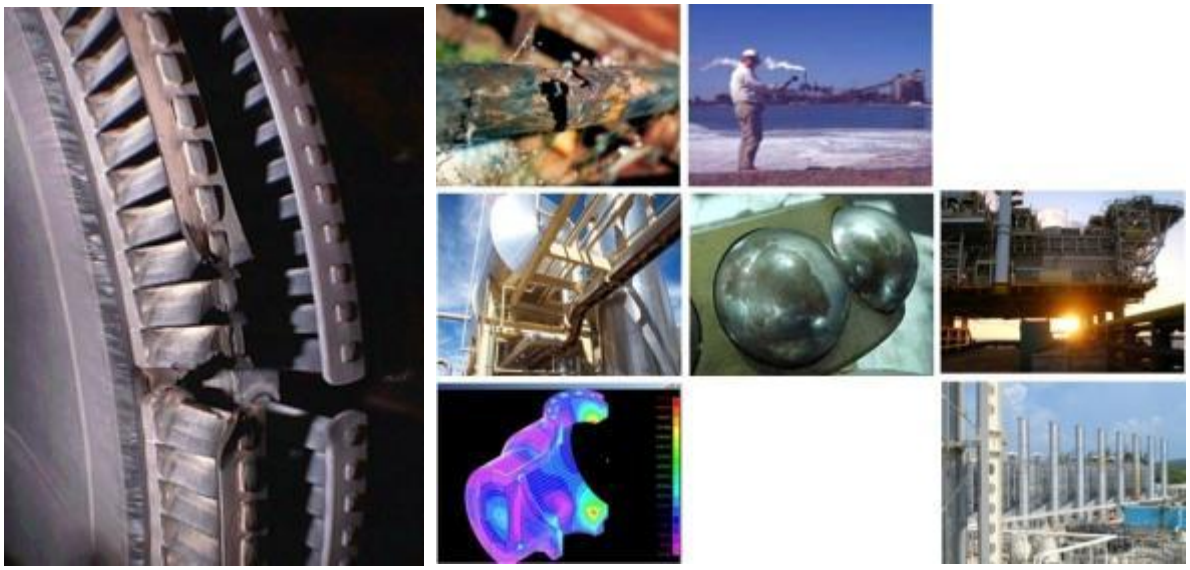
Appendix G

Environmental Referral, North West infrastructure Multi User Iron Ore Export (Landside) Facility

Noise Assessment

SVT ENGINEERING CONSULTANTS

NORTH WEST INFRASTRUCTURE PROPOSED MULTI USER IRON ORE EXPORT FACILITY



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EXECUTIVE SUMMARY

Background

North West Infrastructure (NWI) is in the process of developing port and associated facilities within the precincts of the Port Hedland Port Authority. This includes two berths within South West Creek to provide for the export capacity of 50 million tonnes per year, along with supportive infrastructure incorporating stackers and loaders, conveyors, stockyard, and rail loop

The objectives of the environmental noise impact assessment are to:

- Develop a noise model of the proposed port operations.
- Determine compliance at sensitive receivers with the Environmental Protective (Noise) Regulations 1997.
- Where necessary, determine noise controls measure required to reduce the noise levels at the receivers to the assigned levels.

Noise arising from rail operations (rail loop and connection to trunk line) will be assessed in a separate rail referral, the details of which are dependent on the rail solution(s) currently being negotiated with third party rail operators by NWI shareholders.

Applicable Regulations

For Port operations the Environmental Protection (Noise) Regulations 1997 which operate under the *Environmental Protection Act 1986* are applicable. The Regulations specify maximum noise levels (assigned levels), which are the highest noise levels that can be received at noise-sensitive premises, commercial and industrial premises. Assigned noise levels have been set differently for noise sensitive premises, commercial premises, and industrial premises. For noise sensitive premises, i.e. residences, an "influencing factor" is added to the assigned noise levels. Penalties are also applied for noise that has tonal characteristics. The maximum allowable noise levels for the various point receivers at Port Hedland are given in Table E-1.

Table E-1 Assigned noise levels and maximum allowable levels for noise sensitive premises

Position	L_{A10} Maximum Allowable noise levels in dB(A)		
	Day	Evening	Night
Brearley St	42	37	32
Hospital	42	37	32
Police Station	57	52	47
Pretty Pool	40	35	30
South Hedland	40	35	30
Wedgefield[1]	49	44	39

[1] Wedgefield is referring to the Residential camp, and is considered 'Residential'

Modelling

A noise model of the port facility was developed using SoundPlan noise modeling software. The inputs to the model consisted of noise source data, ground topographical data, meteorological data and sensitive receivers. The port facility noise model consists of approximately 50 noise sources. Worst case meteorological conditions as defined in *Guidance for the Assessment of Environmental Factors, No.8, May 2007*, which include wind direction, wind speed and temperature inversion were also used. See Table for the predicted received levels at the sensitive receivers without any noise control.

Port Facility Compliance and Noise Control

NWI operations are located at the South West creek in the Town of Port Hedland. Due to land use planning there is minimal buffer between industry and sensitive receptors. NWI is committed to reducing noise levels. Noise control recommendations have been based on the pre-existing assigned levels for Port Hedland by the Environmental Protection (Noise) Regulations 1997.

Noise Control

The modelled recieved levels at all locations except for the Hospital comply with the assigned levels. To reduce the recieved noise level at the Hospital to the maximum allowable level it is recommended that the following noise controls be implemented:

1. Either low noise idlers or shielding of idlers on the following conveyors:
    - CV 502
    - CV 501
    - CV 401
    - CV 402
    - CV 511
2. Either shielding or specifying the following 800 kW drives to 82 dB(A) @ 1m:
    - 2 x CV 502 Drives
    - 2 x CV 501 Drives
    - 2 x CV 511 Drives

If the recommended noise controls are implemented the received noise level at the Hospital will comply with the regulation as shown in Table E-2.

Table E-2 Summary of Received Levels

Receiver Locations	Received Levels without noise control	Received Levels with noise control	Assigned Levels
Brearley St	32.0	26.3	32
Hospital	37.6	31.9	32
Police Station	42.3	36.6	47
Pretty Pool	23.5	18.9	35
South Hedland	23.8	20.4	35
Wedgefield	30.7	25.8	65

TABLE OF CONTENTS

1. INTRODUCTION

SVT was commissioned by Coffey Environments Australia Pty Ltd to undertake an environmental noise impact assessment of the proposed North West Infrastructure (NWI) port facility expansion in Port Hedland, Western Australia. The objectives of the study are to determine noise emission levels in order to:

- Develop a noise model of the proposed port operations.
- Determine compliance at sensitive receivers with the Environmental Protective (Noise) Regulations 1997.
- Where necessary, determine noise controls measure required to reduce the noise levels at the receivers to the assigned levels.

1.1 Applicable Documents

The following lists the applicable documents.

- Environmental Protection Act 1986
- Environmental Protection (Noise) Regulations 1997

1.2 Scope of Work

The major activities undertaken during the course of this study are given below.

- Modelling of the multi-user port facility assuming similar equipment of a typical iron ore port facility.
- Compare the modelled results with the pre-existing assigned levels for Port Hedland by the Environmental Protection (Noise) Regulations 1997.
- Where necessary, determine noise control measures required.

2. NWI PORT HEDLAND OPERATIONS

2.1 Introduction

The NWI Multi-User port facility is located at the South West Creek site in Port Hedland. The membership of NWI comprises three emerging miners, namely:

- Atlas Iron Limited
- Brockman Resources Limited
- FerrAus Limited

The port facilities will commence construction in two stages. These capacities are based on installed equipment capacities and exclude port limitations. The equipment quantities and the iron ore product capacity for each stage are listed in Table 2-1.

