Remediation of Midland Railway Workshop Site, Helena West, Midland

Midland Redevelopment Authority

Report and recommendations of the Environmental Protection Authority

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1. Introduction and background

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment on the environmental factors relevant to the proposal by the Midland Redevelopment Authority (MRA) to remediate 15.5 hectare (ha) of land in the western (Helena West) area of the former Midland Railway Workshop Site in Midland. (Figure 1).

Historically the Helena West area of the Midland Railway Workshop site was used for industrial, extensive marshalling and waste disposal activities and for the underwater storage of coal in the coal dam (Figures 2 and 3).

The EPA was advised of the intention to remediate the site on 20 December 2002. Based on the information provided, the EPA considered that while the proposal has the potential to have a significant effect on the environment, it could be readily managed to meet the EPA's environmental objectives. Consequently, it was notified in the *West Australian* newspaper on 10 September 2003 that the EPA intended to set the level of assessment at Assessment on Referral Information (ARI).

The proponent has prepared the environmental referral document and the Environmental Management Program (Midland Redevelopment Authority, 2003), which accompanies this report. The EPA considers that the proposal described can be managed in an environmentally acceptable manner, subject to the imposition of environmental conditions. The net result of the proposal would be an improved environment.

The EPA therefore has determined under Section 40(1) of the *Environmental Protection Act 1986* that the level of assessment for the proposal is Assessment on Referral Information, and this report provides the EPA's advice and recommendations in accordance with Section 44(1) of the Act.

Figure 1: Location of Midland Railway Workshop Site, Helena West in Midland.

