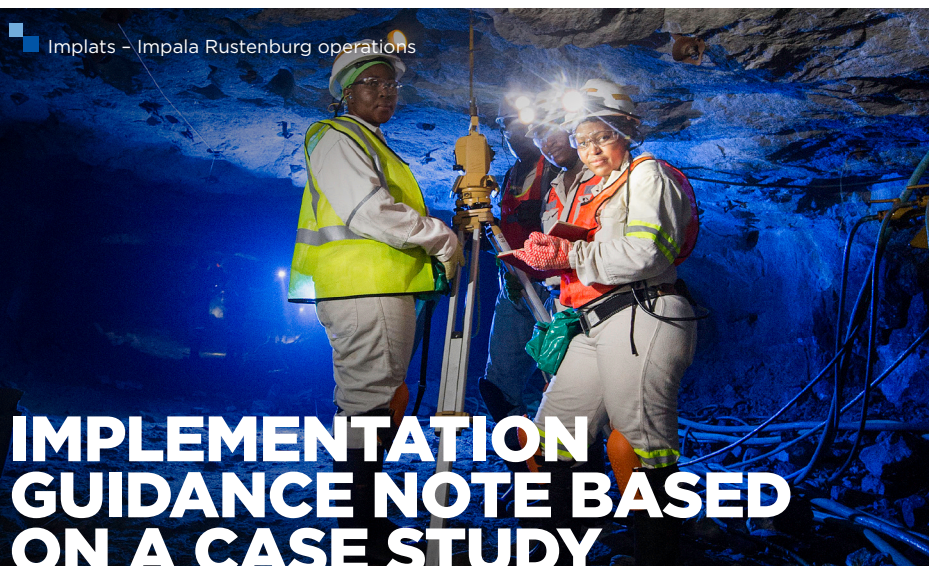




**MINING INDUSTRY  
OCCUPATIONAL  
SAFETY & HEALTH**



**MINERALS COUNCIL  
SOUTH AFRICA**



**For the  
implementation of  
the Industry-wide  
Buy and Maintain  
Quiet Initiative in the  
South African Mining  
Industry**

## **BACKGROUND**

The Minerals Council South Africa has developed a Guidance Note for the implementation of the Industry-wide Buy and Maintain Quiet Initiative in the South African mining industry and through a case study depicts the principals in a practical manner through the Impala Platinum Rustenburg operations rockdrill testing and tag-out maintenance process.

## **MILESTONE FOR THE QUIETENING OF EQUIPMENT**

By December 2024, the total operational or process noise emitted by any equipment must not exceed a milestone sound pressure level of 107dB(A). This milestone of the sound pressure levels will be verified by initiatives under the Centre of Excellence (CoE) and MOSH.

## **MANUFACTURER'S AND SUPPLIER'S DUTY FOR HEALTH AND SAFETY AS STIPULATED IN SECTION 21 OF THE MINE HEALTH AND SAFETY ACT**

(1) Any person who:

- (a) designs, manufactures, repairs, imports or supplies any article for use at a mine must ensure, as far as reasonably practicable:
  - (i) that the article is safe and without risk to health and safety when used properly; and
  - (ii) that it complies with all the requirements in terms of this Act



## PURPOSE

Equipment noise emissions have been identified as a significant occupational health and safety risk within the South African Mining Industry (SAMI). To effectively manage the noise hazard, the need was identified to develop a practical and effective Industry-wide Buy and Maintain Quiet Initiative (IBMQI) to assist the SAMI in its respective efforts to eliminate and/or control noise at source. Noise emission of equipment forms the key focus of the IBMQI, with the appropriate application of incorporating noise as a parameter when procuring and maintaining any equipment used in the SAMI.

This document is aimed at providing guidance to the user on the process to be applied when procuring new equipment considering equipment noise milestones, including the repair and maintenance requirements to ensure that noise levels emitted by equipment used in the SAMI meets the noise industry milestones, as well as maintaining the equipment in such a manner that it never emits noise levels exceeding the industry milestone values.

The practice as documented at the Impala Platinum Rustenburg operations involves the application of quality control measures implemented on equipment maintenance with specific focus on the noise emission.

This practice mitigates the noise risk to the employees, by subjecting the maintained equipment to a noise emission evaluation within a controlled environment and comparing the recorded noise emission to a set equipment noise emission standard of 107dB(A).

Any piece of equipment exceeding the established noise emission standard is tagged-out and not allowed to be returned to the workplace.

***There is no obligation on any mine to apply all or any part of the guidance set out below - it is simply intended as a tool to assist the mines in their engagements with equipment manufacturers and suppliers.***



## INTRODUCTION

Various pieces of machinery and equipment are utilised daily by employees within the mining cycle. Proper and regular maintenance of machinery and equipment is therefore essential, as machinery and equipment will deteriorate with age and if not maintained properly are likely to produce more noise due to factors such as worn parts, poor lubrication and loose panels vibrating.

The equipment noise testing and tag-out practice implemented at Impala Platinum Rustenburg operations focuses primarily on quality maintenance of rockdrills to achieve the following value:

- Increased workplace health and safety
- Improved conformance with set SAMI occupational health and safety milestones
- A reduction in equipment repair/maintenance costs
- Less equipment downtime
- Fewer interruptions to critical operations within the production line
- Longer asset life - components are replaced timeously
- Improved efficiency (assets in good repair tend to operate better)

Increased attention to periodic and quality maintenance of equipment will

therefore assist in the reduction of the noise emission levels, while performing scheduled maintenance on equipment will not only increase equipment and component life but will also make the equipment safer for use and quieter over time.

This practice, rooted in the critical control process, is primarily aimed at the mitigation of the material unwanted event of noise induced hearing loss (NIHL) and ensuring that the noise emissions of equipment is managed within a defined set of performance criteria.

The Critical Control Management Process involves a systematic approach, which ensures that critical controls are in place and effective, as outlined in the diagram below.

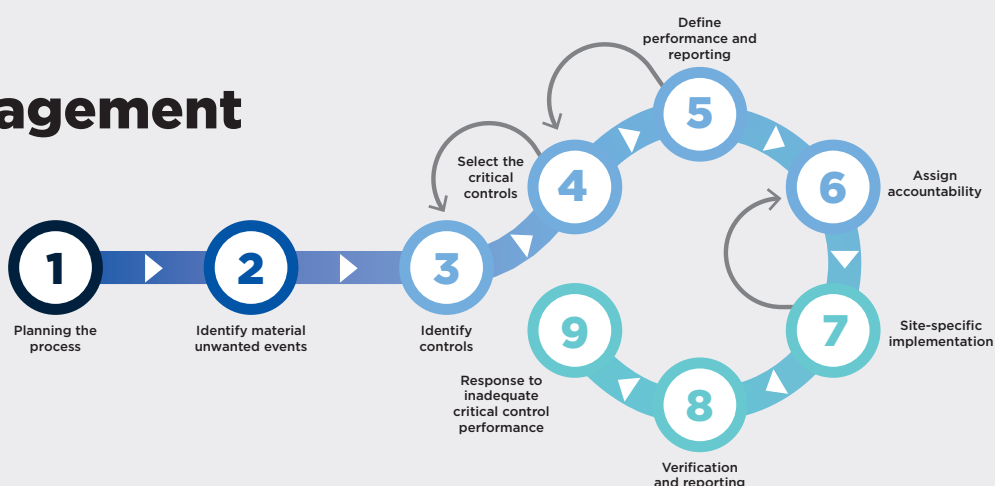
# The critical control management process

