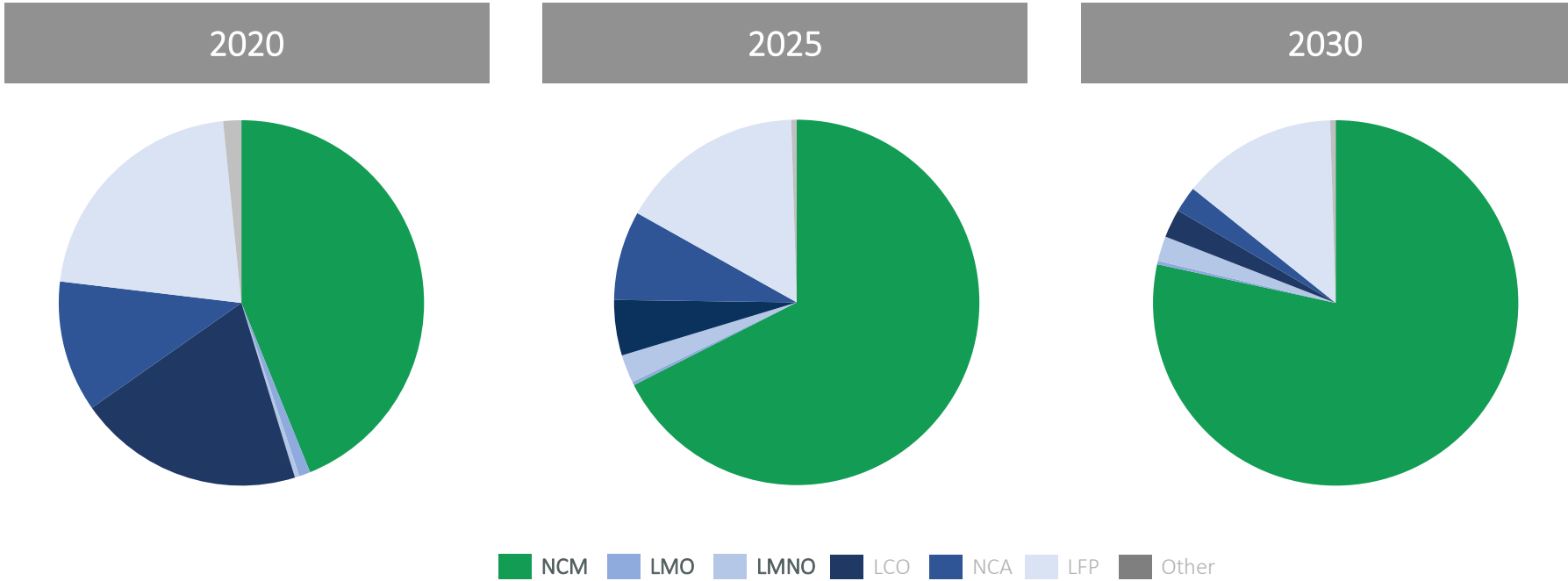
Present

Future – custom chemistries by application



# MANGANESE IN LI-ION BATTERIES

Manganese containing cathode chemistries will dominate the market



Source: Benchmark Mineral Intelligence, August 2020

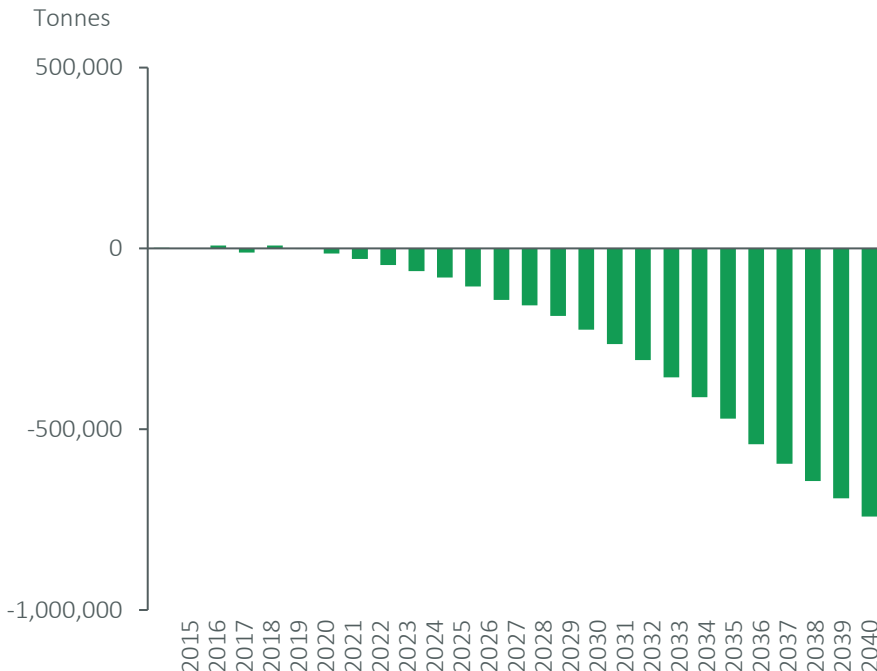
Definitions: NCM - Lithium Nickel Manganese Cobalt Oxide, LMO – Lithium Manganese Oxide, LMNO – Lithium Manganese Nickel Oxide, LCO – Lithium Cobalt Oxide, NCA – Lithium Nickel Cobalt Aluminium Oxide, LFP – Lithium Iron Phosphate

# MANGANESE IN LITHIUM-ION BATTERIES

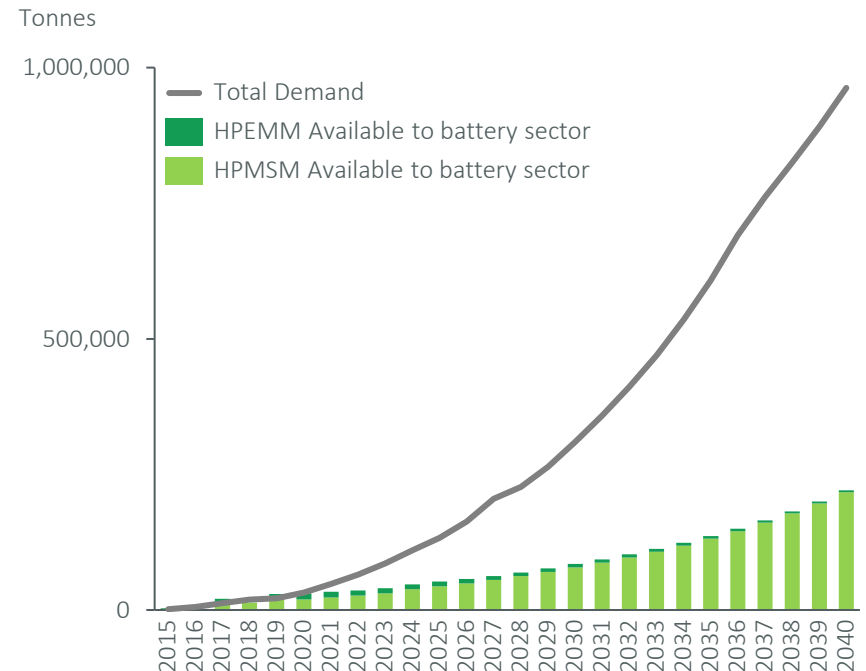
## Where is the Supply?