Description	Stage One	Stage Two
Port Capacity	36 Mtpa	50 Mtpa
Car Dumpers	1	1
Stockyard	6 piles	8 piles
Stackers	2	2
Reclaimers	1	1
Shiploading Berths	1 loading, 1 lay-bye	2 loading

Table 2-1 Stage One and Stage Two Capacity and Equipment Quantities

This study will assess Stage Two of the NWI port facility development.

3. PORT HEDLAND AND SURROUNDING AREA

3.1 Port Hedland

Within Port Hedland there are industrial, commercial and residential areas. The industrial areas are concentrated at Nelson Point and Finucane Island, the commercial area is located at the Town centre of Port Hedland and the residential area is located along the west end of Port Hedland.

The industrial activities in Port Hedland are primarily due to port operations associated with the shipping of iron ore and salt. Other operations include handling and shipping of manganese, copper concentrate and chromate, and the port also operates as an export port for livestock. Of these activities, due to scale, the BHP Billiton facilities at Nelson Point and Finucane Island dominate noise impacts and they are the greatest contributors within the town at the west end.

3.2 Wedgefield Industrial area

The residential area of Wedgefield is some 6 km from the NWI proposed port operations at Port Hedland as shown in Figure 3-1.

3.3 South Hedland

South Hedland is a town, consisting of a residential area and a shopping and office area (zoned commercial). South Hedland is some 9 km away from Port Hedland as shown in Figure 3-1.

Figure 3-1 Port Hedland and Surrounding Areas

4. APPLICABLE REGULATIONS AND ASSIGNED LEVELS

4.1 Summary of Legislation

Noise management in Western Australia is implemented through the Environmental Protection (Noise) Regulations 1997 which operate under the *Environmental Protection Act 1986*. The Regulations specify maximum noise levels (assigned levels), which are the highest noise levels that can be received at noise-sensitive premises, commercial and industrial premises.

Assigned noise levels have been set differently for noise sensitive premises, commercial premises, and industrial premises. For noise sensitive premises, i.e. residences, an "influencing factor" is incorporated into the assigned noise levels.

The Regulations define three types of assigned noise level:

- L_{Amax} assigned noise level means a noise level which is not to be exceeded at any time;
- L_{A1} assigned noise level which is not to be exceeded for more than 1% of the time; and
- L_{A10} assigned noise level which is not to be exceeded for more than 10% of the time.

The L_{A10} noise limit is the most significant for this study since this is representative of continuous noise emissions from the port facility.

Table 4-1 shows the assigned noise levels for noise sensitive premises. As can be seen from the table the time of day also affects the assigned levels for noise sensitive residences.

Table 4-1: Assigned noise levels for noise sensitive premises[2]

Type of premises receiving noise	Time of day	Assigned Level dB(A)		
		LA 10	LA 1	LA max
Locations within 15m of a building directly associated with a noise sensitive use.	0700 to 1900 hours Monday to Saturday	45+ influencing factor	55+ influencing factor	65+ influencing factor
	0900 to 1900 hours Sundays and public holidays	40+ influencing factor	50+ influencing factor	65+ influencing factor
	1900 to 2200 hours all days	40+ influencing factor	50+ influencing factor	55+ influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35+ influencing factor	45+ influencing factor	55+ influencing factor
Locations further than 15m from a building directly associated with a noise sensitive use.	All hours	60	75	80
Commercial premises	All hours	60	75	80

[2] Environmental Protection (Noise) Regulations 1997

Type of premises receiving noise	Time of day	Assigned Level dB(A)		
		LA 10	LA 1	LA max
Industrial and utility premises	All hours	65	80	90

Since the port facilities operate 24 hours a day, the most stringent noise limit that would apply to noise emissions will occur during the night time hours.

Table 4-2: Assigned penalties for intrusive or dominant noise characteristics.[2]

Adjustment where noise emission is not music these adjustments are cumulative to a maximum of 15 dB		
Where tonality is present	Where modulation is present	Where impulsiveness is present
+5 dB	+5 dB	+10 dB

Noise levels at the receiver are subject to penalty corrections if the noise exhibits intrusive or dominant characteristics, i.e. if the noise is impulsive, tonal, or modulated. That is, the measured or predicted noise levels are increased by the applicable penalties, and the adjusted noise levels must comply with the assigned noise levels. Regulation 9 sets out objective tests to assess whether the noise is taken to be free of these characteristics.

The regulation does not deal with:

- Noise within one premises, for example in a workplace;
- Noise from traffic on roads, or trains, except model trains;
- Noise from aircraft, except model planes; and
- Noise from safety warning devices.

4.2 Assigned Level Evaluation for Port Hedland

As the assessment is for a multitude of different premises, different assigned noise levels will be applicable to different areas of the town. As can be seen from Table 4-1 different premises zoning classifications have different assigned levels. So industrial premises have an assigned L_{A10} value of 65dB(A), commercial premises have an assigned L_{A10} value of 60dB(A) while residential premises have different assigned levels depending on the day of the week and the time of the day and surrounding land use. The relevant premises type to each noise monitoring positions is shown in Table 4-3.

Table 4-3 Zones relevant to each monitoring position

Residential	Commercial (60dB(A))
Darlot Street Hospital Rural Village Pretty Pool South Hedland Golf Course Cook Point Brearley Avenue Wedgefield	Police Station (Influencing Factor = 17dB for residents at police station) Port Hedland Shopping Centre South Hedland Telstra Building

The most stringent assigned levels are applicable to residential areas at night time (22:00 to 07:00), on weekends and public holidays. Residential areas will therefore be the focus of the assessment undertaken here.

4.3 Influencing Factors

The influencing factor is calculated at noise sensitive premises and the calculated value is added to the assigned noise levels as shown in Table 4-1. The influencing factor depends on land use zonings within 100 metre circles and 450 metres radius from the noise receiver. The value is dependent on:

- the proportion of industrial land use zonings;
- the proportion of commercial zonings; and
- the presence of major roads within the circles.

Due to the large number of noise sensitive premises an influencing factor has not been calculated for each premise, but rather an influencing factor has been calculated for specific areas as shown in Figure 4-1 and Table 4-4, which is considered representative of the area. As can be seen from the figure, and as expected, the influencing factor and therefore the assigned noise level varies within the town area.

Table 4-4 Influencing Factor for various locations in Port Hedland

Residential Area	Influencing Factor
Police Station	17dB
Hospital	2dB
Darlot St	2 to 3dB
Brearley Avenue	1 to 2 dB
Pretty Pool	0
Cook Point	0
Rural Village	0
South Hedland Golf Course	0

Figure 4-1 Influencing factors that can be applied to different areas of Port Hedland

4.4 Corrections for Characteristic of Noise

Noise levels at the receiver are subject to penalty corrections if the noise exhibits intrusive or dominant characteristics, i.e. if the noise is impulsive, tonal, or modulating.

Since the port facilities operate 24 hours a day, the most stringent noise limit that would apply to noise emissions will occur during the night time hours.

Table 4-2 presents the penalties incurred for noise that exhibits intrusive or dominant characteristics (i.e. if it has tonal, modulating or impulsive characteristics).

As the closest receiver is approximately 3.2 km from the NWI wharf it is not expected that the received levels will have any characteristic noise as the tonal noise characteristics of the noise sources due to absorption will no longer be present at the receiver.

4.5 Assigned Level Evaluation for Wedgefield

Wedgefield is an industrial receiver with the only sensitive receiver being the residential mining camp which is considered as 'Residential'.

4.5.1 Influencing Factors

A 9 dB influencing factor has been applied at the Wedgefield mining camp.

4.5.2 Corrections for Characteristic of Noise

As Wedgefield is approximately 5.5km from the proposed NWI facility at Port Hedland it is expected that there will be no tonality in the received noise from the Port facility due to absorption in the atmosphere. No penalty will therefore be applicable to Wedgefield.