### Legend

Planning steps

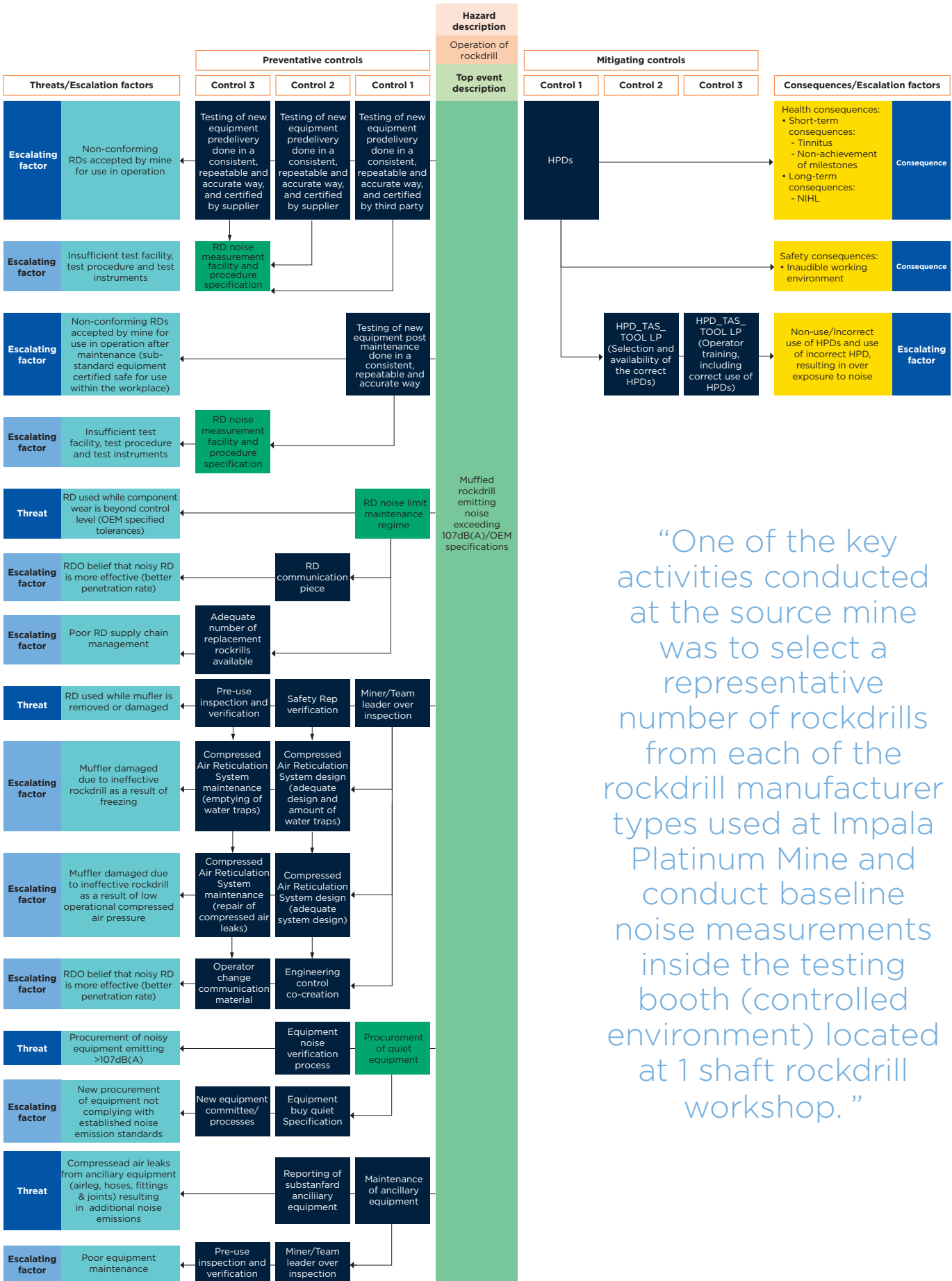
Implementation steps

Feedback



The Guidance Note further incorporates the maintenance principles contained within the IBMQI developed for the SAMI with primary focus on the effective maintenance of equipment to ensure that equipment noise emissions are maintained within set parameters. The preventative and mitigating controls forming part of this practice is outlined within the bowtie analysis below.

### BOWTIE DIAGRAM INDICATING PREVENTATIVE AND MITIGATING CONTROLS



“One of the key activities conducted at the source mine was to select a representative number of rockdrills from each of the rockdrill manufacturer types used at Impala Platinum Mine and conduct baseline noise measurements inside the testing booth (controlled environment) located at 1 shaft rockdrill workshop.”



## NEW EQUIPMENT PROCUREMENT CONSIDERATIONS

When the need arises to procure new or replacement equipment at mining operations, the person responsible for procurement may wish to consider the IBMQI principles listed below, with a view to making an informed decision regarding the procurement of the appropriate equipment from an IBMQI perspective:

- Confirm that where the noise levels emitted by the equipment exceeds 85dB(A), a noise certificate supplied by a certified service provider is available. The noise level can be confirmed by obtaining a third party noise verification measurement
- When the OEM is engaged and the parties involved agree that the equipment does not meet the set noise emission limit, consider initiating a noise reduction process (IBMQI process)
- If an Industry noise emission limit does not currently exist for any given piece of equipment, or equipment population, then the operation could consider establishing its own internal limit, based on their equipment noise screening results (IBMQI process)
- Requesting the OEM to provide details of any alterations made to the equipment which may reduce the noise emissions from the equipment, accompanied by a third party noise verification measurement from the OEM, or from a certified service provider
- The OEM may indicate other noise related issues (i.e. vibration) that need to be considered
- OEM upgrades, (if available) for the replacement or alterations to be made to the equipment exceeding 85dB(A)
- The likelihood of equipment noise emission increases, as a result of wear and tear
- Obtaining of the repair/maintenance procedure from the OEM
- Obtaining an agreement on the repair/replacement strategy and frequency if an external service provider is used to service the equipment
- Applying a price modifier, based on compliance or non-compliance and calculate the cost
- Select the final supplier having regard, inter alia, to the above parameters relating to noise emission
- Ensure that all the equipment documentation is obtained prior to equipment delivery, to enable the operation to verify compliance with the relevant aspects listed above



One of the key activities conducted at the source mine was to select a representative number of rockdrills from each of the rockdrill manufacturer types used at Impala Platinum Mine and conduct baseline noise measurements inside the testing booth (controlled environment) located at 1 shaft rockdrill workshop. Once the baseline noise measurement of each rockdrill was recorded they were marked with a unique colour (white and red for each manufacturer type) and thereafter sent to selected work areas.

The objective of the baseline measurements was to determine the following:

- Baseline noise emission levels of the new equipment, before sending the rockdrills to the shaft
- Compare the noise emission levels before and after use as per the OEM maintenance requirement to evaluate the effectiveness of the rockdrill maintenance

Results are available in a table format below indicating the comparison of the noise emission levels recorded at the Impala Platinum Rockdrill Repair Workshop at a compressed air pressure of 500kPa on the project rockdrills for the different equipment states, operated in a "running free" mode, upon the conclusion of the 28-day project.

### Running free mode

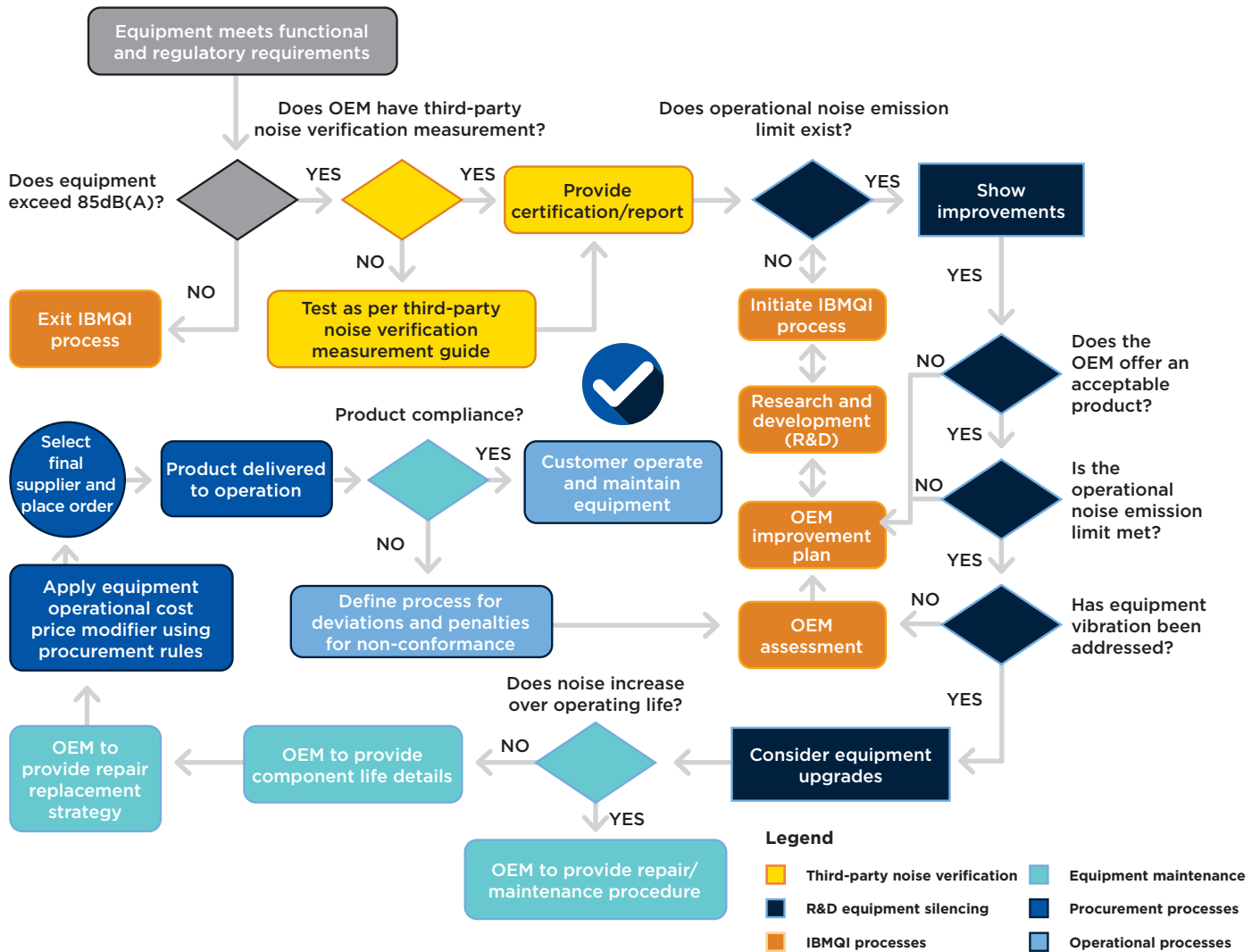
| Rockdrill type | Rockdrill number | Noise emission level for equipment at the end of the 28 days of operation | Noise emission level for equipment after scheduled maintenance | Difference in noise emission level |
|----------------|------------------|---|--|------------------------------------|
| Supplier A     | 197240           | 108.4dB(A)  | 107.5dB(A)   | (0.9)dB(A)                         |
| Supplier A     | 197398           | Not functional due to rust  | 105.0dB(A)   | Unknown                            |
| Supplier B     | 34747            | Not functional due to rust  | 112.0dB(A)   | Unknown                            |
| Supplier B     | 36074            | 114.4dB(A)  | 112.5dBA()   | (2.1)dB(A)                         |

The table below is a comparison of the noise emission levels recorded on the project rockdrills for the different equipment states, operated in a "percussion drilling" mode, upon the conclusion of the 28-day project.