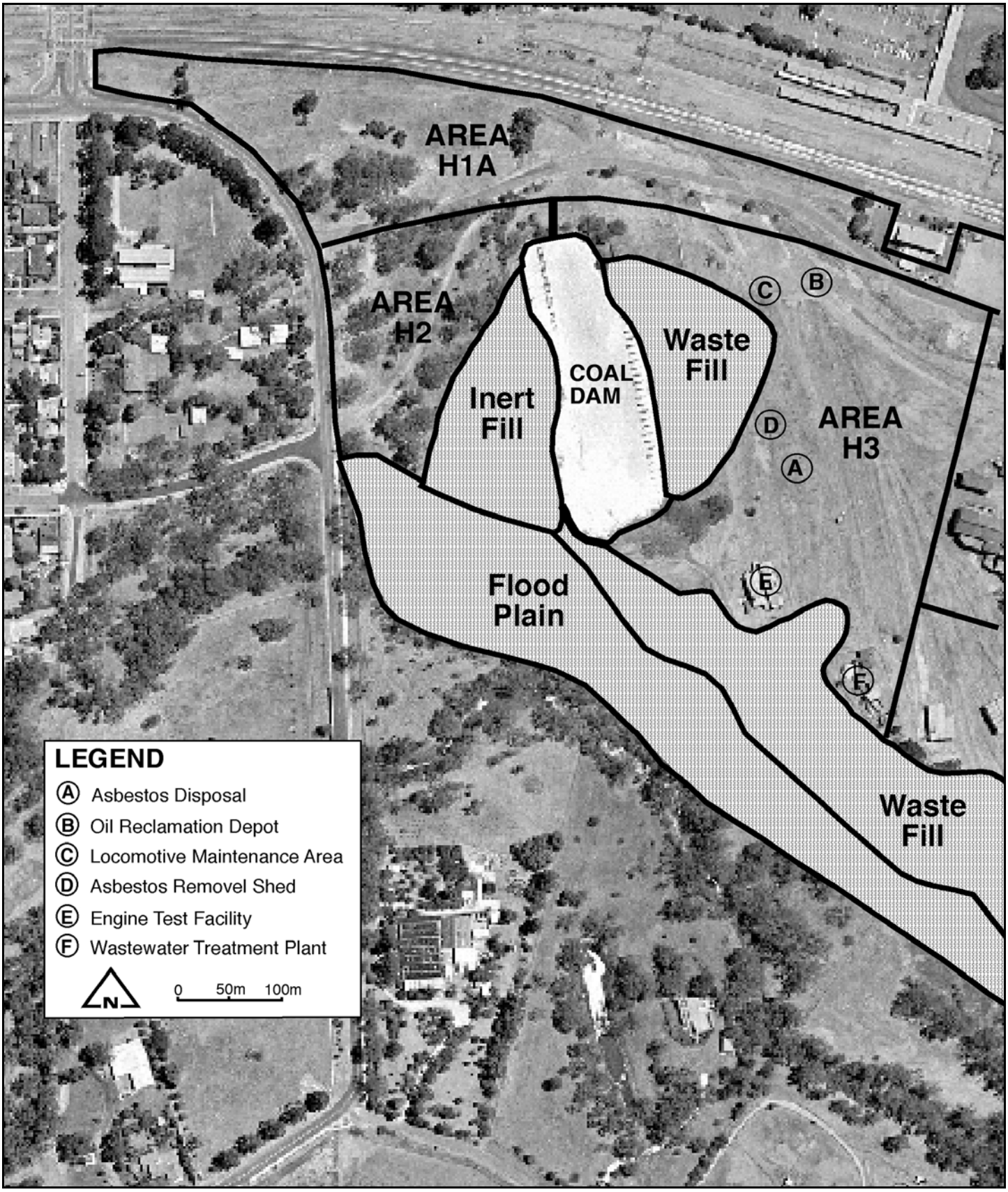

Figure 2: Investigation area and contamination sources

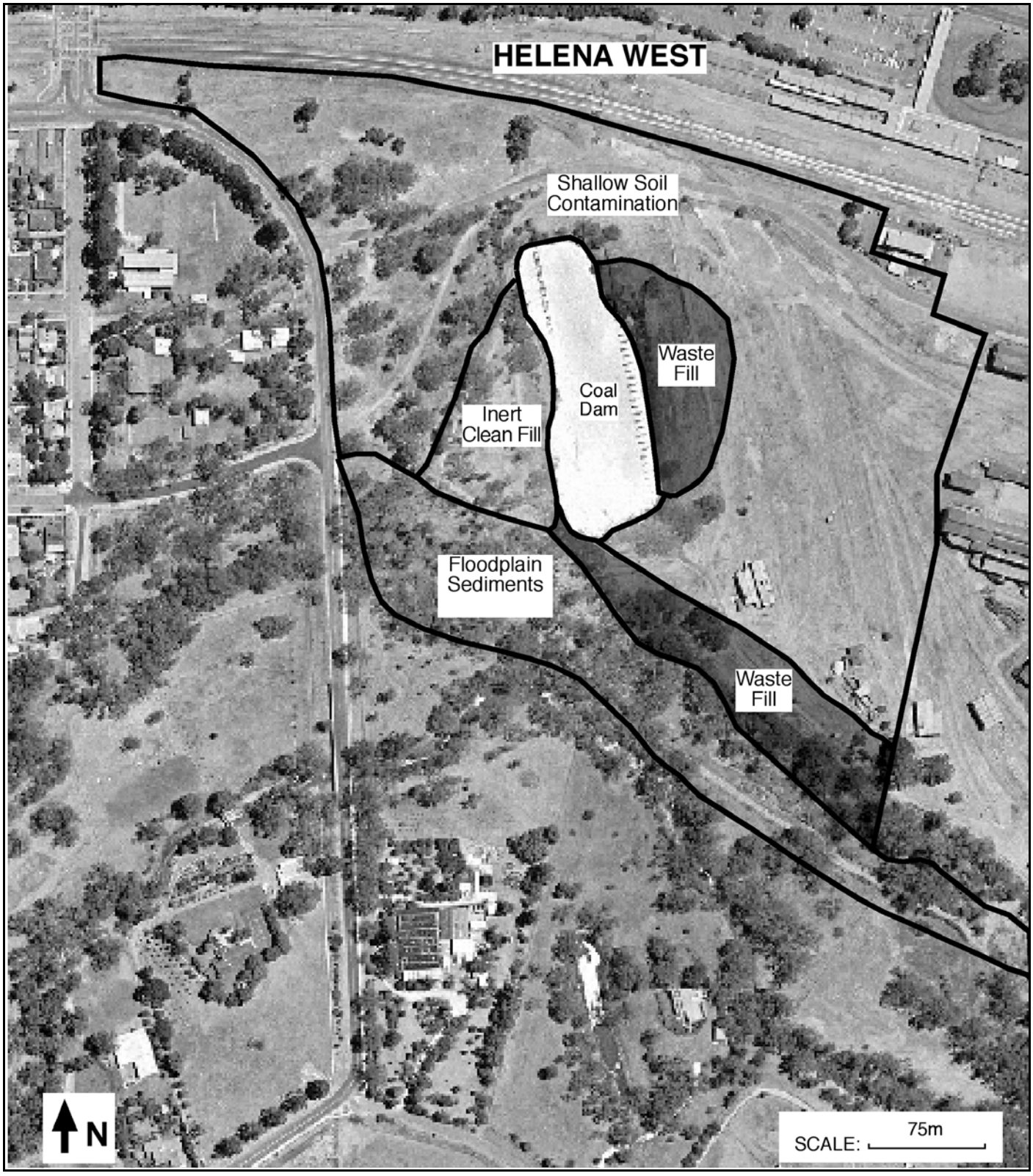

Figure 3: Current contamination status

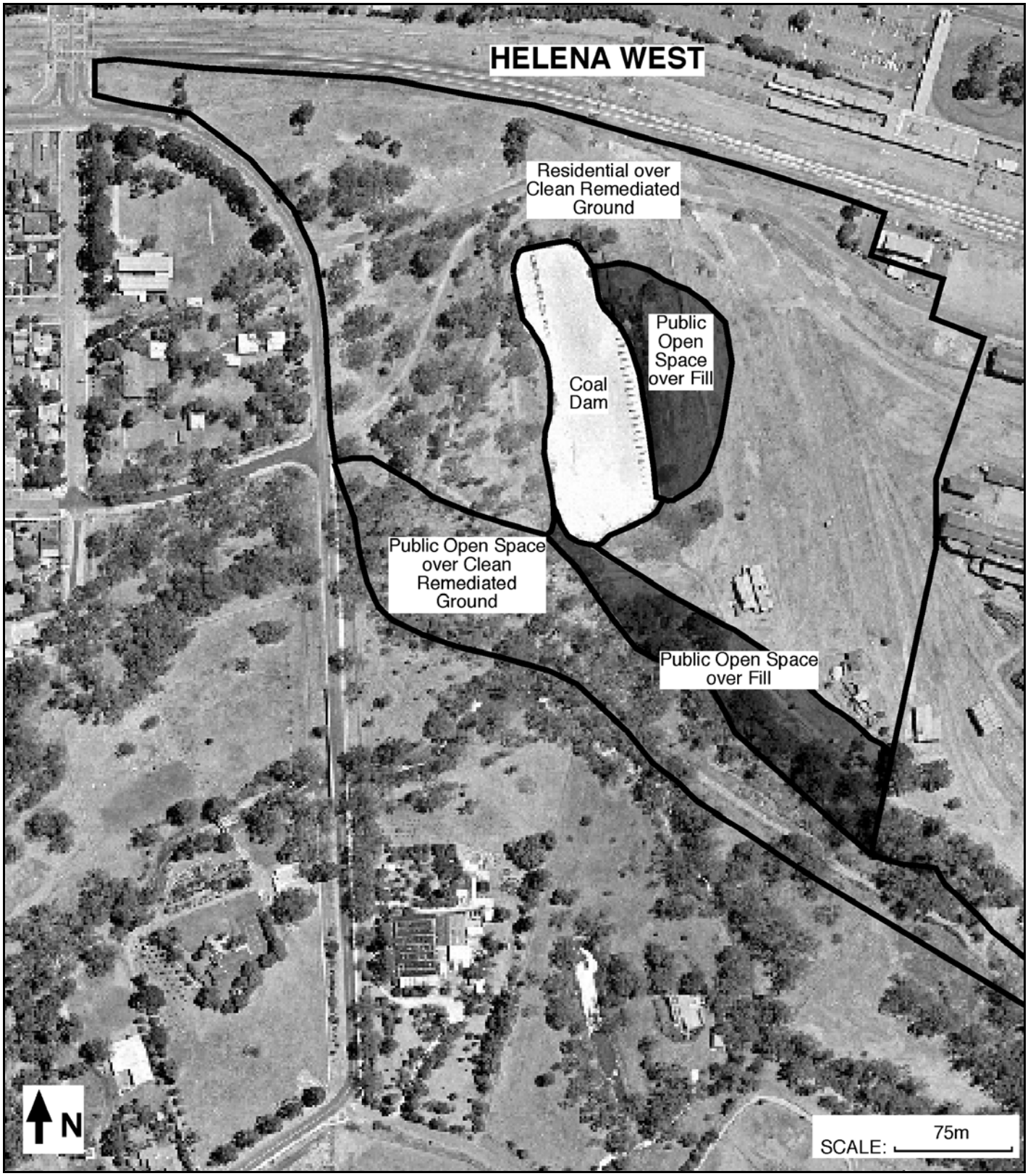

Figure 4: Potential land uses after remediation

2. The proposal

This proposal is to remediate 15.5 ha of land in the western (Helena West) area of the former Midland Railway Workshops Site within the Helena Precinct in Midland (Figure 1).

Approximately 8 ha of the remediated land will be developed for residential purposes with the balance 7.5 ha developed for public open space along the Helena River foreshore. The 8 ha of land to be developed for residential purposes include areas labelled H1A, H2, H3 and inert fill. The 7.5 ha to be developed for public open space will include the waste fill and floodplain areas (Figure 2). The coal dam in the Helena West area will be remediated and retained for heritage purposes and be used as a water feature (Figure 4).

The Helena West site was subject to an extensive site investigation program, which involved 240 soil-sampling points into the natural ground and 10 groundwater monitoring wells up to a depth of 10 m. The extent and nature of heavy metal soil contamination for heavy metals has been investigated and carried out in accordance with a Sampling and Analysis Plan approved by the Department of Environmental Protection. The site contains approximately 148,000 m^3 of contaminated material including:

- waste fill;
- inert fill;
- floodplain sediments;
- surface soils; and
- coal dam sludge and sediments

The contaminant levels vary in each of the materials. The site also contains a 1 ha dam, which was used for the underwater storage of coal. The dam contains approximately 8,000m^3 of oily sludge and sediments (Figure 3).

