

**BOARD OF ENQUIRY INTO MLPS DERAILMENT IN MODDERRIVIER**

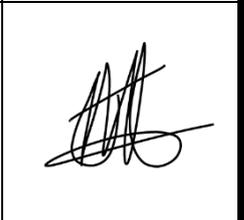
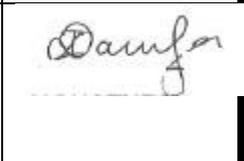
**- HEUNINGSNESKLOOF, KIMBERLEY**

<b>OPERATOR</b>	<b>PASSENGER RAIL AGENCY OF SOUTH AFRICA (PRASA)</b>
<b>PERMIT NUMBER</b>	ASP0002NTS
<b>INVESTIGATION SUBJECT</b>	MODDERRIVIER-HEUNINGSNESKLOOF DERAILMENT
<b>DATE OF OCCURENCE</b>	18 AUGUST 2015
<b>REFERENCE NUMBER</b>	RSR/20150819/001

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## **1. EXECUTIVE SUMMARY**

- 1.1. The Railway Safety Regulator (RSR) is charged with the responsibility to oversee safety of railway transport as expressly articulated in the Railway Safety Regulator Act 16 of 2002 (“the Act”) as amended.
- 1.2. A Board of Inquiry was set up following the derailment in Modderivier, where one of the AFRO 4000 fleet of diesel locomotive was involved. The report of the BOI covers an analysis of the testimony given by different witnesses who appeared before the BOI during the investigation as well as documentary evidence submitted by various parties.
- 1.3. The AFRO 4000 fleet of locomotives was introduced to the Mainline Passenger Service in December 2014. There are currently thirteen (13) locomotives that were supplied to PRASA by the consortium of Swifambo and Vossloh Spain. In keeping with the contractual arrangements between PRASA and the consortium of Swifambo and Vossloh Spain, the locomotives had to be commissioned and tested before they could be fully introduced into the mainline passenger service.
- 1.4. Locomotive 4010 was assigned to the Kimberley region where it was hauling coaches between Kimberley and De Aar. Locomotive 4010 was involved in a derailment on the 18 August 2015 between Modderivier and Heuningsneskloof in the Kimberley area.
- 1.5. In its findings, the RSR BOI concluded that the cause of the derailment was due to the following contributing factors, amongst others:
  - 1.5.1. Lack of communication between PRASA and TFR with regards to occupations and speed notices;
  - 1.5.2. Communication between the train driver and the TCO;
  - 1.5.3. The section speed at which the train was travelling was higher than the speed restriction imposed on that specific day.



Figure 1: Deployment area for Afro 4010

## 1.6 DIRECT CAUSE

1.6.1. The TCO failed to communicate the speed restriction to the train driver;

1.6.2. failure by the train driver and his assistant to observe the first speed restriction board.

## 1.7 ROOT CAUSES

1.7.1. Failure by TFR to inform and furnish PRASA with occupation notice and speed restriction circular;

1.7.2. PRASA train driver was not provided with the occupation notice when signing on for duty, this led to him being unaware of the speed restrictions and changes to the track layout section between kmp 36 and kmp 40;

- 1.7.3. the communication between the TCO and Train Driver was compromised which led to communication break down resulting in crucial information not relayed to the train driver.

## **1.8 Recommendations**

### **The Board of Inquiry recommends that:**

#### **1.8.1 Short-term Corrective Measures (0-6 Months)**

- 1.8.1.1. TFR management must comply with the distribution of Occupations' notices and speed restriction notices to their TCOs and to PRASA management as per TFR/PRASA Safety Interface Agreement and the provisions of clause 1055.0 Section 1 of the General Appendix (Part 1).
- 1.8.1.2. TFR management must provide sufficient supervision during abnormal working to ensure compliance as per Rail Directive – CIR/OD/1373-VDU Boards dated 2012/04/18.
- 1.8.1.3. TFR and PRASA management must ensure that the confusion regarding the distribution of occupation notices and speed restrictions amongst their personnel and the communication procedures thereof is addressed with immediate effect.
- 1.8.1.4. TFR management must address the shortage of personnel in the Kimberley CTC with immediate effect to ensure safe working of trains.
- 1.8.1.5. PRASA staff members in different regions to be trained on how to upload information from event recording system and use as train driver behaviour analysis.
- 1.8.1.6. TFR and PRASA management must ensure that risk assessments are completed before and after each major occupation which does not form part normal maintenance.