### Percussion drilling mode

| Rockdrill type | Rockdrill number | Noise emission level for equipment at the end of the 28 days of operation | Noise emission level for equipment at the end of maintenance interval | Difference in noise emission level |
|----------------|------------------|---|---|------------------------------------|
| Supplier A     | 197240           | 107.8dB(A)  | 101.7dB(A)  | (6.1)dB(A)                         |
| Supplier A     | 197398           | Not functional due to internal rust                                       | 104.4 dB(A)   | Unknown                            |
| Supplier B     | 34747            | Not functional due to internal rust                                       | 103.8 dB(A)   | Unknown                            |
| Supplier B     | 36074            | 112.3dB(A)  | 105.9 dB(A)   | (6.4)dB(A)                         |

## CONSIDERING NOISE DURING THE PROCUREMENT PROCESS



## CONSIDERATIONS FOR THE MAINTENANCE AND REPAIR OF EXISTING EQUIPMENT

In most cases, an operating mine will already have numerous pieces of equipment in operation. These pieces of equipment might not all meet the industry noise milestone or the company internal noise emission limits. It is important that mines initiate processes which will enable the achievement of these limits, for the IBMQI to be effective. The section below describes the process that could be considered to reduce noise levels to below the required noise emission limits:

- When the OEM is engaged and the parties involved agree that the equipment does not meet the set noise emission limit, consider initiating a noise reduction process (IBMQI process)
- Determining whether the equipment noise emission exceeds the relevant industry noise milestone or internal operational noise emission limits,

and confirming whether the piece of equipment was identified as a 'critical noise equipment' (IBMQI process)

- Confirming that noise certification exists when the equipment exceeds 85dB(A) and when equipment is repaired/maintained by a third party. This could be confirmed by obtaining a third party noise verification measurement from the service provider
- If an Industry noise emission limit does not currently exist for any given piece of equipment, or equipment population, then a mine could consider establishing their own internal noise emission limit, based on their equipment noise screening results (IBMQI process)
- Obtaining of the details of any alterations and updates made to the equipment to reduce the noise emission

- Obtaining of details of any other noise-related issues (i.e. vibration) that need to be considered
- OEM upgrades (if available) for replacement or alterations to be made to the equipment exceeding the relevant operational noise limit, or 85dB(A) if no operational limit is defined
- The likelihood of equipment noise emission increases, as a result of wear and tear
- Consulting of the OEM on the appropriate repair/maintenance procedure and intervals and agree on a repair/maintenance/replacement strategy
- Conducting of noise emission verification measurements of the equipment after on-site modifications/repairs have been completed to confirm compliance (as per the Noise Measurement Guide)

Repairing of rockdrills back to original equipment specifications will not only ensure that the equipment operates optimally, but also ensures that the noise emission of worn components within the piece of equipment is effectively controlled and reduced.

The first step in this process resulted in the identification and establishment of a suitable maintenance interval for the rockdrills utilised.

Impala Platinum Rustenburg operations further identified that quality maintenance of rockdrills play a significant role in ensuring that the maintained rockdrills meet the required noise emission standards and penetration rates. This resulted in the establishment of a testing facility (Rockdrill Test Booth), within the Rockdrill Repair Workshop, as a controlled environment for the testing of repaired rockdrills.

The tests conducted on the repaired rockdrills include a penetration test and a noise emission test on every repaired rockdrill.

The result of the noise emission test conducted is compared to an internal noise emission standard and any rockdrill exceeding the established noise emission standard is tagged-out, not allowed to be returned to the workplace and returned to the rockdrill repairers for investigation and remedial action, with the previously mentioned cycle continued until the rockdrill meets the established noise emission standard.

The noise emitted by a rockdrill which is not maintained, or inadequately maintained, can exceed the established equipment noise emission milestone of 107dB(A) set for the SAMI. Exposure to noise levels in excess of 107dB(A) can present numerous health and safety risks to the employees within the workplace where the equipment is in operation, such as NIHL, poor communication, etc.

The following noise measurements were conducted by the Impala Platinum Ventilation and Occupational Hygiene Department on a group of rockdrills which formed part of the project.

The noise measurements were stratified according to the following equipment states:

- When the equipment is new, as a baseline
- During normal operation of the equipment to identify changes in noise emission levels due to the wear of the equipment
- Prior to the equipment being maintained
- Post equipment maintenance, for comparison to the baseline and to the set noise emission standard

The table below provides more information on the noise emission measurements described above. It should however be noted that the compressed air pressures during the noise emission measurements during the various equipment states were not uniform, with the compressed air pressure within the testing booth recorded at 500kPa and the compressed air within the workplaces recorded at levels varying between 200kPa and 250kPa.

## EQUIPMENT NOISE EMISSION LEVELS RECORDED

| Serial number | Rockdrill status  | Evaluation date |                |          |                |          |                |          |                |          |                |          |                |          |                |
|---------------|-------------------|-----------------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|
|               |                   | Dec 2019        |                | Feb 2020 |                | Feb 2020 |                | Mar 2020 |                | Mar 2020 |                | Jun 2020 |                | Jun 2020 |                |
|               |                   | kPa             | dBA            | kPa      | dBA            | kPa      | dBA            | kPa      | dBA            | kPa      | dBA            | kPa      | dBA            | kPa      | dBA            |
| 197240        | New               | 500             | 106.0<br>108.7 |          |                |          |                |          |                |          |                |          |                |          |                |
|               | In production use |                 |                | 250      | 107.7<br>107.9 | 220      | 105.8<br>104.4 | 250      | 106.7<br>105.0 | 240      | 109.4          |          |                |          |                |
|               | Pre- maintenance  |                 |                |          |                |          |                |          |                |          |                | 500      | 108.4<br>107.8 |          |                |
|               | Post-Maintenance  |                 |                |          |                |          |                |          |                |          |                |          |                | 500      | 107.5<br>101.7 |
| 347474        | New               | 500             | 111.7<br>109.4 |          |                |          |                |          |                |          |                |          |                |          |                |
|               | In use            |                 |                | 200      | 104.5<br>107.6 | 220      | 108.2<br>107.5 | 200      | 108.6<br>107.9 | 240      | 104.9<br>105.1 |          |                |          |                |
|               | Pre- maintenance  |                 |                |          |                |          |                |          |                |          |                | 500      | Not functional |          |                |
|               | Post-maintenance  |                 |                |          |                |          |                |          |                |          |                |          |                | 500      | 112.0<br>103.8 |
| 36074         | New               | 500             | 112.3<br>109.2 |          |                |          |                |          |                |          |                |          |                |          |                |
|               | In production use |                 |                | 200      | 107.9<br>107.8 | 220      | 108.6<br>108.4 | 200      | 108.0<br>108.1 |          |                |          |                |          |                |
|               | Pre- maintenance  |                 |                |          |                |          |                |          |                |          |                | 500      | 114.4<br>112.3 |          |                |
|               | Post-Maintenance  |                 |                |          |                |          |                |          |                |          |                |          |                | 500      | 112.5<br>105.9 |
| 197398        | New               | 500             | 104.9<br>106.9 |          |                |          |                |          |                |          |                |          |                |          |                |
|               | In use            |                 |                | 200      | 108.4          | 220      | 108.6<br>109.1 | 200      | 108.8<br>108.9 | 200      | 108.4          |          |                |          |                |
|               | Pre- maintenance  |                 |                |          |                |          |                |          |                |          |                | 500      | Not functional |          |                |
|               | Post-maintenance  |                 |                |          |                |          |                |          |                |          |                |          |                | 500      | 105.0<br>104.4 |

## CONSIDERATIONS FOR THE MEASUREMENT OF EQUIPMENT AND MACHINERY

The following instrument settings should be used for  $L_{Aeq}$ , T measurements:

- A-weighting: on
- Time weighting: “fast” or “impulse” if the noise is impulsive and the SLM has impulse-integrating capability. If the noise is impulsive but the SLM does not provide for impulse-integration, increase the measured  $L_{Aeq}$ , T by 5 dB(A) for moderately impulsive noise (e.g. pneumatic rock drill) or 12 dB(A) for highly impulsive noise (e.g. compressed air-driven charging-up of blast holes or hammer blows in an artisan workshop)
- Sound incidence: where applicable, “frontal” if the microphone is facing a noise source, or “random” if the noise is non-directional/multi-directional
- Frequency filter: out (off)
- Operating mode: integrate or  $L_{Aeq}$
- For the purpose of measuring individual pieces of equipment and machinery, measurements should be taken 1m away from the specific noise source, as far as reasonably practicable
- For steady noise, a measurement time of 1 minute is adequate
- Where the noise varies or is cyclical, the measurement time should be sufficient to capture variations in level and include a reasonable number of work task cycles, to ensure representative results. This  $L_{Aeq}$ , T measurement for the variation or cyclical noise level will then be recorded as the representative noise level for the individual piece of equipment or machine

Kindly be reminded of the requirements as stipulated in the Guidance Note for Noise Measurement of Equipment to Ensure Conformance with the MHSC Milestones:

- Sound Level Meter should be an Integrating Sound Level Meter, to ensure that the noise measurement results are consistent
- The Sound Level Meter should be calibrated with an acoustical calibrator at the start of the shift and again at periodic intervals during the shift. The pre-and post-calibration results should be compared to each other, and should the difference be more than 1dB, the measurement results should be discarded and repeated
- The position of 1m from the rockdrill under evaluation on the Rockdrill Test Bench should be clearly marked
- Employees performing the rockdrill noise emission measurements should be trained on the contents of the Guidance Note for Noise Measurement of Equipment to Ensure Conformance with MHSC Milestones and a system of regular PTOs should be implemented

Impala Platinum Rustenburg operations identified the need for the establishment of a controlled testing environment for the repaired/maintained rockdrills to ensure that external influences, such as the rockdrill repair/maintenance activities performed within the Rockdrill Repair Workshop do not influence the evaluation results of the repaired/maintained rockdrills under evaluation.