The waste fill and coal dam sludge and sediments are the most contaminated, while the inert fill and floodplain sediments being less contaminated. Contaminants in the waste fill and surface soil include the heavy metals arsenic, copper and lead and asbestos. The coal dam sludges and sediments contain heavy metals and hydrocarbons. The inert fill has no significant contamination.

Groundwater beneath the Helena West site is generally free of contamination except in some localised areas around the coal dam, where groundwater quality is contaminated with heavy metals including zinc (Figure 3).

The sediments and water quality of Helena River have been previously tested and reported in the EPA's assessment (EPA Bulletin 1057, 2002).

Proposed remediation

Where the site is proposed to be developed for residential purposes (Figure 4), all contaminated material including the surface soil and inert fill will be removed, validated to Environmental Investigational Levels (EILs) recommended by the Department of Environmental Protection as clean up levels for residential purposes and replaced with clean fill (Figure 4)

Where the waste fill is to be retained on-site, the waste will be managed by the placement of a warning barrier and 1m cover of clean fill and developed as public open space (Figure 4).

The contaminated surface soils and sediments in the floodplain will be removed and relocated to Area C of the eastern part of Midland Railways Workshop site and be covered with a 1m cover of clean fill over a warning barrier and developed as public open space.

Area C will be developed as public open space as previously approved by the EPA (EPA Bulletin 1057, 2002). Consolidation of waste material in Area C land has been previously approved by the EPA (EPA Bulletin 1057, 2002) on the basis that site specific adsorption and attenuation studies carried out by the proponent demonstrated that on-site containment of this material does not pose a significant risk to the environment and human health.

The 8,000 m^3 of coal dam sludge and sediments will be removed by dredge, treated on-site and disposed of to an approved landfill site. The remediated dam will be used as a water feature.

3. Background of contamination

Table 1 provides a summary of the contamination levels found in the waste fill, floodplain and coal dam sediments and surface soils.

3.1 Waste Fill

Approximately 65,000m^3 of waste fill is located on a 2 ha portion of the Helena West site. The waste fill is present to a depth of 8m from the surface. The waste fill occurs in two distinct areas of the site, along the southern embankment of the river floodplain and immediately east of the coal dam within a former reservoir. The waste fill has been extensively tested throughout the profile at over 32 locations for heavy metals, asbestos, pesticides, cyanide and hydrocarbons (including PAH's and phenols) (MRA, 2002).

Waste fill along the southern embankment contains building rubble, cinder ash/clinker, foundry casting sands and slags, and asbestos products such as fibre cement and lagging. It is proposed to leave the waste in-situ and cover with a warning barrier and clean soil to prevent direct contact. This material has the potential to leach and although the leachate concentrations exceeded the Australian Water Quality

Guidelines, groundwater monitoring beneath this fill indicated that there is no significant contamination.

The waste fill east of the coal dam contains primarily cinder ash/clinker and low concentrations of asbestos that has been in contact with the groundwater for more than

Table 1: Summary of site contamination.

Waste Fill

Volume		65,000m^3		
No. Samples Tested		129		
Contaminant	Average Concentration (mg/kg)	Maximum Concentration (mg/kg)	EIL (mg/kg)	HIL_A (mg/kg)
Arsenic	13	280	20	100
Cadmium	0.8	26	3	20
Chromium	27	220	50	120,000
Copper	1,568	160,000	60	1,000
Lead	278	11,000	300	300
Mercury	0.3	30	1	15
Nickel	39	350	60	600
Tin	124	13,000	50	46,900
Zinc	476	30,000	200	7,000
TPH C_{10}-C_{14}	<100	9,000	500	-
TPH C_{15}-C_{28}	<500	25,000	1,000	-
Asbestos	0.04%*	11%*	0.001%**	0.001%**

NOTE *by volume, **by weight

Inert Fill

Volume		10,000m^3		
No. Samples Tested		11		
Contaminant	Average Concentration (mg/kg)	Maximum Concentration (mg/kg)	EIL (mg/kg)	HIL_A (mg/kg)
Arsenic	4	6	20	100
Chromium	41	54	50	210
Copper	18	25	60	1,000
Lead	19	29	300	300
Mercury	<0.1	<0.1	1	15
Tin	<10	<10	50	46,900
Zinc	11	24	200	7,000

Floodplain sediments

Volume		5,000m^3		
No. Samples Tested		19		
Contaminant	Average Concentration (mg/kg)	Maximum Concentration (mg/kg)	EIL (mg/kg)	HIL_A (mg/kg)
Arsenic	15	54	20	100
Cadmium	3.2	40	3	20
Chromium	119	1,000	50	120,000
Copper	190	810	60	1,000
Lead	207	940	300	300
Mercury	0.2	1.2	1	15
Nickel	26	76	60	600
Tin	27	72	50	46,900
Zinc	229	630	200	7,000
TPH C_{10}-C_{14}	<100	3,300	500	-
TPH C_{15}-C_{28}	<500	17,000	1,000	-
Asbestos	0.0004%*	0.013*%	0.001%**	0.001%**

NOTE *by volume, **by weight

Surface soil

Volume		60,000m^3		
No. Samples Tested		139		
Contaminant	Average Concentration (mg/kg)	Maximum Concentration (mg/kg)	EIL (mg/kg)	HIL_A (mg/kg)
Arsenic	46	1,710	20	100
Cadmium	1	14	3	20
Chromium	20	444	50	120,000
Copper	397	7,870	60	1,000
Lead	357	4,580	300	300
Mercury	1	17.8	1	15
Nickel	25	114	60	600
Tin	49	1,150	50	46,900
Zinc	374	8,520	200	7,000
TPH C_{10}-C_{14}	<100	4,800	500	-
TPH C_{15}-C_{28}	<500	13,500	1,000	-
Asbestos	0%*	1%*	0.001%**	0.001%**

NOTE *by volume, **by weight

Coal dam sediment

Volume		8,000m^3		
No. Samples Tested		10		
Contaminant	Average Concentration (mg/kg)	Maximum Concentration (mg/kg)	EIL (mg/kg)	HIL_A (mg/kg)
Arsenic	0.6	0.8	20	100
Cadmium	5.7	11	3	20
Chromium	215	260	50	120,000
Copper	40	60	60	1,000
Lead	30	45	300	300
Mercury	0.05	0.09	1	15
Nickel	118	190	60	600
Tin	3	6	50	46,900
Zinc	86	160	200	7,000
TPH C_{10}-C_{14}	912	1,700	500	-
TPH C_{15}-C_{28}	2,742	5,400	1,000	-

Notes: (TPH) - Total Petroleum Hydrocarbons
EIL and HIL values are maximum concentrations
Source: Department of Environmental Protection-Assessment Levels for Soil, Sediment and Water, December 2001.

50 years. The ash contains low levels of heavy metals. Asbestos levels in this waste are generally significantly lower than what was observed in the waste fill in the southern embankment area. It is proposed to leave the waste in-situ and cover with a warning barrier and clean soil to prevent direct contact.

3.2 Inert Fill

About 1ha of the Helena West site west of the coal dam contains approximately 10,000m^3 of inert fill. The fill is present to a depth of 3 metres from the surface. The fill has been extensively tested over 18 locations for heavy metals, asbestos, pesticides and hydrocarbons (including PAH's and phenols) (MRA 2002a and b, 2003).

Tests indicate that the inert fill contains clay and inert material and that contaminants are at the Ecological Investigation Levels (EILs), however the inert fill area is unsuitable to build on due to geotechnical instability. The inert fill will be screened to remove any foreign material and then be reused as clean soil cover over the retained waste fill.