- 1.8.1.7. After each incident a Risk Assessment must be conducted to review the controls to ensure that the risks are managed adequately and to avoid recurrence.
- 1.8.1.8. All thirteen(13) Afro 4000 locomotives series that were delivered to PRASA must be fitted with built-in two way radio for the drivers and TCO to have uninterrupted communication.
- 1.8.1.9. formal communication action plan between PRASA and TFR with regards to the communication of any changes to the Rail Network related to the implementation of any temporary or permanent speed restrictions as well as Occupation notices needs to be operationalised and implemented.
- 1.8.1.10. Human factor issues in Kimberley both at PRASA and TFR be attended to immediately this include , lack of supervision, the presence of many critical vacancies and non- adherence to rules and procedures.
- 1.8.1.11. TFR must ensure that individuals acting in higher positions are provided with the requisite and adequate training and be assessed to determine whether they are competent to perform the work in the manner prescribed.
- 1.8.1.12. TFR and PRASA must ensure that substance abuse testing is conducted immediately following an incident (this refers to both alcohol and drug tests).

## 1.8.2 **Medium Term Corrective Measures (6-12 Months)**

- 1.8.2.1. The interface agreement between PRASA and TFR needs to be reviewed and improved upon.

1.8.2.2. PRASA and TFR management must review the Safety interface agreement so that it is relevant to their current respective operational challenges and train service needs. The agreement must outline clear processes that expressly provided for or implied in the agreement regarding the communication of occupations and notices between the two operators.

1.8.2.3. The MLPS integration into the PRASA operations be strengthened and funded optimally.

1.8.2.4. PRASA must develop and implement a documented platform for employees to declare if they are fatigued at sign on.

### **1.8.3 Long Terms Corrective Measures (12 Months – onwards)**

1.8.3.1. TFR and PRASA management must continuously monitor compliance to the Safety Interface agreement and make provision for management review where necessary.

1.8.3.2. PRASA must ensure that the HFID/Ergonomics requirements are suitable for the employees.

1.8.3.3. PRASA must ensure that in the future, they procure the services of suitably qualified specialists to assist in the design specifications for technology.

1.8.3.4. PRASA must identify the risks and processes that will be used to mitigate the driver and the assistant being ejected from the locomotive during impact. In the event that the risk cannot be mitigated, PRASA must come up with a proposal on how the driver and the assistant will be protected in the cabin in case of an incident.

1.8.3.5. PRASA must activate speed governing devices on all AFRO 4000 locomotives.

## 2. DEFINITIONS

Derailment:	Means a disturbance between wheel and rail interaction which results in a train moving out of the track;
Rolling Stock:	Means a locomotive, wagons or coaches that travel on rail tracks
Slew:	Means a diversion of one track to the adjacent track
Occupation:	Means a period allowed for infrastructure maintainers to do maintenance on perway, OHTE or signaling;
Vossloh Espana:	Means a Spanish locomotive manufacturer

### 3. ABBREVIATIONS

BOI	Board of Inquiry
CEO	Chief Executive Officer
EAP	Employee Assistance Programme
HL	Hazard Log
HFID	Human Factors In Design
KM/H	Kilometers Per Hour
LCM	Life Cycle Management
MLPS	Main Line Passenger Services
OHTE	Overhead Traction Equipment
POD	Point of Derailment
PRASA	Passenger Railway Agency of South Africa
PPE	Personal Protective Equipment
RA	Risk Assessment
RCAT	Root Cause Analysis Technique
RS	Rolling Stock
RSR Act	National Railway Safety Regulator Act 16 of 2002 as amended
RSR	Railway Safety Regulator
SANS	South African National Standards
SARCC	South Africa Rail Commuter Corporation
TCO	Train Control Officer
TFR	Transnet Freight Rail
TWR	Train Working Rules
YQ	Trip Authorisation Certificate

**THE REPORT OF A FORMAL BOARD OF INQUIRY WHICH INVESTIGATED  
THE DERAILMENT OF A SHOSHOLOZA MEYL LONG DISTANCE PASSEN-  
GER TRAIN, TRAIN 71010 ON 18 AUGUST 2015 BETWEEN MODDERRIVIER  
AND HEUNINGSLKOOF IN KIMBERLEY (NC)**

**RSR RERENCE NUMBER: RSR/20150819/001**

## **4. STATEMENT OF INTENT, OBJECTIVES AND TERMS OF REFERENCE**

### **4.1. Statement of Intent**

This Inquiry has been constituted in accordance with Section 38 of Railway Safety Regulator Act, Act 16 of 2002 (As amended). The Inquiry was conducted with the objective of:-

- 4.1.1. determining the facts of the occurrences;
- 4.1.2. determining the immediate and underlying causes;
- 4.1.3. making recommendations to prevent, or reduce the risk of recurrence.