- The market balance of high purity manganese required for batteries is forecast to be in a growing deficit
- Few announcements have been made of new capacity planned to meet demand

### Battery Suitable Supply Demand Balance (contained Mn)



### High Purity Manganese Supply Vs. Demand (contained Mn)



Source: Benchmark Mineral Intelligence, August 2020

HPEMM: High Purity Electrolytic Manganese Metal

HPMSM: High Purity Manganese Sulphate Monohydrate

# K.HILL RESOURCE ESTIMATE (2020)

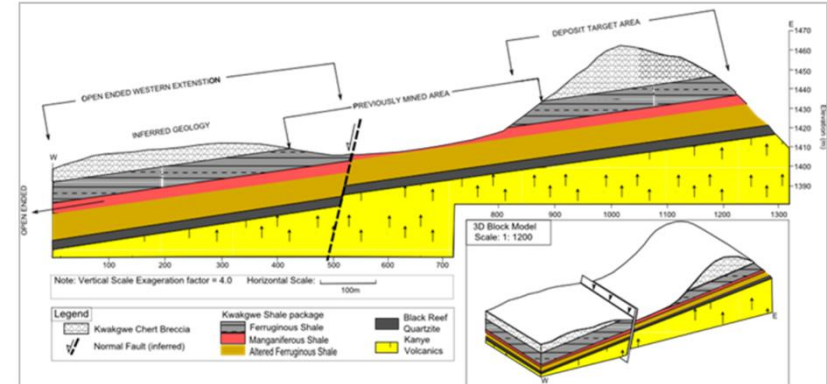
1.24Mt at 27.3% Manganese Oxide – with Significant Upside Potential

K.Hill Mineral Resource Estimation by Domain							
Domain	Category	Tonnes millions	MnO %	Al <sub>2</sub> O <sub>3</sub> %	SiO <sub>2</sub> %	Fe <sub>2</sub> O <sub>3</sub> %	LOI %
High-Grade Upper Mn Shale	Inferred	1.00	31.2	8.9	26.3	16.9	8.8
Low-Grade Upper Mn Shale	Inferred	0.24	11.2	9.9	58.5	9.8	4.8
<b>Total</b>	<b>Inferred</b>	<b>1.24</b>	<b>27.3</b>	<b>9.1</b>	<b>32.5</b>	<b>15.5</b>	<b>8.1</b>

Example of K.Hill core from 10m to 30m



Upper Chert Breccia in **blue**, low grade manganese in **orange**, high grade manganese in **red**, and footwall iron shale in **yellow**



- Two manganese shale horizons, predominantly Mn-oxide
- Horizon average thickness of 5m (ranges from 2m to 12m)
- Shallow dip ( 5-10°) towards the NW
- Mn-shale represents a primary manganese deposition in a shallow marine basin, upgraded by supergene enrichment
- Friable deposit amenable to free digging
- K.Hill prospect open to the south

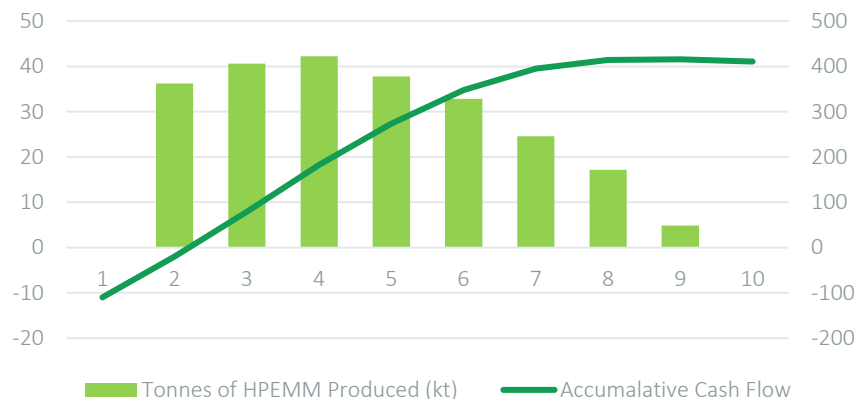
Resource Estimate Notes: The Inferred Mineral Resource Estimate is reported above a cut-off grade of 8.9% MnO. A 10% reduction has been applied to the resource tonnage to account for moisture content. Tonnages can therefore be considered dry. The Mineral Resource Estimate is constrained within grade based solids and within a Lerchs-Grossman optimised pit shell based on an HPEMM price of US\$4,700 /t and the following parameters: a. Mining Cost – US\$3.46 /t rock b. Processing Cost – US\$276.5 /t ore c. Selling cost – 3% d. G&A – US\$20 /t ore e. Discount Rate – 10% f. Processing Recovery – 87.5% g. Mining Recovery – 95% h. Mining Dilution – 5% i. Geotechnical Slope Angle - 45° All figures are rounded to reflect the relative accuracy of the estimate. Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. It is uncertain if further exploration will convert Inferred Mineral Resources to higher confidence categories.

The Qualified Person (as that term is defined by NI 43-101) responsible for preparing the Mineral Resource statement, PEA and Amended Technical Report for the K.Hill is Michael John Beare, BEng, CEng, MIOM of SRK Consulting (UK) Ltd. Mr. Beare has reviewed and approved the scientific and technical content contained in this press release and verified the underlying technical data. Mr. Beare is independent of the Company.