4.5.3 Assigned Noise Levels

The assigned levels for Wedgefield will therefore be the same as per the Regulations for industrial areas.

4.6 Assigned Level Evaluation for South Hedland

South Hedland can be classified as predominately residential. For the purposes of this report and for evaluation purposes the commercial area of South Hedland will not be considered since the most restrictive assigned noise levels for the town is due to noise sensitive premises. Therefore, South Hedland will be subject to assigned levels as per the Regulation for noise sensitive premises.

4.6.1 Influencing Factors

Since there are large areas of South Hedland which are zoned residential, the influencing factor is assumed to be 0. The limits as per the Regulation for noise sensitive areas will be used as a worst case scenario for all areas in South Hedland.

4.6.2 Corrections for Characteristic of Noise

As South Hedland is approximately 9km from the proposed NWI facility at Port Hedland it is expected that there will be no tonality in the received noise from the Port facility due to absorption in the atmosphere. No penalty will therefore be applicable to South Hedland.

4.6.3 Assigned Noise Levels

The assigned levels for South Hedland will therefore remain as per the Regulations.

4.7 Assigned and Maximum Allowable Noise Levels for Port Hedland, South Hedland and Wedgefield

If noise levels at noise sensitive premises are already in exceedance of the assigned noise levels, then the regulations require that noise from a new emitter should be 5 dB below the assigned noise level, so that the new emitter is not a significant contributor to the accumulative noise levels at the premises. The assigned noise levels for the various point receivers are given in Table 4-5.

Table 4-5: Assigned noise levels for noise sensitive premises including 5dB penalty for tonality.

Position	Influencing Factor in dB	L_{A10} Assigned noise levels in dB(A)			Non significant contributor	L_{A10} Maximum Allowable noise levels in dB(A)		
		Day	Evening	Night		Day	Evening	Night
Brearley St	2	47	42	37	5	42	37	32
Hospital	2	47	42	37	5	42	37	32
Police Station	17	62	57	52	5	57	52	47
Pretty Pool	0	45	40	35	5	40	35	30
South Hedland	0	45	40	35	5	40	35	30
Wedgefield[3]	9	54	49	44	5	49	44	39

When checking the modelled results compliancy with the assigned noise levels set by the Environmental Protection Noise Regulation 1997 the most relevant maximum to consider is L_{10A} allowable noise levels in dB(A) at night. This is because the restrictions are the most stringent at

[3] Wedgefield is referring to the Residential camp, and is considered 'Residential'

night and if this level is met then it is assumed that the noise level will not exceed the restrictions during the day or evening.

5. NOISE MODELLING – OVERVIEW

5.1 Noise Model Software

An acoustic model has been developed using the SoundPlan noise modelling program developed by SoundPlan LLC. The SoundPlan software calculates sound pressure levels at nominated receiver locations or produces noise contours over a defined area of interest around the noise sources. The inputs required are noise source data, ground topographical data, meteorological data and receiver locations. The model has been used to generate noise contours and predict noise levels at noise sensitive locations for the area around Port Hedland, South Hedland and Wedgefield.

5.2 Input Data

5.2.1 Source Sound Power Levels

The NWI noise model consists of approximately 50 noise sources comprising the major elements of the project, specifically rail, car dumping, stacker, reclaimers, conveyers and shiploaders for fines iron ore transfer only. The sound power levels used in the model are taken from similar equipment used in the iron ore industry for Port Facilities and are given in Appendix A. The selection of sound power levels was based on the proposed equipment design, such as conveyor speed and drive power (Appendix B).

Due to the product type conveyors 401, 402 and 501 will be partially enclosed (see Appendix E, F and G). These enclosures have been included in the model by means of adjusting their Sound Power Levels according to the calculated composite transmission loss expected from the enclosures as per the drawings in the appendices. In the case of conveyor 401 and 402 the sound powers were increased as the conveyor screen forms a reflective plane in the direction of the Town of Port Hedland.

The rail yard in the port facility will consist of a rail loop and car dumper. Ten rail movements (i.e. 5 incoming and 5 outgoing) are planned to occur each day which implies that there will be one rail movement every 2.4 hours over a 24 hour period. Trains will consist of 2 locos and 240 cars. The maximum yard speed will be 30kph.

The noise sources from the rail movements in the yard will be shunting and rail squeal. As the rail movements are only one every 2.4 hours rail is not expected to have any impact on the L_{A10} received levels. This is especially true given the distance between the rail loop and sensitive receptors.

Rail noise is usually assessed under State Planning Policy 5.4 as it is excluded from the noise regulations. Therefore rail noise, including rail within the yard, will not be assessed in this assessment for the port facility but will rather be assessed *in toto* in the rail noise assessment of the rail project which is a separate assessment for this project. In this assessment rail will be evaluated under State Planning Policy 5.4.

5.2.2 Topography and Ground Types

Topographical information for the noise model was provided in .dxf format files, which were imported into the noise model directly. Ground absorption for hard and soft surfaces is as specified

by the CONCAWE[4] propagation algorithms. The ground absorption for the sea surface has been set to zero (perfectly reflecting), representing a realistic worst-case condition at the frequencies of interest. Soft ground has been used for land. The stockyard for this model is flat to represent an empty stockyard. CONCAWE is a conservative algorithm, which has been shown to over predict by 3 dB. It is also accepted by the Department of Environment and Conservation.

5.2.3 Receiving Locations

Table 5-1 Co-ordinates of receiving locations

Receiver	Location	GPS co-ordinates (GDA-94)
R1	Brearley St , Port Hedland	7753338 N, 667699 E
R2	Hospital , Port Hedland	7753424 N, 665799 E
R3	Police Station, Port Hedland	7753117 N, 664652 E
R4	Pretty Pool, Port Hedland	7752609 N, 671261 E
R5	South Hedland	7742771 N, 667852 E
R6	Wedgefield Industrial Estate	7746567 N, 666048 E

5.3 Meteorology

Certain meteorological conditions can increase noise levels at a receiving location by a process known as refraction. When refraction occurs, sound waves that would normally propagate directly outwards from a source can be bent downwards causing an increase in noise levels. Such refraction occurs during temperature inversions and where there is a wind gradient.

The SoundPlan noise model has a range of different algorithms which it can use to calculate noise levels for user defined meteorological conditions. The CONCAWE algorithm for industrial noise simulation has been used in the SoundPlan model to predict the sound levels at each of the point receiver locations and the surroundings. Meteorological conditions assigned to the model are in accordance with EPA's recommendations for worst-case weather conditions outlined in *Guidance for the Assessment of Environmental Factors, Draft No.8, May 2007*:

- Day (07:00 - 19:00) wind speed – 4m/s; Pasquill Stability Class "E"; temperature - 20°C; and relative humidity – 50%.
- Night (19:00 – 07:00) wind speed – 3m/s; Pasquill Stability Class "F"; temperature – 15°C; and relative humidity – 50%.

[4] CONCAWE (Conservation of Clean Air and Water in Europe) was established in 1963 by a group of oil companies to carry out research on environmental issues relevant to the oil industry. The outcome was an empirical algorithm which predicts noise levels at receiving locations.

Worst-case conditions usually occur during night-time, when downward refraction bends the waves towards the ground increasing the noise levels at the receiver. The night time meteorological conditions were used in the model.

5.4 Noise model configuration

The NWI model has been configured using process flow diagrams supplied to SVT by SKM (see Appendix C). The process flow diagram identifies all equipment items for Stage One and Stage Two of the multi-user port facility. The positions of fixed equipment are determined by conveyor lengths (Appendix B) and coordinates (Appendix D) provided to SVT by SKM as shown in Figure 5-1. The position of the mobile equipment such as the reclaimers and stackers are located closest to the receivers within the designed translational limitations to simulate worst case operational conditions as shown in Figure 5-2. The noise sources of Stage Two are included in this study.