3.3 Floodplain Area

Stormwater from the site discharges into an extensive low-lying area along the river floodplain. Soil samples along the floodplain at approximately 40 locations were tested for a range of heavy metals, asbestos, hydrocarbons and pesticides. Results indicate that the sediments are contaminated with metals in particular arsenic, copper, lead and zinc, and hydrocarbons in some areas. The presence of low levels of asbestos could be due to the airborne drift from dumping activities in the waste fill and from erosion of asbestos cement roofs used in the Workshops.

It is estimated that there is 5,000m^3 of contaminated material including sediments and deposits of waste fill used as embankments and access roads. This material will be removed where possible without damaging the large number of stands of mature trees and relocated to Area C.

3.4 Surface Soil

Ash and foundry sand were detected in surface soils. Both the ash and foundry sand component of the surface soils contained heavy metals including arsenic, copper and lead. Asbestos fibres in the form of chrysotile (white) were detected in a number of locations. Visible asbestos products were not observed. Natural ground beneath the surface soil was tested and found to be free of contamination (MRA, 2002 a and b).

Notwithstanding lead, table 1 indicates that all other heavy metals present in the ash and foundry sand component of the soil complies with the Health Investigation Levels (HIL) (Department of Environmental Protection *Assessment Levels for Soil, Sediment and Water*, 2001) for a commercial land use but is unsuitable for residential purposes. In order to develop the land for residential purposes 60,000m^3 of surface soil containing ash and foundry sand will be relocated to Area C and the land validated to Environmental Investigation Level recommended for residential land use.

3.5 Coal dam sediments

The coal dam was used for the under water storage of unstable coal to prevent it from igniting. Liquid wastes from the on-site wastewater treatment plant were also discharged into the dam. This has resulted in the accumulation at the base of the dam of approximately 8,000m^3 of oily sludges containing heavy metals and hydrocarbons.

The dam sediments have been tested for a range of heavy metals and hydrocarbons including PAH's and phenols. These contaminants could become mobilised if the dam water were to be significantly disturbed or if there was a change to its quality.

It is intended to use the dam as a water feature and stormwater detention basin. Sediments containing the oily sludge will be removed, treated on-site to remove water and then disposed off-site to an approved landfill.

3.6 Groundwater quality

Groundwater quality monitoring indicates that there is no significant contamination from heavy metals. Low levels of hydrocarbons were observed at three specific locations but at concentrations below environmental criteria (Australian Water Quality Guidelines – AWQG) set for the protection of the Helena River (Department of Environmental Protection *Assessment Levels for Soil, Sediment and Water*, 2001).

Groundwater quality monitoring beneath the waste fill indicates that zinc levels exceed the Australian Water Quality Guidelines. However, groundwater quality monitoring at five locations downgradient of the waste fill indicates that there is no significant off-site contamination.

Groundwater quality around the dam has been affected by the leaching of sediments. Monitor wells immediately outside of the dam contained elevated levels of copper and zinc up to 5 times the Australian Water Quality Guidelines.

Table 2: Key proposal characteristics

Element	Description
SITE IDENTIFICATION	The site occupies an area of approximately 15.5ha and is located on the western part of the former Midland Railway Workshops.
CURRENT ZONING	INDUSTRIAL
PROPOSED ZONING	RESIDENTIAL, COMMERCIAL AND PUBLIC OPEN SPACE PURPOSES.
DEMOLITION	Yes
NATURE OF CONTAMINANTS	*Waste Fill:* approximately 65,000m^3 of waste fill over an area of 2ha consists of building rubble, cinder ash, foundry sand and slag and occasional asbestos products such as fibre cement and lagging. *Inert Fill*: Approximately 1ha of the Helena West site west of coal dam contains 10,000 m3 of inert fill that contains heavy metals, asbestos, pesticides and hydrocarbons. *Floodplain sediments:* approximately 5,000m^3 of sediments containing heavy metals and asbestos fibres are located on the floodplain. *Surface soil:* approximately 60,000m^3 of surface soils present over an area of 12ha consists of sand, gravel, rock ballast and layers of coal cinders with low-levels of heavy metals. *Coal Dam:* approximately 8,000m^3 of oily sludge and sediments present over a 1ha site contain heavy metals and hydrocarbons. *Groundwater:* localised low concentration of heavy metal and hydrocarbons.
REMEDIATION AND MANAGEMENT	
Waste fill Inert fill Surface soils Floodplain sediments Coal dam oily sludge	• Retain 65,000m^3 of *waste fill* in Helena West and cover with a clearly visible warning barrier and at least 1 metre cover of clean soil. • Excavate, screen and validate on-site 10,000 m3 of *inert fill* for reuse as clean fill. • Relocate 5,000 m3 of *floodplain sediments* to Area C containment area in the far eastern part of the Workshop site and cover with a clearly visible warning barrier and 1 metre cover of clean soil. • Relocate 60,000m^3 of *surface soils* to Area C containment area in the far eastern part of the Workshop site and cover with a clearly visible warning barrier and 1 metre cover of clean soil. • Remove 5,000m^3 of oily sludge and sediments from the base of the coal dam and treat on-site prior to disposal off-site to landfill.
Environmental Management Program	• Implement the Environmental Management Program which includes the following plans to ensure remedial works are undertaken in a safe and effective manner: - Waste Management Plan; - Asbestos Management Plan; - Coal Dam Remediation Plan; - Dust and Air Quality Management Plan; - Noise and Vibration Management Plan; - Validation Plan; - Groundwater Management and Contingency Plan;

Element	Description
	- Stormwater Management Plan; and - Irrigation Management Plan. • Place memorials on titles and prepare a Sub-surface Constraints Register to outline the presence of the waste material and prevent contact. • Prepare an Environmental Management System (EMS) to ensure the waste is managed securely in the long term.
Groundwater	• Use of natural attenuation capacity of clay soils "bind" heavy metals. • Carry out a fate and transport modelling study model to predict potential risk of contaminants to reach the Helena River. • Implement contingency measures to cover the waste fill areas with an impermeable cap to prevent leaching, if groundwater monitoring or modelling indicates a risk to the Helena River.
Helena River	• Implement the Stormwater Management Plan to replace the existing system to prevent contaminated groundwater from entering the stormwater system..
Worker and Public Safety	• Implement the Public Occupational Health and Safety Plan as approved by Worksafe WA

The proponent in the accompanying referral document discusses the potential impacts of the proposal.

4. Consultation

During the preparation of the environmental referral document the proponent has undertaken consultation with various key stakeholders and the local community with a direct interest in the project.

Prior to the preparation of the environmental referral document, the EPA advised the MRA that it intended to set a formal level of assessment of Assessment of Referred Information (ARI) provided all necessary information is provided. The EPA advised that an ARI could be set provided the Midland Redevelopment Authority and the Swan Education District consulted with members of the public and the Woodbridge Primary School community and advised of the proposed remediation works adjacent to the school and that further remediation work will need to occur on areas beyond the 400m buffer zone at a later time (EPA letter, Dec 2002).

The P&C Association of the Woodbridge Primary School was consulted and has supported the expedited formal approval process. The P&C Association provided a letter of support in December 2002. In response to this community support the proponent referred the remediation proposal.