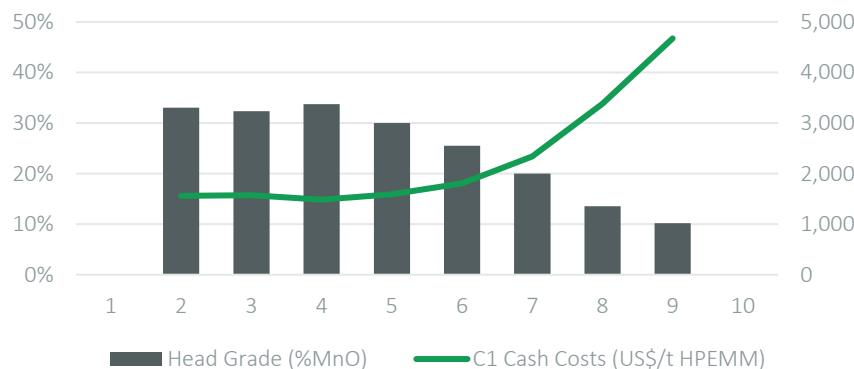
# K.HILL PROJECT PEA

## Robust Economics Over a 10 Year Project Life

Annual Production (LHS) vs  
Accumulative Cash Flow (RHS)



Head Grade (LHS) vs C1 Cash Costs (RHS)



### HIGHLIGHTS

- Pre tax NPV<sup>10</sup> of C\$505M (US\$357M)<sup>2</sup>
- After tax NPV<sup>10</sup> of C\$389M (US\$275M)<sup>2</sup>
- After tax IRR of **82.1%**
- C\$155M (US\$110M)<sup>2</sup> Capex
- C\$7M (US\$5M)<sup>2</sup> closure cost
- Payback within year 3
- 10 year operating life
- 30 - 40kt per annum of HPEMM (or equivalent amount in high purity Manganese Sulphate Monohydrate)
- Open pit, free-digging mining (no blasting required)

### IMPROVEMENT POTENTIAL TO ECONOMICS

- Resource upside at K.Hill
- Inclusion of Otse and Lobatse in mine plan
- Inclusion of lower power costs

1. Kgwakgwe Hill Manganese Project Independent Technical Report. SRK, February 2020  
2. C\$:US\$ 0.70 as of 02/05/2020

# MAKING HIGH PURITY MANGANESE

## Acid Dissolution, Solvent Extraction And Electrowinning

### LOW COST PROCESS OF THE K.HILL MANGANESE ORE

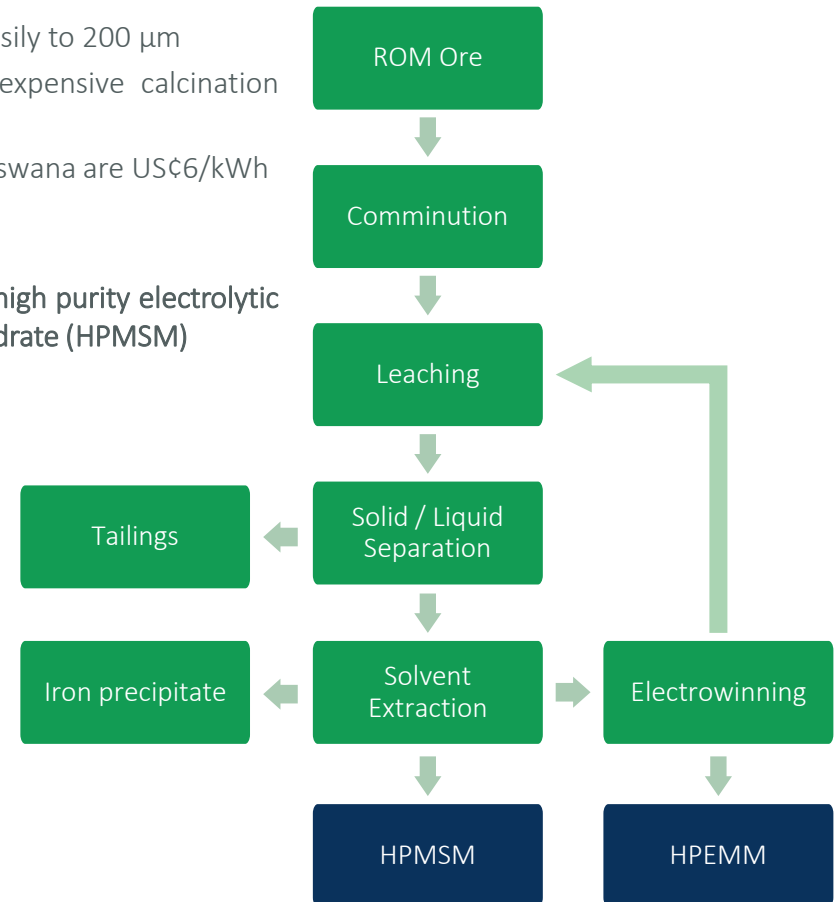
- **Low cost of grinding** → friable ore means free dig mining and grinds easily to 200 µm
- **Low cost of leaching** → oxide ore leaches in sulphuric acid (no expensive calcination required)
- **Low cost of electrowinning** → standard commercial power costs in Botswana are US\$6/kWh

### 2 HIGH PURITY PRODUCTS

In order to offer customers a choice, the Giyani plant will produce both **high purity electrolytic manganese metal (HPEMM)** and **high purity manganese sulphate monohydrate (HPMSM)**

### PROCESS OVERVIEW

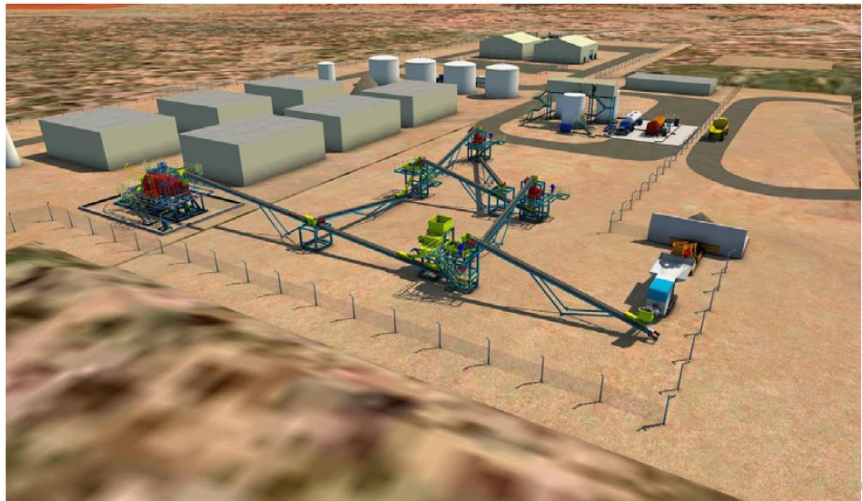
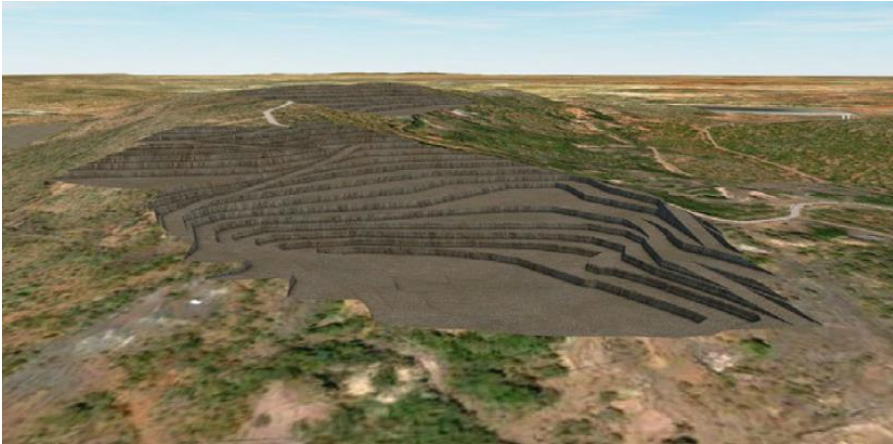
- Manganese is extracted using acid leach, solvent extraction and electrowinning (SX/EW) process - similar to the processing method of copper and other base metals
- Mn ore is milled before being dissolved in an acid solution
- The ore goes through a series of precipitation and solution purification processes before the manganese pregnant solution is fed into electrolytic cells where the pure Mn gets plated on the cathodes
- The HPMSM product is deposited out prior to the electrowinning circuit
- The plated manganese is stripped from the cathodes, washed, dried and degassed