### **4.2. The Objective of the Inquiry**

The Inquiry was conducted with the following objectives:

- 4.3.1. Establishment of the facts;
- 4.3.2. Determination of the immediate causes;
- 4.3.3. Determination of the root causes;
- 4.3.4. Development of robust recommendations;
- 4.3.5. Succinct report covering all the elements of the Terms of Reference.

### **4.3. Terms of Reference**

The Board of Inquiry is required to investigate, make findings and report on the following:

- 4.3.1. the immediate and the root/ underlying causes leading up to and surrounding the occurrence.
- 4.3.2. Background regarding activities pertaining to adherence to, specifically applicable train operating procedures by the train drivers and the TCO concerned as set out in local instructions, General Appendix and other applicable directives.
- 4.3.3. The adequacy and effectiveness of maintenance systems and procedures for signals, perway and rolling stock.

- 4.3.4. Investigate previously what the RSR has recommended to be procured by the Operator which might have a bearing in this particular occurrence or similar type of occurrences.
- 4.3.5. Investigate reasons for non-implementation of the RSR's recommendations stated above.
- 4.3.6. Recommend ways in which corrective action plans can be implemented swiftly in line within the PFMA and NRSR Act 16 of 2002 without compromising the safety of people, rolling stock and infrastructure.
- 4.3.7. Investigate how much money is lost through occurrence like this including damage to Rolling Stock and Infrastructure, injuries and fatalities to people, Opportunity Costs and any other related costs.
- 4.3.8. The Board of Inquiry is further mandated to make robust recommendations to prevent and/or reduce the risk of, and/or mitigate the consequences of recurrence of the accident. The Board of Inquiry is requested to formulate their recommendations in such a way that:
  - 4.3.8.1. the recommendations are clear, specific and unambiguous as to what is expected from whom;
  - 4.3.8.2. the recommendations are measurable, practical and attainable; and
  - 4.3.8.3. the recommendations are results orientated and coupled to specific time frames.

## **5. SCOPE OF THE REPORT**

- 5.1. This report must be read together with the Preliminary Investigation Report compiled by the Lead Investigator. To the extent where reference is made to this report, attempt has been made to avoid detailed repetition of the said report as it forms part of the annexure to this report.

- 5.2. The report was compiled following the interview of witnesses from Transnet Freight Rail (“TFR”) and the Passenger Rail Agency of South Africa (“PRASA”), perusal of the evidence bundle, site visits and photographic evidence.
- 5.3. The report covers the five elements that must be considered in order to determine the root cause and to the extent that technical information is referred to, reliance is made to the Engineers’ report compiled by the Board of Inquiry members and interviews of specialist from both PRASA and TFR.
- 5.4. A site visit was conducted on the 6 April 2016 and the hearing of evidence on 6, 7, 11 and 13 April 2016, correspondence was addressed to both Passenger Rail Agency of South Africa (PRASA) and Transnet Freight Rail (TFR) which assisted the Board of Inquiry with its investigations.

## **6. BACKGROUND**

- 6.1. On the evening of 18 August 2015 at approximately 23h20, a passenger train number 71010 operated by PRASA en route from Johannesburg to Cape town derailed between Modderivier and Heuningsneskloof station in the Kimberley area. The derailment occurred whilst the train was moving from the existing mainline through a newly constructed slew on to the newly constructed line.
- 6.2. Four people were injured, including the train crew and fifty –eight( 58) passengers were treated for shock and later released from hospital. Extensive damage to both the rolling stock and infrastructure was experienced.
- 6.3. At the time of the incident, the train was travelling at 95km/h speed even though the 30km/ h speed boards were erected by TFR.

- 6.4. The derailment occurred on an infrastructure owned and maintained by TFR, whereas PRASA is a train operator in the Kimberley area.

## **7. SUMMARY OF EVIDENCE CONSIDERED**

The Onsite investigation conducted by the Board covered witness evidence, inspection of the perway site, perway design layout for the constructed slew, Kimberley Centralised Traffic Control and photographic evidence revealed that:

### **7.1. Position Evidence**

- 7.1.1. Train 71010 was travelling at night (23h20) at a section speed (95km/h) on the main line between Modderivier and Heuningsneskloof in the Kimberley area;
- 7.1.2. the train travelled on its wheels for a distance of 194m from the first emergency brake application before coming to a standstill at 238m;
- 7.1.3. the driver expected to be travelling on a straight line that he normally traverses, but when approaching kmp 36/10, he realized that the straight line was no longer visible;
- 7.1.4. the train driver did not notice the speed warning board which was 1.5 km away from the actual speed restriction of 30 km/h as per speed restriction circular no CIR/OD/1865 which was applicable at the time;
- 7.1.5. the speed board that was just before the track deviation to the new track was visible to both the train driver and the assistant driver (which was 63m from the actual slew) as testified to by the assistant train driver. This testimony clarifies the reason the train was travelling at a speed above 90 km/h when approaching the slew from the old line to the new line;

- 7.1.6. both the assistant driver and the section manager confirmed that the illumination of the head light fitted on the Afro 4000 fleet of locomotives is bright enough to observe warning boards and any obstruction that could be on the track. The assistant also mentioned that the front wind screen of the locomotive also assist in the viewing the track due to its size (see Figure 2 below).