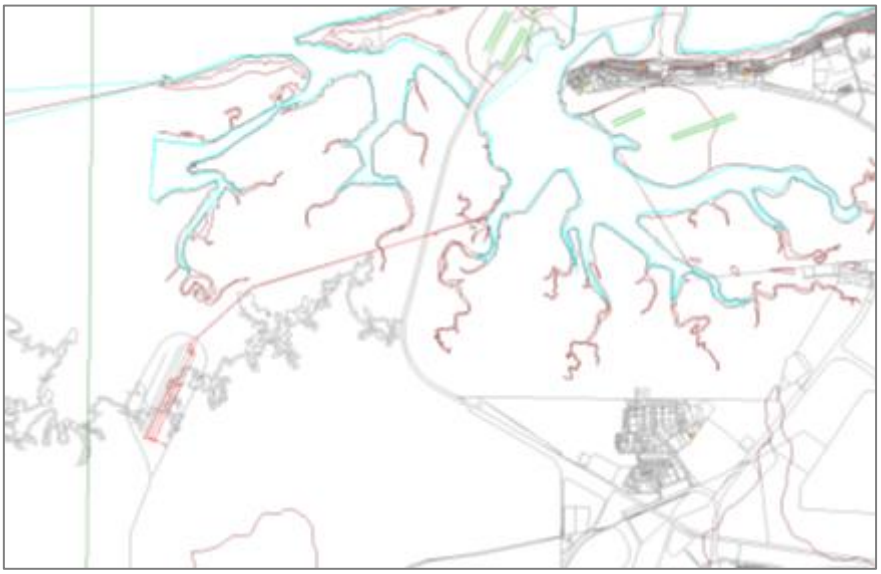


Figure 5-1 Modelled Layout of the Port Facility

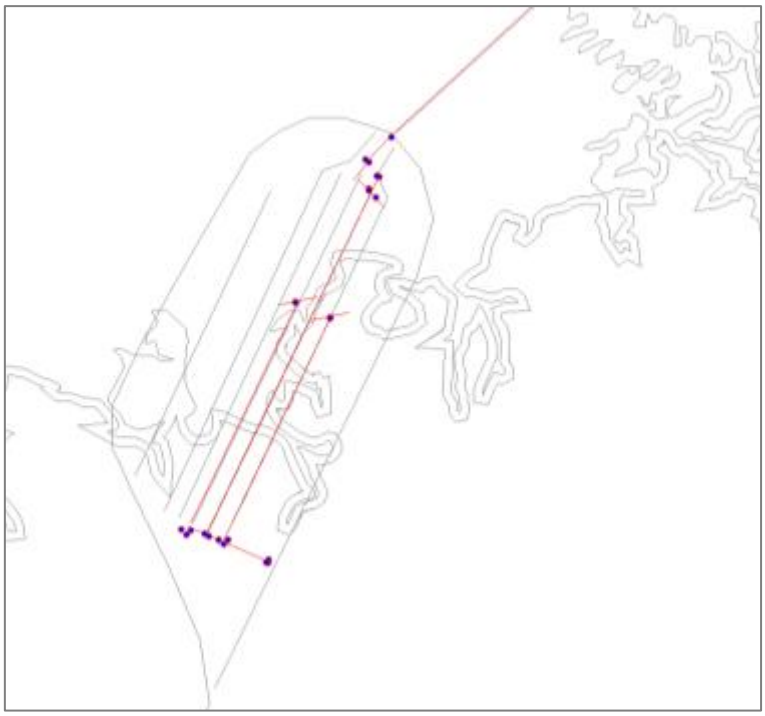


Figure 5-2 Close up of the noise sources modelled in the stockyard

6. NOISE MODELLING RESULTS

6.1 Modeled Results Without Noise Control

The worst case predicted noise levels at the point receivers are given in Figure 6-1 and

Table 6-1. The port facility is modelled in isolation of the surrounding Port Hedland noise sources as required by the regulation. The noise levels at all the receivers except the Hospital are below the maximum allowable level set by Environmental Protection (Noise) Regulation 1997. The Hospital exceed the maximum allowable noise level by 5.6 dB.

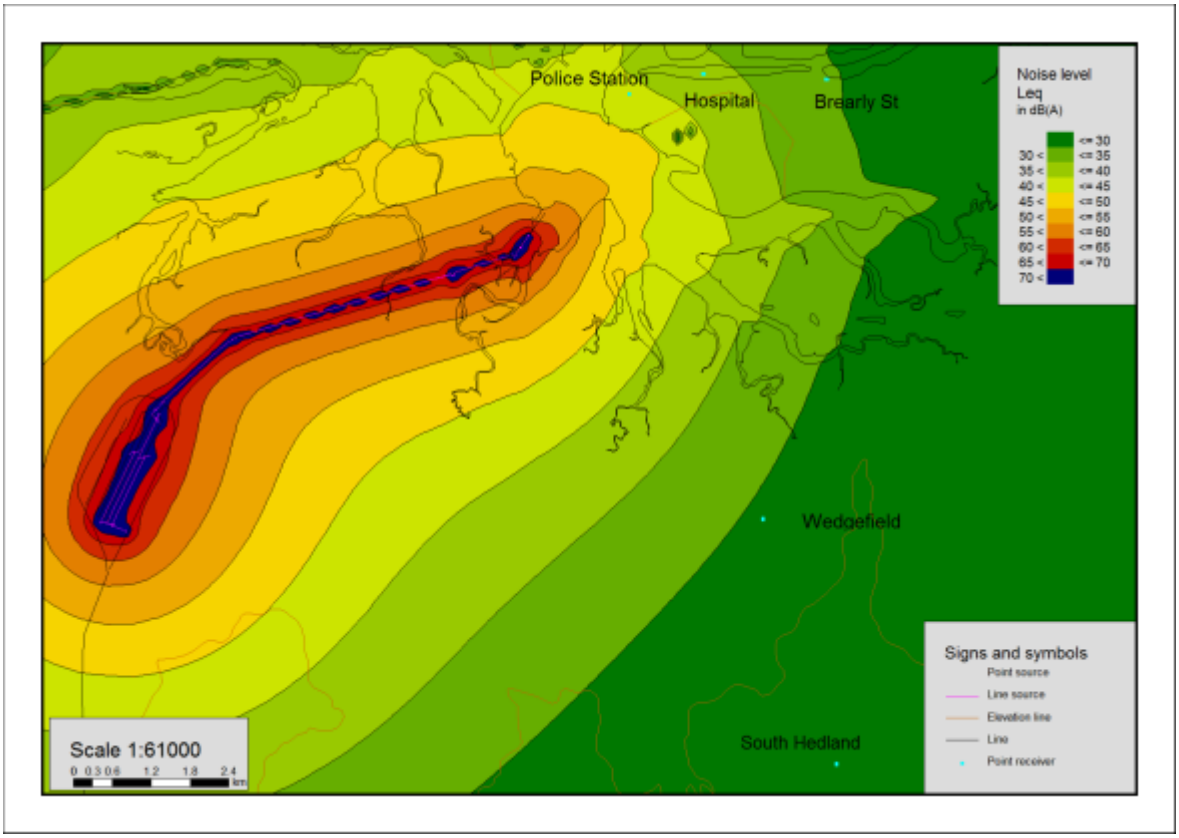


Figure 6-1 Noise Contour of NWI Port Facility

Table 6-1 Modelled L_{A10} Noise Level without Noise Control in dB(A)

Receiver Locations	Assigned Levels	Received Levels	Difference
Brearley St	32	32.0	0
Hospital	32	37.6	5.6
Police Station	47	42.3	-4.7
Pretty Pool	35	23.5	-11.5
South Hedland	35	23.8	-11.2
Wedgefield	65	30.7	-34.3

7. ANALYSIS OF RESULTS AND NOISE CONTROL RECOMMENDATIONS

7.1 Methodology

The objective of environmental noise control is to identify what noise controls can be practicably implemented to reduce noise levels at non-compliant noise receivers so that the assigned noise levels can be met.