# K.HILL PROJECT PEA

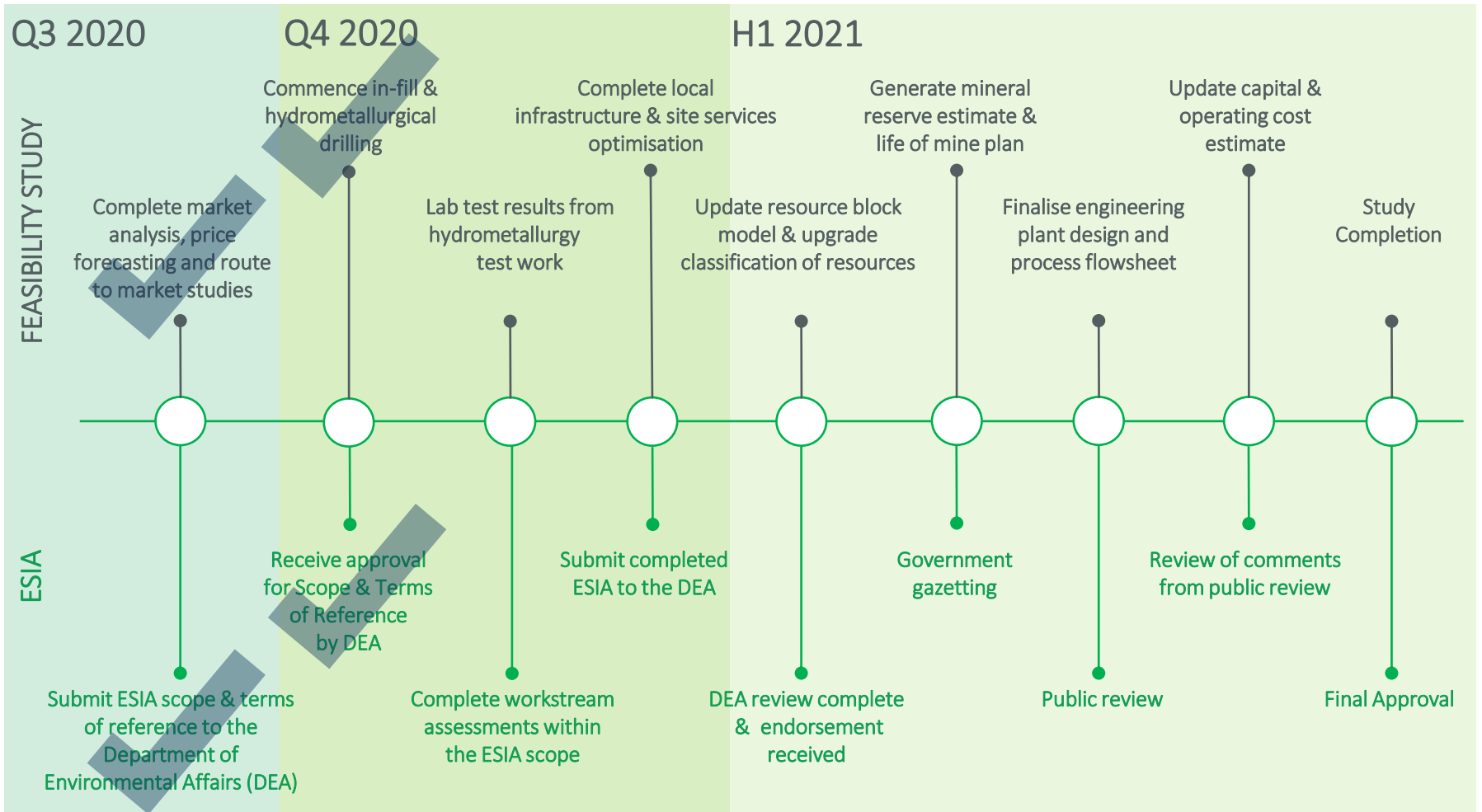


## Visualisations



# K.HILL PROJECT

## Timeline





# BOARD AND MANAGEMENT



## Proven Record in Mining Company Management & Project Delivery

### BOARD

<p><b>JONATHAN HENRY B.A.(Hons)</b> Non Executive Chairman</p>	<p><b>EUGENE LEE Bcom.</b> Non Executive Director</p>	<p><b>JOHN PETERSEN J.D, B.S.</b> Non Executive Director</p>	<p><b>MICHAEL JONES C.Eng.</b> Non Executive Director</p>
<p><b>25 years of experience in mining company leadership and management</b></p> <ul style="list-style-type: none"> <li>- Executive Chairman of Ormonde Mining</li> <li>- President and CEO Gabriel Resources</li> <li>- CEO of Avocet Mining</li> </ul>	<p><b>Over 20 years of experience in mine finance capital markets, financial reporting, risk management, internal controls and corporate governance</b></p> <ul style="list-style-type: none"> <li>- Director, Marketing at Hudbay Minerals</li> <li>- Non-Executive Director Nevada Zinc Corp</li> <li>- CFO at Premier Royalty Inc.</li> </ul>	<p><b>40 years of experience in law, sustainability and energy storage and is a global thought leader on energy and sustainability issues</b></p> <ul style="list-style-type: none"> <li>- Director &amp; VP at ePower Engine Systems Inc</li> <li>- Chairman at Axion Power International Inc</li> <li>- Partner at Fefer Peterson &amp; Co</li> </ul>	<p><b>30 years of experience in mine management, corporate finance and corporate development</b></p> <ul style="list-style-type: none"> <li>- Director at Hatch</li> <li>- Corporate Development at African Minerals</li> <li>- Head mining corporate finance at Canaccord</li> <li>- Various mining engineering roles at Gencor, DE Beers and Debswana</li> </ul>