The Controlled Testing Environment was constructed as a room within the Rockdrill Repair Workshop, with sound absorption materials added to the walls, an extraction fan fitted for ventilation purposes and a lockable door equipped with acoustical sealing material.

The dimensions of the Controlled Testing Environment are 3.700m in length, 3.600m in width and 2.800m in height, with the walls with sound absorption materials added to the walls consisting of RS Pro Adhesive PUR foam sound proofing material. The sound proofing material was supplied by RS Pro in the form of sheets, with dimensions of 1.000m in length, 0.600m in width and a thickness of 0.025m. The Controlled Testing Environment is further equipped with a Rockdrill Test Bench and a compressed air supply regulated at a constant compressed air pressure of 500kPa. A dimensional drawing of the Controlled Testing Environment is contained within the Impala Platinum Rockdrill Maintenance Safe Operating Procedure.

The process on the noise measurement of repaired/maintained rockdrills implemented within the Controlled Testing Environment at Impala Platinum operations entails the manual conducting of noise emission measurements by trained rockdrill repairers, making use of a non-integrating Type 2 Sound Level Meter. The noise measurement is conducted at a position of 1m away from the repaired/maintained rockdrill fitted to the Rockdrill Test Bench, for evaluation. The noise measurement is initiated, upon the starting-up of the rockdrill on the test bench and concluded once the rockdrill is stopped. The noise emission result and rockdrill serial number is recorded within the Repaired Rockdrill Noise Emission Evaluation Logbook.

“The noise measurement is conducted at a position of 1m away from the repaired/maintained rockdrill fitted to the Rockdrill Test Bench, for evaluation.”

The table below is a comparison of the noise emission levels recorded on the project rockdrills for the different equipment states, operated in a “running free” mode, upon the conclusion of the 28-day project.

#### Running free results

| Rockdrill type | Rockdrill number | Noise emission level for equipment at the end of the 28 days of operation | Noise emission level for equipment after scheduled maintenance | Difference in noise emission level |
|----------------|------------------|---|--|------------------------------------|
| Supplier A     | 197240           | 106.0dB(A)  | 108.4dB(A)   | 2.4dB(A)                           |
| Supplier A     | 197398           | 104.9dB(A)  | Not functional due to internal rust                            | Unknown                            |
| Supplier B     | 34747            | 111.7dB(A)  | Not functional due to internal rust                            | Unknown                            |
| Supplier B     | 36074            | 112.3dB(A)  | 114.4dB(A)   | 2.1dB(A)                           |

The table below is a comparison of the noise emission levels recorded on the project rockdrills for the different equipment states, operated in a “percussion drilling” mode, upon the conclusion of the 28-day project.

#### Percussion drilling results

| Rockdrill type | Rockdrill number | Noise emission level for equipment at the end of the 28 days of operation | Noise emission level for equipment after scheduled maintenance | Difference in noise emission level |
|----------------|------------------|---|--|------------------------------------|
| Supplier A     | 197240           | 107.8dB(A)  | 107.8dB(A)   | 0.0dB(A)                           |
| Supplier A     | 197398           | 106.9dB(A)  | Not functional due to internal rust                            | Unknown                            |
| Supplier B     | 34747            | 109.4dB(A)  | Not functional due to internal rust                            | Unknown                            |
| Supplier B     | 36074            | 109.2dB(A)  | 112.3dB(A)   | 3.1dB(A)                           |

The table below is a comparison of the noise emission levels recorded on the project rockdrills for the different equipment states, operated in a “running free” mode, post the completion of the 28-day maintenance.

#### Running free results

| Rockdrill type | Rockdrill number | Noise emission level for equipment at the end of the 28 days of operation | Noise emission level for equipment after scheduled maintenance | Difference in noise emission level |
|----------------|------------------|---|--|------------------------------------|
| Supplier A     | 197240           | 106.0dB(A)  | 107.5dB(A)   | 1.5dB(A)                           |
| Supplier A     | 197398           | 104.9dB(A)  | 105.0dB(A)   | 0.1dB(A)                           |
| Supplier B     | 34747            | 111.7dB(A)  | 112.0dB(A)   | 0.3dB(A)                           |
| Supplier B     | 36074            | 112.3dB(A)  | 112.5dB(A)   | 0.2dB(A)                           |

The table below depicts the noise emission levels recorded for the project rockdrills for the different equipment states, operated in a “percussion drilling” mode, post the completion of the 28-day maintenance.

#### Percussion drilling results

| Rockdrill type | Rockdrill number | Noise emission level for equipment at the end of the 28 days of operation | Noise emission level for equipment after scheduled maintenance | Difference in noise emission level |
|----------------|------------------|---|--|------------------------------------|
| Supplier A     | 197240           | 107.8dB(A)  | 101.7dB(A)   | (6.1)dB(A)                         |
| Supplier A     | 197398           | 106.9dB(A)  | 104.4dB(A)   | (2.5)dB(A)                         |
| Supplier B     | 34747            | 109.4dB(A)  | 103.8dB(A)   | (5.6)dB(A)                         |
| Supplier B     | 36074            | 109.2dB(A)  | 105.9dB(A)   | (3.3)dB(A)                         |



## THIRD PARTY EQUIPMENT NOISE VERIFICATION PROCESS

### Manufacturer /Supplier equipment noise reports

Each user of equipment should ensure that an equipment noise emission report which complies with the requirements specified in this document is provided on delivery of each item procured, serviced or refurbished.

The following information must be recorded and stipulated in the equipment noise emission report:

- Integrating Sound Level Meter information, consisting of the following minimum information:
  - Instrument type (including make and model)
  - Instrument serial number
  - Microphone serial number
  - SANAS calibration information (date, certificate number, service provider/laboratory information, etc.)
- Environmental, equipment information and evaluation results, consisting of the following minimum information:
  - Supplier/ OEM name
  - Division (if applicable)
  - Type of equipment - name and description
  - Equipment model
  - Serial/Equipment number
  - Intended use - purpose and location
  - Power source e.g. pneumatic/ electric/electro-hydraulic/hydro power
  - Noise measurement duration/period per measurement
  - Noise level (LavgdBA) - (log average to be recorded)
  - Noise level (dBA) - (all scenarios/ cycles to be recorded and listed)
  - Background noise levels and background noise sources list
  - Description of the acoustical environment and the environmental conditions in which the equipment noise evaluation was conducted
- Description of the operating conditions and workload of the equipment during the evaluation
- A dimensioned drawing or sketch of area where measurements were conducted, with measurement positions/ locations
- Compressed air\water pressure recorded during the conduction of the equipment noise evaluation - for pneumatic/hydro equipment
- Date and time of the equipment noise evaluation and report number
- Details of the competent person (including but not limited to name, qualifications, experience and certification)
- Equipment maintenance interval requirements based on noise emission



**The basic steps to follow when performing noise measurement on an identified piece of equipment:**

# 01

Identify the equipment to be measured and note the details of the equipment (Manufacturer, Equipment Type, Model, etc.).

# 02

Determine the background noise level present in the area to be measured. Define the distance the background noise equipment is away from the equipment to be measured e.g. 6m away.

# 03

Identify which equipment or activities can be safely stopped or switched off for the noise measurement duration.

# 04

Isolate the equipment and activities identified in step 3 above, where required.

# 05

Conduct background noise measurements.

# 06

Record the background noise level present, together with the relevant information on the equipment and/or activities which could not be isolated.

# 07

Conduct noise measurements according to the measurement procedures stipulated within Section 4 of the Guidance Note for 3rd Party Equipment Noise Verification Measurement. Measurement of any cyclic equipment must take place from the initial start to the end of such cycle. i.e. a rock drill will be measured from starting the machine, collaring, drilling and withdrawing the machine.