Determining which noise control options to implement can be a difficult undertaking as there are many factors that need to be taken into consideration. Ultimately the primary purpose of environmental noise control is to propose measures that will reduce noise levels at the sensitive receivers so that they will be compliant with the assigned noise levels. The methodology followed in this report is based on the following:

- Reduce Noise to as low as reasonably practicable, and where reasonably possible, comply with the requirements of the Environmental Protection (Noise) Regulations 1997 (including seeking exemptions if necessary).
- Where it is impracticable to comply with the Environmental Protection Noise Regulations, ensure continuous improvement is facilitated through a Noise Reduction Management Plan.

7.2 Modeled Results With Noise Control

To reduce the recieved noise level at the Hospital to the maximum allowable level it is recommended that the following noise controls be implemented:

1. Either low noise idlers or shielding of idlers on the following conveyors:
    - CV 502
    - CV 501
    - CV 401
    - CV 402
    - CV 511
2. Either shielding or specifying the following 800 kW drives to 82 dB(A) @ 1m:
    - 2 x CV 502 Drives
    - 2 x CV 501 Drives
    - 2 x CV 511 Drives

Sheilding of the drives and conveyors is defined as the use of noise barriers (e.g. walls, berms or partial enclosures) to reduce the noise impacts at the receivers by eliminating the direct path between the noise source and the receiver. To achieve the required noise reduction the barriers must be placed inbetween the noise source (i.e. drive or conveyor) and the receivers and be as close to the noise source as practicable. The details of the sheilding will be determined during detailed design.

It must be noted that the cover on conveyor 501 (see Appendix E) and the full enclosure on conveyor 402 provide some shielding of the noise source (i.e. the conveyor) for the parts that are covered. The full enclosure providing better noise reduction due to the larger surface area of the barrier. The composite transnission loss has been calculated from the drawings provided to SVT by Coffey.

For conveyors 401 and 402 (see Appendix F) the partial cover forms a reflective plane in the direction of the Town of Port Hedland and therefore increases the noise impact of this conveyor on the receivers in Port Hedland.

If the recommedned noise controls were implemented the received noise level at the Hospital will comply with the regulation as shown in Table 7-1 and Figure 7-1.

Table 7-1 Modelled Noise Results with Noise Control in dB(A)

Receiver Locations	Received Levels
Brearley St	26.3
Hospital	31.9
Police Station	36.6
Pretty Pool	18.9
South Hedland	20.4
Wedgefield	25.8

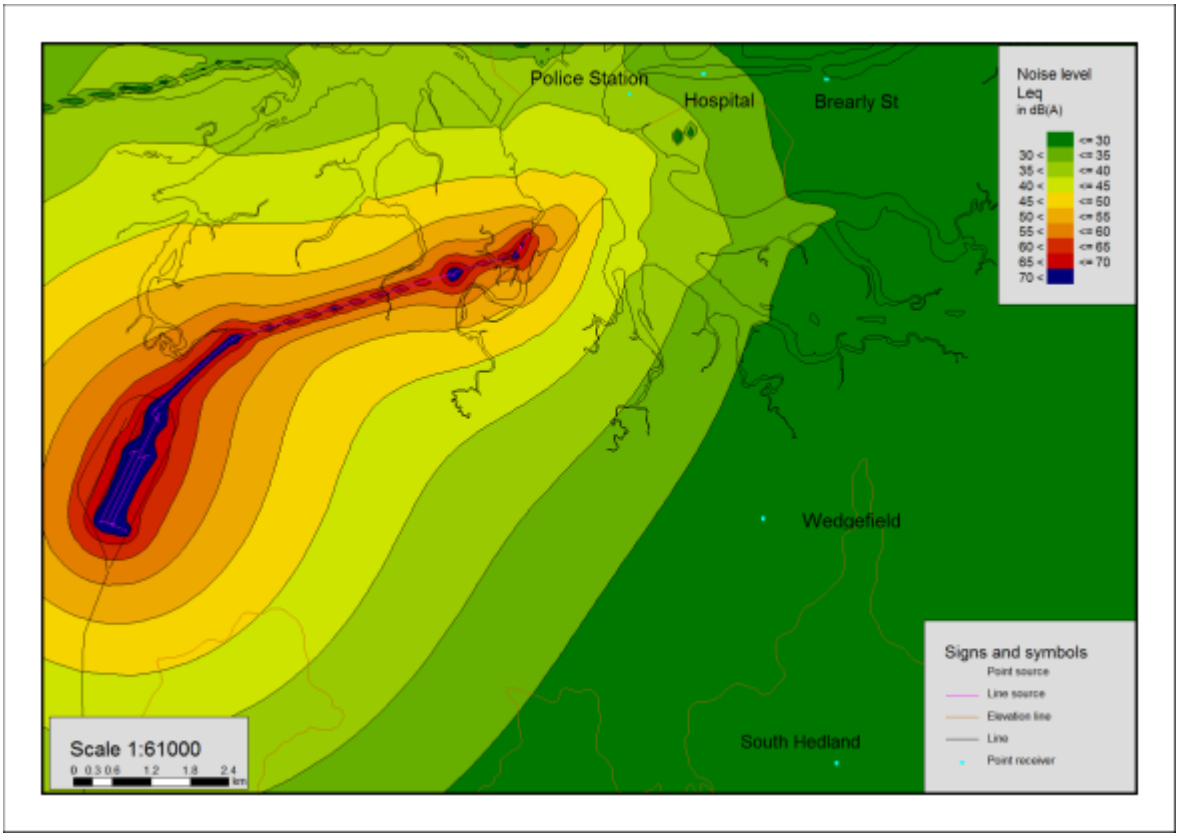


Figure 7-1 Noise Contour at Received Levels with Noise Controls Implemented

7.3 Comparison with Existing Background Noise Levels

Ambient background noise measurement for this study has been obtained from previously published studies of the Port Hedland area. The ambient background noise in this area is due to the cumulative noise levels of FMG, Dampier Salt, Port Hedland Authority and BHP Billiton Iron Ore (RGP 3 configuration). This study consisted of noise logging at various receivers in noise sensitive locations. The relevant measured noise logging data statistic for the relevant sensitive receivers is summarized in Table 7-2. As can be seen from the table the NWI predicted received levels at the sensitive receivers are below the existing ambient noise levels at the sensitive receivers and there is therefore not expected to be a small increase in ambient noise levels at the sensitive receivers as a result of NWI's development.

Table 7-2 Summarised Ambient Noise Levels at Night (22:00 to 7:00 hrs)

Location	Average L_{90} of L_{A90} dB(A)	Predicted Received Levels NWI
Hospital	46.5	31.8
Police Station	41.9	36.8
Pretty Pool	36	19.8
South Hedland	44	20.2
Wedgefield	34.5	26.0

7.4 Cumulative Assessment Including Outer Habour Development

Table 7-3 shows the cumulative noise levels of the North West Infrastructure project and BHP Billiton's Iron Ore Outer Harbour project. The Outer Harbour project noise levels shown in Table 7-3 is for Stage 4 (240 Mtpa) and is in isolation of RGP 5. It must be noted that the outer harbour referral predicted levels do not include any noise mitigation as the Outer Harbour project is still in the process of determining what noise controls are reasonably practicable. The predicted levels are therefore not a true reflection of the received levels at the end of the project.