### MANAGEMENT

<p><b>ROBIN BIRCHALL MBA, M.Sc.</b> Chief Executive Officer</p>	<p><b>DERK HARTMAN<sup>1</sup> M.Sc.</b> President &amp; Chief Operating Officer</p>	<p><b>OMAR GONZALEZ CPA</b> Chief Financial Officer</p>	<p><b>THOMAS HORTON MBA, M.Eng.</b> Vice President, Business Development</p>
<p><b>18 years of experience in investment banking, senior management and development of resource companies</b></p> <ul style="list-style-type: none"> <li>- Executive Chairman of Silver Bear Resources</li> <li>- V.P. Investment and Corporate Banking at BMO Capital Markets</li> <li>- V.P. Corporate Finance at Canaccord</li> </ul>	<p><b>20 years of experience in investment banking, senior management, project delivery and development of resource companies</b></p> <ul style="list-style-type: none"> <li>- Director at Royal IHC, Project Delivery</li> <li>- Director of Awale Resources</li> <li>- CFO at Silver Bear Resources</li> <li>- Director at BMO Capital Markets</li> </ul>	<p><b>Over 20 years of finance experience in public accounting, audit and assurance</b></p> <ul style="list-style-type: none"> <li>- Senior Manager at BDO Canada</li> <li>- Senior Manager at Deloitte Canada</li> <li>- Audit Partner at Deloitte Venezuela</li> </ul>	<p><b>13 years of sector experience in finance, business development and project engineering</b></p> <ul style="list-style-type: none"> <li>- VP Corporate Development at Pembridge Resources</li> <li>- Investment Executive at Duke Street Capital</li> <li>- Project Engineer at AMEC Americas &amp; Fluor</li> </ul>

<p><b>KNEIPE SETLHARE B.Sc.</b> Country Manager</p>	<p><b>LUHANN THERON M.Sc.</b> Chief Geologist</p>	<p><b>THUSO DIKGAKA B.Eng.</b> Non-Executive Chairman of Menzi</p>	<p><b>MAUREEN MOKGAOTSANE M.Eng.</b> Director of Menzi</p>
<p><b>13 years of operations experience in base metals and diamond mining within Botswana</b></p> <ul style="list-style-type: none"> <li>- Consultant to Premium Nickel Resources</li> <li>- Facilities Manager at Discovery Metals</li> <li>- Shift Co-Ordinator at BCL limited</li> </ul>	<p><b>13 years of exploration geology experience across Africa</b></p> <ul style="list-style-type: none"> <li>- Project Geologist at Remote Exploration Services</li> <li>- Consulting Geologist at Lambda Tau</li> </ul>	<p><b>Over 40 years of experience in operations, management and government within Botswana</b></p> <ul style="list-style-type: none"> <li>- Mining Manager at Debswana Orapa mine</li> <li>- Mining Manager Tati Nickel Mine</li> <li>- Director of Botswana Department of Mines</li> </ul>	<p><b>Over 20 years of experience in exploration, management and government within Botswana</b></p> <ul style="list-style-type: none"> <li>- Non-Executive Director for Equity Drilling</li> <li>- Held a number of senior roles with Petra Diamonds, Firestone Diamonds, Debswana Diamonds &amp; Botswana Ministry of Minerals, Energy and Water Resources</li> </ul>

### Menzi Battery Metals, Botswana

1. Start date in Q1 2021

# SHARE STRUCTURE

## Capital Structure and Major Shareholders



### MAJOR SHAREHOLDERS

RAB Capital	11%
Tribeca	2%
US Global	1%
Directors and Management	6%

TICKER	MARKET CAP*	SHARE PRICE*	52 WEEK RANGE	SHARES ISSUED
TSXV : EMM	C\$27 M	C\$0.245	C\$0.28 – 0.04	112,378,234

	TOTAL	EXERCISE PRICE	EXPIRY
Options*	9,887,500	C\$0.10 - C\$0.34	24/06/2021 – 10/03/2025
Warrants*	12,130,319	C\$0.10 - C\$0.20	18/03/2022 – 25/05/2023

\* As at close on November 25, 2020

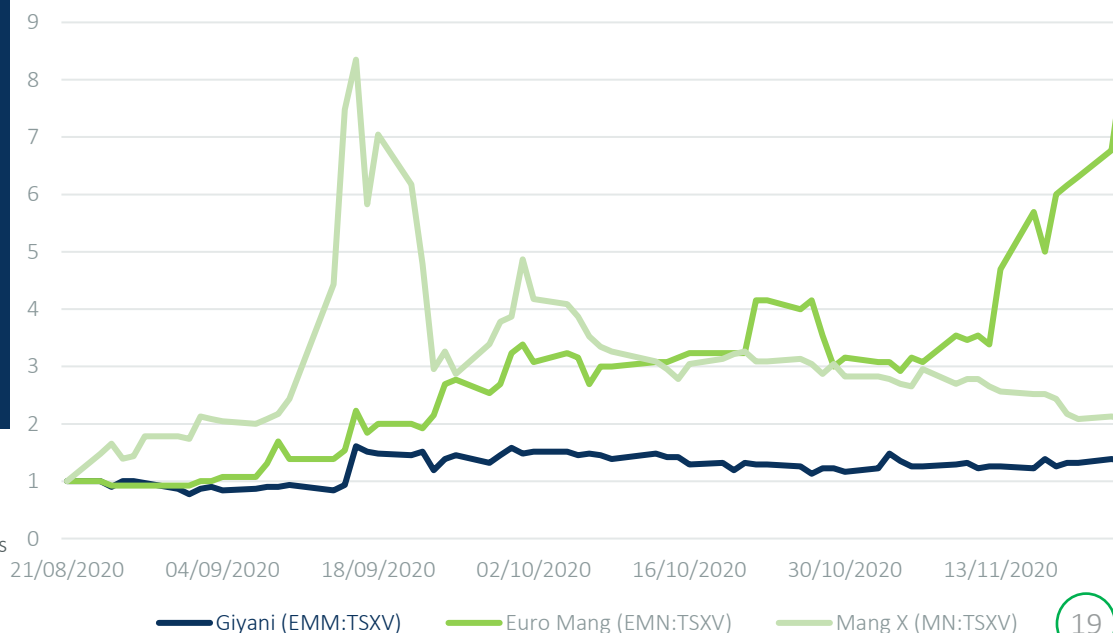
# HIGH PURITY MANGANESE PEERS



Company	Project Name	Location	Market Cap <sup>1</sup>	Battery Grade Product	Resource Grade	Opex <sup>2</sup>	Capex <sup>3</sup>	After-Tax NPV	After-Tax IRR	Stage	Project Life
			C\$M		% Mn	US\$/t	US\$ <sup>1</sup>	US\$	%		Yrs
Giyani Metals EMM:TSXV	K.Hill	Botswana	27	HP EMM & MnSO <sub>4</sub>	27.3%	1,730	110m	275m (10% DR)	82%	Doing FS	10
Euro Manganese EMN:TSXV EMN:ASX	Chvaletice	Czech Republic	143	HP EMM & MnSO <sub>4</sub>	7.3%	2,570	403m	593m (10% DR)	23%	Doing FS	25
Manganese X MN:TSXV	Battery Hill	Canada	24	HP EMM & MnSO <sub>4</sub>	9% <sup>4</sup>	-	-	-	-	Doing PEA	40