A key stakeholder meeting was arranged on 10 March 2003 where representatives from the following were in attendance:

- Western Australian Police Service;
- City of Swan;
- Woodbridge Primary School;

- Office of the Member for Midland, Michelle Roberts; and
- West Net Rail.

A number of the local ratepayers associations were also invited but did not attend.

An Information Session for the public was provided on 10 March 2003. This was widely advertised in the local newspapers: Echo, The Hills Gazette and the Midland/Kalamunda Reporter on the 22nd, 25th, and 28th of February and 4th March 2003. Information regarding the proposed remediation and outline of the nature of the contamination was provided in the form of a presentation. The event was advertised extensively in the local newspapers with a total of 23 residents and interested persons attending.

The following issues were raised during the stakeholder meeting:

- disposal of waste material off-site;
- approach to public consultation;
- approach to occupational health and safety; and
- timing of truck movements.

The Proponents response to these issues is specifically covered in the Environmental Management Program for the remediation. Waste material is to be retained on-site and be covered with a warning barrier and 1m of clean fill, and developed as public open space. Low-level contaminated soil is to be relocated into the eastern part of the site and developed as part of the future Police facility.

The following environmental topics were raised during the Public Information Session:

- approach to remediation;
- status and remediation of the Coal Dam;
- retention of vegetation;
- future vegetation on top of cover;
- identification of retained waste fill on maps;
- warning barrier and drainage issues; and
- current airborne asbestos monitoring and condition of buildings.

The Proponent has addressed these issues by developing an Environmental Management Program for the remediation. Retention of vegetation is considered problematic as it will need to be removed to either install the soil cover or remove the contaminated soil itself. Future vegetation on the cover will be shallow rooted bushes and grasses rather than trees. Air quality is currently monitored for asbestos fibres from time to time as part of the on-going management of on-site asbestos buildings. Buildings have been and are being inspected for asbestos products, removed and disposed of in a safe manner.

The proponent has been proactive and formed a community based consultation group referred to as the Midland Central Environmental Reference Group. This group is regularly informed on all environmental issues including land contamination and is

able to provide comment back to the proponent for review and consideration. This group is able to then convey information back to the wider local community.

The EPA considers that the consultation process has been appropriate and that all reasonable steps have been taken to inform the community and key stakeholders on the proposed remediation.

5. Relevant environmental factor

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

It is the EPA's opinion that the following environmental factor relevant to the proposal requires evaluation in this report:

Risk of contaminated material to groundwater quality, Helena River and human health.

The EPA has summarised its assessment of this factor in Section 5 below.

Description

Details of site contamination are provided in section 3 and table 1.

The waste fill, coal dam sediments and the surface soils containing ash and foundry sand pose a significant risk to groundwater quality and the Helena River due to potential leaching of contaminants. Contaminated groundwater also poses a risk to the Helena River due to discharge of groundwater to the Helena River and to human health if used for domestic use. The contaminated material also has the potential to affect human health through direct contact.

Remediation of the coal dam also poses a potential risk for the generation of odours and hydrocarbons. As part of the preliminary investigation of remediation options for the coal dam sediments, the proponent carried out air monitoring to assess the potential for release of air contaminants and odours. Initial trials carried out by Chemistry Centre of Western Australia indicate that the main constituents were aliphatic hydrocarbons and that "no significant levels of any highly toxic or noxious compounds were detected" (Chemistry Centre, February 2003).

The proponent has prepared a Coal Dam Management Plan that which discusses the remediation of the coal dam. The proponent has also prepared a Dust and Air Quality Management Plan to address air quality monitoring during the remediation of the Helena West site and the coal dam.

To assess the potential risk of groundwater contamination due to leaching of contaminants from the waste fill, leachate tests were carried out using the Australian

Standard Leachability Potential (ASLP) method. Laboratory tests on 30 waste fill samples show it to be relatively resistant to leaching. Groundwater monitoring at the waste fill areas show that there is no significant impact to groundwater quality.

In the unlikely event that leaching occurred, the proponent has carried out adsorption tests to determine whether the naturally occurring clay soils present in the area had the capacity to attenuate (bind) heavy metals. The adsorption (kd) tests involved the collection of a significant number of clay soil samples from beneath and immediately downgradient of the waste fill and upgradient of the Helena River.

In the unlikely event that contaminants leached into groundwater and moved offsite unattenuated by the clay soils, the proponent will carry out fate and transport modelling tests to determine the potential for contaminated groundwater to reach the Helena River.

Proposed Remediation Options

To manage the impact of the contaminated material discussed in section 3 on the environment and human health, the proponent has followed the remediation approach recently approved by the EPA for the Area BCD assessment (EPA Bulletin 1057, 2002) and will adopt the following remediation options.

- On-site treatment;
- Disposal off-site; and
- On-site relocation and containment using a warning barrier and clean fill cover.

The proponent has considered treatment options such as on-site treatment using screening and drying, natural attenuation, off-site disposal to landfill, on-site relocation and containment of waste fill using a clean fill over a warning barrier on waste fill areas only.

On-site treatment methods will be used to screen the least contaminated inert fill material and reuse on site as validated clean fill.

Natural attenuation is the process for naturally occurring biophysical and chemical processes to occur in the groundwater aquifer to reduce the mass of contaminants.

The disposal off-site option involves the total removal of all coal dam sediments and oily sludge to an approved landfill site after on-site treatment to reduce the water content of the material before disposal. Generally landfill disposal of contaminated soil is the most common approach to remediation in Western Australia. However, as indicated in its Guidance Statement 17, landfill disposal option is generally not the EPA's preferred option and is not usually considered where there is a significant volume of waste. In this particular case, the estimated volume of coal dam sediment is 8,000 m^3 and contains high levels of heavy metals and hydrocarbons and if remained on site would pose a risk to the environment and human health if not managed in an acceptable manner.

The on-site relocation involves the movement of floodplain sediments and low level contaminated surface soils to Area C containment area in the far eastern part of the Workshop site. This material will be covered with a 1m clean fill cover over a warning barrier.

Assessment

The area considered for assessment of this factor is the 15.5 ha of land referred to as the Helena West area of the Helena Precinct within the Midland Railway Workshop site in Midland.

The EPA's environmental objective for this factor is to protect groundwater, the Helena River ecosystem and human health by:

- Ensuring the extent and nature of soil contamination is fully determined so that appropriate remedial and management measures can be implemented for the rehabilitation of the site;

- Ensuring the rehabilitation of the site to an acceptable standard that is compatible with the intended land use, consistent with appropriate criteria including ANZECC guidelines , health risk assessment criteria and applicable international standards; and

- Ensuring that the remediation strategy is consistent with the objectives of the EPA's hierarchal approach for site remediation (EPA Guidance Statement No 17).

As indicated in Guidance Statement No 17, the EPA's preferred hierarchal approach for site remediation is for contaminated material to:

- Be treated on-site and the contaminants reduced to acceptable levels; or
- Be treated off-site and returned for reuse after the contaminants have been reduced to acceptable levels.

Disposal to an approval landfill and 'cap and contain' isolation measures should only be used if the preferred approaches are not practicable and if undertaken in an environmentally acceptable manner.

Waste characteristic

The EPA considers that the extent and nature of site contamination has been adequately determined for the purposes of this assessment. The EPA also considers, on advice from the Department of Environmental Protection that for the remediation/validation phase of works at this site, the proponent should use other techniques such as a photo ionisation detector to detect the presence of hydrocarbon and not rely on mainly visual and olfactory methods. The EPA notes the advice provided that the proponent should also analyse soils for analytes including cyanide.