Table 7-3 Cumulative noise levels of North West Infrastructure with the Outer Harbour development in dB(A)

Noise Source	Receivers					
	Brearley St	Hospital	Police Station	Pretty Pool	South Hedland	Wedgefield Industrial Estate
North West Infrastructure In Isolation	32.0	37.6	42.3	23.5	23.8	30.7
Outer Harbour (Stage 4) In Isolation	42.9	49.1	52.3	33.9	29.3	35.9
Cumulative Impacts	43.2	49.4	52.7	34.3	30.4	37.0

Appendix A : SOURCE SWL

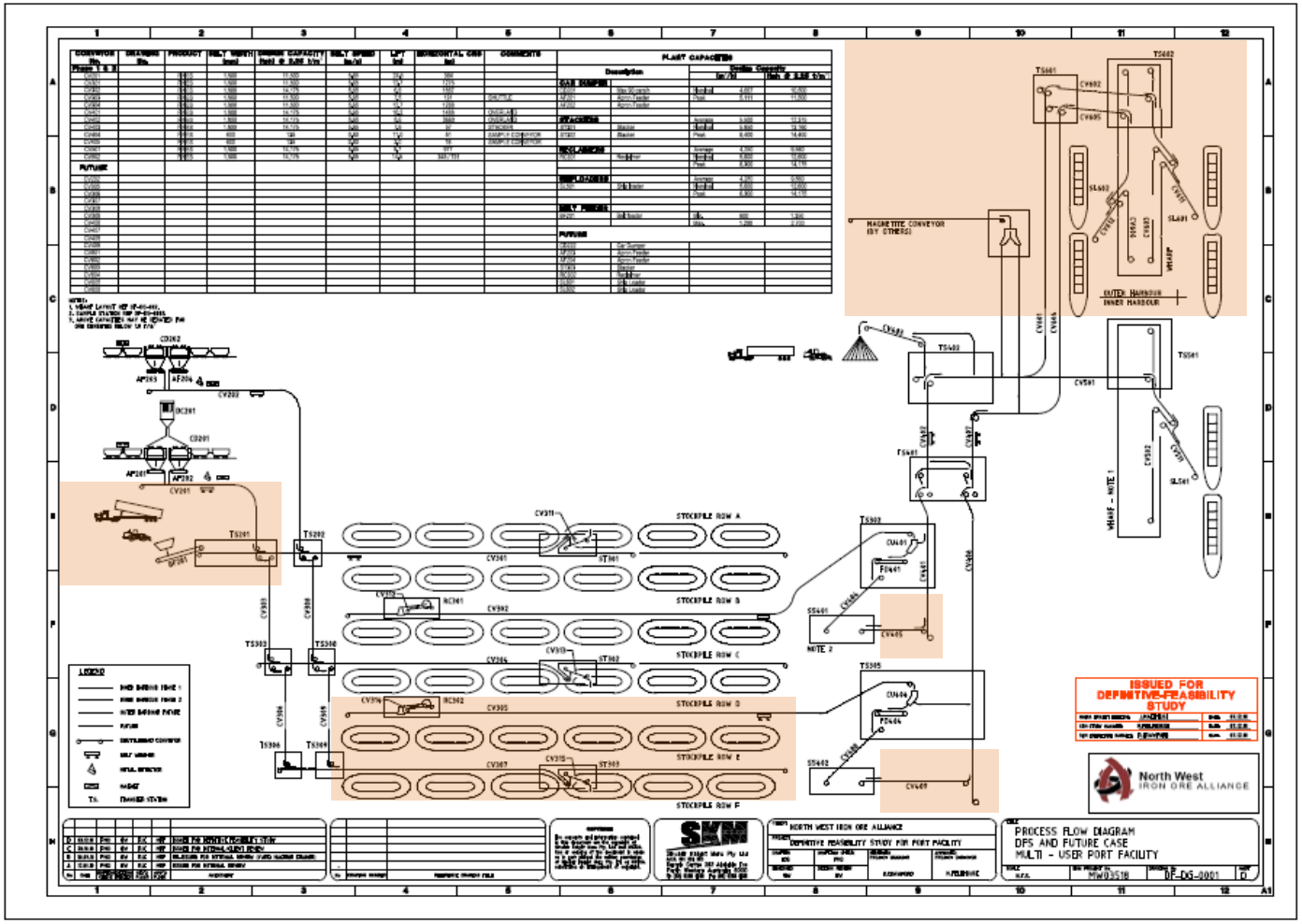
Source	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	Overall
	dB(Lin)								dB(A)
Conveyor									
CV402 Redispan	84.9	76.5	70.1	62	53.8	46.4	35.2	23.2	66.4
CV201	88.7	92.7	92	90.1	86.4	83.3	75.4	67.2	91.8
CV301	88.7	92.7	92	90.1	86.4	83.3	75.4	67.2	91.8
CV302	88.7	92.7	92	90.1	86.4	83.3	75.4	67.2	91.8
CV303	88.7	92.7	92	90.1	86.4	83.3	75.4	67.2	91.8
CV304	88.7	92.7	92	90.1	86.4	83.3	75.4	67.2	91.8
CV401	90.7	94.7	94	92.1	88.4	85.3	77.4	69.2	93.8
CV402	90.7	94.7	94	92.1	88.4	85.3	77.4	69.2	93.8
CV404	88.7	92.7	92	90.1	86.4	83.3	75.4	67.2	91.8
CV405	88.7	92.7	92	90.1	86.4	83.3	75.4	67.2	91.8
CV501	87.2	91.2	90.5	88.6	84.9	81.8	73.9	65.7	90.3
CV502	88.7	92.7	92	90.1	86.4	83.3	75.4	67.2	91.8
CV511 (Shiploader conveyor 501)	88.7	92.7	92	90.1	86.4	83.3	75.4	67.2	91.8
Reclaimer conveyor 301 (CV312)	94.5	95.1	95.5	94.5	88	83	76	69.7	94.6
Stacker 301 conveyor (CV311)	93.3	94.1	92.2	93.3	93.1	89.3	81.4	75.9	96.7
Stacker 302 conveyor (CV313)	93.3	94.1	92.2	93.3	93.1	89.3	81.4	75.9	96.7
Drive									
Drive CV 401 A	102.2	103.6	104.7	105.4	102.1	102.4	85.4	77.4	112.7
Drive CV 401 B	102.2	103.6	104.7	105.4	102.1	102.4	85.4	77.4	112.7
Drive CV 402 A	102.2	103.6	104.7	105.4	102.1	102.4	85.4	77.4	112.7
Drive CV 402 B	102.2	103.6	104.7	105.4	102.1	102.4	85.4	77.4	112.7
Drive CV 402 C	102.2	103.6	104.7	105.4	102.1	102.4	85.4	77.4	112.7
Drive CV 402 D	102.2	103.6	104.7	105.4	102.1	102.4	85.4	77.4	112.7
Drive CV 404	102.9	101	102.5	105.8	99.2	94.7	85.5	77.2	110.1
Drive CV 405	102.9	101	102.5	105.8	99.2	94.7	85.5	77.2	110.1
Drive CV201 A	104.9	100.7	101.2	106.6	103.4	102.3	89	82.9	108.4
Drive CV201 B	104.9	100.7	101.2	106.6	103.4	102.3	89	82.9	108.4
Drive CV301 A	102.2	103.6	104.7	105.4	102.1	102.4	85.4	77.4	112.7
Drive CV301 B	102.2	103.6	104.7	105.4	102.1	102.4	85.4	77.4	112.7
Drive CV302 A	102.2	103.6	104.7	105.4	102.1	102.4	85.4	77.4	112.7
Drive CV302 B	102.2	103.6	104.7	105.4	102.1	102.4	85.4	77.4	112.7
Drive CV304 A	102.2	103.6	104.7	105.4	102.1	102.4	85.4	77.4	112.7
Drive CV304 B	102.2	103.6	104.7	105.4	102.1	102.4	85.4	77.4	112.7