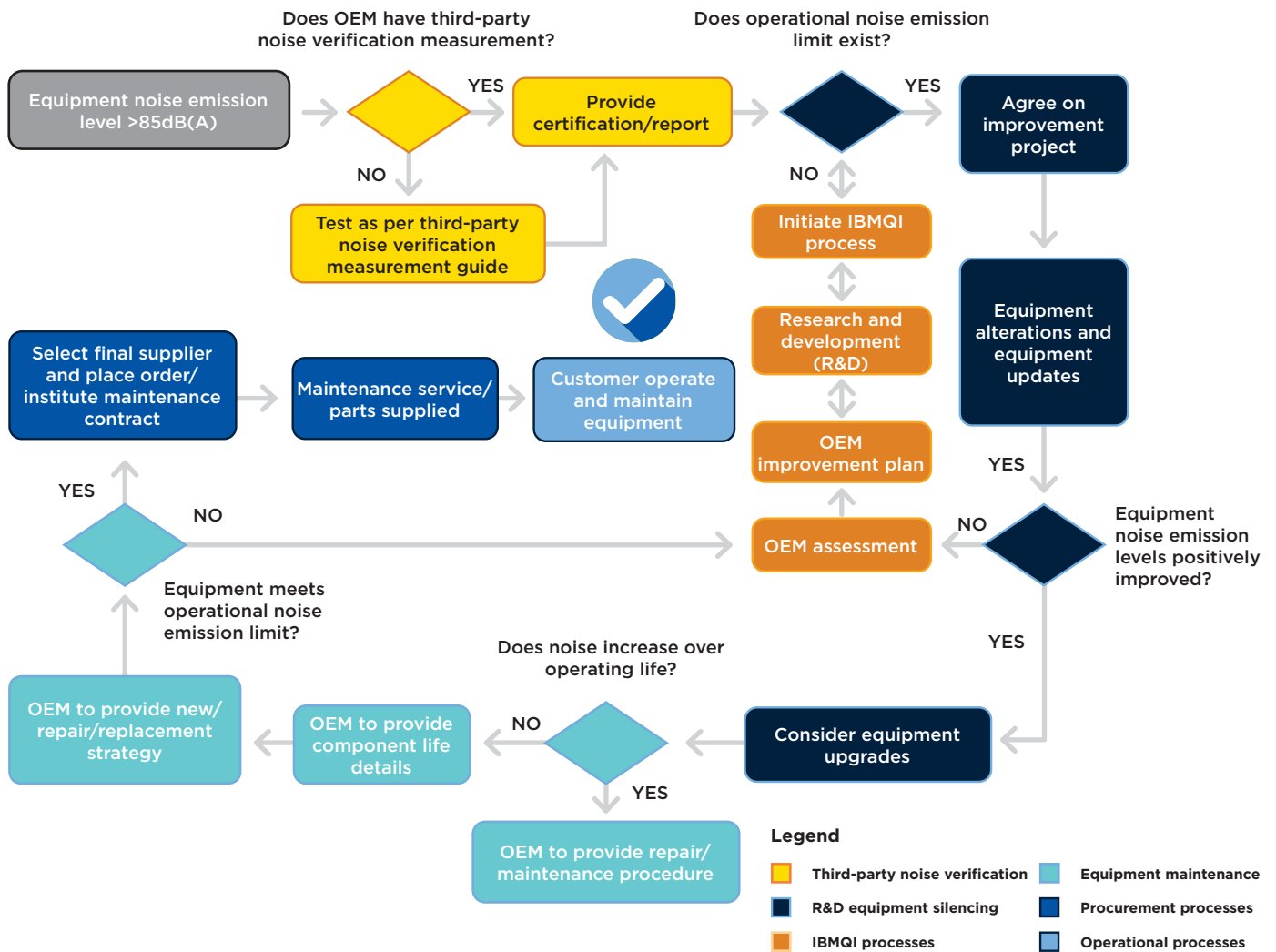
# 08

Once the noise measurement process for the equipment being evaluated is complete, all other equipment and/or activities which constituted the background noise within the area could be restarted and the entire process should be repeated for every other piece of equipment to be evaluated.

# 09

Record all the other relevant information, as specified in the Manufacturer/Supplier Equipment Noise Reports in Section 5 of this Guidance Note. The report should also indicate the microphone positions in relation to the equipment and surroundings evaluated, for future reference.

## CONSIDERING NOISE DURING THE REPAIR/MAINTENANCE OF EXISTING EQUIPMENT PROCESS



## DETAILED DISCUSSION WITH OEM

One of the fundamental processes in the application of the IBMQI principles within the procurement of equipment, is the engagement with the OEM to determine the extent previous equipment silencing developments considered/utilised/effected/introduced as part of ensuring compliance with the requirements of section 21 of the MHSA.

The outcomes of the procurement processes referred to above, together with the results of any critical noise equipment screening process, would provide the procurement team, led by the most senior engineer, with the basis for the establishment of a comprehensive equipment silencing and development plan for engagement with the relevant OEM.

The IBMQI process table reflects examples of issues which may be discussed during engagements with OEMs on equipment improvement initiatives. It may also provide guidance on potential focus areas for the identification of noise risk reduction options in respect of a piece of equipment. This form may provide useful guidance to the procurement team, as it incorporates technological, energy conversion and mechanical design considerations, guiding the procurement team towards meaningful engagements with the OEM on the reduction of the noise emission levels of the equipment.

### IBMQI OEM process engagement form example

| IBMQI PROCESS                                  |                               |      |  |  |
|--|-------------------------------|------|--|--|
| GENERAL INFO                                   |                               |      | OEM DISCUSSION AND TARGET SETTING  |  |
| Mining company                                 | ABC Mining                    |      | 1. Independent third-party equipment noise verification measurements conducted? Please provide details.                  |  |
| Commodity                                      | Platinum                      |      | 2. How do you plan to meet the set industry noise emission targets? Please provide details.                              |  |
| Mining method/type                             | UG Conventional               |      | 3. What type of muffler/silencing device do you make use of? Please provide details.                                     |  |
| Activity area                                  | Stoping                       |      | 4. Do you have a R&D plan? Please provide details.   |  |
| Equipment/process category                     | Rock drill                    |      | 5. What type of equipment development have you done? Please provide details.   |  |
| Noise emission level in dB(A)                  | 103dB(A)                      |      | 6. Have your equipment developments been successful? Please provide details.   |  |
| Industry target for 2020                       | 105dB(A)                      |      | 7. Are the outcomes of the equipment developments available? Please provide details.                                     |  |
| Power source (pneumatic/hydro/ electric, etc.) | Pneumatic                     |      | 8. When do you plan to have the equipment developments available in the market? Please provide details.                  |  |
| Manufacturer/supplier                          | Victoria Engineering          |      | 9. Who do you utilise for equipment R&D? Please provide details.   |  |
| Equipment and/or process type                  | SECO                          |      | 10. Do you have a project plan available? Please provide details.  |  |
| Model  | SE26                          |      | 11. Please provide details on your next planned equipment R&D? Please provide details.                                   |  |
| Supply of complete units/components/ repairs   | Complete units and components |      | 12. Please provide details on the equipment R&D cost impacts? Please provide details.                                    |  |
| Sub-component supplier (e.g. CAT)              | N/A                           |      | 13. Have you considered measures to reduce the equipment vibration? Please provide details.                              |  |
| Sub-component (e.g. CAT C15 engine)            | N/A                           |      | 14. Have you conducted noise frequency analysis? Please provide details.   |  |
| CRITICAL NOISE EQUIPMENT SCREENING RESULTS     |                               |      | 15. Have you considered the increase in noise emissions as a result of wear? Please provide details.                     |  |
| Noise measurement result in dB(A)              | 106                           | 9    | 16. Have you quantified the equipment deterioration as a result of equipment wear? Please provide details.               |  |
| No. of persons exposed/affected                | 10                            | 9    | 17. Please provide the results of the equipment lifecycle analysis.  |  |
| No. of machines at workplace/site              | 394                           | 10   |  |  |
| Exposure duration/time                         | 5hrs                          | 8    | 18. Do you have an equipment/component maintenance procedure?  |  |
| Confined work space/environment                | Yes                           | 10   |  |  |
| Machine vibration                              | Yes                           | 10   | 19. Please provide details on the equipment/component maintenance procedure.   |  |
| Maintenance impact                             | Yes                           | 6    |  |  |
| Equipment improvements, silencing solutions    | Yes                           | 7    | 20. How do you address deviances from the equipment/component maintenance procedure? Please provide details.             |  |
| Hearing protection                             | Noise clipper                 | 8    |  |  |
| Critical frequency range                       | 4kHz                          | 9    | 21. What do you do in case of non-compliance with the equipment/component maintenance procedure? Please provide details. |  |
| Equipment noise screening risk ranking         | High                          | 8.77 |  |  |

The MOSH Noise Team and members of the established Impala Platinum Documenting Team visited three main service providers responsible for manufacturing and maintaining rockdrills for the Impala Platinum Rustenburg operations.

The purpose of the visits was to:

- Establish OEM and repairer maintenance requirements for rockdrills used at Impala Platinum Rustenburg operations
- Compare the rockdrill noise testing and operating requirements from the OEM and repairer in comparison with the established testing and repairing

procedures implemented at Impala Platinum Rustenburg operations

- Confirm if the documented best practice is well established and implemented at the external facility and if the Source Mine Report containing the documented potential leading practice information needs to be amended

## CRITICAL NOISE EQUIPMENT TARGET SETTING

A non-compulsory critical noise equipment target setting framework was developed to assist the SAMI in applying appropriate noise target reduction principles as part of the quantification of the noise risk associated with equipment. The framework considers the appropriate factors which may form part of control evaluation and further outline the processes that may be followed for the reduction of equipment noise risk, in consultation with OEMs. The critical noise equipment target setting process developed consists of 10 key steps, which the individual mining operations may consider as outlined in the diagram below.

### Critical Noise Equipment Target Setting Process





The Impala Platinum Ventilation and Occupational Hygiene Department maintain an equipment noise inventory that gets reviewed by the Noise Working Group Committee on a regular basis. Rockdrills, identified as a critical noise emitting piece of equipment, are listed by the Engineering Department and maintained at predetermined intervals to ensure they are not operated when exceeding 107dB(A) as predetermined by the Noise Working Group Committee.

The Rockdrill Maintenance Programme implemented at Impala Platinum performs scheduled maintenance on the rockdrills utilised within the production sections of Impala Platinum. Rockdrills requiring repair or maintenance are received at the rockdrill repair workshops, where they are cleaned, stripped and all components are inspected, and the tolerances measured. Any component found to be defective is then replaced, prior to the re-assembly of the rockdrill. The repaired rockdrill is then forwarded to the Controlled Testing Environment (Rockdrill Testing

Booth) where the repaired/maintained rockdrill is subjected to penetration and noise emission evaluations.

This involves the installation of the repaired/maintained rockdrill to a test bench within the Controlled Testing Environment and being operated at a standardised compressed air pressure of 500kPa, as part of the penetration evaluation. The noise emission of the repaired/maintained rockdrill is then also evaluated during the penetration evaluation, making use of a non-integrating Type 2 Sound Level Meter at a fixed position from the repaired/maintained rockdrill under evaluation. The noise measurement result, together with the rockdrill serial number is recorded within the Repaired Rockdrill Noise Emission Evaluation Logbook, upon the completion of the evaluation.

All repaired/maintained rockdrills complying with the internal noise emission limit set for repaired/maintained rockdrills are passed, tagged, and sent back to the shaft. Any repaired/maintained rockdrill not complying with the internal noise emission limit set for repaired/

maintained rockdrills are failed and sent back to the rockdrill repair assembly line for investigation and remedial action, with the abovementioned process continued until the repaired/maintained rockdrill passes the penetration and noise emission evaluations.

