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Orica Australia Pty Ltd

Summary Audit Report International Cyanide Management Code (ICMC) Recertification Audit

Orica Yarwun Production Facility

October 2023

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Orica Yarwun Production Facility

International Cyanide
Management Institute (ICMI)
1400 I Street, NW
Suite 550
Washington DC 20005
United States of America

Orica Australia Pty Ltd
Matthew Adamson, Senior Manager
Production - Cyanide
30 Reid Road Yarwun QLD 4694
PO Box 375 Gladstone QLD 4694
Australia

WSP
Lvl 3, Mia Yellagonga Tower 2, 5 Spring St
Perth WA 6000
PO Box 7181
Cloisters Square WA 6850

Tel: +61 8 9489 9700
Fax: +61 8 9489 9777
wsp.com

Rev	Date	Details
A	28/07/2023	Summary Audit Report
B	9/08/2023	Client Comment Review
C	5/10/2023	Updates following ICMI Review

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	Name	Date	Signature
Prepared by:	R. Seebach	11/08/2023	
Reviewed/ Approved by:	E. Clerk	11/08/2023	

Table of Contents

Summary Audit Report

Name of Production Facility:	Yarwun Production Facility
Name of Facility Owner:	Orica Australia Pty Ltd
Name of Facility Operator:	Orica Australia Pty Ltd
Name of Responsible Manager:	Matthew Adamson, Senior Manager Production – Cyanide
Address:	30 Reid Road Yarwun, Gladstone QLD, 4680
	PO Box 375. Gladstone QLD, 4680
State/Province:	Queensland (QLD)
Country:	Australia
Email:	matthew.adamson@orica.com

Location detail and description of operation

Orica Australia Pty Ltd, Yarwun Facility

Orica is an Australian-owned, publicly listed company with global operations, and one of the world's largest producers of cyanide. Orica operates the Yarwun Production Facility, which is located 9 km north-west of Gladstone, Queensland (QLD). The Site has been operational since 1990 and Orica operates the following plants at the site:

- Three Nitric Acid plants
- Two Ammonium Nitrate plants
- Ammonium Nitrate Emulsion Phase plant
- Sodium Cyanide plant.

The facility also operates two raw material import facilities at the Fisherman's Landing port, located approximately 5 km north of the main site. The facilities incorporate ammonia and caustic soda unloading and storage facilities that are connected to the site through an underground pipe network. The site employs more than 230 permanent personnel along with contractors. At any one time the maximum number of persons likely to be on-site is between 175 and 250 personnel.

Cyanide is manufactured at Yarwun using the Andrussow process. In this process, hydrogen cyanide (HCN) is produced by reacting ammonia, natural gas, and pre-heated process air over a platinum catalyst. The HCN is then absorbed with caustic soda to form a solution of sodium cyanide. This cyanide liquor can then be concentrated, crystallised, dried, and compacted into solid sodium cyanide.

Cyanide manufactured at Yarwun is used in gold mining operations within Australia, Asia, Africa, Papua New Guinea, New Zealand, and South America.

Auditors findings

Orica is:

☒ **in full compliance with**

☐ in substantial compliance with **The International Cyanide Management Code**

☐ not in compliance with

This operation has not experienced any compliance issues during the previous three-year audit cycle.

Auditor information

Audit Company: WSP

Audit Team Leader: Rudi Seebach, ICMI Lead Auditor

Email: Rudi.Seebach@wsp.com

Name and Signatures of Auditors:

The Certification Audit team was composed of:

- Mr Rudi Seebach (Lead Auditor)

– Mr Ed Clerk (Technical Specialist)

Name	Position	Signature	Date
Rudi Seebach	ICMI Lead Auditor		11/08/2023
Ed Clerk	Technical Specialist		11/08/2023

Auditor Attestation

The field component of the Recertification Audit was undertaken on 6 to 8 June 2023.

I, Rudi Seebach attest that I meet the criteria for knowledge, experience and conflict of interest for Code Verification Audit Team Leader, established by the International Cyanide Management Institute and that all members of the audit team meet the applicable criteria established by the International Cyanide Management Institute for Code Verification Auditors.

I attest that this Summary Audit Report accurately describes the findings of the Recertification Audit. I further attest that the Recertification Audit was conducted in a professional manner in accordance with the International Cyanide Management Code's *Cyanide Production Verification Protocol* (CPV Protocol) and using standard and accepted practices for health, safety and environmental audits.

1 Principle 1 – Operations

Design, construct and operate cyanide production facilities to prevent release of cyanide

1.1 Production Practice 1.1

Design and construct cyanide production facilities consistent with sound, accepted engineering practices and quality control/quality assurance procedures.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 1.1**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 1.1 requiring cyanide production facilities to be designed, constructed, and operated to prevent releases of cyanide.

Quality assurance and quality control (QA/QC) programs have been implemented during construction of cyanide production and storage facilities. QA/QC records have been retained. Appropriately qualified personnel reviewed the Yarwun facility construction and provided documentation that the Yarwun facility has been built as proposed and approved.

During the Certification Audit in 2006 it was verified that quality management programs had been implemented during the original construction and subsequent modification of cyanide production and storage facilities, that records had been retained and that the reviews had been undertaken by appropriately qualified personnel.

Since the last recertification audit various modifications have been completed on the cyanide plant within the Chemicals Complex. It is a requirement that full records of the modification shall be filed in Enabler. A Completion Check is done to record and ensure that all aspects of the modification have been completed from engineering, operational and safety, health and environment perspectives and signed off by qualified Orica personnel.

The following records are saved in the Orica Enterprise Library:

- Design specifications for process equipment
- Engineering Line Diagrams
- Equipment files
- Hazard Study Records are saved in Orica Enterprise Library (OEL) Risk Register

The materials used for construction of cyanide production facilities are compatible with the reagents used and the processes employed. Standards adopted for materials of construction were set out in the report of the Certification Audit in 2006. Those standards have continued to be employed for the design and installation of new equipment installed. Improvements are ongoing and include:

- Lining of chemical complex trenches with stainless steel
- Improvements to the piping standard to include more detailed information around gasket specifications
- New floor sealing designs
- No use of aluminium, brass and bronze due to incompatibility with caustic

The Yarwun General Scheme for Piping and Gasket Specification for the cyanide plant was provided as evidence. This approved specification can be used on all Yarwun piping, for either new projects or in maintenance activities. There are automatic systems or "interlocks" to shut down production systems and prevent releases due to power outages or equipment failures. As verified in the Certification Audit, the cyanide plant design is such that there is no risk of a cyanide release in the event of power failure. The cyanide plant fails in a safe state.

Physical process controls are implemented through a programmable Distributed Control System (DCS) and through a hard wired trip system. In the event that control is lost, a Trip 10 (Total cyanide plant Trip) is activated, which over-rides operation of the front end (conversion and absorption area) of the cyanide plant. This is one of several automatic systems that protect the cyanide plant from an uncontrolled event.

There is an emergency power supply to maintain lighting and critical processes function (critical trips, backup air system, etc) rather than keep the cyanide plant fully functional. A standby power generator feeds an uninterruptible power supply. Weekly tests are conducted to ensure the standby power generator is performing well.

Cyanide is managed on a concrete surface that can minimise seepage to the subsurface.

As verified in the Certification Audit, there is extensive concrete surfacing in the process area, which is bounded by a stainless steel lined perimeter drain discharging to the Effluent Sump that is lined with concrete and a chemical resistant membrane. The Cyanide Tank Farm Bund is also lined with concrete and a chemical resistant membrane. All tanks containing cyanide process solutions, except for the inground solids dissolving tank, are supported at grade level are founded on concrete plinths.

Solids Dissolving Tank is located below ground floor level to facilitate gravity drainage from equipment on the ground floor of the Cyanide Plant. The tank is of a dual skin design with 3 × 50 nominal bore (nb) nozzles giving access to the annular space between the 2 tank walls. Nozzle 'R' is for a level probe LT-0435, nozzle 'S' is to enable a pump to be used to empty the space if required, and nozzle 'T' is for a visual inspection point.

Since 2020:

- Electrostatic earth points in the concrete have been sealed
- Protective coating has been applied to the floors
- Trenches have been lined with stainless steel and where not possible a ChemClad seal coat has been applied

The facility employs methods to prevent the overfilling of cyanide process and storage vessels. As verified in the Certification Audit, there are extensive level instruments and trip systems throughout the facility. Physical process controls are implemented through a programmable DCS and through a hard wired trip system. Trip 10 (Total cyanide plant Trip) is the key trip that is activated in the event of potential loss of control as may be indicated through high-high level alarms. Operator inspections are used to verify levels reported to the DCS via instrumentation are correct. Levels are recorded in check sheets. There are preventative maintenance systems in place for sensors including level sensors.

Secondary containments are provided for process and storage tanks and containers are constructed of materials that provide a competent barrier to leakage, and which are sized to hold a volume greater than that of the largest tank or container within the containment and any piping draining back to the tank, with additional capacity for the design storm event.

As noted in the Certification Audit, there are two secondary containments for process and storage tanks and containers. These are the Cyanide Storage Tank Bund and the Effluent Pit. There have been no increase to the secondary containment volumes during the audit period and the laser scanning program confirmed bund containments met Australian Standards, licence conditions and Code requirements.

Spill containment and prevention measures are provided for all cyanide solution pipelines.

As noted in the Certification Audit, flange guards are used on cyanide solution pipe flanges on above ground pipelines. Pipe in pipe solution lines between the absorber catch pots and the solids dissolving tank have level transmitters and inspection ports.

The operation has two underground drains that intermittently carry cyanide solution intercepted by stainless steel line perimeter trenches downgradient of the main processing area. These drains convey solutions to the Effluent Pit and are configured to enable a regular leak test to be conducted as a prevention measure.

The facility stores cyanide in a manner that minimises the potential for exposure of cyanide to moisture, with adequate ventilation to prevent the build-up of hydrogen cyanide gas and cyanide dust, in a secure area and separately from incompatible materials.

Once packaged into Intermediate Bulk Containers (IBC) solid cyanide is stored initially within the packaging warehouse and then transferred to shipping containers and containers placed in the external laydown area. IBCs may be temporarily handled if required for onward shipping, but this occurs within the cover external loading dock of the storage facility.

