RESOURCE POTENTIAL FOR LAND USE PLANNING
Basic Raw Material Resources
PORT HEDLAND

Basic raw materials

Surficial materials

Unit	Description
Calcrete, caliche	Massive nodular and cavernous calcrete, variably silicified; alluvial and residual
Ferricrete	Reddish brown, pisolitic or massive lateritic duricrust; residual; low, undulating surfaces and paleodrainage lines
Limesand	Pale pinkish grey quartz sand and shell debris; eolian; coastal dunes, spits and low ridges
Limestone	Pale yellowish brown, sandy limestone; variably lithified; eolian; shore-parallel low ridges
Sand and gravel	
Alluvial sand and gravel	Dark red sand and gravel in rivers and creeks; sand, red and reddish brown silt and clay on floodplains; alluvial; floodplains, terraces, rivers and creeks
Colluvial sand and gravel	Reddish brown, gravelly sands and silts and red silts and clays; colluvium; proximal outwash fans
Eolian sand	Red, fine- to medium-grained quartz sand; eolian; sandplains
Ferruginous sand and gravel	Red, gravelly sandy silts and clays dominated by ferruginous material; sheetwash; distal outwash fans
Outwash plain sand and gravel	Red and reddish brown sands and gravels, silt and clay; areas of expansive clays; alluvial; outwash plains
Quartzofeldspathic sand	Red, fine- to medium-grained quartz sand; residual and sheetwash; sandy surfaced plains
Sheetwash sand and gravel	Red and reddish brown sandy silts and clays; sheetwash; distal outwash fans
Spoil bank	Pale yellowish brown, medium- to coarse-grained sand with some gravel layers; made ground

Hard rocks

Unit	Description
Igneous and metamorphic rocks	
Basalt	Dark grey, fine-grained, generally massive basalt; exposed; rugged hills, bedrock strike ridges, plateau remnants
Felsite	Pale coloured, fine-grained, felsic lavas, sedimentary and pyroclastic rocks; exposed; hills and strike ridges
Gabbro	Dark green, coarse-grained gabbro, subordinate medium-grained dolerite; exposed; rugged hills and plateau remnants
Granite	Pink to grey, medium- to coarse-grained granitic rock; exposed; rugged hills, ridges and low hills
Ultramafics	Dark-coloured, dense, medium- to coarse grained ultramafic rock; exposed; rugged strike ridges
Sedimentary rocks	
BIF–jaspilite–chert	Grey, white and black banded chert, ferruginous chert, and banded iron- formation (BIF) with subordinate fine-grained clastic sedimentary rock; bedrock hills and strike ridges
Sandstone, minor conglomerate	Pale- to mid-brown, quartz-rich, coarse-grained sandstone; exposed; undulating low hills, rugged hills, bedrock strike ridges
Silicified carbonate and clastic rocks	Silicified carbonate rocks, sandstone, conglomerate, chert and dolomite

Analyses

Calcrete, caliche: $CaCO_3$ / Acid insoluble residue

Limesand: $CaCO_3$ / Acid insoluble residue

Limestone: $CaCO_3$ / Acid insoluble residue

Sand and gravel: Gravel / Fines / Sand

Quarries and pits

- Active
- Inactive
- Proposed
- Cali — Calcrete, caliche
- Gvl — Gravel
- Lsd — Limesand
- Lst — Limestone
- Rc — Crushed rock
- Sd — Sand

Boreholes (showing thickness of surficial material, in metres)

- 3 Water bore

Tenement for basic raw materials

- Mining lease, live (*Mining Act 1978*)

Crown reserve for basic raw materials

- Townsite (*Land Administration Act 1997*)