Giyani is the lowest opex and capex high purity manganese project that is close to production

3 Month Price Chart – Rebased<sup>1</sup>



- As at 25 November 2020
  - Site operating cost for producing per metric ton of high purity electrolytic manganese metal. Excludes shipping and selling costs
  - C\$:US\$ 0.76
  - Not classified under JORC or NI 43101
- DR = Discount Rate  
All information taken from public disclosures

# CONTACT US



TSXV : EMM



 Giyani Metals Corp.  
c/o Stikeman Elliott LLP  
5300 Commerce Court West  
199 Bay Street  
Toronto, Ontario M5L 1B9  
Canada

 [info@giyanimetals.com](mailto:info@giyanimetals.com)

 [www.giyanimetals.com](http://www.giyanimetals.com)

 @GiyaniMetals

 #GiyaniMetals

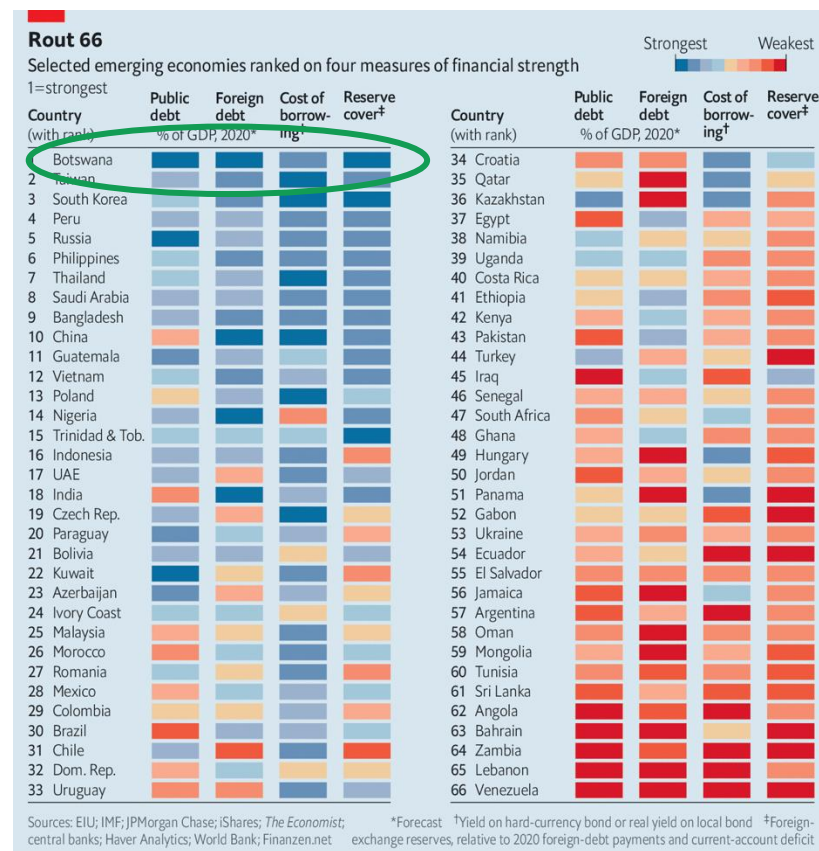
# APPENDIX - BOTSWANA AFRICA'S PREMIER MINING JURISDICTION



## Economic & Geopolitically Stability + Mature and Supportive Mining Sector

### STABLE ECONOMY TO INVEST IN

- Domestic pension fund assets account for 41 per cent of GDP (US\$7Bn) with 30% of which mandated to invest domestically<sup>1</sup>
- Well established mining industry with investor friendly laws and processes for exploration, development and operations
- Local currency is the Botswanan Pula. The currency is freely convertible and pegged against a basket of currencies including the South African rand
- Longest serving democracy in Africa (independence in 1966)
- Steady economic growth of 3.7% in the 12 months to September 2019 (5% previous 12 months)
- Investment grade rating - A2 Stable<sup>2</sup> (unchanged since 2001)
- Central Bank of Botswana benchmark interest rate 4.25% & headline inflation rate of 2.2%<sup>3</sup>
- Economy highly reliant on mining (20% of GDP & 88% of exports)<sup>4</sup> – which has been in decline in recent years
- One of only three African countries to offer a flat universal pension program<sup>5</sup>



The *Economist's* ranking of 66 countries, using four indicators of financial strength<sup>6</sup>

1. The Economist, May 2020
2. OECD public data, 2019
3. Moody's April 2020
4. TradingEconomics.com April 2020
5. African Development Bank Group 2018
6. The Economist, April 2020

## Specific Economic Advantages for Giyani

### FISCAL ADVANTAGES FOR THE K.HILL PROJECT

- One of the most attractive mining jurisdictions in Africa with political stability and transparency<sup>1</sup>
- Government royalty is 3% for manganese
- No import taxes on mining equipment and spares
- Potential to classify Giyani processing plant as *manufacturing*, which has a low corporate tax rate of 15%
- Deduction of 100% of the mining capital expenditure incurred during the tax year with an unlimited carry forward of losses
- There is no mandatory national or governmental joint venture (JV) / free carry / Black Economic Empowerment (BEE) regulation. Debswana is the only JV, set up in 1969, with a 50/50 share between the government of Botswana and De Beers
- Very low level of corruption - **Botswana ranked 34/198 countries in terms of corruption** (the highest ranking of any African, Middle Eastern, Central Asian, South Asian, South East Asian nation)<sup>2</sup>