Figure 2: Headlights on Afro 4000 locomotive

## **7.2. Parts/ Component Evidence**

- 7.2.1. The BOI established that the derailment occurred on a newly constructed temporary deviation/ slew that allowed for a transition between current mainline and the newly constructed line at kmp36/10-14 (see Figure 3 below).
- 7.2.2. We further established that the radius of the reverse curve was 400m at the time of the derailment and the condition of the rails; sleepers, ballast and formation were in good order. The newly cast thermit welds were properly joggled at the time of the incident to allow the train to traverse at a speed of 30km/h.
- 7.2.3. It was also confirmed that the two goods trains, namely, Trains 2232 and 8469 had safely traversed across the affected section at the prescribed speed of 15 and 30km/h for electric and diesel locomotives respectively on the 18 August 2016 prior to the derailment of train 71010.
- 7.2.4. As stated above we can confirm that the condition of the permanent way and related infrastructure is deemed not to be the root cause of the incident.

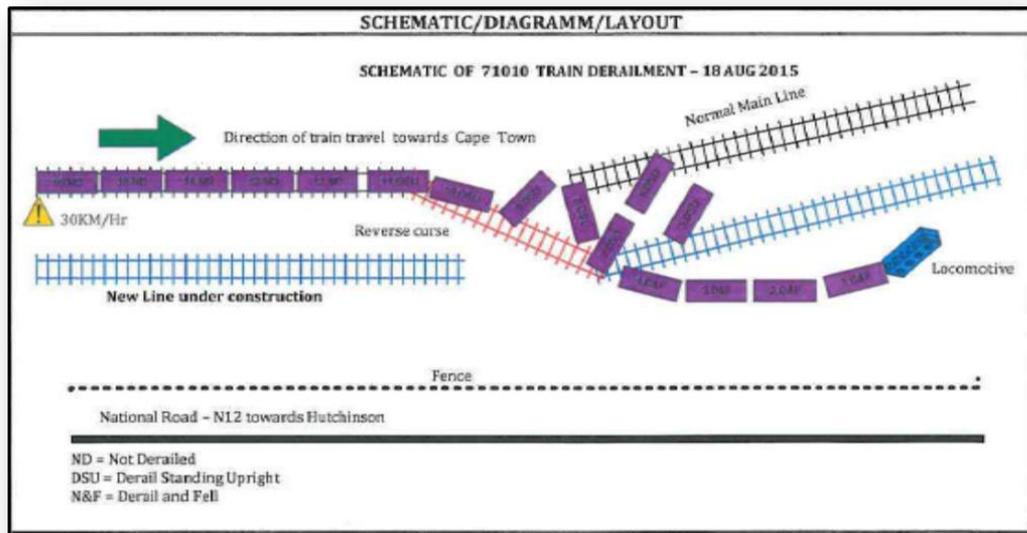


Figure 3 : Derailment site layout

### 7.3. Paper Evidence

- 7.3.1. Alcohol test was conducted on the TCO and the results indicated that they were negative, even though an explanation could not be advanced to the BOI on the time discrepancy as the testing records showed that the alcohol test was conducted at 04h23 whilst Mr. Cee-rust testified that the testing was conducted immediately after the derailment;
- 7.3.2. it was also in evidence that there was no drug test conducted;
- 7.3.3. no risk assessment document was provided to the board despite the request to TFR;
- 7.3.4. Mr. Visagie was found “not yet competent” for both theoretical assessments conducted for train working rules in April 2015. No further assessment results were provided indicating whether Mr. Visagie was declared competent in train working rules;

- 7.3.5. the risk Profile for Mr. van Syfers (TCO) showed that the employee had received a 12 month serious written warning on 6 January 2015. The risk profiles also revealed that the employee was supposed to receive discipline/agreement/increased supervision;
- 7.3.6. the workload assessments conducted for the CTC only focused on the panels operated by the TCO and not on the activities performed by the coordinator;
- 7.3.7. The Board was also provided with the following documents from both TFR and PRASA:
  - 7.3.7.1. Occupation notice;
  - 7.3.7.2. design drawing of the slew;
  - 7.3.7.3. Swifambo Locomotives AFRO4010 Accident Report (25 August 2015)
  - 7.3.7.4. copy of the electrical switching book, and
  - 7.3.7.5. copy of the occupation request
  - 7.3.7.6. interface agreement between TFR and PRASA
  - 7.3.7.7. speed restriction notice

#### **7.4. Process/Environmental Evidence**

- 7.4.1. From the photographic and witnesses evidence, the incident occurred when the weather was clear and there was no problem with visibility;
- 7.4.2. When the train derailed, the assistant train driver, Mr. Boer testified that, he found himself under the locomotive roof a couple of meters from the locomotive. The sketch below shows the locomotive cab design where Polyester Fairing is used on the cab structure. This explains why the assistant driver was ejected out of the locomotive during the derailment and found himself under the rubble ahead of the locomotive.