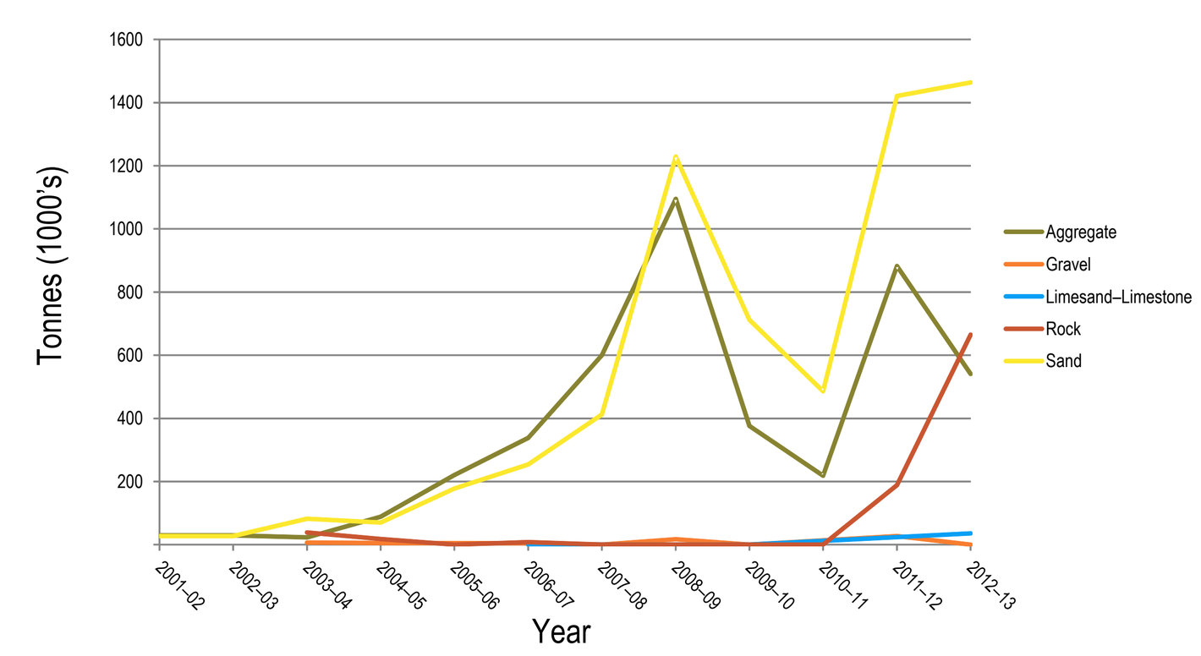
- Aboriginal community
- Homestead
- Locality
- Highway
- Major road
- Minor road
- Railway, operating
- Jetty/Wharf
- Local government authority
- Drainage network
- Contour, elevation in metres