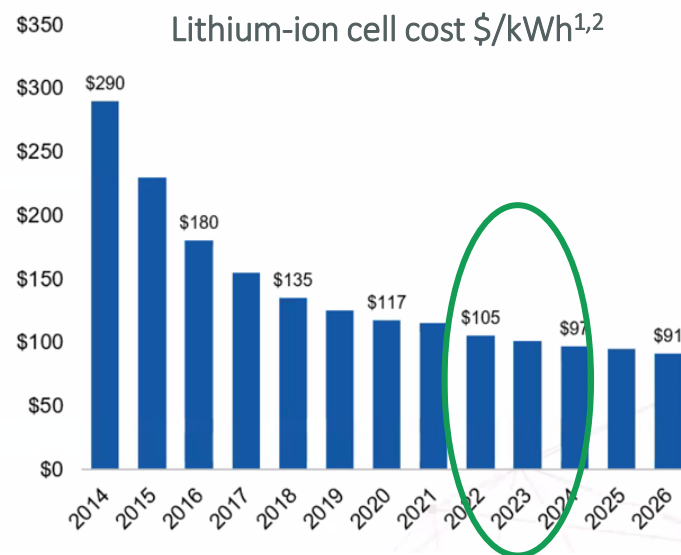
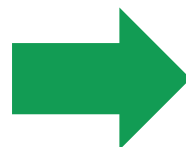
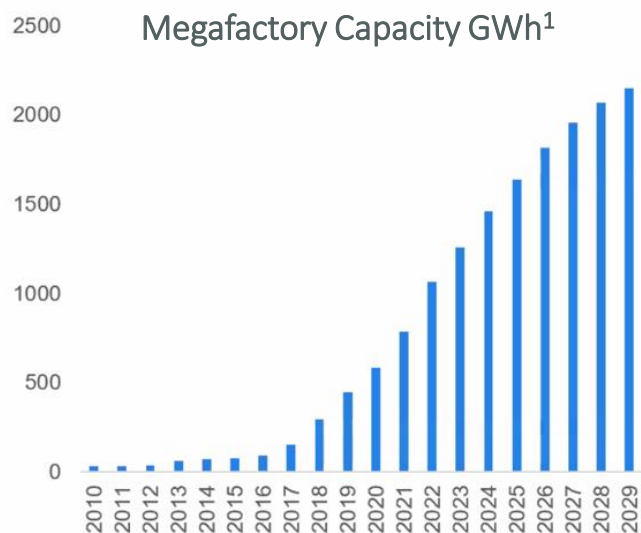
1. Fraser Institute, Survey of Mining Companies 2019  
2. Transparency.org 2019

# APPENDIX - MASS ADOPTION OF EVS IMMINENT

## As BEVs Become Price Competitive with ICEVs Adoption will Accelerate

Over the next decade **130** individual lithium-ion Battery Megafactories are planned, which will produce a capacity of **2,397.5 GWh<sup>1</sup>**

Economies of scale drive down the cost of a lithium-ion battery below the **US\$100/kWh - the point where the cost of a BEV ≈ ICEV**



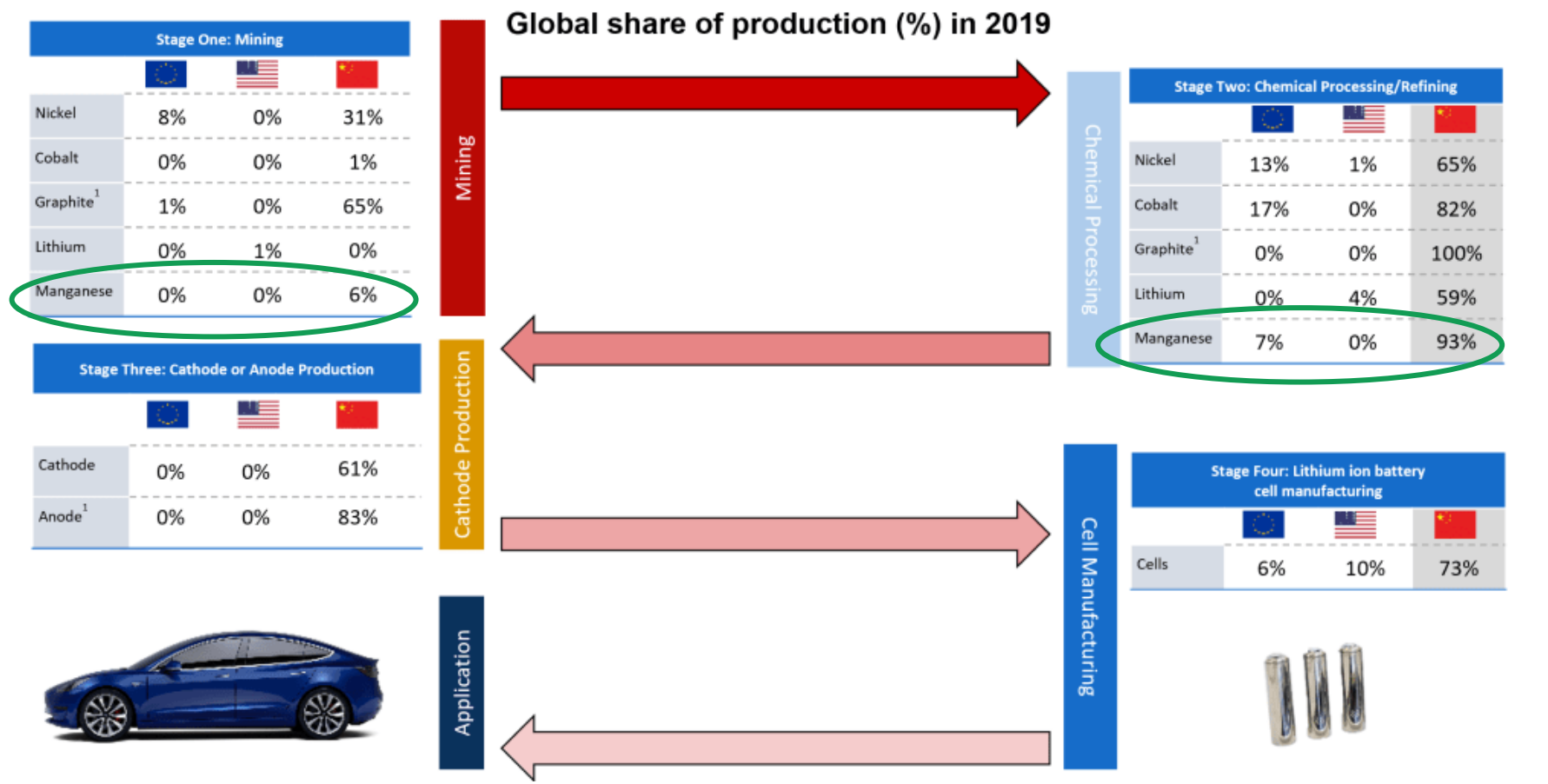
BEVs Battery Electric Vehicles  
 ICEVs Internal Combustion Engine Vehicles  
 GWh Gigawatt hour  
 \$/kWh US\$ per Kilowatt hour

Battery composition	Critical metals required (tonnes /GWh) <sup>3</sup>			
	Lithium	Nickel	Manganese	Cobalt
NCM 111	14	40	40	40
NCM 622	13	60	20	20
NCM 811	11	80	10	10

1. Benchmark Mineral Intelligence, March 2020  
 2. Assuming flat future raw material costs, excludes margin, module and pack costs, figure accounts for top 80% of producers by scale only  
 3. IMnI Report, May 2019

# APPENDIX - FROM MINE TO EV

## The Lithium-Ion Battery Supply Chain<sup>1</sup>



1. Benchmark Mineral Intelligence, new lithium-ion battery supply chain data exposes manganese weaknesses. March 2020



# APPENDIX - MANGANESE IN LI-ION BATTERIES

## Li-ion Batteries have different types of cathode chemistries

### NCM – THE DOMINANT CATHODE FOR AT LEAST THE NEXT 8 YEARS

- NCM cathodes are expected to be use in at least 50% of all batteries (not just EVs) by 2028 - currently 35%<sup>1</sup>
- Solid state technologies will be slow to develop and likely to only be commercialised, if at all, in the 2030s.
- NCM cathodes come in many different chemistries, such as 1:1:1, 8:1:1, 5:3:2.