On-site containment

The EPA considers that on-site containment of waste fill is the most practicable and feasible option as the waste can be managed in an environmentally acceptable manner.

In relation to heavy metals in the waste fill and its potential effect on human health and the environment, the EPA considers that the leachate tests indicate that the waste fill showed a significant resistance to leaching. The EPA also notes that the adsorption tests of clay soils beneath and downgradient of the waste fill area showed a natural capacity to bind heavy metals. The EPA considers that based on these studies, the potential risk of groundwater contamination and to human health is not significant.

In addition, the EPA considers that the 1 metre clean fill cover over a geotextile fabric barrier will ensure that exposure to heavy metals in the waste fill will be significantly reduced. The EPA considers on advice of the Department of Health that the proposed level of cover over waste fill material for public open space is considered protective of public health. Having regard to the limited presence of asbestos, the EPA considers that on-site containment of the waste fill is acceptable provided a minimum cover of 1 metre clean fill is placed over the waste fill. The EPA considers that this approach is consistent with the management approved for Areas B, C and D. The EPA considers that a minimum 1-metre cover should apply to areas where on-site containment of waste fill is proposed. The EPA also considers that the subsurface constraints register and ongoing management of the site would protect against disturbance of this material.

The EPA requires material used as backfill to be validated and meet the Environmental Investigation Levels (EILs) unless sourced from a quarry. The EPA considers on advice from the Department of Environmental Protection that if backfill material is to be sourced from a quarry, a letter or certificate from the quarry demonstrating that the material is from a clean source will need to be provided to the Department of Environmental Protection.

The EPA considers that services such as power, drainage and telephone should be installed within the clean cover material. The EPA considers that where services are located below the cover, soil validation is required to demonstrate that the soil is not contaminated. In the event of contamination, the EPA considers that appropriate health procedures should be applied. The EPA considers that the cover of clean fill over the geotextile warning barrier over the waste fill will reduce the potential risk of exposure to asbestos fibres.

The EPA notes the commitments by the proponent to:

- undertake ongoing groundwater monitoring to confirm that natural attenuation is occurring;
- carry out more detailed fate and transport modelling;
- install an impermeable cap over the waste fill should groundwater quality monitoring indicate that leaching was occurring; and
- implement a groundwater contingency plan which considers all practical management techniques and includes groundwater abstraction, treatment and

containment options, if fate and transport modelling indicates that there is insufficient natural attenuation occurring and there is risk to the Helena River.

The EPA notes that current groundwater quality beneath the project area is not contaminated at levels that could potentially impact the Helena River. The EPA considers that superficial groundwater should not be used as an irrigation supply unless the proponent can clearly demonstrate there is no risk to the environment or public health in either the short or long term. The EPA considers that banning the use of the superficial groundwater for domestic use may be required to reduce the risk to public health. This is a matter for the Department of Environmental Protection and the Department of Health.

Proponent's additional management commitments

The proponent has made commitments to implement them in accord with the environmental management program (EMP) that has been prepared as part of the environmental referral document. The EMP addresses:

- Waste Management Plan
- Stormwater Management Plan
- Asbestos Management Plan
- Validation Plan
- Noise and Vibration Management Plan
- Groundwater Management and Contingency Plan
- Coal Dam Remediation Plan
- Dust and Air Quality Management Plan
- Irrigation Management Plan

Summary

Having particular regard to the:

(a) proposed site remediation;
(b) proponent's management commitments; and
(c) recommended Conditions

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

6. Conclusions

The EPA has considered the proposal by the Midland Redevelopment Authority to remediate 15.5 hectare (ha) of land referred to as Helena West within the Helena Precinct of the former Midland Railway Workshop Site in Midland and has concluded that the proposal can be managed to meet the EPA's objectives of protection of groundwater, the Helena River ecosystem and human health provided that there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 2

The remediation of the Midland Railway Workshops Helena West site can be achieved by a combination of:

- On-site treatment;
- Disposal off-site; and
- On-site relocation and containment using a warning barrier and clean fill cover.

The EPA considers that the extent and nature of site contamination has been adequately determined for the purposes of this assessment.

The EPA considers that on-site containment of waste fill is the most practicable and feasible option as the waste can be managed in an environmentally acceptable manner. In relation to heavy metals in the waste fill and its potential effect on human health and the environment, the EPA considers that studies carried out indicate that the soil has a natural attenuation capacity to adsorb heavy metals due to its clay content. The EPA also notes that these studies showed that the natural ground between the waste fill and the river exhibited a strong capacity to bind heavy metals. The EPA considers that based on these results the potential risk of groundwater contamination and public health is minimal.

In addition, the EPA considers that a 1 metre clean fill cover over a geotextile fabric barrier will ensure that exposure to heavy metals in the waste fill will be significantly reduced. Having regard to the limited presence of asbestos, the EPA considers that on-site containment of the waste fill is acceptable provided a minimum cover of 1 metre clean fill is placed over the waste fill. The EPA considers that this approach is consistent with the management of Areas B, C and D. The EPA considers that a minimum 1 metre cover should apply to areas where on-site containment of waste fill is proposed. The EPA also considers that material used as backfill is to be validated and meet the Environmental Investigation Levels (EILs) unless sourced from a quarry.

The EPA considers that services such as power, drainage and telephone should be installed within the clean cover material. The EPA considers that where services are located below the cover, soil validation is required to demonstrate that the soil is not contaminated. In the event of contamination, the EPA considers that appropriate health procedures should be applied. The EPA considers that the cover of clean fill over the geotextile warning barrier over the waste fill will reduce the potential risk of exposure to asbestos fibres.

The EPA notes that current groundwater quality beneath the project area is not contaminated at levels that could potentially impact the Helena River. The EPA considers that superficial groundwater should not be used as an irrigation supply unless the proponent can clearly demonstrate there is no risk to the environment or human health in either the short or long term. The EPA considers that banning the use of the superficial groundwater for domestic use may be required to reduce the risk to public health. This is a matter for the Department of Environmental Protection and the Department of Health.

The EPA notes that the proponent has prepared an environmental management program (EMP) as part of its environmental referral document that includes plans to address:

- Stormwater Management Plan;
- Asbestos Management Plan;
- Validation Plan;
- Noise and Vibration Management Plan;
- Groundwater Management and Contingency Plan;
- Coal Dam Remediation Plan;
- Dust and Air Quality Management Plan; and
- Irrigation Management Plan.

In summary, the EPA has concluded that the proposed arrangements for remediation, as set out in Section 2 of this report, are appropriate for residential, commercial and public open space development.

The proponent has committed to this process in its list of commitments.

7. Recommendations

The EPA submits the following recommendations to the Minister for the Environment and Heritage:

1. That the Minister notes that the proposal being assessed is for the remediation of 15.5 ha of land in the Western (Helena West) area of the former Midland Railway Workshop Site in Midland.
2. That the Minister considers the report on the relevant environmental factor as set out in Section 5;
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 2, including the proponent's commitments.
4. That the Minister imposes the conditions and procedures recommended in Appendix 2 of this report.

Appendix 1

References

ANZECC (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment and Conservation Council.