Solid Cyanide is also packed in to Sodium Cyanide Solids Isotainer which is designed, built and approved to International Maritime Organisation (IMO) standards in accordance with the Australian Dangerous Goods Code (ADG) and the International Maritime Dangerous Goods Code (IMDG) that travel by Road, Rail and Ship. These are also stored in a dedicated area of the storage yard. Liquid cyanide is stored within tanks in accordance with Major Hazard Facility (MHF) and dangerous goods licence requirements. Segregation of incompatible materials is a requirement of the MHF licence. The areas where the Intermediate Bulk Containers (IBC) and tanks are located are weatherproof but not enclosed facilities and therefore provided with adequate ventilation to prevent the build-up of hydrogen cyanide gas.Access to the whole cyanide plant it controlled with perimeter security, CCTV and access control systems in place. Public assess is prohibited.

1.2 Production Practice 1.2

Develop and implement plans and procedures to operate cyanide production facilities in a manner that prevents accidental releases.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 1.2**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 1.2 requiring the development and implementation of plans and procedures to operate cyanide production facilities in a manner that prevents accidental releases.

The Yarwun facility has procedures that describe the standard practices necessary for its safe and environmentally sound operation.

The plans and procedures adopted at the Yarwun facility are based upon the Orica Safety Health and Environment Management System. Plans and procedures are administered through the OEL.

Information on the computerised systems is made available to plant personnel via Orica's computer network and all personnel have access. Plant personnel who are not allocated an individual computer and network connection have access to the documentation through shared equipment located in:

— CN complex control room (seven terminals)

— Facilitator's office

- Conference roomInformation on the computerised systems is made available to plant personnel via Orica's computer network and all personnel have access. Plant personnel who are not allocated an individual computer and network connection have access to the documentation through shared equipment located in:
- CN complex control room (seven terminals)
- Facilitator's office
- Conference room

The Yarwun facility has procedures for contingencies during upsets in its activities that may result in cyanide exposures or releases.

The menu screen of the site's OEL displays the systematic structure of the documentation which includes Abnormal Operating Instructions for each process node. Each processing node procedure (Conversion, back-end centrifuge) follows a set structure:

- Abnormal operations
- Forms
- General process description
- Job procedure
- Main items and key facts
- Normal operations
- Safety
- Shut down
- Start up

The standard features of Abnormal Operating Instructions address the following generic abnormal conditions:

- Power Failure
- Instrument Air Failure

Other abnormal conditions are specific to the kinds of processing upsets and incidental conditions that may arise predictably but irregularly during operations, such as machine failures (agitators, pumps), material accumulations and blockages.

The Yarwun facility uses Uniformance to monitor trends in abnormal operating conditions from the administration office and areas of the control room usually occupied by the Plant Superintendent and Shift Facilitator. This enables analytical and interpretive input to be made by specialised staff, without needing to interfere with the "live" activities of the plant technician dealing with abnormal conditions.

The Yarwun facility has a procedure to identify when site operating practices have, or will be, changed from those on which the initial design and operating practices were predicated.

The procedure applies to all plant modifications to ensure that they are implemented in a manner which does not present a hazard to safety, health, the environment, or physical security.

The operation uses SAP for its asset management functions. ENABLON (cloud-based software) administers the proposal and approval of plant changes and these then follow through to asset maintenance in SAP. The SAP system prevents the issue of work orders relating to proposals that have not been approved.

As the Management of Change (MOC) process is rigorous, all changes are initially screened through an MOC Idea Form to assess the viability of the proposed change before being formally reviewed through the MOC process.

The MOC process involves the following stages:

- Change initiator/author
- Gate keeping (high level review)
- Analysis
- Reviewers (multiple reviewers in parallel who are identified from the risk assessment and technical requirements)
- Final approval
- Implementation
- Operations

All MOC proposals are reviewed by suitably qualified people including appropriate line managers and workgroup Safety, Health, Environment and Security (SHES) representatives to ensure appropriate hazard management, application of design standards, regulatory compliance and the use of risk assessment approaches.

SHES Superintendent may be part of the initial change approval process if nominated by the change initiated through a risk assessment process. Alternatively, the SHES Superintendent may be part of the final signoff (Final Approval). Once the change has been approved and constructed, the change cannot be operated (Operations) until a SHE Acceptance form is completed and approved by a SHES representative, operations representative, maintenance representative, engineering representative and technical representative to confirm the change is safe to operate.

The DMS incorporates a revision control process which enables Yarwun facility personnel to participate in the regular review of procedures, recommending improvements by annotating a copy of the controlled procedure with suggested changes.

Approximately 100 changes were initiated during the audit period. Preventive maintenance programs are implemented, and activities documented, for equipment and devices necessary for cyanide production and handling.

The operation uses SAP for its asset management functions. Preventive maintenance has been the focus of continual improvement. The approach adopted focuses on processing systems, based on the commonality of processing conditions (composition, temperature and pressure, etc), materials of construction and engineering standards that are adopted for groups of equipment that comprise larger systems at various steps through the material flow sequence of the manufacturing process.

Preventive maintenance is scheduled and carried out for equipment items including pressure vessels, tanks, pumps, piping, valves, bunds, and drains, with the nature of the activities specific to the operating conditions rather than just the type of equipment. Maintenance is assigned an activity type and criticality indicator.

The preventive maintenance administration functions are managed through SAP which supports a total maintenance system that integrates administration of the:

- Equipment Register
- Spare Parts
- Preventive Maintenance Routines
- Work Orders for Maintenance, Repair and Modification
- Maintenance and Repair History of equipment items

Process parameters are monitored with necessary instrumentation. The instrumentation is calibrated according to manufacturer's recommendations. Examples of key instrumentation used to control the chemical quality of product supplied from the Yarwun facility, waste streams disposed from it and the environmental quality at the facility include:

- Pyrometers used for temperature control of the HCN Converter
- Pressure transmitter installed on the HCN Converter to confirm normal operation (55-80 kPa) and to raise alarms (120 kPa and 130 kPa) to indicate increased risk of a release (bursting disc rupture at 200 kPa)
- Redox potential probe used to control the addition of sodium hypochlorite to destroy cyanide in wastewater
- HCN detectors installed to monitor for hydrogen cyanide concentrations in the workplace
- Level transmitter in the Stormwater Pit

The pyrometers and HCN detectors are scheduled in SAP for preventive maintenance routine. The pyrometers can only be accessed during plant shutdowns. Hence, the temperature of the catalyst gauze in the converter is cross-checked against measurements collected manually using a spectrometer. The temperatures indicated by the installed pair of pyrometers are compared against each other automatically to provide a continual cross check of their respective calibrations.

The manufacturer's recommended procedure for calibration of the HCN Gas Detectors is adopted at the Yarwun facility and implemented regularly. The redox potential probes installed on the Cyanide Effluent Tank are calibrated using a work method that incorporates the manufacturer's calibration specification.

All trips are tested during each shut down (approximately three times per year). The remaining instrumentation is categorised. Instrumentation is on an operate to failure strategy. Other instruments that need to be tested or maintained are done so on an interval that is determined by a process engineer in consultation with the instrument datasheet.

Stormwater is retained separately, checked for compliance, and then pumped to the discharge point.

The Yarwun facility has an environmentally sound procedure for disposal of cyanide or cyanide-contaminated solids.

The procedure of the despatch of regulated waste identifies cyanide contaminated wastes such as oils, greases, bags and liners as requiring disposal in accordance with applicable regulation. The Environment Team is responsible for ensuring that wastes are correctly classified so that arrangements can be made for the waste to be disposed of to an appropriately licensed facility.

The movements of such wastes are required to be tracked using Waste Transport Certificates as a means of verifying that movements only occur between appropriate locations and under the control of licensed transporters. Waste tracking information was evident for cyanide contaminated waste that was send for disposal during the recertification period.

Procedures were available for the external companies that were being used for the disposal of cyanide contaminated waste that shows decontamination management, and disposal of cyanide-contaminated materials, including the ultimate destination of any disposed material.

Wherever possible, cyanide-contaminated equipment or materials are decontaminated rather than disposed of as cyanide-contaminated solids. For example, equipment sent off-site for maintenance inspections is decontaminated before departure. The decontamination approach is preferred to disposal as it is environmentally sound and reduces the cyanide-related risks.

There are procedures to ensure that the cyanide is packaged as required by the political jurisdictions through which loads will pass. Product supplied from the Yarwun facility is packaged in three forms:

- Cyanide solution in liquid isocontainers built and designed in accordance with the Australian Dangerous Goods (ADG) Code.
- Cyanide solids in ADG approved sparge isocontainers.

- Cyanide solids in UN approved standard wood/plastic composite intermediate bulk containers (IBCs) comprising bulk bags inside a liner within a timber box

The IBC design is tested by a National Association of Testing Authorities (NATA) accredited laboratory to the relevant requirements of the Orange Book, the Australian Dangerous Goods Code and the Code. Boxes are branded with the UN approval number UN/11HD2/X/0506/AUS/Orica-42119/6480/1200. Boxes are transported in shipping containers that must carry a current compliance plate to satisfy the requirements of the International Maritime Organisation (IMO). The operation has to deal with special requirements of one country, Peru, where there are special requirements regulating the space required between packages and the door of the shipping container.

Product packages carry labels in accordance with UN regulations, identifying the UN number of the product, the product class and detailing safety precautions. Product packages destined for use within Australia must carry an Emergency Information Panel (EIP) in accordance with criteria set out in the Australian Dangerous Goods Code. The operation voluntarily displays an EIP on packages destined for export. The procedure prescribes the correct locations for each EIPs, marine pollutant stickers and poison stickers. The EIP identifies Orica as the consignor and provides contact details for emergency response assistance; Orica Australia operates a 24 hour emergency response service to provide emergency response information.

1.3 Production Practice 1.3

Inspect cyanide production facilities to ensure their integrity and prevent accidental releases.

The operation is

☒ **in full compliance with**

☐ in substantial compliance with

☐ not in compliance with

Production Practice 1.3

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 1.3 requiring the inspection of cyanide production facilities to ensure their integrity and prevent accidental releases.