The makeup of the cathode materials must address the following key challenges<sup>2</sup>:

- Specific Energy
- Specific Power
- **Safety / Thermal stability**
- Life Spam
- **Cost**
- **Performance / Power Output**

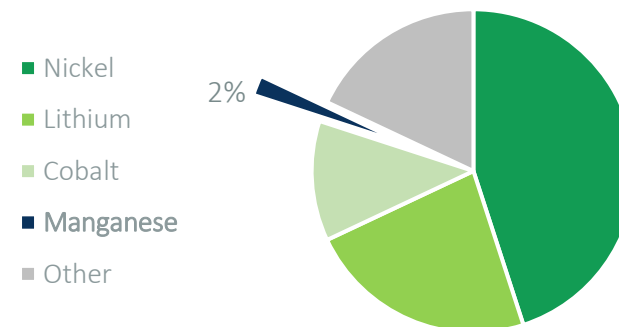
### MANGANESE A SMALL COMPONENT, BUT HERE TO STAY

Battery composition	Critical metals required (kg/kWh) <sup>1</sup>			
	Lithium	Nickel	Manganese	Cobalt
NCM 111	0.14	0.4	0.4	0.4
NCM 622	0.13	0.6	0.2	0.2
NCM 811	0.11	0.8	0.1	0.1

### Properties of Manganese in Cathodes

- **Safe / high thermal stability** (low risk of thermal runaway)
- Supply chain not complicated by *conflict* sources
- **Cheapest** raw material component in the cathode (**2%**)
- **High Performance / Power Output**

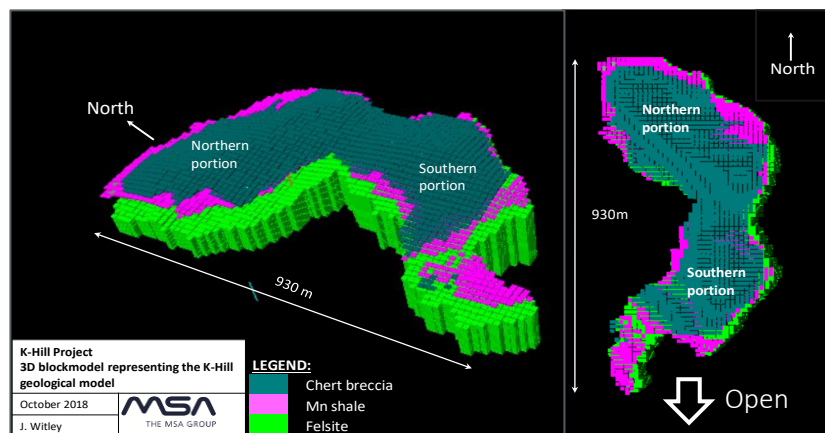
Cathode Cost of an NCM 811 per Raw Material<sup>2</sup>



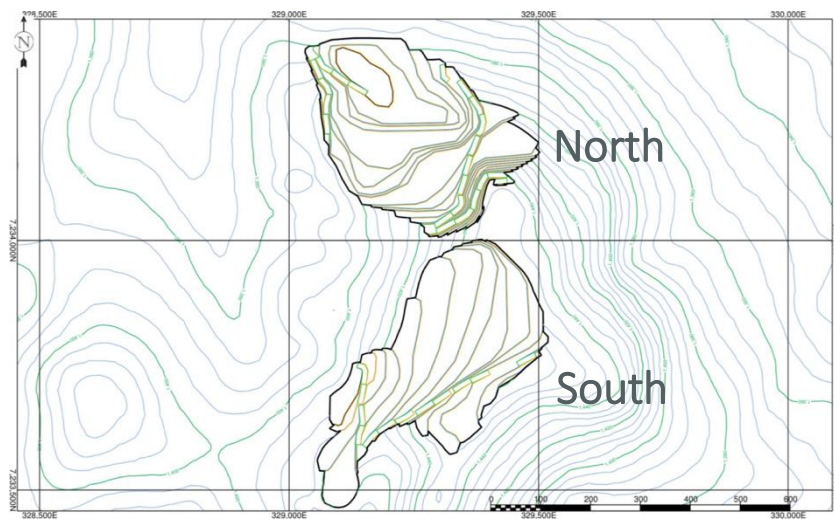
1. IMNI Report, May 2019  
 2. Liu et al. (2017)

# APPENDIX – K.HILL DEPOSIT

## Mining, Processing and Upside



Block Model of K.Hill Resource



April 2020 PEA Pit Design

### MINING & PROCESSING CHARACTERISTICS

- Low tonnage mining – 175,000tpa operation
- Life of Mine stripping ratio of 7.3:1
- 3 months for pre-stripping in year 1
- Small mining fleet:
  - X4 30t dump trucks
  - X2 excavators
- US\$3.56/t rock mined & US\$276.45 ore processed
- 87.5% total process recovery
- Total Cash Cost of US\$1,855 per tonne (HPEMM)

### THE UPSIDE

- Following reserve drilling program, resource & reserves will be remodelled with the aim that the two pits will join into one large pit – increase tonnage and improving economics
- Additional exploration to the south expected to delineate additional mineralisation
- K.Hill PEA does not include inclusion of Otse & Lobatse

# APPENDIX – K.HILL 2020 DRILL PROGRAM

## Program Summary

**Phase 1** – channel chip sampling program along 3 outcropping sections of the ore horizon.

**Phase 2** – RC drilling verification program where 4-holes will be drilled with an RC rig as twins of previously drilled diamond holes.

**Phase 3** – RC drilling program over a regular 50m grid over the entire deposit.

**Phase 4** – ONLY required infill drilling to the phase 3, 50m grid as defined by the channel chip program.

Phase	Quantity	Average depth (m)	Total (m)	Comments
1	30	4	120	Channel chip samples
2	4	30	120	RC - Verification
3.1	80	30	2400	RC – Regular grid
3.2	6	30	180	RC – Supporting holes
4	<i>If &amp; only required</i>			