DEP (2001). Assessment Levels for Soil, Sediment and Water. Contaminated Sites Management Series. Department of Environmental Protection.

EPA (1997). Guidance Statement for Remediation Hierarchy for Contaminated Land. July 2000. Policy No.17. Environmental Protection Authority.

EPA (2002). Remediation of the Midland Railway Workshops – Area B, C and D for the Proposed Police Operations Facility. Bulletin 1057. Environmental Protection Authority.

MRA (2002 a). Detailed Site Investigation-Helena Precinct Waste fill- Midland Railway Workshops Vol 1) October 2002.

MRA (2002 b). Detailed Site Investigation-Helena Precinct Waste fill- Midland Railway Workshops Vol 2) October 2002.

MRA (2003a). Detailed Site Investigation-Helena Precinct Waste fill- Midland Railway Workshops Vol 2) October 2002.

MRA (2003). Midland Railway Workshops Site, Helena West Precinct Proposed Remediation. Scoping Document. March 2003.

MRA (2003). Midland Railway Workshops Site, Helena West Precinct Proposed Remediation. Environmental Referral Document. June 2003.

MRA (2003). Environmental Management Program. Remediation of the Midland Railway Workshops. Helena West Precinct, Midland. May 2003.

Appendix 2

Recommended Environmental Conditions and Proponent's Consolidated Commitments

Statement No.

Statement No.

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
(PURSUANT TO THE PROVISIONS OF THE
ENVIRONMENTAL PROTECTION ACT 1986)

REMEDIATION OF MIDLAND RAILWAY WORKSHOPS SITE
HELENA WEST AREA, HELENA PRECINCT, MIDLAND

Proposal: The remediation of approximately 15.5 hectares of land which includes the western portion (Helena West) of the former Midland Railway Workshops Site within the Helena West precinct in Midland, for residential, commercial and public open space purposes, as documented in schedule 1 of this statement.

Proponent: Midland Redevelopment Authority

Proponent Address: Railway Institute Building
Midland Railway Workshop Site
Montreal Road East
Midland WA 6056

Assessment Number:

Report of the Environmental Protection Authority: Bulletin 1111

The proposal referred to above may be implemented by the proponent subject to the following conditions and procedures:

Procedural conditions

1 Implementation and Changes

1-1 The proponent shall implement the proposal as documented in schedule 1 of this statement subject to the conditions of this statement.

1-2 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment

determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.

1-3 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is not substantial, the proponent may implement those changes upon receipt of written advice.

2 Proponent Commitments

2-1 The proponent shall implement the consolidated environmental management commitments documented in schedule 2 of this statement.

2-2 The proponent shall implement subsequent environmental management commitments that the proponent makes as part of the fulfilment of the conditions in this statement.

3 Proponent Nomination and Contact Details

3-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.

3-2 If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.

3-3 The nominated proponent shall notify the Department of Environmental Protection of any change of contact name and address within 60 days of such change.

4 Commencement and Time Limit of Approval

4-1 The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposal has been substantially commenced or the approval granted in this statement shall lapse and be void.

Note: The Minister for the Environment will determine any dispute as to whether the proposal has been substantially commenced.

4-2 The proponent shall make application for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement to the Minister for the Environment prior to the expiration of the five-year period referred to in condition 4-1.

The application shall demonstrate that:

1. the environmental factors of the proposal have not changed significantly;
2. new, significant environmental issues have not arisen; and
3. all relevant government authorities have been consulted.

Note: The Minister for the Environment may consider the grant of an extension of the time limit of approval not exceeding five years for the substantial commencement of the proposal.

Environmental conditions

5 Compliance Audit

5-1 The proponent shall prepare an audit program and submit compliance reports to the Department of Environmental Protection which address:

1 the implementation of the proposal as defined in schedule 1 of this statement;
2 evidence of compliance with the conditions and commitments; and
3 the performance of the environmental management plans and programs.

Note: Under sections 48(1) and 47(2) of the *Environmental Protection Act 1986*, the Chief Executive Officer of the Department of Environmental Protection is empowered to audit the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this statement.

6 Dust and Air Quality

6.1 The proponent shall have in place a Dust and Air Quality Management Plan to the requirements of the Minister for the Environment, on advice of the Environmental Protection Authority and the Department of Health.

6.2 The plan shall include:

(a) ambient monitoring during remediation at the boundary of Helena West site at not less than two locations on the boundary for Particulate Matter (PM_{10} and $PM_{2.5}$), total suspended particulates (TSP), arsenic, copper, lead and zinc and asbestos fibres.

(b) ambient monitoring during remediation for TSP and arsenic, copper, lead and zinc in the vicinity of and surrounding the areas to be disturbed.

(c) ambient monitoring during remediation for naphthalene, benzene, xylene, sulphur dioxide and hydrogen sulphide in the vicinity of and surrounding the coal dam.

6.3 The plan shall indicate absolute and target levels as follows:

Absolute	Arsenic	5ug/m^3/8 hour
	Copper	100 ug/m^3/8 hour
	Lead	0.5 ug/m^3/ year

	Zinc		1000ug/m^3/8 hour
	Asbestos		0.01 fibres/ml
	Naphthalene		1ppm/ 8 hour
	Benzene		50 ug/m^3/8 hour
	Xylene		8ppm (8 hour)
	Sulphur dioxide		0.25 ppm/ 1 hour
	Hydrogen sulphide		1 ppm/ 8 hour
Target	PM10	50ug/m^3/24 hour	
	PM2.5	25 ug/m^3/24 hour	
	TSP	150ug/m^3/24 hour	

6.4 The plan shall specify that:

(a) an exceeedence of any of the Absolute levels in 6.3 at any of the monitoring sites will immediately require all activities on the project site to cease and not recommence until an investigation report has been prepared and submitted to the Department of Environmental Protection and approval to recommence has been given by the Department of Environmental Protection.

(b) an exceedence of any of the target levels in 6.3 at any of the monitoring sites will immediately result in a change to activities on the project site and response to achieve levels below target levels as soon as possible, and a report submitted to the Department of Environmental Protection outlining the action taken to achieve levels below the target including time to be taken.

Procedures

1 Where a condition states "to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority", the Chief Executive Officer of the Department of Environmental Protection will obtain that advice for the preparation of written advice to the proponent.

2 The Environmental Protection Authority may seek advice from other agencies, as required, in order to provide its advice to the Chief Executive Officer of the Department of Environmental Protection.

Note

1 The Minister for the Environment will determine any dispute between the proponent and the Environmental Protection Authority or the Department of Environmental Protection over the fulfilment of the requirements of the conditions.

Proposal (Assessment No. 1488) Schedule 1

The remediation of approximately 15.5 hectares of land which includes the western portion (Helena West) of the former Midland Railway Workshops Site within the Helena West precinct in Midland, for residential, commercial and public open space purposes.