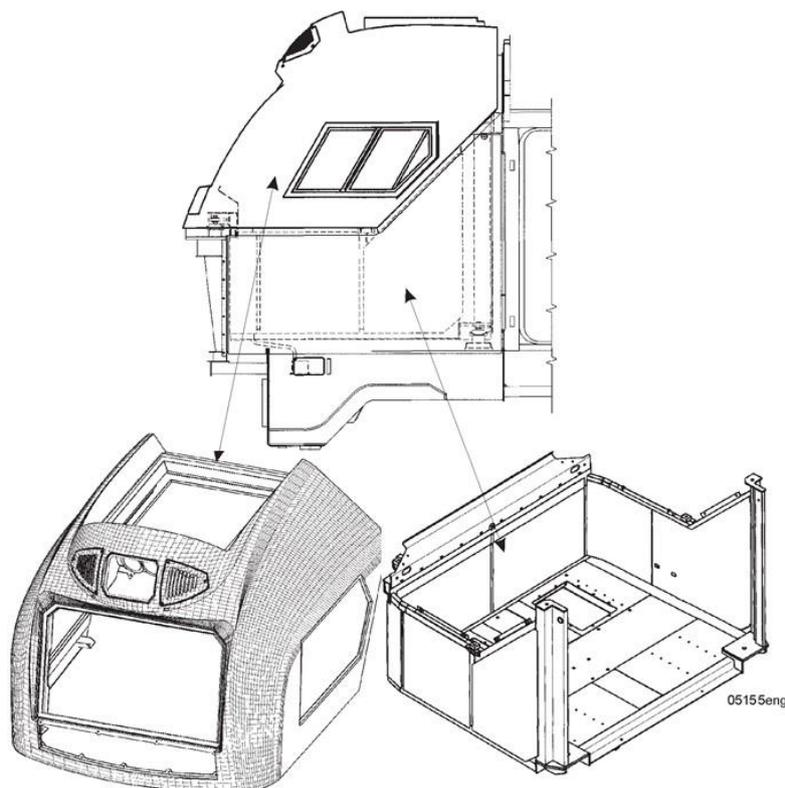


Figure 4: Afro 4000 cab structure

- 7.4.3. the train derailed with one locomotive plus four (4) coaches lying on the side whilst seven other coaches derailed in an upright position and the last five coaches did not derail.
- 7.4.4. The SAPS were first on the scene as per the train manager, Ms Precious Kumsiya testimony, who then notified MOCC which, in turn alerted NCC and the Kimberley CTC.
- 7.4.5. The Co-ordinator in the CTC activated the emergency services, PRASA's and TFR's personnel
- 7.4.6. Witnesses testified to the Board that an Onsite Investigation Team was formed between TFR and PRASA in order to conduct preliminary investigations to determine the cause of the derailment. The Board examined the preliminary report, RIC and Line investigation report.
- 7.4.7. The line investigation report outlined the following as the root causes

Why did the incident happen?	The driver did not adhere to the temporary speed restriction boards erected at that point of the section
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<p>Why was the driver over speeding?</p>	<p>Driver did not adhere to TWR 177 by regulating his train speed so to ensure a safe and steady passage of his train around curves and over points and crossings. There was not proper communication between the TCO and the Driver</p>
<p>Why was proper communication not followed?</p>	<p>TCO van Syfers did not adhere to the VDU instruction dated 2012/04/18 by not informing the driver of the abnormal circumstances on that part of the line as well as the temporary speed restriction applicable – The Occupation notice with Ref: X2/20/92 dated 2015/08/13 was not communicated from PRASA Head Office with the PRASA Crew at Kimberley</p>
<p>Why didn't the TCO inform the driver of the temporary speed restriction on that part of the line?</p>	<p>TCO van Syfers neglected to inform the driver as such</p>
<p>Why wasn't the Occupation Notice with Ref: X2/20/92 dated 2015/08/13 communicated with the PRASA Crew?</p>	<p>Neglected to ensure that Occupation Notices are proper communicated to all personnel involved</p>

## 7.5. People Evidence

Witnesses were called upon to testify before the BOI on 6, 7, 11 and 13 April 2016, correspondence was addressed to both Passenger Rail Agency of South Africa (PRASA) and Transnet Freight Rail (TFR) which assisted the Board of Inquiry with its investigations. Witnesses that were called were those that were either directly or indirectly involved in the incident. The purpose of the witness testimony was for the BOI to establish the cause of the incident. The following witnesses testified before the BOI.