The MOSH Noise Team and members of the established Impala Platinum Project Team visited three main service providers responsible for manufacturing and maintaining production rockdrills for Impala Platinum Rustenburg operations.

The purpose of the visits was to:

- Establish OEM and repairer maintenance requirements for rockdrills used at Impala Platinum Rustenburg operations
- Compare the rockdrill Noise testing and operating requirements from the OEM and repairer in comparison with the established testing and repairing procedures implemented at Impala Platinum Rustenburg operations
- Discuss potential improvements to be considered in reducing equipment noise

## BEHAVIOURAL ASPECTS

Importantly, sustainable adoption of a leading practice must include adoption of not only the technical aspects, but also its behavioural communication and leadership behaviour aspects.

This first step in the adoption process of any practice would be to secure the support for adoption through identifying the applicability of the leading practice to the company or site.

Tasks in this step also include aspects relating to stakeholder engagement and establishing readiness to adopt. The second step of the adoption process requires that a resourced and competent adoption team is established to lead, oversee and monitor the adoption of the leading practice. Confirmation of the socio-technical systems aspects related to the adopting mine that need to be considered to enable successful and sustainable adoption of the leading practice are the

third step in the process, followed by step four where a decision is taken on the applicable area and documentation than needs to be amended accordingly. Step five includes the operational processes of updating of all processes and a review of documentation at the operation to ensure inclusion of changes brought about by the adoption of the leading practice. Step six are considered the diligent execution of the leading practice to all other areas applicable.

TASKS REQUIRED TO ENABLE SUCCESSFUL COMPLETION OF EACH STEP

| STEP 1<br>SECURE SUPPORT FOR<br>ADOPTION  | STEP 2<br>ESTABLISH MINE<br>ADOPTION TEAM  | STEP 3<br>CONFIRM MINE STS<br>ELEMENTS TO BE<br>ADDRESSED   | STEP 4<br>ESTABLISH MINE<br>ADOPTION PLAN  | STEP 5<br>REVIEW, UPDATE AND<br>MONITOR OPERATIONAL<br>PROCESSES AND<br>DOCUMENTATION  | STEP 6<br>EXECUTE LEADING<br>PRACTICE (LP)<br>ADOPTION AND<br>IMPLEMENTATION IN<br>PILOT SITE/AREA  | STEP 7<br>ROLL OUT THE LP<br>TO THE REST OF THE<br>ORGANISATION/ MINE   |
|---|--|---|--|--|---|---|
| <p><b>Task 1</b> - Facilitate/ or confirm mine leading practice related risks and controls/verify whether the leading practice is applicable to the mine. (persuade/ tool for mine of value case "site specific context")</p> <p><b>Task 2</b> - Senior mine management/ Manco session and orientation presentation</p> <p><b>Task 3</b> - Engage organised labour (adopting mine GM or ATM/Adoption Champion)</p> <p><b>Task 4</b> - Issue mine-wide communication</p> <p><b>Task 5</b> - COPA sign up and attendance (full leading practice) and other interest groups (simple leading practice)</p> <p><b>Task 6</b> - Conduct adoption readiness review</p> | <p><b>Task 1</b> - Identify functional groups involved in the adoption process</p> <p><b>Task 2</b> - Attend MOSH "competence/capability/ awareness programme"</p> | <p><b>Task 1</b> - Review the leading practice adoption guide (LPAG) and generic adoption plan of source/demo mine to familiarise the operation with potential STS aspects</p> <p><b>Task 2</b> - Confirm mine processes and documentation defining the operation's STS aspects (ss listed in the Mine Adoption Readiness Review)</p> | <p><b>Task 1</b> - Decide on pilot site/area</p> <p><b>Task 2</b> - Update adoption plan</p> <p><b>Task 3</b> - Develop leading practice monitoring plan</p> | <p><b>Task 1</b> - Develop and/ or update existing COPs and procedures</p> <p><b>Task 2</b> - Develop and/or update training material</p> <p><b>Task 3</b> - Introduce monitoring mechanisms</p> <p><b>Task 4</b> - Develop change communication plan and material/update existing material, to communicate the impact and operational changes effectively</p> | <p><b>Task 1</b> - Pilot site/ area leading practice adoption</p> <p><b>Task 2</b> - Monitoring of LP execution based on developed monitoring metrics (step 5 – task 3)</p> | <p><b>Task 1</b> - Facilitate effective roll-out and duplication of adoption process as undertaken/ developed during pilot process</p> <p><b>Task 2</b> - Provide ongoing feedback and reports on adoption to MOSH learning hub</p> |

## Training

The training material developed at Impala Platinum Rustenburg operations aided the mine in achieving implementation of the significant requirements of the leading practice. All applicable training documents have been integrated into the stakeholder training requirements and is executed using the following training methodologies:

- Formal class training
- Audio visual
- On-the-job training

## Leadership Behaviours

Leaders' behaviour also has a profound impact on the behaviour of employees. The table below indicates the key leadership behaviours identified at Impala Platinum Rustenburg operations:

## KEY LEADERSHIP BEHAVIOURS IN IMPLEMENTING THE EQUIPMENT TESTING AND TAGGING PRACTICE

| Level of leadership           | Antecedent  | Behaviour  | Consequences   |
|-------------------------------|---|--|--|
| <b>Line management</b>        | <ul style="list-style-type: none"> <li>• Knows and complies with all applicable safety and health policies</li> <li>• Provides visible sponsorship/endorsement of safety/health strategies</li> <li>• Ensures adequate resources for deployment of safety/health strategies</li> <li>• Leads documentation and reporting of performance against goals and implementation of improvement opportunities</li> <li>• Reviews all significant injuries and incidents and appropriate corrective actions against 'scorecard' goals on a monthly basis</li> <li>• Reviews all near hit reports and corrective actions</li> </ul>                                   | <ul style="list-style-type: none"> <li>• Provides visible sponsorship/endorsement of safety/health strategies</li> <li>• Ensures adequate resources for deployment of safety/health strategies</li> <li>• Leads documentation and reporting of performance against goals and implementation of improvement opportunities</li> <li>• Reviews all significant injuries and incidents and appropriate corrective actions against 'scorecard' goals on a monthly basis</li> <li>• Reviews all near hit reports and corrective actions</li> </ul> | <ul style="list-style-type: none"> <li>• Provides visible sponsorship/endorsement of safety/health strategies</li> <li>• Ensures adequate resources for deployment of safety/health strategies</li> <li>• Leads documentation and reporting of performance against goals and implementation of improvement opportunities</li> <li>• Reviews all significant injuries and incidents and appropriate corrective actions against 'scorecard' goals on a monthly basis</li> <li>• Reviews all near hit reports and corrective actions</li> </ul> |
| <b>Engineering management</b> | <ul style="list-style-type: none"> <li>• Knows and complies with all applicable safety and health policies</li> <li>• Ensures full reporting on injury/illness/incidents and reviews investigation outcomes</li> <li>• Ensures employees are equipped and trained to perform work safely</li> <li>• Ensures that identified critical issues are resolved without delay</li> <li>• Supports achievement of performance targets by conducting formal documented monthly inspections</li> <li>• Ensures adequate staffing levels to achieve agreed actions and performance levels</li> <li>• Reviews OHS scorecard and ensures that gaps are closed</li> </ul> | <ul style="list-style-type: none"> <li>• Provides visible leadership through regular communication of incidents and corrective actions, OHS goals and improvement opportunities</li> <li>• Incorporates relevant OHS messages into regular communications</li> <li>• Uses dialogue skills to highlight key OHS issues</li> </ul>   | <ul style="list-style-type: none"> <li>• Provides regular, specific and constructive feedback from a monthly review of OHS scorecard</li> <li>• Recognises and celebrates OHS accomplishments</li> <li>• Holds managers accountable for progress and delivery of expected results on time</li> </ul>   |