The Yarwun facility conducts routine inspections of pressure vessels, tanks, valves, pipelines, containments and other cyanide production and storage facilities as noted in this question.

The operation uses SAP for its asset management functions. Preventive maintenance has been the focus of continual improvement. Preventive maintenance is scheduled and carried out for equipment items including pressure vessels, tanks, pumps, piping, valves, bunds, and drains, with the nature of the activities specific to the operating conditions rather than just the type of equipment. Maintenance is assigned an activity type and criticality indicator Activity types include:

- Statutory
- Pump
- Vibration
- Ultrasonic
- Improvement
- Process cleaning.

Criticality indicators include:

- A – Safety, Health, Environment Committee (SHEC) and Business Critical
- B – SHEC Critical
- C – Business critical
- D – Not business critical.

The preventive maintenance administration functions are managed through SAP which supports a total maintenance system that integrates administration of the:

- Equipment Register
- Spare Parts
- Preventive Maintenance Routines
- Work Orders for Maintenance, Repair and Modification
- Maintenance and Repair History of equipment items.

The procedure for in-service inspection of pressure vessels applies to the routine inspection and integrity testing of pressure vessels, many of which are in cyanide service. The vessels are on inspection periods of up to four years based on failure modes and history.

Underground lines handling cyanide solutions are subject to hydrostatic testing every five years with the effluent lines inspected every two years. Atmospheric pressure tanks in cyanide solution duty are scheduled for integrity inspections every five years. Bunds providing secondary containment to cyanide solution storage tanks are scheduled for annual integrity inspections.

Pipelines handling cyanide solutions sometimes include flexible hoses to isolate the piping from the vibration associated with machines such as centrifuges. These hoses are identified as critical items of equipment and are scheduled for six-monthly hydrostatic testing. Pumps in cyanide solution services are scheduled for inspection of seals and overall integrity, typically on six monthly cycles.

Operational inspections occur more frequently than integrity inspections. Operators conduct per-shift (i.e. twice daily) inspections in their areas of responsibility. These inspections focus more on short term issues such as the detection of leaks, housekeeping (available space in bunds free of hoses, containers, loose equipment, etc), the correct configuration of equipment (such as flange guards and safety signs) and signs of operating conditions (such as vibration, noise or heat) that may indicate a risk of early integrity failures. Weekly inspections address similar issues to the daily inspections, but allow for more time to be allocated as a cross check to the effectiveness of the shift inspections.

Inspections are conducted on all isotainers prior to filling and post filling prior to leaving site to ensure the full integrity of the vessel is maintained. These are recorded on an inspection form. The isotainers are inspected every 2.5 and 5 years by third party namely, Central Coast Inspections.

Inspection frequencies are sufficient to assure that equipment is functioning within design parameters.

Process operation is monitored continually using permanently installed process instrumentation for levels, flows, temperatures, pressures and composition-related parameters. Most parameters are displayed in the control room via the DCS or hard-wired instruments. The DCS provides the means of automatic control as well as manual manipulation of the status of equipment, with alarms set to flag when equipment moves outside normal control ranges or when equipment changes operating status. Trips are also installed to automatically shut down process operations safely under pre-determined scenarios that pose unacceptable risk.

There are an extensive range of inspections carried out ranging from twice daily (one per-shift) through weekly to annually and less frequent for integrity inspections. Whilst there have been incidents involving the leaks of cyanide

solutions where equipment has become degraded, none of these incidents has resulted in significant consequences (apart from a leak identified many years ago from a below-ground tank; the risk of recurrence has been significantly reduced).

Inspection of the process plant during the audit indicated a very high standard of housekeeping. There was evidence that some minor releases had occurred in the 24 hours period prior to the inspection – these being related to routine operations around the centrifuges.

Based on the reported frequency and severity of cyanide incidents, the observation of a high standard of control over leaks and the existence of an ongoing program of continual improvement to eliminate sources of leaks and spills, it is concluded that inspection frequencies are sufficient to assure that equipment is functioning within design parameters.

Inspections are documented:

- The documentation identifies specific items to be observed and includes the date of the inspection, the name of the inspector, and observed deficiencies
- The nature and date of corrective actions are documented and the inspection records are retained

Records of inspections of major equipment items with regulatory implications are maintained in SAP along with the procedure for the equipment inspection, hours booked against the equipment number, whether the inspection was completed, name of the inspector and the date. Some statutory inspections are physically signed and scanned into SAP.

The daily and weekly checklists completed by operations personnel are stored as bound hardcopies in the control room area for approximately two years before they are transferred to archive. The check sheets are completed with the name of the person undertaking the inspection together with the date (and shift where applicable). Actions identified as necessary during inspections may be initiated as new work orders in SAP or their completion may be recorded on the inspection sheets if they are capable of immediate resolution.

The operation documents its routine facility inspection information. All maintenance and preventative maintenance is recorded in the maintenance software SAP.

2 Principle 2 – Worker safety

Protect workers' health and safety from exposure to cyanide

2.1 Production Practice 2.1

Develop and implement procedures to protect plant personnel from exposure to cyanide.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 2.1**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 2.1 requiring the Facility to develop and implement procedures to protect plant personnel from exposure to cyanide.

The Yarwun facility has developed formal procedures to minimise worker exposure during:

- Normal plant operations from receipt of raw materials through finished product packaging and shipping
- Non-routine and emergency operations
- Maintenance related activities

All documents prepared for the Yarwun facility are managed within the Yarwun DMS. The Preparation and Implementation of Yarwun System Documents procedure provides detailed instructions regarding the preparation of Yarwun facility system documents (procedures, instruction and forms).

Detailed procedures have been prepared covering the discrete components of the cyanide plant:

For each discrete component listed above procedures have been developed covering the following topics:

- Abnormal Operating Instructions
- General process description
- Forms
- Job Procedures
- Main Items and Key Facts
- Normal Operation
- Safety
- Shutdown
- Start-up.

Within the Safety Procedures for each component of the Cyanide plant, the issues of toxicology, PPE, housekeeping, and other special information (such as exothermic hydrolysis reactions within the evaporative process) are discussed in detail. Operating procedures and instructions were reviewed and it was noted that the appropriate level of safety detail was contained within the documents. It was noted that in addition to safe practices being described within the section relating to Safety, they were also integrated within the procedures for Normal Operations, Shut Down and Abnormal Operations.

In addition to area specific safety procedures, the Yarwun facility has developed specific safety system procedures detailing the safety systems relevant to the cyanide plant including:

- Safety system tests
- Safe working procedures
- Cyanide safety
- Isolations and permits
- Visitors in the cyanide plant
- Preparation of equipment for maintenance.

For routine maintenance activities conducted outside of shutdown operations, safety instructions are detailed on Job Instructions linked to preventative maintenance schedules. JHA (Job Hazard Analysis) are undertaken for specific jobs on a case by case basis. It was considered that the procedures and work instructions maintained on the DMS, along with safety information detailed on maintenance requests as part of the preventative maintenance system, adequately satisfy the requirements of this question.

The Yarwun facility has implemented procedures to review proposed process and operational changes and modifications for their potential impacts on worker health and safety, and incorporate the necessary worker protection measures. The Plant Modifications Procedure applies to all plant modifications to ensure that they are implemented in a manner which does not present a hazard to safety, health, the environment or physical security.

Modification proposals are reviewed by suitably qualified people including appropriate line managers and workgroup SH&E representatives to ensure appropriate hazard management, application of design standards, regulatory compliance and the use of risk assessment approaches.

Under the Yarwun facility organisation structure, it is the accountability of the Technical Manager to ensure it is consistent with the site's SH&E objectives and targets and to assess its potential to introduce new significant hazards, substantially increase site risk or otherwise change the basis on which the site is expected to operate. This accountability is consistent with an approach to managing cyanide risks by adopting technical options with inherently low risk. The sample of modifications observed showed that the Site SH&E Manager had reviewed and signed off on the proposed changes in all cases sampled.

The Facility does solicit and consider worker input in developing and evaluating health and safety procedures. The operation solicits worker input in developing and evaluating health and safety procedures at the Yarwun facility using five key processes:

- Standard Operating Procedure amendments within the DMS with automated updates sent to the workforce
- Standard Operating Procedure Review Process
- During Shift Handovers – Chemicals Plant Operations Log
- Personnel meetings such as
- Critical Issues Meeting/Prestart Meetings/Toolbox Discussions
- Formal SH&E committee meetings (for major site-specific subject matter).

The DMS and OEL store and provide widespread access to the latest approved copy of Yarwun facility system documentation. It is available on-line and site wide.

A review period is assigned to all procedures and is based on the criticality of the procedure. The document owner who is assigned at the development of the procedure is responsible for conducting the review. The review process is the same as that described for procedure amendments.

A Chemical Complex Operations Log (CCOL) is completed at each shift change and is a record of communications from each shift. Communications can include proposed changes to operational procedures as well as safety information. In addition to completing the CCOL, the Facilitator, Cyanide Liquor Technician, Solids Technician (No 1 backend), Solids Technician (No 2 backend) and DCS Operator all hand over verbally to their counterparts on the new shift prior to leaving. Issues concerning the need for procedural change and safety concerns are discussed during this time.

A Critical Issues Meeting involving maintenance, process engineering, the Chemicals Complex Superintendent and Shift Facilitator commenced in August 2008 and is held routinely on a weekly basis. The meeting is used to discuss critical issues including safety issues that require priority actions. The forum can be used to discuss critical procedure reviews and solicit input.

A SH&E Monthly Meeting is conducted for the Yarwun facility Issues raised within the meetings are captured in the ENABLON system and tracked to completion. The forum can be used to discuss procedure reviews and solicit input.

The facility uses monitoring devices to confirm that controls are adequate to limit worker exposure to hydrogen cyanide gas and sodium, calcium or potassium cyanide dust to 4.7 ppm (5 mg/m3) or less, as cyanide.