### PRASA

- 7.5.1. the train driver Mr Schoeman could not be interviewed due to him taking early retirement in January 2016;
- 7.5.2. the train assistant, Mr Boer stated in his testimony that a safety talk was conducted by the section manager when he and the train driver reported on duty on the 18 August 2015;
- 7.5.3. it was stated in evidence by the train assistant and Mr Ludick, the section manager that in areas where the radio communication network might prove to be a challenge, the train drivers are provided with company cell phones which can be used as an alternative for communication purposes with the TCO;
- 7.5.4. both the train assistant and section manager testified that the locomotive was not fitted with a built in radio. The driver is expected to use a hand held radio to communicate with the TCO throughout his journey;
- 7.5.5. it was the testimony of the train assistant that was corroborated by data downloaded from the Teloc 1500 event recorder system by Swifambo Locomotives, that the train was travelling at a speed of 95 km/h;

- 7.5.6. the train assistant also mentioned that he and the train driver did not notice the speed warning board which was 1.5 km away from the actual speed restriction of 30 km/h;
- 7.5.7. In his testimony, the train assistant mentioned that they saw the speed restriction board that was just before the track deviation to the newly constructed track/line . This testimony clarifies the reason the train was travelling at a speed above 90 km/h when approaching the slew from the old line to the new line;
- 7.5.8. Mr Ludick, the section manager, testified that the notice about occupations and speed restrictions are normally communicated by TFR either by phone or via email to the section manager and that this information is available at least one (1) or two (2) weeks in advance;
- 7.5.9. however, it was Mr Ludick's tetimony that PRASA in the Kimberley area, became aware of the speed restriction notice and occupation after the incident of the 18 August 2015 had occurred, as he personally went to the TFR offices in Kimberley to enquire about the occupation and speed restriction on the 20 August 2015 and was furnished with such then;
- 7.5.10. it seems that the communication between PRASA Rail and MLPS, and between PRASA Rail and TFR on occupations and speed restriction notices is highly fragmented and unstructured;
- 7.5.11. the interface agreement between PRASA and TFR is not working accordingly, and thus has compromised the safe operations of MLPS;
- 7.5.12. it is in evidence that the speed restriction notice was sent to the NCC but was never sent to PRASA;
- 7.5.13. Mr. Bester stated that there is no documented platform for employees to declare if they are fatigued at sign on;

7.5.14. Ms. Khumsha the train manager stated that no training was provided for how to handle manage hazardous substances in the event of an incident;

7.5.15. Mr. Mahlobogwane the national maintenance manager reported that HFID/Ergonomics requirements for the South African population were not specified as the manufacturer was responsible for the design and layout. Mr. Mahlobogwane mentioned that PRASA did not specify any design requirements due to a lack of specialists/capabilities in this field.

#### TFR

7.5.16. The TCO who was on duty on the 18 August evening was not in a position to give evidence before the BOI as he had been dismissed from employment by TFR;

7.5.17. the Board established that the CTC in Kimberley has had major issues with filling of vacancies for the past two years which had impacted the operations of the CTC negatively;

7.5.18. it is common cause that the TCO is instrumental in ensuring safe passage of trains at any given time and as such must adhere to strict rules that govern the safe movement of trains as set out by TFR in their policies and procedures;

7.5.19. Mr. Sisya acted as a coordinator for three months and was not provided with any formal training, only on-the-job training, to act in this position. Mr. Sisya is still required to act as a coordinator when the CTC is running short of staff. No task observations were conducted on Mr. Sisya while he was acting as a coordinator.

7.5.20. in his evidence to the BOI, Mr. Sisya stated that the TCO was notified of the speed restriction notice for the 18 August 2015 and that in terms

of their duties, they are expected to advise the train drivers of any abnormalities that exist on the running line, viz, occupations, speed restrictions and any other deviations that affect safe running of trains;

7.5.21. through the testimonies of Messrs Sisya, Seereft, and Moshou the 30 km/h speed boards were erected on the 18 August 2016;

7.5.22. it was confirmed by Mr Sisya that before the deralement of Train 71010 at 23h20, two other trains passed the slew/deviation, with one of the trains passing at approximately at the same time as train 71010 and that he could hear his other colleague in the TCO warning other drivers about the speed restrictions;