## KEY LEADERSHIP BEHAVIOURS IN IMPLEMENTING THE EQUIPMENT TESTING AND TAGGING PRACTICE *continued*

| Level of leadership          | Antecedent  | Behaviour  | Consequences   |
|------------------------------|---|--|--|
| <b>Rockdrill repairers</b>   | <ul style="list-style-type: none"> <li>Knows and complies with all applicable safety and health policies</li> <li>Works and maintains workplace in compliance with procedures, standards and policies</li> <li>Personally works in a safe and compliant manner</li> <li>Asks for assistance when perceived assistance is useful or required</li> <li>Identifies hazards and near hits and assists in resolving both</li> </ul>  | <ul style="list-style-type: none"> <li>Reports all new hazards.</li> <li>Reports all unsafe/non-compliant behaviour and conditions</li> <li>Reports all injuries, regardless of nature or severity, illnesses or health-related symptoms</li> <li>Readily volunteers suggestions for improving occupational health and safety performance</li> </ul> | <ul style="list-style-type: none"> <li>Intervenes and acts immediately when risky or non-compliant actions are observed</li> <li>Provides constructive feedback in a positive manner to help others to work in a safe and compliant manner</li> <li>Encourages others to participate in occupational health and safety improvement efforts such as near hit reporting</li> </ul> |
| <b>Union representatives</b> | <ul style="list-style-type: none"> <li>Knows and complies with all applicable safety and health policies</li> <li>Conducts daily work area inspections to identify new hazards and safety or compliance issues and opportunities for action and positive feedback</li> <li>Ensures thorough reporting of injury/illness/incidents</li> <li>Participates in appropriate investigations, such as accident or near hit reconstruction and analysis</li> <li>Ensures employees are equipped (have and are appropriately using safety equipment) to perform work safely and have completed all training</li> </ul> | <ul style="list-style-type: none"> <li>Regularly dialogues with employees on safety/health issues and opportunities</li> <li>Regularly dialogues on hazard and risk identification and estimation</li> <li>Makes assignments based on priorities, clearly indicating responsibilities and due dates</li> </ul>                                       | <ul style="list-style-type: none"> <li>Positively enforces/reinforces occupational health and safety compliance and employee adherence to relevant policies and procedures</li> <li>Provides regular, specific and constructive feedback and holds employees accountable for safety/health performance and compliance</li> </ul>   |
| <b>Rockdrill operators</b>   | <ul style="list-style-type: none"> <li>Knows and complies with all applicable safety and health policies</li> <li>Works and maintains workplace in compliance with procedures, standards and policies</li> <li>Personally works in a safe and compliant manner</li> <li>Asks for assistance when perceived assistance is useful or required</li> <li>Identifies hazards and near hits, and assists in resolving both</li> </ul>   | <ul style="list-style-type: none"> <li>Reports all new hazards</li> <li>Reports all unsafe/non-compliant behaviour and conditions</li> <li>Reports all injuries, regardless of nature or severity, illnesses, or health-related symptoms</li> <li>Readily volunteers suggestions for improving occupational health and safety performance</li> </ul> | <ul style="list-style-type: none"> <li>Intervenes and acts immediately when risky or non-compliant actions are observed</li> <li>Provides constructive feedback in a positive manner to help others to work in a safe and compliant manner</li> <li>Encourages others to participate in occupational health and safety improvement efforts such as near-hit reporting</li> </ul> |

## ACCOUNTABILITY AND RESPONSIBILITY FRAMEWORK: ROLES AND ACCOUNTABILITIES OF STAKEHOLDERS

| Control  | Muffled/Silenced equipment (including maintenance)   |   |  |
|--|--|---|--|
| Relevant levels of leadership  | Essential control actions  | Control responsibility  | Control accountability   |
| Mining/Production  |  |   |  |
| <b>Equipment operator</b>  | Operated equipment to be quieter when muffler/silencer is intact   | Pre-use inspection to be performed on the muffler/silencer installed  | None   |
|  | Equipment with defective muffler/silencer not to be operated   | Immediate reporting of defects to the muffler/silencer to supervisor  | None   |
|  | Operator understands the function of the muffler/silencer and its performance criteria                           | Operators to report poor performing equipment to their supervisors and not damage the muffler/silencer                | None   |
| <b>First line supervisor (Miner/Section leader)</b>                  | Ensures that the operators understand the purpose of the muffler/silencer and its performance criteria           | Conducts planned task observations/visible felt leadership (VFL)  | None   |
|  | Ensures that equipment with defective muffler/silencer is not operated   | Issues replacement equipment when muffler/silencer is damaged   | None   |
|  | Is informed of the number of equipment with damaged mufflers/silencers   | Withdraws equipment with damaged muffler/silencer   | None   |
|  | Performs/oversees inspections on equipment mufflers in area of responsibility                                    | Withdraws equipment with damaged muffler/silencer   | Ensures that the pre-use inspection is performed on the muffler/silencer |
|  | Sends the equipment for maintenance, as per the maintenance schedule/requirement                                 | Withdraws equipment due for maintenance, issues replacement equipment and sends equipment to the maintenance workshop | None   |
| <b>Second level supervisor</b><br>(Shift supervisor/Shift leader)    | Ensures that equipment with defective muffler/silencer is not operated   | Withdraws equipment with damaged muffler/silencer and sends equipment to the repair/ maintenance workshop             | Ensures availability of replacement rockdrills                           |
|  | Ensures that equipment due for maintenance is not used and sent for maintenance, as per the maintenance schedule |   | Oversees inspections on equipment  |
|  |  | Withdraws equipment due for maintenance, issues replacement equipment and sends equipment to the maintenance workshop | Ensures availability of replacement rockdrills                           |
| <b>Third level supervisor</b><br>(Mine overseer/Production overseer) | Ensures that equipment with defective muffler/silencer is not operated   | Withdraws equipment with damaged muffler/silencer and sends equipment to the repair/maintenance workshop              | Maintains the allocated quantities of replacement equipment              |
|  | Ensures that equipment due for maintenance is not used and sent for maintenance, as per the maintenance schedule | Withdraws equipment due for maintenance, issues replacement equipment and sends equipment to the maintenance workshop | Maintains the allocated quantities of replacement equipment              |



## ACCOUNTABILITY AND RESPONSIBILITY FRAMEWORK: ROLES AND ACCOUNTABILITIES OF STAKEHOLDERS continued

| Control   | Muffled/Silenced equipment (including maintenance)   |   |   |
|---|--|---|---|
| Relevant levels of leadership   | Essential control actions  | Control responsibility  | Control accountability  |
| Mining/Production   |  |   |   |
| <b>Fourth level supervisor</b><br>(Section manager/production superintendent) | Ensures that equipment with defective muffler/silencer is not operated   | Withdrawing of equipment with damaged muffler/silencer and sending of equipment to the repair/maintenance workshop  | Allocation of adequate quantities of replacement equipment for the section  |
|   | Ensures that equipment due for maintenance is not used and sent for maintenance, as per the maintenance schedule   | Withdraws equipment due for maintenance, issues replacement equipment and sends this equipment to the maintenance workshop  | Ensures allocation of adequate quantities of replacement equipment for the section  |
| <b>Fifth level supervisor</b><br>(Production/Mine/ Plant manager)             | Develops systems to ensure that equipment with defective muffler/silencer is not operated  | Ensures that developed systems ensuring equipment with defective muffler/silencer is not to be operated are implemented at all levels                                     | Ensures awareness of all stakeholders of the developed systems ensuring equipment with defective muffler/silencer not to be operated  |
|   |  | Ensures adequate resource determination and allocation for equipment with defective muffler/silencer to be withdrawn  |   |
|   | Ensures that equipment due for maintenance is not used and sent for maintenance, as per the maintenance schedule   | Ensures that developed systems ensuring equipment due for maintenance is not used and sent for maintenance, as per the maintenance schedule are implemented at all levels | Ensures awareness of all stakeholders of the developed systems ensuring equipment due for maintenance is not used and sent for maintenance, as per the maintenance schedule |
|   |  | Ensures adequate resource determination and allocation for equipment due for maintenance to be withdrawn  | None  |
| <b>Sixth level supervisor</b><br>(General manager)                            | Ensures determination and provision of adequate resources to ensure that equipment with defective muffler/silencer not operated  | Ensures the appropriate utilisation of resources is made available  | Ensures adequate resource determination and allocation for equipment requiring repairs are available  |
|   | Ensures determination and provision of adequate resources to ensure that equipment due for maintenance is not used and sent for maintenance, as per the maintenance schedule | Ensures the appropriate utilisation of resources is made available  | Ensures adequate resource determination and allocation for equipment requiring maintenance are available  |

## ACCOUNTABILITY AND RESPONSIBILITY FRAMEWORK: ROLES AND ACCOUNTABILITIES OF STAKEHOLDERS continued

| Control  | Muffled/Silenced equipment (including maintenance)   |   |  |
|--|--|---|--|
| Relevant levels of leadership                              | Essential control actions  | Control responsibility  | Control accountability   |
| <b>Central engineering/Maintenance</b>                     |  |   |  |
| <b>Equipment repair technician</b>                         | Performs high quality equipment repair/maintenance, according to established procedures and standards  | Strict adherence to the existing equipment repair/ maintenance standards and procedures                           | None   |
|  | Ensures competency in equipment repair and equipment maintenance requirements  | Ensures satisfactory knowledge of the equipment repair/maintenance standards/manuals                              | None   |
|  | Ensures competency in the testing of repaired/maintained equipment and the conducting of noise emission measurement of repaired/maintained equipment | Satisfactory knowledge of the equipment testing standards and the equipment noise measurement standards           | None   |
| <b>First line supervisor (GES)</b>                         | Ensures that the equipment repair technician understands the purpose of the equipment repair/ maintenance  | Performs planned task observations on the equipment repair technicians  | Planning of planned task observations on the equipment repair technicians  |
|  | Ensures quality assurance of equipment repairs/maintenance conducted by the equipment repair technicians   | Performs/oversees inspections on the equipment repairs/ maintenance conducted by the equipment repair technicians | None   |
|  |  | Ensures availability of quality replacement components/parts and tools/equipment                                  | Ensures maintenance of adequate stock levels of replacement parts  |
|  | Ensures the investigation of equipment not passing the noise emission evaluation   | Conducts investigations to determine the root causes of equipment not passing the noise emission evaluation       | None   |
|  | Ensures the competency verification of equipment repair technicians  | Trains equipment repair technicians   | None   |
|  |  | Performs planned task observations on the equipment repair technicians  | None   |
| <b>Second level supervisor (Engineer/Section engineer)</b> | Ensures high quality equipment repair/maintenance  | Review of the quality of the Planned Task Observations conducted  | Ensuring the conduction of high quality planned task observations on the equipment repair technicians  |
|  |  | Calibration of verification equipment   | Provision of adequate resources to ensure high quality equipment repair/ maintenance   |
|  |  | Identification of credible suppliers for replacement parts  | Availability of quality replacement components/ parts and tools/equipment  |
|  | Ensures competency verification of equipment repair technicians  | Acquires training materials from credible training providers/OEM's  | Trains equipment repair technicians  |
|  |  | Performs VFL evaluation and coaching  | Ensures that planned task observations are performed on the equipment repair technicians   |
|  | Ensures investigation of equipment not passing the noise emission evaluation   | Reviews equipment repair reports and investigation outcomes   | Ensures the conduction of high quality investigations for each piece of equipment not passing the noise emission evaluation, to determine the root causes of equipment not passing the noise emission evaluation |
| <b>Third level supervisor (Engineering manager)</b>        | Ensures determination and provision of adequate resources to ensure high quality equipment repair/maintenance  | Ensures the appropriate utilisation of resources made available   | Ensures adequate resource determination and allocation for resources for high quality equipment repair/maintenance to be performed   |