Table 1: Key proposal characteristics

Element	Description
SITE IDENTIFICATION	The site occupies an area of approximately 15.5ha and is located on the western part of the former Midland Railway Workshops.
CURRENT ZONING	INDUSTRIAL
PROPOSED ZONING	RESIDENTIAL, COMMERCIAL AND PUBLIC OPEN SPACE PURPOSES.
DEMOLITION	Yes
NATURE OF CONTAMINANTS	*Waste Fill:* approximately 65,000m^3 of waste fill over an area of 2ha consists of building rubble, cinder ash, foundry sand and slag and occasional asbestos products such as fibre cement and lagging. *Inert Fill*: Approximately 1ha of the Helena West site west of coal dam contains 10,000 m3 of inert fill which contains heavy metals, asbestos, pesticides and hydrocarbons. *Floodplain sediments:* approximately 5,000m^3 of sediments containing heavy metals and asbestos fibres are located on the floodplain. *Surface soil:* approximately 60,000m^3 of surface soils present over an area of 12ha consists of sand, gravel, rock ballast and layers of coal cinders with low-levels of heavy metals. *Coal Dam:* approximately 8,000m^3 of oily sludge and sediments present over a 1ha site contain heavy metals and hydrocarbons. *Groundwater:* localised low concentration of heavy metal and hydrocarbons.
REMEDIATION AND MANAGEMENT	
Waste fill Inert fill Surface soils Floodplain sediments Coal dam oily sludge Environmental Management Program	• Retain 65,000m^3 of *waste fill* in Helena West and cover with a clearly visible warning barrier and at least 1 metre cover of clean soil. • Excavate, screen and validate on-site 10,000 m3 of *inert fill* for reuse as clean fill. • Relocate 5,000 m3 of *floodplain sediments* to Area C containment area in the far eastern part of the Workshop site and cover with a clearly visible warning barrier and 1 metre cover of clean soil. • Relocate 60,000m^3 of *surface soils* to Area C containment area in the far eastern part of the Workshop site and cover with a clearly visible warning barrier and 1 metre cover of clean soil. • Remove 5,000m^3 of oily sludge and sediments from the base of the coal dam and treat on-site prior to disposal off-site to landfill. • Prepare and implement a Coal Dam Remediation Plan to finalise the removal and treatment methods. • Implement the Environmental Management Program which includes the following plans to ensure remedial works are undertaken in a safe and effective manner:

Element	Description
	- Waste Management Plan; - Asbestos Management Plan; - Coal Dam Remediation Plan; - Dust and Air Quality Management Plan; - Noise and Vibration Management Plan; - Validation Plan; - Groundwater Management and Contingency Plan; - Stormwater Management Plan; and - Irrigation Management Plan. • Place memorials on titles and prepare a Sub-surface Constraints Register to outline the presence of the waste material and prevent contact. • Prepare an Environmental Management System (EMS) to ensure the waste is managed securely in the long term.
Groundwater	• Use of natural attenuation capacity of clay soils "bind" heavy metals. • Carry out a fate and transport modelling study model to predict potential risk of contaminants to reach the Helena River. • Implement contingency measures to cover the waste fill areas with an impermeable cap to prevent leaching, if groundwater monitoring or modelling indicates a risk to the Helena River.
Helena River	• Implement the Stormwater Management Plan to replace the existing system to prevent contaminated groundwater from entering the stormwater system..
Worker and Public Safety	• Implement the Public Occupational Health and Safety Plan as approved by Worksafe WA

Schedule 2

Proponent's Consolidated Environmental Management Commitments

September 2003

REMEDIATION OF MIDLAND RAILWAY WORKSHOP SITE HELENA WEST – HELENA PRECINCT, MIDLAND

MIDLAND REDEVELOPMENT AUTHORITY

PROPONENT'S ENVIRONMENTAL MANAGEMENT COMMITMENTS FOR THE REMEDIATION OF HELENA WEST, HELENA PRECINCT, MIDLAND RAILWAY WORKSHOPS, MIDLAND REDEVELOPMENT AUTHORITY (Assessment No. 1488)

Note: The term "commitment" as used in this schedule includes the entire row of the table and its six separate parts as follows:

- A commitment number;
- A commitment topic;
- The "action" to be undertaken by the proponent;
- The objective of the commitment;
- The timing requirements of the commitment; and
- The body/agency to provide technical advice to the Department of Environmental Protection.

No.	Topic	Action	Objectives	Timing	Advice
1.	Rehabilitation	Cover waste material with a warning barrier and a clean soil cover of at least 0.5m beneath hardstand and 1metre in open areas.	To prevent direct contact with hazardous material.	Post remediation	
2.	Groundwater Quality	Perform a computer fate and transport groundwater model for the heavy metal contaminants from the waste fill.	To determine whether natural attenuation alone will degrade contaminants to levels acceptable for discharge into the Helena River and the need for an impermeable cap to prevent leaching.	Post remediation	
3.	Coal Dam Management	Implement the Coal Dam Remediation Plan previously submitted	To ensure the sediments are removed as best as practical and treated in an environmentally responsible manner to minimise air emissions including odour.	During remediation	
4.	Waste Management	Implement the Waste Management Plan for the excavation, transport and relocation of the waste fill previously submitted	To ensure that waste fill is relocated to the correct locations and that the material is excavated and shifted in a safe manner.	During remediation	
5.	Asbestos Products	Implement the Asbestos Waste Management Plan previously submitted addressing the handling and disposal of asbestos dumps.	To prevent the release of asbestos fibres from the remedial works.	During remediation	DOH
6.	Asbestos Management	Perform a health risk assessment for very low-level asbestos impacted ground that cannot be removed from the floodplain due to retention of vegetation.	To ensure the asbestos does not become airborne and represent an unacceptable risk to public health.	Post remediation	DOH

No.	Topic	Action	Objectives	Timing	Advice
7.	Air Emissions	Implement the Dust and Air Quality Management Plan addressing: -air quality monitoring; –asbestos monitoring; and –dust management practices.	To ensure nuisance and contaminated dust including asbestos fibres potentially generated from remedial works comply with regulatory standards protective of human health.	During remediation	DOH
8.	Noise and Vibration	Implement the Noise and Vibration Management Plan addressing: -prevention of excessive and nuisance noise; and -prevention of damage due to vibration.	To prevent noise emissions and vibration during remedial works exceeding regulatory standards.	During remediation	
9.	Soil Quality Validation	Implement the Validation Plan addressing: -sampling methodology; and -clean-up criteria.	To ensure that all contaminated soil is removed.	During remediation	DEP
10.	Soil Quality	Prepare a Sub-surface Constraints Register detailing location and depth of retained waste fill, including details of cover construction.	To prevent uncontrolled contact with the waste fill.	Post remediation	
11.	Groundwater Quality	Implement the Groundwater Management and Contingency Plan addressing: -monitoring of groundwater levels; -monitoring of groundwater quality; -treatment of contaminated groundwater; and -management of any groundwater impact.	To monitor the performance of remedial works and attenuation of contaminants from groundwater into natural soils and prevent elevated contaminant levels from reaching and potentially harming the aquatic environment of the Helena River.	Post remediation	DEP
12.	Irrigation Management Plan	Implement the Irrigation Management Plan addressing: -water balance, subsurface drainage; and -overall irrigation strategy.	To reduce minimise subsurface drainage and enhanced leaching of contaminants into the underlying groundwater.	Post remediation	DEP
13.	Stormwater Quality Management	Implement the Stormwater Management Plan previously submitted for managing stormwater discharging from the site.	To monitor the performance of stormwater system in attenuating contaminants.	Post remediation	DEP
14.	Community Consultation	Consult with interest groups and keep the local community informed on the progress of the remedial works.	To inform, seek feedback and address community concerns about the project.	Prior to commencement of ground-disturbing activities	

Legend

DEP	Department of Environmental Protection
DOH	Department of Health