7.5.23. however, it is Mr Sisya's testimony that he did not hear his colleague in the CTC warn the driver of train 71010, as he was attending to other TCO's in the CTC. This version was further corroborated by Mr Cee-rust, who stated that when retrieving the voice logger, he could pick up that the driver of train 71010 introduced himself but could not establish with certainty, the communication between the driver of train 71010 and the TCO advising on the applicable speed restriction on the section in question;

7.5.24. evidence from the recordings from CTC indicate that the conversation between the driver and the TCO was cut short due to reasons that could not be explained by the acting manager at CTC. This led to the driver of the train, Mr Schoeman, having to use the cell phone to call the CTC;

7.5.25. it will seem that the driver of train 71010 would not have been in a position to have heard the conversations of the TCO with the drivers of the other train that was allowed to pass kilometre point 36 due to non-availability of the open channel radio on the Afro 4000;

7.5.26. it would appear that the TCO authorised train 71010 at 23h05 but didn't mention any applicable speed restriction.

## **8. FINDINGS**

### **8.1. Technical factors**

- 8.1.1. A temporary reverse curve that was installed by HATCH/GOBA to enable train to cross from the existing mainline to the newly constructed line;
- 8.1.2. the required speed restrictions boards were in place at the time of the incident and were correctly placed in accordance with Transnet Infrastructure Engineering Manual for Track Maintenance dated 22 June 2012;
- 8.1.3. procedures related to Occupation Notices request and permission for the construction work as well as speed restriction boards were followed by the project managers HATCH/GOBA;
- 8.1.4. the derailed locomotive was not fitted with a built in radio communication system.

### **8.2. Operational Factors**

- 8.2.1. Occupation notice for construction work and speed restriction notice was not communicated and distributed in accordance with laid down procedures and instructions;
- 8.2.2. non-compliance to operational instructions by the TCO not communicating the applicable speed restriction with the driver as per Rail Directive Circular – CIR/OD/1373;
- 8.2.3. The train driver and train assistant did not observe the speed warning board which was placed 1.5 km away from the affected area;

- 8.2.4. there is a clear lack of communication between PRASA and TFR operations in giving effect to the Interface agreement that govern their working relationship;
- 8.2.5. as per the documentation submitted, the Train driver and Train Assistant were fit for duty and their training on AFRO4000 series was still valid;
- 8.2.6. temporary speed boards were in place and were correctly erected in line with existing rules;
- 8.2.7. lack of monitoring of operational personnel Train crew of PRASA (speed monitoring as per PRASA Norms and Standards);
- 8.2.8. lack of monitoring of operational personnel TCOs by TFR( CTC Co-ordinator to monitor TCOs during abnormal working as per Train Working Rules);
- 8.2.9. shortage of operational personnel both at the TFR Kimberly CTC as well as the PRASA Kimberly depot (Kimberly CTC has only one Co-ordinator instead of four as per their strength requirement);
- 8.2.10. TCOs involved in the occurrence did not have the occupation notice and was not aware of the nature of work performed in the section;
- 8.2.11. the speed restriction notices was signed for by the TFR personnel and Section managers on the 20 -22 August 2015 after the derailment has occurred;
- 8.2.12. no risk assessments was conducted on the planned slew;
- 8.2.13. train 71010 was equipped with a hand held radio which is less receptive than the built –in train radio.

### **8.3. Human Factor and Management**

- 8.3.1. The TCO van Syfer did not communicate the speed restrictions on his section to the train driver as per Rail Directive – CIR/OD/1373-VDU Boards dated 2012/04/18;
- 8.3.2. The Occupation Notice from the NCC was not communicated and distributed to the distribution list including PRASA personnel as per the agreed communication protocol;
- 8.3.3. no formal training was provided for Mr. Sisya to act as a coordinator;
- 8.3.4. no task observations were conducted on Mr. Sisya while he was acting as a coordinator;
- 8.3.5. no workload assessment was conducted for the activities performed by the coordinator in the Kimberley CTC;
- 8.3.6. the alcohol testing was not conducted immediately after the incident occurred;
- 8.3.7. the substance abuse testing conducted did not include drug testing;
- 8.3.8. PRASA has not implemented a documented platform for employees to declare if they are fatigued at sign on;
- 8.3.9. PRASA employees on the MLPS have not been trained on how to manage hazardous substances in the event of an incident;
- 8.3.10. The HFID/Ergonomics requirements for the South African population were not specified to the manufacturer due to a lack of specialists/capabilities at PRASA.

## 9. DIRECT CAUSES

- 9.1. The TCO failed to communicate the speed restriction to the train driver;
- 9.2. failure by the train driver and his assistant to observe the first speed restriction board.