There are 18 HCN detectors, installed in the following locations:

- Top of Bulk Solids Chute (West End)
- Bag Loading Station
- Inspection Station (Mezzanine Floor)
- Box Filling Booth (four in total)
- Wet Cake Converter area (two in total)
- Mezzanine Floor under Decanter ‘C’
- Top of Solids Dissolving Tank
- Cyanide Recovery – Ground Floor
- Cyanide Recovery – Top Floor
- Cyanide Operations Building
- Laboratory Annex Building – East Wall
- Laboratory Annex Building – West Wall
- Change Room – Orica Personnel
- Change Room – Contractors

Fixed monitors are located in areas with the greatest potential for HCN exposure. The fixed HCN gas detectors have been set to alarm at two levels – 4.7 ppm and 10 ppm. When 4.7 ppm is reached, the detector alarms locally and in the control room to prompt investigation. The HCN alarm located in the Operations Centre air conditioning duct will automatically sound the alarm if gas is detected at or above the alarm settings. In areas where background noise may be an issue such as in the Box Filling Area, fixed detectors also provide a visual alarm. In these areas, a yellow light indicates 5 ppm and a red light indicates 10 ppm. If the red-light flashes, the area is required to be evacuated. The location and number of detectors revealed no obvious anomalies. The detectors were observed during the audit and the DCS Operator within the Control Room showed the HCN alarm signals.

Personnel HCN Monitors are used at the facility and these are managed by the Laboratory Department to monitor worker exposures to HCN during the cyanide plant operation. The selection of employees is undertaken by the Laboratory

Analyst and is based on past recordings and exposure risk. The results are used to guide PPE requirements and amend the monitoring program.

The results are entered into the site's occupational hygiene database. Any result exceeding the 4.7 ppm limit (average over eight hours) and 10 ppm limit (over 10 seconds) are highlighted by the database software and an ENABLON Event Report is automatically generated for investigation and reporting. For the audit period, records indicated that no worker exceeded the 4.7 ppm over eight hours limit and four workers exceeded the 10 ppm instantaneous limit. The HCN monitoring equipment is maintained, tested, and calibrated as directed by the manufacturer.

A procedure has been established whereby the Laboratory Department sends the portable instruments for calibration via the manufacturer (or supplier). Calibration information is summarised on a spreadsheet that is checked on a weekly basis to ensure equipment scheduled for calibration and maintenance is taken out of service and sent off-site on a routine basis. The information contained in the spreadsheet was cross checked against a selection and calibration records over the past three years.

The Fixed HCN Monitors are calibrated by the site Electrical and Instrument Department as part of a preventative maintenance routine every 90 days. The facility has identified areas and activities where workers may be exposed to HCN gas or cyanide dust and requires the use of PPE as necessary in these areas when these activities are being performed.

For all cyanide plant upgrades or modifications, an occupational health statement is prepared as part of a Hazard Study. The Senior Specialist SHES- Safety advised that no additional areas requiring monitoring were identified during the audit period. The Yarwun facility has provisions to ensure that a buddy system is used, or workers can otherwise notify or communicate with other personnel for assistance, help or aid where deemed necessary.

The Senior Specialist SHES- Safety and the Process Operators advised that the cyanide plant uses both a buddy and radio system to maintain communication channels. This was confirmed during the site tour.

The cyanide plant uses both a buddy and radio system to maintain communication channels. This was confirmed during the site tour. The Site has a radio channel dedicated to the Chemical Complex. The radio system forms the critical link between an Operator and the DCS Controller within the Control Room. Time spent within the cyanide plant is kept to a minimum and Process Operators only enter to perform specific tasks such as sample collections or to perform maintenance activities such as plant washouts, as required. Where an operator is required to enter the cyanide plant alone for routine functions, communication is maintained via radio link to the DCS Controller. A Clearance to Work system is in operation for non-routine activities including maintenance activities. This involves conducting a process risk assessment, in addition to the mandatory safe work method statement (SWMS). The Clearance to Work is handed to personnel conducting non-routine activities and then handed back at the completion of the task. During high risk non-routine activities such as a washout, a buddy system operates with a minimum of two persons. In this situation, a second person wearing PPE must stand by to observe the operator. The duty of the observer is to raise the alarm, via radio, in the event of an emergency. A buddy system is also used for emergency response requirements.

When Managers and Supervisors need to enter the cyanide plant, they are required to use the tag board (as all operators do) and inform the Chemicals Complex Shift Facilitator. A public announcement system is also used at the Yarwun facility. The facility assesses the health of employees to determine their fitness to perform their specified tasks.

The Yarwun facility has a Health Assessment Procedure that defines the requirements for assessment and ongoing monitoring of employee and contractor health. The procedure contains a number of Appendices and Attachments that detail the following health assessments:

- Orica pre-placement health assessment standard
- Orica job transfer health assessment standard
- Health assessment standard – fitness for work during employment

- Specific fitness for work health assessments
- Biological and health effects monitoring
- Contractors health assessments
- Assessment of health
- Health assessment task matrix
- Employee pre-placement health assessment (operations/manufacturing)
- Employee pre-placement health assessment (office workers)
- Contractors pre-placement health assessment
- Health assessment and monitoring

A Health Assessment Matrix was reviewed but individual records were not due to confidentiality. Health assessments are undertaken for a variety of reasons, including:

- Pre-placement Health Assessments on all prospective employees prior to an offer of employment.
- Contractor Health Assessments depending on risks associated with the contract work and length of the contract.
- Job Transfer Health Assessments on all job transfers involving a transfer to a significantly different position, significant changes to a person's existing position or where health issues may significantly affect a person's ability to perform work safely.
- Return to Work Health Assessments on persons returning to work after an absence of five working days or more due to illness or injury.
- Periodic Health Assessments (annual) to assess a person's continuing fitness to perform a specific job or monitor a person's exposure to specific chemicals or physical agents.
- Health Assessments by Requests where there are reasonable grounds to suspect the presence of a condition which may be aggravated by work or may compromise the safety of employees or other persons on the site.

The cyanide plant has a clothing change procedure for employees, contractors and visitors to areas with the potential for cyanide contamination of clothing.

The cyanide plant is demarcated by a blue line. All personnel crossing the blue line to enter the cyanide plant must use the designated change room to change into blue overalls (buttoned at the wrist and neck) which are placed over their existing layer of clothing, black work boots, safety glasses, safety helmet and hearing protection. Gloves are also required for persons undertaking manual work within the cyanide plant.

Upon leaving the facility the blue overalls are removed within the change room and placed in a dissolvable red bag that is collected by an approved external laundry. Remaining PPE items are kept within the Blue Zone and may only be removed from this area by following site decontamination and testing procedures. The use of a dissolvable red bag avoids the requirement for the laundry to directly handle the clothes. Actual contaminated clothing is decontaminated and disposed of on-site. A change room exists for employees, contractors and visitors.

The change of clothing procedure is also detailed within the induction training material. Observations during the audit confirmed that personnel conformed to these requirements. Warning signs advising workers that cyanide is present and that, if necessary, suitable PPE must be worn, are located around the site.

The cyanide plant is demarcated by a blue line. All personnel crossing the blue line to enter the cyanide plant must use the designated change room to change into blue overalls (buttoned at the wrist and neck) which are placed over their existing layer of clothing, black work boots, safety glasses, safety helmet and hearing protection. Gloves are also required

for persons undertaking work within the cyanide plant. This requirement is detailed within a procedure and reinforced during training.

Personnel interviewed had an appropriate level of knowledge regarding PPE requirements and persons working in the cyanide plant were observed wearing the correct PPE. Personnel are prohibited from smoking, eating and drinking, and having open flames in areas where there is the potential for cyanide contamination.

The prohibition of all personnel from smoking, eating and drinking, and having open flames in areas where there is the potential for cyanide contamination is adequately outlined by signage, within site induction programs and procedures. The Safety Systems – NaCN Plant, Normal Operating Instructions procedure details that food and drink may only be consumed at the cyanide plant in the Planning and Superintendent Offices, Operations Centre Mess Room and SH&E hut – all of which are demarcated as a "No Blue Zone". Food and drink is prohibited in all other cyanide plant areas.

The site induction material clearly describes the cyanide plant as a "nil by mouth area" where eating, drinking and smoking are prohibited. Smoking is not permitted within the fenced perimeter of the entire site. The induction also details the prohibition of naked flames within the plant. Observations during the audit confirmed that personnel conformed to these requirements.

2.2 Production Practice 2.2

Develop and implement plans and procedures for rapid and effective response to cyanide exposure.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 2.2**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 2.2 requiring the development and implementation of plans and procedures for rapid and effective response to cyanide exposure.

The Facility has developed specific written emergency response plans and procedures for responding to cyanide exposures. The following list of documents were reviewed:

- Yarwun Operations Emergency Plan
- Orica Mining Chemicals Emergency Response Guide – Sodium Cyanide
- Orica Group Procedure – SHES Emergency Management
- Guidelines for Recognition and Medical Treatment of Cyanide Poisoning.

The Yarwun Operations Emergency Plan (OEP) covers those actions to be carried out by site personnel during an on-site emergency. The OEP addresses the following key items:

- Identify potential emergency scenarios and define combat strategies that control or limit any effect that an emergency or potential emergency may have on personnel, the site/business, the facilities and neighbouring areas.
- Provide the roles and responsibilities of the different response teams.
- Describe the response requirements when an emergency alarm sounds.
- Facilitate the reorganisation and reconstruction activities so that normal operations can be resumed.
- Provide a reference for training so that a high level of preparedness can be continually maintained.

The OEP is supported by the Orica Mining Chemicals Emergency Response Guide – Sodium Cyanide (ERG). The Cyanide ERG has been developed by Orica Mining Chemicals to provide guidance in the development of specific site and transport route emergency response plans for the management of incidents involving spillage of cyanide product; Appendix 4 of the ERG covers toxicity, first aid and medical treatment associated with cyanide exposure.

The Guidelines for Recognition and Medical Treatment of Cyanide Poisoning provides information on exposure pathways, toxic effects and what initial actions personnel should take. It also contains a stepped-out process for responding to an exposure scenario and includes reference to raising an alarm, decontaminating via emergency showers and the use of cyanide poisoning antidotes by medical professionals.