Source	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	Overall
	dB(Lin)								dB(A)
Drive CV501 A	104.9	100.7	101.2	106.6	103.4	102.3	89	82.9	108.4
Drive CV501 B	104.9	100.7	101.2	106.6	103.4	102.3	89	82.9	108.4
Drive CV502 A	104.9	100.7	101.2	106.6	103.4	102.3	89	82.9	108.4
Drive CV502 B	104.9	100.7	101.2	106.6	103.4	102.3	89	82.9	108.4
Drive CV511 A	104.9	100.7	101.2	106.6	103.4	102.3	89	82.9	108.4
Drive CV511 B	104.9	100.7	101.2	106.6	103.4	102.3	89	82.9	108.4
Drive Reclaimer 301 (CV312)	106.1	110.9	111.4	109.4	113.8	106.4	100.5	90.6	115.7
Drive Reclaimer Bucket 301 (CV312)	101.4	106.2	106.8	104.7	109.1	101.7	95.9	86	111
Drive Stacker 301 (CV311)	104.1	107.2	105.5	104.7	103.8	102.5	92.7	85.7	108.5
Drive Stacker 302 (CV313)	104.1	107.2	105.5	104.7	103.8	102.5	92.7	85.7	108.5
Other									
Car Dumper 201	123.1	118.2	113.9	107.5	104.3	100.8	97.6	88	111.2
Chute CV511	90	93.6	90.1	90.4	86.1	81.5	74.2	66.6	91.3
Reclaimer Chute 301 (CV312)	83	85.5	86.2	86.4	87.8	83.1	80.1	72.3	91.1
Sample Station 401	105.1	104.1	101.9	107.9	104.8	98.4	91.7	84.8	108.7
Stacker Chute 301 (CV311)	90	93.6	90.1	90.4	86.1	81.5	74.2	66.6	91.3
Stacker Chute 302 (CV313)	90	93.6	90.1	90.4	86.1	81.5	74.2	66.6	91.3
Transfer Station 201	90.1	89.1	86.9	92.9	89.8	83.4	76.7	69.8	93.7
Transfer Station 302	90.1	89.1	86.9	92.9	89.8	83.4	76.7	69.8	93.7
Transfer Station 303	90.1	89.1	86.9	92.9	89.8	83.4	76.7	69.8	93.7
Transfer Station 401	90.1	89.1	86.9	92.9	89.8	83.4	76.7	69.8	93.7
Transfer Station 402	90.1	89.1	86.9	92.9	89.8	83.4	76.7	69.8	93.7
Transfer Station 405	90.1	89.1	86.9	92.9	89.8	83.4	76.7	69.8	93.7
Transfer Station TS501	90.1	89.1	86.9	92.9	89.8	83.4	76.7	69.8	93.7

Appendix B : SPECIFICATIONS OF CONVEYORS AND DRIVES

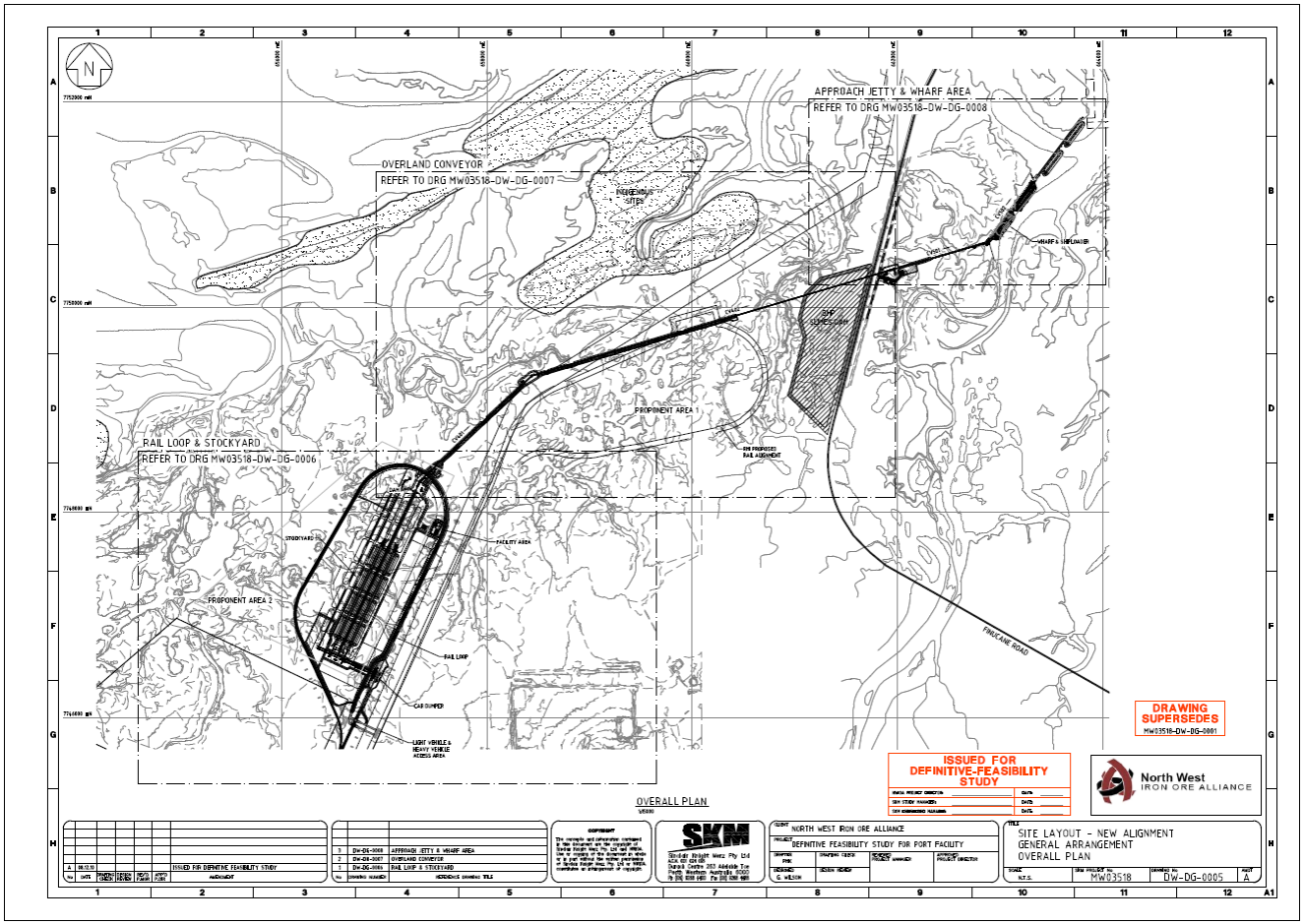
Conveyor	Length (m)	Belt Speed (m/s)	Belt Width (mm)	Demand Power (kW)	Installed Power (No. x kw)
CV201	364	5.65	1800	1290	2 x 800
CV301	1725	5.65	1800	1870	2 x 1250
CV302	1867	5.65	1800	2320	2 x 1250
CV303	131	5.65	1800	690	1 x 800
CV304	1718	5.65	1800	1870	2 x 1250
CV401	1420	5.65	1800	1620	2 x 1250
CV402	3380	5.65	1800	4420	4 x 1250
CV403	57	5.65	1800	530	1 x 800
CV501	860	5.65	1800	1440	2 x 800
CV502	348	5.65	1800	1515	2 x 800