## 10. ROOT CAUSES

- 10.1. Failure by TFR to inform and furnish PRASA and their TCOs with occupation notice and speed restriction circular;
- 10.2. PRASA train driver was not provided with the occupation notice when signing on for duty, this led to him being unaware of the speed restrictions and changes to the track layout section between kmp 36 and kmp 40;
- 10.3. the communication between the TCO and Train Driver was compromised which led to communication breakdown resulting in crucial information not relayed to the train driver.

## 11. RECOMMENDATIONS

In order to keep the safety and excellent record of MLPS operations, the Board of Inquiry recommends that the following must be addressed:

### 11.1. Short-term Corrective Measures (0-6 Months)

- 11.1.1. TFR management must comply to the distribution of Occupations' notices and speed restriction notices to their TCOs and to PRASA management as per TFR/PRASA Safety Interface Agreement and the provisions of clause 1055.0 Section 1 of the General Appendix (Part 1).
- 11.1.2. TFR management must provide sufficient supervision during abnormal working to ensure compliance as per Rail Directive – CIR/OD/1373-VDU Boards dated 2012/04/18.

- 11.1.3. TFR and PRASA management must ensure that the confusion regarding the distribution of occupation notices and speed restrictions amongst personnel of the communication procedures is addressed with immediate effect.
- 11.1.4. TFR management must address the shortage of personnel in the Kimberley CTC with immediate effect to ensure safe working of trains.
- 11.1.5. PRASA staff members in different regions to be trained on how to upload information from event recording system and use as train driver behaviour analysis.
- 11.1.6. TFR and PRASA management must ensure that risk assessments are completed before and after each major occupation which does not form part normal maintenance.
- 11.1.7. After each incident a Risk Assessment must be conducted to review the controls to ensure that the risks are managed adequately and to avoid recurrence.
- 11.1.8. All thirteen(13) Afro 4000 locomotives series that were delivered to PRASA must be fitted with built-in two way radio for the drivers and TCO to have uninterrupted communication.
- 11.1.9. formal communication action plan between PRASA and TFR with regards to the communication of any changes to the Rail Network related to the implementation of any temporary or permanent speed restrictions as well as Occupation notices needs to operationalised and implemented.

- 11.1.10. Human factor issues in Kimberley both at PRASA and TFR be attended to immediately this include, lack of supervision, the presence of many critical vacancies and non- adherence to rules and procedures.
- 11.1.11. TFR must ensure that individuals acting in higher positions are provided with the requisite and adequate training and be assessed to determine whether they are competent to perform the work in the manner prescribed.
- 11.1.12. TFR and PRASA must ensure that substance abuse testing is conducted immediately following an incident (this refers to both alcohol and drug tests).
- 11.1.13. PRASA must develop written working procedures for the utilisation of the AFRO4000 locomotives so that task observations can be conducted on the train crew.
- 11.1.14. PRASA and TFR must assess the risks attached to the use of portable radios in the CTC sections in order to manually authorize trains and provide the RSR with reasons why this practice should not be prohibited.
- 11.1.15. TFR must ensure that workload assessments (during normal and abnormal conditions) are conducted for the coordinator's activities in the Kimberley CTC.
- 11.1.16. TFR must ensure that all assessment results are documented and recorded and that individuals found "not yet competent" do not perform critical tasks until such a time that they are found to be competent.

## **11.2. Medium Term Corrective Measures (6-12 Months)**

- 11.2.1. The interface agreement between PRASA and TFR needs to be reviewed and improved upon.
- 11.2.2. PRASA and TFR management must review the Safety interface agreement so that it is relevant to their current respective operational challenges and train service needs. The agreement must outline clear processes that expressly provided for or implied in the agreement regarding the communication of occupations and notices between the two operators.
- 11.2.3. The MLPS integration into the PRASA operations be strengthened and funded optimally.
- 11.2.4. PRASA must develop and implement a documented platform for employees to declare if they are fatigued at sign on.

## **11.3. Long Terms Corrective Measures (12 Months – onwards)**

- 11.3.1. TFR and PRASA management must continuously monitor compliance to the Safety Interface agreement and make provision for management review where necessary.
- 11.3.2. PRASA must ensure that the HFID/Ergonomics requirements are suitable for the employees.
- 11.3.3. PRASA must ensure that in the future, they procure the services of suitably qualified specialists to assist in the design specifications for technology

- 11.3.4. PRASA must identify the risks and processes that will be used to mitigate the driver and the assistant being ejected from the locomotive during impact. In the event that the risk cannot be mitigated, PRASA must come up with a proposal on how the driver and the assistant will be protected in the cabin in case of an incident.
  
- 11.3.5. PRASA must activate speed governing devices on all AFRO 4000 locomotives.