Showers, low-pressure eye wash stations and non-acidic fire extinguishers are located at strategic locations throughout the Facility. They are maintained and inspected on a regular basis. There are 26 emergency shower/eye wash stations within the cyanide production plant, these consist of the following four types:

- Walk-In Multiple Spray: multiple spray showers provide complete simultaneous coverage of the entire body from all angles by individual spray heads. The shower is activated by stepping on the platform.
- Deluge Shower/Eye Wash: the deluge shower provides a deluge of water when the operating handle is pulled. It is equipped with an eye wash facility, operated by a push handle or foot pedal.
- Eye Wash Units: the eye wash units provide a stream of water to the eyes when the hand operated push handle or foot pedal is activated. These units are pedestal mounted.
- Eye Wash Bottles: portable eye wash; bottles are stationed at each walk-through multiple spray shower station.

The Safety Systems, Normal Operating Instruction lists the location of all shower stations and details the inspection type and frequency required; safety showers and eye wash stations are stated to be tested on a weekly basis. A selection of these were verified during the inspection and site walkover. Plant personnel advised that the equipment had been placed in all areas where there was an increased risk of cyanide exposure and this was supported by observations of the facilities during the site inspection.

Dry powder fire extinguishers were observed throughout the facility and are inspected on a regular basis. Inspection test tags on the equipment were observed to be completed and in date. Fire detectors and 14 push-button stations are provided throughout the site to raise a fire alarm.

The Facility has oxygen, defibrillators, resuscitators, cyanide poisoning antidotes, a site medical transport vehicle and a means of communication or emergency notification readily available for use in the plant. The site Nurse advised that there are three cylinders of oxygen (Oxysox) and three manual resuscitators located in the cyanide plant. emergency medical kits are located in all toxic refuges, large field kits are located in both control rooms (Chemicals Complex and Ammonium Nitrate Complex) and the Occupational Health Centre and these are used for transport to hospital. Cyanokit Antidotes containing hydroxocobalamin are kept in the fridge within the Occupational Health Centre. Sealed bottled water is readily available in the Occupational Health Centre and also stored at eyewash stations to aid in the rinsing of eyes or the mouth if cyanide has been ingested. Radios are used for communication during an emergency on-site and the telephone is used to advise external parties such as the hospital.

The emergency response equipment maintained on site includes the oxygen cylinders, oxygen cylinder trolley, resuscitators and medical transport vehicle. Antidote injection medicine (sodium nitrate, sodium thiosulfate, and methylene blue) are stored in the on-site Medical Centre. Mobile phones, walkie-talkies and fixed calling points are readily available as a means of communication in the event of emergency. Self-contained breathing apparatus (SCBA) kits are located outside the control room.

Personnel interviewed knew the location of antidotes, response equipment and the emergency notification process. Inspection records were sampled for the audit period and found to be in order. The Facility inspects its first aid equipment regularly to assure that it is available when needed. The first aid and emergency response equipment are stored and tested as directed by their manufacturer and replaced on a schedule so that they will be effective when used.

The Nurse advised that all emergency medical kits are checked twice annually by an outside service provider, Essential First Aid. The inspector notes the date of the inspection on a label on each kit. A spreadsheet was observed noting a sample of completed and scheduled inspections. The Oxysox are checked every six months by an outside service provider, Mediquip. A spreadsheet was observed noting a sample of completed and scheduled inspections.

Cyanokit antidotes are stored in the Occupational Health Centre fridge in accordance with manufacturers' storage instructions (< 25°C and away from light). A weekly Safety Checklist is used by Plant Operators to perform checks on all safety showers, push button alarms, safety boxes incorporating eyewash bottles, fire hydrants, extinguishers, dust masks, Oxysox, Rescue Kits and toxic gas monitors.

The plant operators conduct weekly checks on the SCBA units. The checks are documented and stored for a 12-month period. Safety data sheets (SDS) and first aid procedures on cyanide safety are in the language of the workforce and are available to workers at the site. All the signs and procedures are in English, which is the official language.

All site personnel have access to ChemAlert and can be accessed via the Orica Safety Sata System (OSDS). ChemAlert is managed by Orica's Head Office in Melbourne. ChemAlert was used during the audit to observe SDS for cyanide that conforms to both Australian and New Zealand Standards. Hard copies of SDS are also maintained in the Administration Building and the Control Room.

All employees, contractors and visitors are required to attend an induction before working at the Yarwun facility. The Induction video provides detailed information on the symptoms of cyanide poisoning and treatment methods. In addition, all employees are issued with a Basis of Safety – Sodium Cyanide Manufacture booklet produced by Orica. The booklet is designed to take learnings from past incidents and put them into a concise package of knowledge, with the aim of ensuring that future incidents are avoided or prevented. The booklet contains information on recognising the symptoms of cyanide poisoning and the procedure to follow in the event of exposure to cyanide.

The Yarwun facility has developed a formal Procedure titled Guidelines for Recognition and Medical Treatment of Cyanide Poisoning. This procedure covers the information in detail and is available to all personnel through the DMS. Storage tanks, process tanks, containers and piping that contain cyanide are labelled to alert workers and identify their contents.

During the site walkover, lines observed were labelled to alert workers of their contents and direction of flow. All tanks observed were clearly labelled with individual tank identification numbers and emergency information panels. The facility has a decontamination policy and procedures for employees, contractors and visitors leaving the areas with the potential for skin exposure to cyanide. All visitors and facility workers receive induction training detailing information about the danger of cyanide, risks at the plant and safety information in general, including cyanide exposure procedures.

The decontamination procedure is discussed in initial training material, the NaCN Plant Normal Operating Instructions and Guidelines for Recognition and Medical Treatment of Cyanide Poisoning. The procedures detail the actions to be carried out by work personnel and visitors in the event of a potential contamination by cyanide. Anyone who suspects they may have ingested cyanide, or has come into contact with it in such a way that it may be absorbed through the skin, e.g. saturated clothing or incidental splashing, must follow the following in strict sequence:

- Alarm – activate the cyanide emergency alarm (e.g. radio, emergency button or pressure plate in shower).
- Shower – Remove all clothing and footwear and shower for a minimum of 15 minutes – or as directed by emergency
- responders.
- In addition to the shower, if cyanide has entered the mouth, commence and continue to spit, rinse, and spit until the mouth is free of cyanide.

Any contact with liquid within the cyanide plant is treated as a true exposure event and procedures are in place to ensure the affected person(s) are placed in an emergency shower, oxygenated, taken to the hospital and have blood samples

collected. For the audit period there were a total of 27 potential exposure events, cyanide in blood concentrations were reviewed for each of these events, they ranged from 0.03 mg/L to 0.42 mg/L.

Of those tested, only one returned a blood cyanide level greater than 0.3 mg/L cyanide. The 0.3 mg/L limit is an internal measure used by Orica as a trigger for reporting a cyanide exposure incident. A reading of 0.5 mg/L limit is noted as being the international standard at which signs of cyanide poisoning are evident. All such events are included as incidents in the Incident database and are followed up in accordance with the Incident Investigation procedure.

Plant Operators interviewed during the audit had a sound understanding of the procedure for cyanide exposure and decontamination and their responsibilities. The Basis of Safety booklet requires all employees to be familiar with the emergency response procedures. The Facility has its own on-site capability to provide first aid to workers exposed to cyanide. The site has its own on-site capability to provide first aid or medical assistance to workers exposed to cyanide. The site has an on-site first-aid clinic.

Inspections and interviews conducted during the audit confirmed an on-site Occupational Health Centre is staffed by a Registered Nurse during day shift with an on-call system during the evenings. In the event of a cyanide exposure, initial response will be administered by site medical staff prior to the injured person being transferred to Hospital via the patient transfer vehicle.

Emergency medical kits containing equipment suitable for the medical treatment of workers exposed to cyanide are located in all toxic refuges, and large emergency medical kits are located in both Control Rooms and the Occupational Health Centre. In addition to the Registered Nurse, all Plant Operators are required to have Advanced First Aid and Resuscitation Certifications which is required to be renewed annually.

Training records for a sample of Plant Operators were sighted. In the event an antidote is required, it is administered by the trained medical staff at the Local Hospital. No antidote is administered on-site and as such, training in this is not required. The Facility has developed procedures to transport exposed workers to locally qualified, off-site medical facilities.

It is the role of the Orica Company Doctor and the Site Occupational Health Nurse to visit the Local Hospital at least every two years to inform and educate hospital staff on the issues associated with cyanide exposure and confirm arrangements between the Yarwun facility and the local hospital regarding emergency response requirements. Additionally, the OEP states that as part of the development of the plan, emergency services in the Gladstone region along with local industry and the Gladstone Regional Council have been consulted.

In the event of a cyanide exposure, initial response will be administered by site medical staff prior to the injured person being transferred to the local hospital via the patient transfer vehicle. The injured person is accompanied during the journey and the cyanide antidote kit travels with the patient to the hospital. The patient transfer vehicle is stationed on-site and is available 24 hours a day.

In addition, the patient is sent to the hospital with a standardised letter advising the hospital staff that the patient has been referred for assessment following suspected exposure to cyanide. The letter also requests that the Senior Medical Officer, on-site, be notified upon the arrival of the patient. The Facility has alerted local hospitals, clinics, etc. of the potential need to treat patients for cyanide exposure, and the facility is confident that the medical provider has adequate, qualified staff, equipment and expertise to respond to cyanide exposures.

It is the role of the Orica Company Doctor and the Site Occupational Health Nurse to visit the Local Hospital at least every two years to inform and educate hospital staff on the issues associated with cyanide exposure and confirm arrangements between the Yarwun facility and the local hospital regarding emergency response requirements. Additionally, the OEP states that as part of the development of the plan, emergency services in the Gladstone region along with local industry and the Gladstone Regional Council have been consulted.

The facility is required to meet a series of commitments in order to maintain its Major Hazard Facility license, one of these commitments is to run emergency response scenarios over the next five years that will test the knowledge and

response capability of the Emergency Response Team (ERT) crews core skills that must be applied in response to a series of emergency events. Procedures are in place to investigate and evaluate cyanide exposure incidents to determine if the operations programmes and procedures, to protect worker health and safety and to respond to cyanide exposures, are adequate or need to be revised.

The Incident Management and Corrective Action procedure defines the requirements for immediate action, classification, reporting and investigation and corrective actions of Safety, Health, Environment and Security incidents. The scope of this procedure applies to all events, including cyanide exposures, which may:

- Cause or have the potential to cause injury, illness, damage or loss to company assets, damage to the environment or public alarm, and/or
- Are potentially notifiable to the relevant statutory authorities, including matters which may have national security implications involving Dangerous Goods.