Appendix C : PROCESS FLOW DIAGRAM

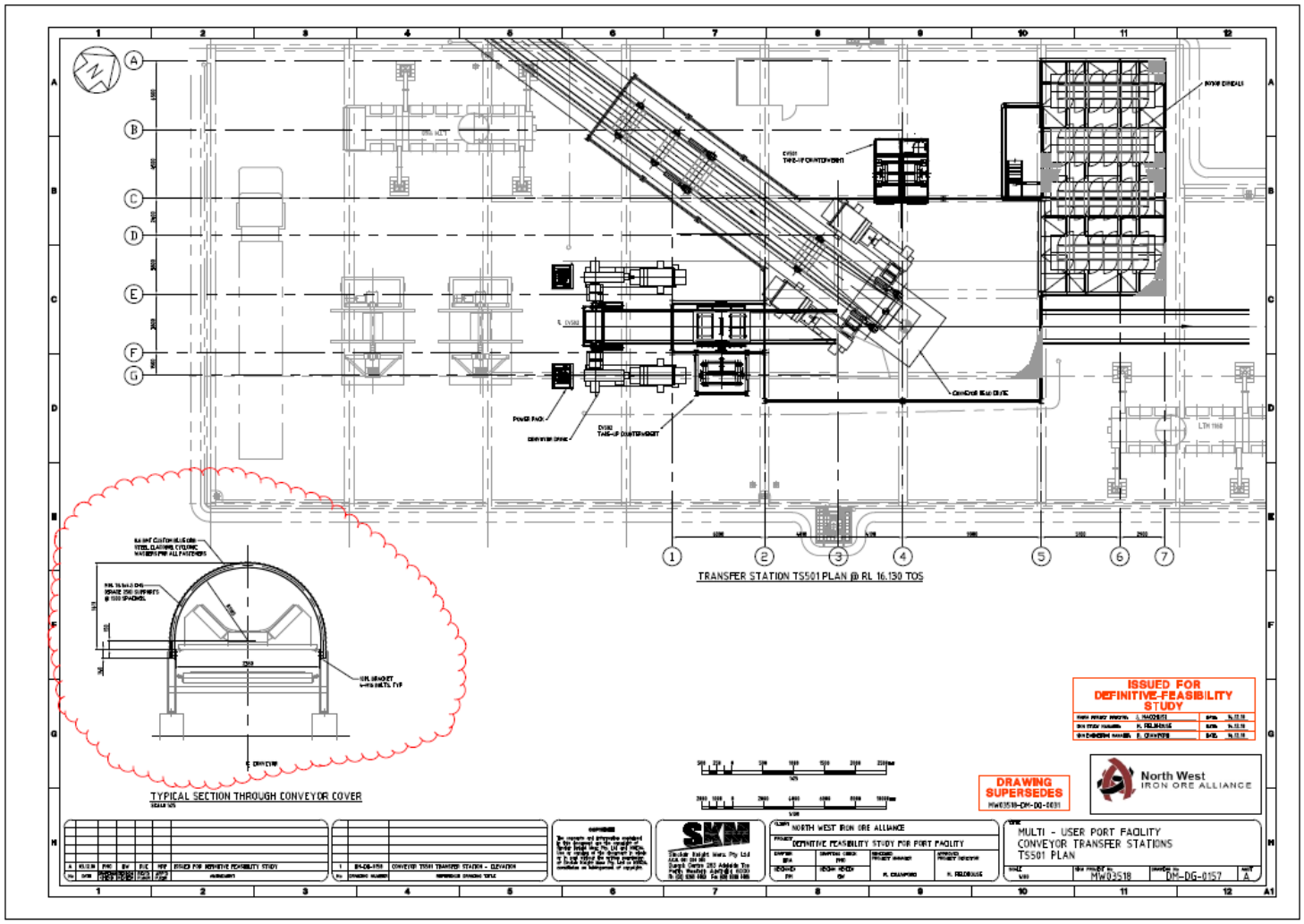


Not represented in this study

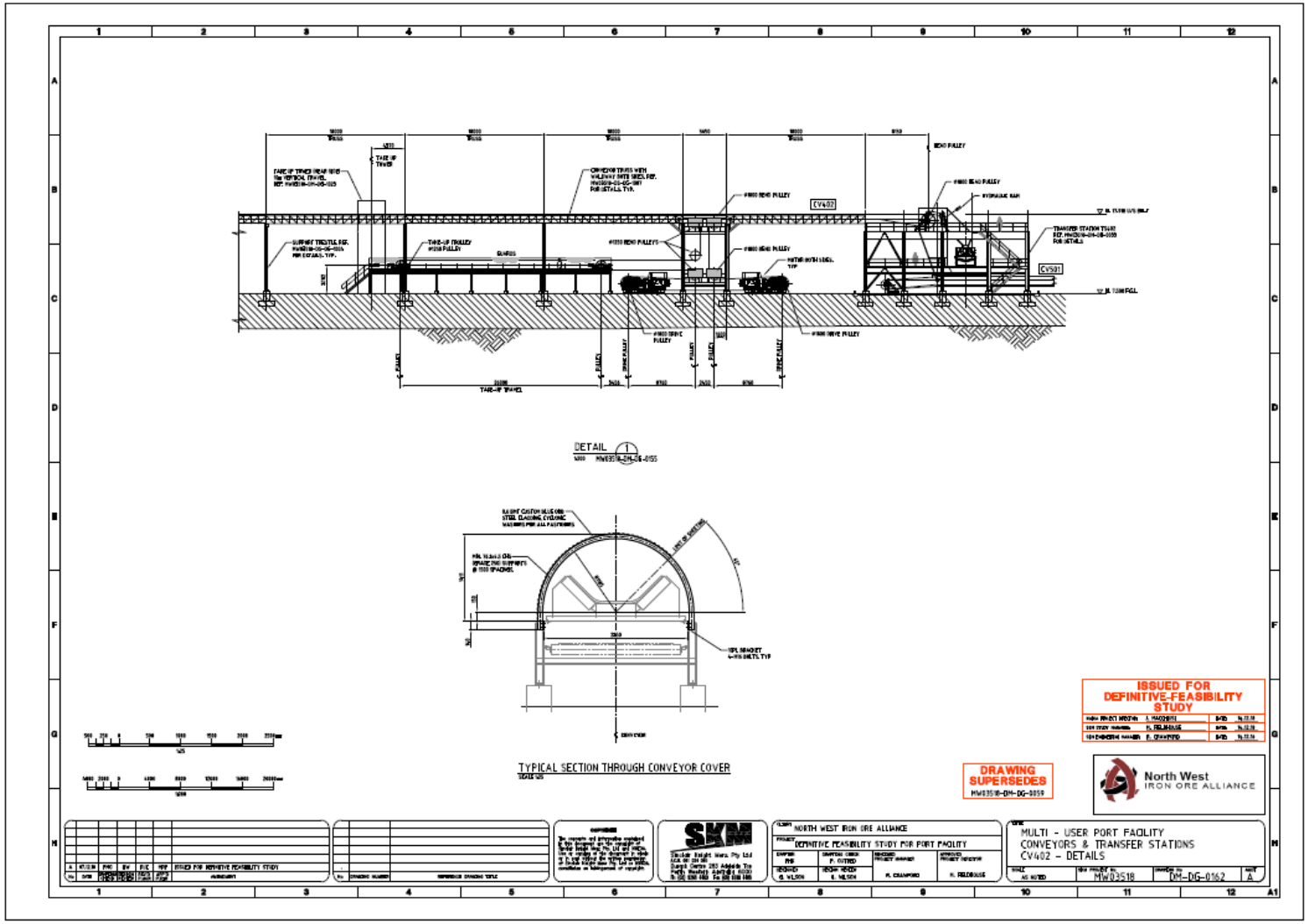
Appendix D : PORT FACILITY LAYOUT



Appendix E : CV 501 FULL COVER



Appendix F : CV401 & CV402 PARTIAL COVER



Appendix G : CV 402 FULL ENCLOSURE