## ACCOUNTABILITY AND RESPONSIBILITY FRAMEWORK: ROLES AND ACCOUNTABILITIES OF STAKEHOLDERS continued

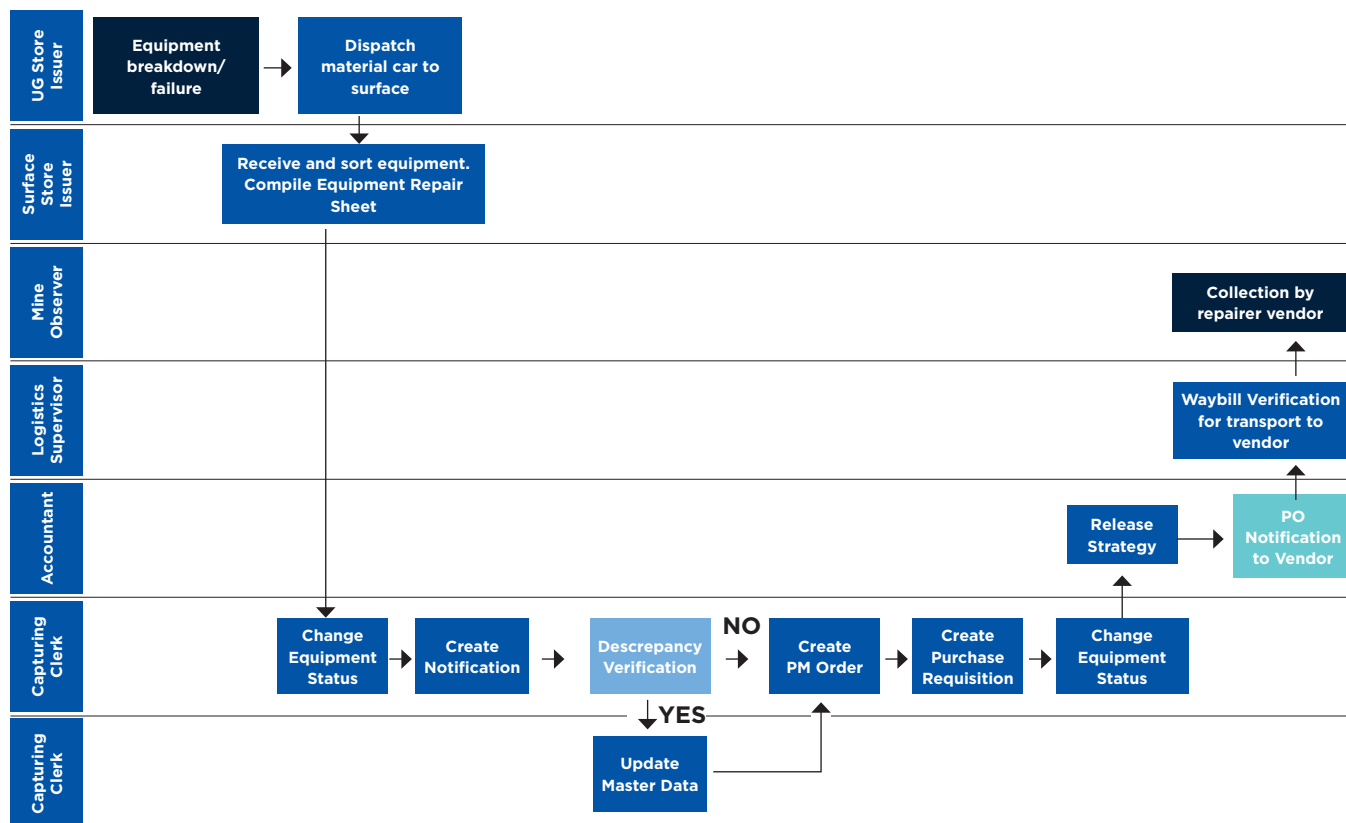
| Control  | Muffled/Silenced equipment (including maintenance)  |   |   |
|--|---|---|---|
| Relevant levels of leadership                      | Essential control actions   | Control responsibility  | Control accountability  |
| <b>Shaft logistics</b>                             |   |   |   |
| <b>Logistics co-ordinator</b><br>(Line management) | Maintains adequate equipment inventory levels above the minimum levels per equipment type and re-orders equipment   | Ensures that adequate amount of replacement equipment is available in the surface logistics store at the shaft  | None  |
|  | Delivers equipment to underground half-level stores, as required by the mining/production departments   | Ensures the timeous delivery of replacement equipment to the half-level store, where required   | None  |
|  | Ensures extraction of equipment requiring repair/maintenance from underground half-level stores, as required by the mining/production departments   | Ensures the timeous extraction of replacement equipment from the half-level store, for maintenance/repair   | None  |
|  | Transports equipment requiring repair/maintenance from the shaft to the Equipment Maintenance Workshop for repair/maintenance and back to the shaft after the repair/maintenance is concluded | Ensures the timeous transportation of equipment requiring repair/maintenance from the shaft to the Equipment Maintenance Workshop and back to the shaft               | None  |
|  | Reports information associated with the logistics processes at the shaft to the immediate line manager (shaft engineer) and the mining/production departments                                 | Ensures adherence to the established reporting processes/procedures associated with the logistics processes and the equipment repair/maintenance processes/procedures | Ensures accurate and effective reporting to immediate line manager (shaft engineer) and the mining/production departments                               |
|  | Executes and reviews logistics processes and procedures associated with equipment repair/maintenance established at the shaft   | Ensures effective logistics processes and procedures associated with equipment repair/maintenance are established and followed at the shaft                           | None  |
| <b>Shaft engineer</b>                              | Maintains adequate equipment inventory levels above the minimum levels per equipment type and re-orders equipment   | Conducts/oversees inspections on equipment inventory processes  | Ensures that adequate amount of replacement equipment is available in the surface logistics store at the shaft  |
|  | Delivers equipment to underground half-level stores, as required by the mining/production departments   | Ensures that logistics processes associated with the transport of equipment are followed  | Ensures the timeous delivery of replacement equipment to the half-level store, where required   |
|  | Extracts equipment requiring repair/maintenance from underground half-level stores, as required by the mining/production departments  | Ensures that logistics processes associated with the transport of equipment are followed  | Ensures the timeous extraction of replacement equipment from the half-level store, for maintenance/repair   |
|  | Transports equipment requiring repair/maintenance from the shaft to the Equipment Maintenance Workshop for repair/maintenance and back to the shaft after the repair/maintenance is concluded | Ensures that logistics processes associated with the transport of equipment are followed  | Ensures the timeous transportation of equipment requiring repair/maintenance from the shaft to the Equipment Maintenance Workshop and back to the shaft |
|  | Reports information associated with the logistics processes at the shaft to the Equipment Maintenance Workshop  | Ensures adherence to the established reporting processes/procedures associated with the logistics processes and the equipment repair/maintenance processes/procedures | Ensures accurate and effective reporting to the Central Engineering/Equipment Maintenance Workshops   |
|  | Ensures competency verification of equipment repair technicians   | Performs VFL evaluation and coaching  | Ensures that planned task observations are performed on the logistics co-ordinator  |
|  | Defines logistics processes and procedures associated with equipment repair/maintenance established at the shaft  | Engages the stakeholders involved/affected by the shaft logistics processes during the review of the established logistics processes/procedures                       | Ensure effective logistics processes and procedures associated with equipment repair/maintenance are established and followed at the shaft              |

A mine cannot transfer this responsibility to a service provider and remains accountable for the practice. Where the repair and maintenance functions are outsourced to an external service provider, the mine adoption champion should ensure that the appointed service provider is made aware of their control responsibilities as per the above table.

## ACCOUNTABILITY

Roles and responsibilities were outlined for each role player to know what is expected from them. The following roles and responsibilities were recorded in the Impala Platinum Rustenburg Operations Standard Operating Procedure:

## EXTERNAL REPAIR PROCESS



## ENGAGEMENT WITH HEALTH AND SAFETY COMMITTEES

The primary purpose of the engagement was to present the principles of the system to the H&S Committee and to seek support of this committee during the project documentation phase. Basic information that was shared during the engagement included the following:

- Overview of the process in documenting the leading practice
- Responsibility of all stakeholders
- Project schedule and programme

## ABBREVIATIONS

**dB(A)** – Decibels measured on the A-weighting scale

**CoE** – Centre of Excellence

**IBMQUI** – Industry-wide Buy and Maintain Quiet Initiative

**MHSA** – Mine Health and Safety Act (Act 29 of 1996), as amended

**MHSC** – Mine Health and Safety Council

**NIHL** – Noise induced hearing loss

**OEM** – Original equipment manufacturer

**TCO** – Total cost of ownership

**SAMI** – South African mining industry

## REFERENCES

- Guidance Note for Noise Measurement of Equipment to Ensure Conformance with MHSC Milestones (Version 2)
- Guidance Note for 3<sup>rd</sup> Party equipment noise verification Measurement (Version 1)
- IBMQUI Online Critical Noise Equipment Screening Tool (<https://www.mosh.co.za/tools/noise/screening/>)
- MOSH Noise webpage (<https://www.mosh.co.za/noise/summary>)
- Source Mine Report on the Equipment Noise Testing and Tag-out Leading Practice at Impala Platinum Rustenburg Section