A sample of investigations reports were reviewed for reported incidents during the period. The reports included an assessment of the root causes and actions for prevention. As a result of the reports and investigations the facility has initiated an improvement program on the cyanide facility to minimise potential exposures via plant and equipment leaks. The Yarwun Site Cyanide Exposure Improvements Program aims to imbed an operating philosophy around prevention of leaks before they appear and establish a methods to deal with any leaks as they appear in an urgent and effective manner.

3 Principle 3 – Monitoring

Ensure that process controls are protective of the environment.

3.1 Production Practice 3.1

Conduct environmental monitoring to confirm that planned or unplanned releases of cyanide do not result in adverse impacts.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 3.1**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 3.1 requiring environmental monitoring to be conducted to confirm that planned or unplanned releases of cyanide do not result in adverse impacts.

The facility does monitor for cyanide in discharges to surface water and in surface and ground water upgradient and downgradient of the site. The Yarwun site is governed by the Environmental Authority (EA) EPPR00872013. This document is administered by the Department of Environment and Science (DES). The Site's EA and Stormwater Management Plan contain the required monitoring for cyanide in discharges to surface water and in surface and ground water upgradient and downgradient of the site.

The Facility does not have a direct discharge to surface water under normal operating conditions. The facility uses a segregated stormwater system to capture, monitor, and if required, treat wastewater prior to discharging from licensed discharge points.

The facility has identified two separate effluent streams and manages them accordingly. Stormwater with no potential for contamination by cyanide flows off-site into natural drainage systems, whilst stormwater from within the cyanide production plant is channelled to a stormwater diversion system. The diversion system is equipped with a 3 megalitre (ML) capacity, retention pit. The pit has been installed to meet the environmental requirements of the regulatory authorities and is located on Orica's property, outside of the northern perimeter fence. The diversion pit only collects stormwater from Orica's Chemicals Complex (CC) and is a safeguard to prevent contaminated stormwater from being discharged to the environment. The stormwater diversion system also provides backup to the on-site first flush system.

Surrounding the cyanide plant is an impermeable surface designed to collect and direct run-off to a designated sump, this area, together with specific floors of the plant which receive direct rainfall, is drained to the First Flush Sump. The current operation of the first flush system is to collect the first 10 mm of rainfall and redirect any subsequent run-off to the Rainfall Event Management (REM) Tank. This ensures that any cyanide contaminated water is captured for recovery and/or treatment, rather than washed to stormwater. At the conclusion of the downpour the contents of the first flush sump and the REM tank can be pumped to two main effluent storage and treatment tanks, this prepares the First Flush System for the next rainfall event.

Both the stormwater diversion system pit and the First Flush Sump can be pumped to the two main effluent tanks situated on-site between the plant and the stormwater diversion pit. Within the effluent tanks, dilution and treatment (sodium hypochlorite dosing) may be used to remove any remaining cyanide from the water in order to meet site discharge criteria. The effluent ponds are tested before wastewater can be released from site, to a third-party managed, trade waste effluent facility. This trade waste facility was not included within the scope of this Recertification Audit. From the third-party operated trade waste facility, wastewater is discharged to the ocean.

The facility does not have an indirect discharge to surface water. The EA contains effluent and stormwater release limits for cyanide. The EA only references free cyanide, but the facility monitors for Weak Acid Dissociable (WAD) and total cyanide as well. The EA specified release limits are as follows:

- Chemicals Complex Effluent via Third Party Trade Waste: 1 mg/L free cyanide
- Chemicals Complex Stormwater via Third Party Trade Waste: 1 mg/L free cyanide
- Chemicals Complex stormwater: 0.011 (normal operation) and 0.077 (high-rainfall event) mg/L free cyanide

The EA and the Stormwater Management Plan contain the required monitoring frequencies for the above mentioned effluent streams and discharge points. No free cyanide was detect in the stormwater monitoring during the reporting period.

Free cyanide concentrations (or other species of cyanide for which there is a numerical standard established by the applicable jurisdiction) in groundwater at compliance points below or downgradient of the Yarwun facility are generally at or below levels that are protective of identified beneficial uses of the groundwater.

The most recent Ground Monitoring Event (GME) found that free cyanide remains present at concentrations exceeding the Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand and Australian State and Territory Governments (ANZAST 2018) screening values in groundwater at some monitoring locations on the site. Concentrations of free cyanide in groundwater that exceed the relevant trigger value have been delineated within the site boundary with no detected concentrations of total cyanide in the downgradient monitoring wells on the east side of Reid Road. Therefore, this indicates that total cyanide in groundwater has not migrated to the receiving environment.

The protected beneficial use of groundwater downstream of the Yarwun facility is the ecosystem functioning of a forested wetland supported by sand flats to the north-east of the Yarwun facility, approximately 150 m from the boundary fence. The facility's EA requires groundwater monitoring however, no numerical standard is referenced on the permit for cyanide in order to define the concentration protective of the beneficial use. In the absence of a standards specifically defined for the site and its locality, the Yarwun facility has adopted the ANZAST 2018 Guidelines of 0.011 mg/L for free cyanide. These Guidelines are the primary reference used by environmental regulators in Australia when determining environmental quality objectives for the protection of beneficial uses.

The EA only references free cyanide, however, in annual monitoring events, Orica analyse for both WAD and total cyanide levels as well. The facility has advised that independent testing results have shown WAD results to be similar to the free cyanide results and as such, they use free cyanide as the more conservative result. Of significance, the regulator has accepted monitoring of free cyanide as an effective indicator that the operation has operated within the intent of its obligations.

The facility limits the atmospheric emissions of hydrogen cyanide gas and dust such that the health of workers and the community are protected. The facility has the following licensed atmospheric discharge point for the cyanide plant; CN Drier Scrubber Vent 1/2/Warehouse Extraction Cyclone, regulatory release points 4C/9C/C24.

The licence limit for the release point is 35 mg/Nm3 (dry) for gaseous hydrogen cyanide and 70 mg/Nm3 (dry) for particulate sodium cyanide. Monitoring is conducted annually, though this can be scaled up or down based on results. Monitoring of these parameters is conducted by a third party with appropriate testing certification. The most recent emissions monitoring program found that all results for sources on the cyanide plant were compliant with licence limits. Personnel limits are based on HCN concentrations in air of 10 ppm instantaneously and 4.7 ppm continuously over eight hours.

The facility does monitor for cyanide in discharges to surface water and in groundwater both up and down gradient of the site. Discharges to surface water are monitored in accordance with the information discussed above.Groundwater monitoring is undertaken on an annual basis, and biannually at key locations. Monitoring is conducted at frequencies adequate to characterise the medium being monitored and to identify changes in a timely manner.

The facility's current EA does not specify wells to be sampled, parameters or a sampling frequency, though it does require the submission of an "Annual Groundwater Report" addressing, amongst other things, an assessment of groundwater quality results and an assessment of the potential for environmental harm. Monitoring is conducted at frequencies adequate to satisfy this operating condition.

4 Principle 4 – Training

Train workers and emergency response personnel to manage cyanide in a safe and environmentally protective manner.

4.1 Production Practice 4.1

Train employees to operate the facility in a manner that minimizes the potential for cyanide exposures and releases.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 4.1**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 4.1 requiring employees to be trained to operate the plant in a manner that minimises the potential for cyanide exposures and releases.

The operation does train workers to understand the hazards of cyanide and refresher training is periodically conducted. The Site maintains a training matrix, which outlines minimum training requirements for staff positions, and relevant contractors, across operational areas. The training includes site inductions and Cyanide Basis of Safety training material which is a requirement for all employees and contractors who work in or near operational cyanide areas. The training and induction material provides awareness of cyanide hazards, minimum PPE requirements, cyanide management controls, response to spills and emergencies, and basic first aid requirements.

Cyanide Basis of Safety training has a validity of three years before refresher training is required to be completed. Employees and who undertake work on the plant are required to re-sit the General Site Induction every two years and contractors every year. Employees are trained prior to working with cyanide and undertake competency based training depending on their position. These training requirements are outlined in the training plan document and are managed/tracked in the Learning Management System. There are automatic notifications for training requirements, and training material is reviewed every two years.

Interviews with personnel and personnel training files confirmed that workers are trained in cyanide hazards prior to undertaking works and refresher training is provided. The Facility trains workers in the use of personal protective equipment (PPE) and when and where this equipment is required.

PPE training is covered in site inductions, Cyanide Basis of Safety training and job specific training materials. There are specific management and departmental procedures regarding PPE storage, maintenance and which type of PPE is required in the different operations. The minimum cyanide PPE identified in the training materials are listed below:

- Hard hat
- Overalls
- Safety glasses
- Hearing protection
- Second layer of clothing (under overalls)
- Safety boots
- Chemical gloves.

Interviews with employees confirmed that training on how and when to use PPE is provided.

The Facility trains workers to perform their normal production tasks with minimum risk to worker health and safety and in a manner that prevents unplanned cyanide releases. The Site maintains a training matrix, which outlines minimum training requirements for staff positions. Employees are trained prior to working with cyanide and undertake specific competency based training to perform tasks.

New employees are partnered with experienced operators to learn the job and must demonstrate competency prior to working unsupervised. The training and induction material provides awareness of cyanide hazards, minimum PPE requirements, cyanide management controls, response to spills and emergencies, and basic first aid requirements.

Employees are trained prior to allowing them to work with cyanide. The training elements necessary for each job are identified in training materials. The Site training matrix identifies the training materials, including site inductions, SHEC program, Basis of Safety Program, emergency response, health and safety requirements etc., and also specific training elements necessary for each job.

Refresher training on normal production tasks are provided to ensure that employees continue to perform their work in a safe and environmental protective manner. Refresher training takes place every 3 years. Refresher training records were evident.

Employees are trained prior to allowing them to work with cyanide. Workers must complete the specific training materials for their position, as identified in the training matrix, and demonstrate competency before being allowed to perform work. New employees are also teamed with an experienced operator for a period of time until they are deemed competent, this is generally in the order of four to six weeks but varies according to the complexity of the work area. New employees are not permitted to work unsupervised until the supervisor is satisfied that the person can complete the necessary tasks safely in accordance with procedures.

Training is provided by appropriately qualified personnel. Training is provided in each functional operational area by appropriately trained subject matter specialists. These trainers are generally experienced operational employees with significant expertise and experience in the operations. Trainers also receive external training in field based training and assessment.

The Site evaluates the effectiveness of cyanide training by testing and observation. Yarwun training is competency based. Evaluation is required to confirm competency standards have been achieved. Competency and training evaluations methods vary and include:

- Written assessment
- Oral assessment
- Practical demonstration
- Observation of behaviours.

The Plant Operator assessments are based on national competency requirements. New personnel are teamed up with an experienced operator and must demonstrate competency before being allowed to perform work unsupervised.

4.2 Production Practice 4.2

Train employees to respond to cyanide exposures and releases.

The operation is ☒ **in full compliance with** / ☐ in substantial compliance with / ☐ not in compliance with **Production Practice 4.2**

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 4.2 requiring employees to be trained to respond to cyanide exposures and releases.

The Facility does train workers in the procedures to be followed if a cyanide release is discovered. Workers are trained in procedures to be followed if a cyanide release is discovered during the Site Induction, Basis of Safety training and job specific training.

Workers interviewed could describe the response processes including evacuation to an upwind location, use of safety showers, raising the alarm and reporting the incident and how the use of cyanide antidotes is only carried out by medical professionals. The Site also has dedicated emergency responders that are trained in higher level response actions.

The Facility does train workers to respond to worker exposure to cyanide and routine drills are used to test and improve their response skills. Mock drills are conducted with workers to train them and test their response skills. The facility has conducted worker exposure scenarios. The drills are recorded and reports assess the performance of the exercise and improvements needed.

Training records are retained throughout an individual's employment, documenting the training they have received and including the names of the employee and the trainer, the date of training, the topics covered, and how the employee demonstrated an understanding of the training materials. Electronic training records for members of the facility were reviewed and contained evidence of training including course content, assessments and certificates.

All workers receive training on personal protective equipment and emergency response procedures during a spill or exposure in site inductions and Basis of Safety training. Emergency drills are evaluated from a training aspect to determine if personnel have the knowledge and skills required for effective response.

The drills are recorded in the Emergency Response Debrief Document and these reports assess the performance of the exercise and if improvements are needed. If required, corrective actions are developed, assigned and entered into the Environment Health Safety (EHS) management system (Enablon) for implementation and tracking.

5 Principle 5 – Emergency response

Protect communities and the environment through the development of emergency response strategies and capabilities.

5.1 Production Practice 5.1

Prepare detailed emergency response plans for potential cyanide releases.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 5.1**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 5.1 requiring a detailed emergency response plan for potential cyanide releases.

The Facility has developed an Emergency Response Plan to address potential releases of cyanide that may occur on site or may otherwise require a response. The Yarwun Operations Emergency Plan (OEP) has been developed to identify potential emergency scenarios and define combat strategies that control or limit any effect that an emergency or potential emergency may have on personnel, the site/business, the facilities and neighbouring areas.

The OEP is the key document describing the response actions for site personnel during an internal emergency. The OEP was developed in accordance with the Orica corporate emergency response requirements detailed in Orica Group Procedure SHES Emergency Management.

The operations emergency response plan and associated documentation does consider the potential failure scenarios appropriate for site-specific environmental and operating circumstances. Potential failure scenarios have been addressed as follow:

- Catastrophic release of hydrogen cyanide has been described in the OEP Combat Strategy Event: Loss of Containment of Hydrogen Cyanide.
- Releases during loading and dissolution operations has been described in the OEP Combat Strategy Event: Loss of Containment of Hydrogen Cyanide.
- Releases during fires and explosions has been described in the OEP Event: Surface Infrastructure Fire (Fire in the Cyanide Warehouse).
- Pipe, valve and tank ruptures has been described in the OEP Combat Strategy Event: Loss of Containment of Hydrogen Cyanide.
- Power outages and equipment failures has been described in the Ammonia Supply – NaCN Plant Abnormal Operating Instructions, Trip Schedule. The site has backup generators that kicks in as soon as a grid power failure occurs which will result in no loss in containment. If the generators should fail there is still an uninterrupted power supply through the control system to power down the plant in a safe state.

Overtopping of ponds, tanks and waste treatment facilities has been described in the Site Effluent System Abnormal Operating Instructions. The site is designed as such a so that any over topping will be captured in secondary containments with controlled release to an external council managed waste water treatment facility or creek depending on the water quality results after testing. The operation's emergency response plan and associated documentation further describes emergency response as follow:

- Specific response actions, as appropriate for the anticipated emergency situations, such as evacuating site personnel and potentially affected communities from the area of exposure has been described in the OEP.
- Use of cyanide antidotes and first aid measures for cyanide exposure has been described in the Management of Cyanide Poisoning Procedure.
- Control of releases at their source has been addressed in the OEP combat strategies.

Containment, assessment, mitigation and future prevention of releases has been addressed in the Safety Health Environment and Security (SHES) Events Management procedure.

5.2 Production Practice 5.2

Involve site personnel and stakeholders in the planning process.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 5.2**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 5.2 requiring the Facility to involving site personnel and stakeholders in the planning process.

The OEP is the key emergency management document that describes the response actions for site personnel during an onsite emergency. The OEP was developed in accordance with the Orica corporate emergency response requirements and notes that employees and the relevant external community emergency service organisations shall be consulted during the development of the emergency plan. As a MHF, the operations' OEP must meet national legislated guidelines and pass an assessment by the Research and Scientific Branch of Queensland Fire and Emergency Services before a MHF license is issued (or renewed) for the facility.

The OEP states that as part of the development of the plan, emergency services in the Gladstone region along with local industry and the Gladstone Regional Council have been consulted. Additionally, to maintain effectiveness of the OEP, Orica continues to consult and discuss emergency response training and preparedness with its employees, industrial neighbours and the Queensland Fire and Emergency Services (QFES), through the Mutual Aid Group of Gladstone (MAGG).

The OEP identifies the following stakeholders:

- Workers in the area
- Site population including contractors
- Orica Senior Management
- Adjacent industry
- Community groups including the Gladstone Regional Council Disaster Management Group, MAGG and Gladstone Industry Leadership Group.
- Local Council
- Visitors and people passing through the local area
- Regulatory authorities associated with the Site's Licence to Operate

Given the site is classed as a Major Hazards Facility, there is a requirement for a comprehensive assessment of Orica's risk structures and management systems by the Hazardous Chemical Industries Branch to ensure the nationally legislated standards are met before issuing or renewing a licence to operate. This process is repeated every five years.

The Orica Group Procedure – Safety, Health, Environment and Security (SHES) Emergency Management requires that Orica:

- Consult with employees, neighbours, regulators and emergency services during development of emergency response plans. Include customers, where the site is located on customer's property.
- Provide all personnel with sufficient information about the emergency response plan during their induction, so that they know what actions to take in an emergency.
- Make emergency response plans available to external support agencies, statutory authorities, neighbours and the public, as required by local regulations

Orica is a founding member of the MAGG. This group consists of neighbouring major companies, emergency services personnel (Fire, Police, Ambulance), Work Health and Safety (WH&S) representatives and Local Government. The group meets quarterly to discuss emergency response. In the event of an emergency one of the members can request mutual aid and assistance will be provided. Through the group Orica involves the local stakeholders in the emergency response planning process.

During the audit period, relevant employees have been involved in the emergency response planning process through initial training and simulation exercises and debriefs. Employees are also involved in the planning and revision of site procedures and plans thorough the document review process.

Orica has made potential affected communities aware of the nature of their risks associated with accidental cyanide releases and consulted with them directly or through community representatives regarding what communications and response actions are appropriate.

Emergency coordinator noted that Orica has a cyanide awareness brochure kept at the Gladstone library. The Facility has identified external entities having emergency response roles, and involved those entities in the cyanide emergency response planning process. The OEP states that as part of the development of the plan, emergency services in the Gladstone region along with local industry and the Gladstone Regional Council have been consulted. Additionally, to maintain effectiveness of the OEP, Orica continues to consult and discuss emergency response training and preparedness with its employees, industrial neighbours and the QFES, through the MAGG.

The operation engages in regular consultation and communication with stakeholders to assure that the emergency response plan addresses current conditions and risks. The facility has established processes to engage in regular consultation or communication with internal and external stakeholders.

The facility undertook a Safety Case Assessment, workforce consultation mechanisms were considered in this assessment and there are several communication methods in use. The primary communication tool is the monthly site Safety, Health and Environment (SHE) Committee meeting managed by the SHE Manager. The SHE Committee minutes are saved on the Yarwun Site Database which is accessible to all employees. The SHE Manager also sends an email after the meeting to all site employees containing a link to this folder.

There are monthly area toolbox talks within each operational area with records managed by the respective department leads. Site Manager Communication sessions are held quarterly with employees containing a SHE component and site emails from the SHE Manager on relevant SHE issues affecting site.

All employees are involved throughout each year in planned emergency evacuation exercises managed by the Training Co-ordinator which test the effectiveness of the OEP. Many of the exercises involve evacuation from particular areas within the site and are based on a particular scenario occurring e.g. fire. Employees are trained, and expected, to follow the OEP and assemble at their nominated emergency assembly areas where a manual roll call is conducted.

Orica is on the Mutual Aid Group of Gladstone. This group consists of neighbouring major companies, emergency services personnel (Fire, Police, Ambulance, WH&S representatives and Local Government. The group meets quarterly to discuss emergency response. In the event of an emergency one of the members can request mutual aid and assistance will be provided. Through this group it is communicated what the current emergency response plan is at the Yarwun facility and what potential assistance is available. Orica can share ideas to determine if the plan is current and potential risks are addressed.

Orica has made potential affected communities aware of the nature of their risks associated with accidental cyanide releases and consulted with them directly or through community representatives regarding what communications and response actions are appropriate.

5.3 Production Practice 5.3

Designate appropriate personnel and commit necessary equipment and resources for emergency response.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 5.3**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 5.3 requiring designated appropriate personnel and committed equipment and resources for emergency response.

The emergency response documentation:

- Does designate primary and alternate emergency response coordinators.

Section 15 of the OEP identifies the Incident Controller (IC) as the Orica employee responsible for leading the emergency response team, generally this role is occupied by the facilitator of the plant affected by the incident. The IC may be relieved by a designated member of the QFES if external assistance is involved. Additionally, there is both an Incident Response Team (IRT) and an Incident Management Team (IMT) each with a designated leader during an emergency response.

- Identifies Emergency Response Teams.

Orica Yarwun has both an IRT and IMT, each with different roles and responsibilities during an emergency situation. Section 15.2 of the OEP describes the role of the IRT which is predominately based on physical response actions, the IRT is made up of shift personnel. Whilst the IMT (section 15.3 of the OEP) is made up of members of site management teams and designated specialists, the IMT is responsible for external interfacing and providing technical support to the IRT.

- Requires appropriate training for emergency responders.

Section 24 of the OEP states the required emergency response training for all personnel onsite. At a minimum, all personnel are required to have completed the site safety induction, whilst personnel with an emergency services role are required to complete structured emergency response training units in accordance with nationally accredited competencies. Training details including frequencies and refresher training is contain in the site training matrix.

- Includes call-out procedures and 24-h contact information for the coordinators and response team members.

Appendix A of the OEP contains the list of contact information for notification of key personnel. This list includes off-site emergency contacts, neighbouring industrial contacts and other emergency services. Section 17 of the Operation Emergency Management Plan (OEMP)details the afterhours and additional support emergency response process which

involves contacting Orica Emergency Response Service (ERS) which is a third-party emergency response service provider.

- Specifies the duties and responsibilities of the coordinators and team members.

Section 15 of the OEP specifies the duties and responsibilities of the incident response teams.

- Lists all emergency response equipment that should be available.

Section 12 of the OEP provides a shortlist of emergency response resources available onsite, and accessible to all personnel. Appendix L of the OEP contains a full manifest of emergency response equipment available to the IRT during an emergency event.

- Include procedures to inspect emergency response equipment and assure its availability when required.

Emergency response equipment is inspected in accordance with legal and other requirements and available when in key locations across the plant and control room. Inspections is scheduled through SAP and procedures have been developed for this purpose. Inspection records were evident.

- Describes the role of outside responders, medical facilities or communities in emergency response procedures.

Section 15.9 of the OEP states the role of the QFES in the event of an emergency situation requiring external assistance. Medical facilities have been made aware of their possible need to assist should the site clinic need to transfer a patient(s). The facility confirmed that outside entities included in the OEP are aware of their involvement and are included as necessary in mock drills or implementation exercises.

External responders, medical facilities and other outside entities have been advised of their roles and are aware of aid requirements during an emergency response. QFES would be the primary external responder in the event of a cyanide release scenario and the Department has been involved in major response exercise drills in the past.

Due to the nature of the facility, and specialised training requirements of qualified external responders, emergency response is largely self-contained and or limited to HAZMAT or other specialised agencies. All outside entities listed within the site OEP have been provided with a copy of the Plan. Outside entities are included within both tabletop and field exercises.

5.4 Production Practice 5.4

Develop procedures for internal and external emergency notification and reporting.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 5.4**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 5.4 requiring development of procedures for internal and external emergency notification and reporting.

The OEP describes the procedure and provides contact information for notifying management, regulatory agencies, outside response providers and medical facilities as appropriate. The OEP contains an Emergency Response Plan – flow diagram which includes prompts for contacting external response providers. The contact names, numbers and contact instructions for key Orica contacts are contained within Appendix A.

The OEP includes consideration of the role of outside responders including QFES and QLD Ambulance (Gladstone) who have been provided a copy of the plan. Notifications to local community industrial neighbours may be initiated via short

message service (SMS) text messaging service through the Orica Emergency Response Service, followed up by landline communication with the industrial neighbours that may be exposed to the event.

The emergency response documentation includes procedures and contact information for notifying potentially affected communities and communication with the media. Notifications to local community industrial neighbours will be initiated via SMS text messaging service through Orica ERS, this can be followed up by landline communication with the industrial neighbours that may be exposed to the event.

A member of the IMT is responsible for external communications and liaison with the media if applicable. The operation does have a written procedure for notifying ICMI of any significant cyanide incidents, as defined in ICMI's Definitions and Acronyms document. The procedure has been documented in the Orica SHES Events Management Procedure. According to Facility personnel there has been no significant cyanide incidents that have occurred that had to be reported to the ICMI.

5.5 Production Practice 5.5

Incorporate remediation measures and monitoring elements into response plans and account for the additional hazards of using cyanide treatment chemicals.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 5.5**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 5.5 requiring the Facility to incorporate monitoring elements that account for the additional hazards of using cyanide treatment chemicals into response plans and remediation measures.

Procedures have been developed to describe specific, appropriate remediation measures, decontamination of contaminated media and management and/or disposal of spill clean-up debris, and provision of an alternate drinking water supply, as appropriate. The Decontamination of Equipment in Cyanide Service procedure describes the decontamination process for cyanide equipment, requiring that it be treated within the area delineated by blue lines using hot condensate, dilute sodium hypochlorite or weathering processes depending on the type of equipment and degree of contamination. The procedure describes monitoring techniques to confirm the equipment is free of contamination.

Procedures were also evident to clean up a cyanide spill on a unsealed surface. The process includes delineation of the spill and the excavation of visibly impacted material (e.g. soil) for re-treatment within the plant. The process also include testing the area of the spill for the presence/absence of cyanide. Drinking water for the region is supplied from Awonga Dam, approximately 25 km away and is not at risk from cyanide incidents. Local groundwater was reported to be too saline to be used as drinking water.

No natural surface waters are located within the Yarwun facility and consequently the Yarwun OEP does not contain a reference prohibiting the use of chemicals such as sodium hypochlorite, ferrous sulfate and hydrogen peroxide to treat cyanide that has been released into surface water. However, the Cyanide Emergency Response Guide that has been developed for offsite releases and guides response actions should there be a release to surface water does include a clear prohibition on the use of these chemicals to treat cyanide release to surface waters.

Potentially cyanide impacted stormwater is contained on site and is tested prior to discharge. If impacted, it is pumped back to the plant for treatment or to trade waste if acceptance criteria are met.

5.6 Production Practice 5.6

Periodically evaluate response procedures and capabilities and revise them as needed.

	☒ **in full compliance with**	
The operation is	☐ in substantial compliance with	**Production Practice 5.6**
	☐ not in compliance with	

Summarise the basis for this Finding/Deficiencies Identified:

Orica is in FULL COMPLIANCE with Production Practice 5.6 requiring the Facility to periodically evaluate response procedures and capabilities and revise them as needed.

The emergency response documentation contains provisions for periodically reviewing and evaluating its adequacy and they are being implemented. The OEP is subject to continuous improvement, and updated annually as a minimum or when deemed necessary, such as:

- Following an emergency incident
- Following a Near-Miss incident
- In conjunction with changes in legislation
- In conjunction with changes in the quantity or nature of the site's hazardous substances
- In conjunction with any update, revision or feedback on the MHF Safety Case
- In conjunction with changes to surrounding land use
- Following simulated emergency exercises
- Following audits
- As a result of consultation with QFES

The emergency plan was last updated in November 2022.

Mock emergency drills are conducted periodically to test response procedures for various exposure scenarios. A range of mock drills were conducted on site during the audit period. These ranged from internal exercises amongst shift crews, internal exercises facilitated by an outside provider and major drills involving external agencies.

The facility is required to meet a series of commitments in order to maintain its Major Hazard Facility license, one of these commitments is to run emergency response scenarios that will test the knowledge and response capability of the ERT crews core skills that must be applied in response to a series of emergency events.

A range of mock drills were conducted on site during the audit period. These ranged from internal exercises amongst shift crews, internal exercises facilitated by an outside provider and external agencies. Formal training is reinforced through a program of simulated emergency exercises. Both table-top and field-based exercises are performed. The simulated emergency program covers a range of emergency scenarios and all shift teams. Evidence were sighted of mock emergency drills that included cyanide release and cyanide exposure scenarios.

Formal training is reinforced through a program of simulated emergency exercises. The Senior Specialist SHES- Safety is responsible for the publishing of an annual simulated emergency exercise plan and the Senior Product Line Managers, are responsible for the execution of the program. An exercise is required to be performed at a frequency of at least every six months. Both table-top and field-based exercises are performed. The simulated emergency program covers a range of emergency scenarios and all shift teams.

The program is used to test the adequacy of the site OEP and the emergency response procedures. During review of each exercise, suggested improvements are noted for implementation. The Senior Specialist SHES- Safety is responsible for ensuring that improvement actions are maintained in a register and activated in accordance with the designated priority. The Emergency Response Team (ERT) training schedule put together by the training department is based on a three-yearly cycle and is split into two blocks, one is a training component and the other an emergency scenario.

In 2017 to 2018 there was an influx of new operations personnel to the site due to change in product demand and the focus was on getting the basic emergency response skills embedded into the crews through face to face training which took precedence over staged emergency exercises. In 2019 the training scenario reverted to Orica's standard format with the introduction of a major emergency scenario in the second block of the year for each crew. In 2019 the scenario was based upon a traffic incident with an ammonia tanker, resulting in a leak, this scenario covered off all of the skills that would also be applied to a major liquid cyanide spill or release of HCN gas type scenario.

The facility has provisions to evaluate the plan after an emergency that required implementation of the plan, and for revising the plan as necessary. The OEP is subject to continuous improvement, and updated annually as a minimum or when deemed necessary, such as:

- Following an emergency incident
- Following a Near-Miss incident
- In conjunction with changes in legislation
- In conjunction with changes in the quantity or nature of the site's hazardous substances
- In conjunction with any update, revision or feedback on the MHF Safety Case
- In conjunction with changes to surrounding land use
- Following simulated emergency exercises
- Following audits
- As a result of consultation with QFES

6 Important Information

Your attention is drawn to the document titled – "Limitation Statement", which is included in Appendix A of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Limitation Statement document does not alter the obligations WSP has under the contract between it and its client.

APPENDIX A
Limitation Statement