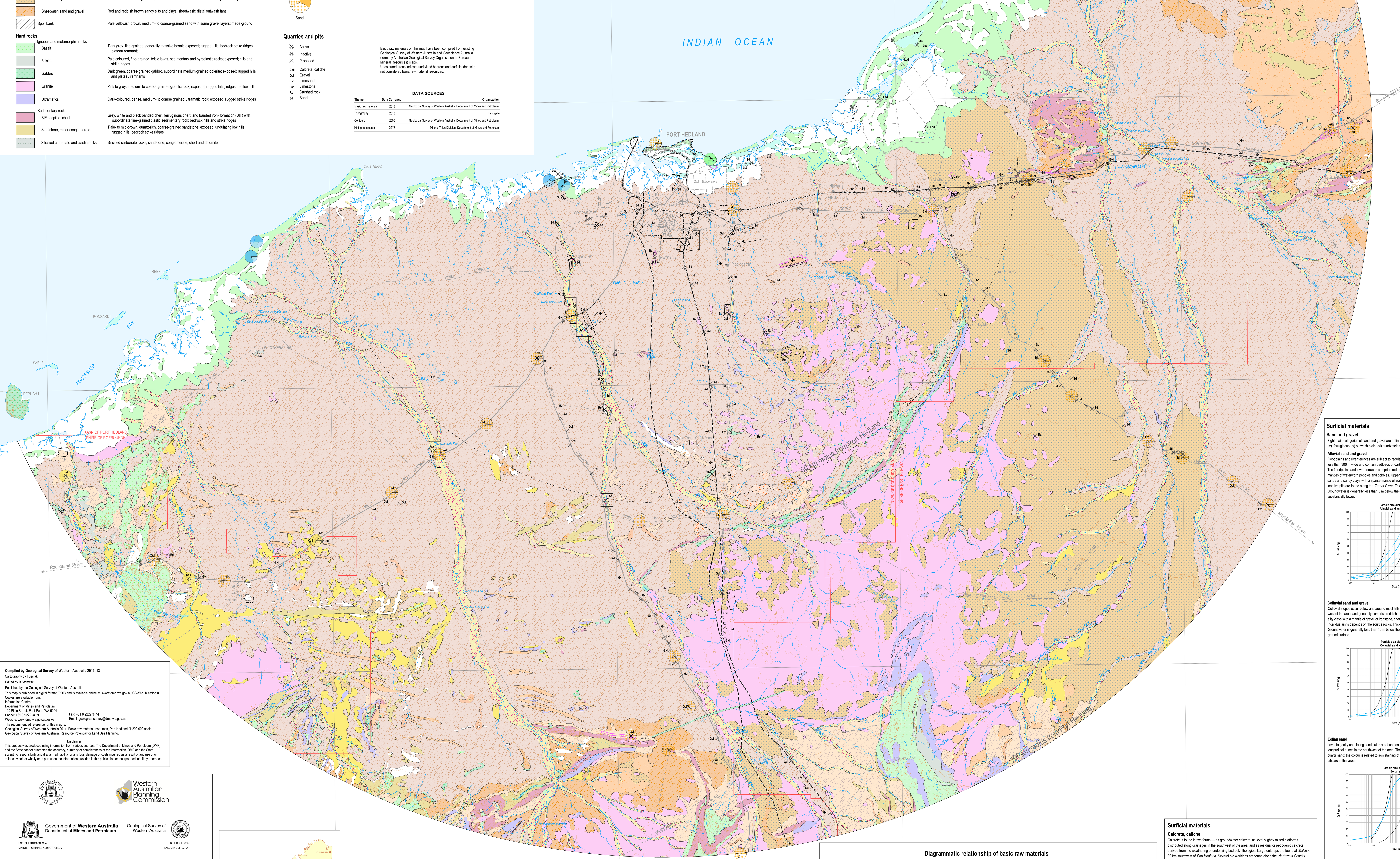
Basic raw materials on this map have been compiled from existing Geological Survey of Western Australia and Geoscience Australia (formerly Australian Geological Survey Organisation or Bureau of Mineral Resources) maps.
Uncoloured areas indicate undivided bedrock and surficial deposits not considered basic raw material resources.

DATA SOURCES

Theme	Data Currency	Organization
Basic raw materials	2013	Geological Survey of Western Australia, Department of Mines and Petroleum
Topography	2013	Landgate
Contours	2006	Geological Survey of Western Australia, Department of Mines and Petroleum
Mining tenements	2013	Mineral Titles Division, Department of Mines and Petroleum

Production summary of Basic Raw Materials from mining tenements
Town of Port Hedland





Compiled by Geological Survey of Western Australia 2012–13
Cartography by I Lesiak
Edited by B Striewski
Published by the Geological Survey of Western Australia
This map is published in digital format (PDF) and is available online at <www.dmp.wa.gov.au/GSWApublications>.
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Website: www.dmp.wa.gov.au/gswa Email: geological survey@dmp.wa.gov.au
The recommended reference for this map is:
Geological Survey of Western Australia 2014, Basic raw material resources, Port Hedland (1:200 000 scale): Geological Survey of Western Australia, Resource Potential for Land Use Planning.

Western Australian Planning Commission

Government of Western Australia
Department of Mines and Petroleum

Geological Survey of Western Australia

HON. BILL MARMION, MLA
MINISTER FOR MINES AND PETROLEUM

RICK ROGERSON
EXECUTIVE DIRECTOR

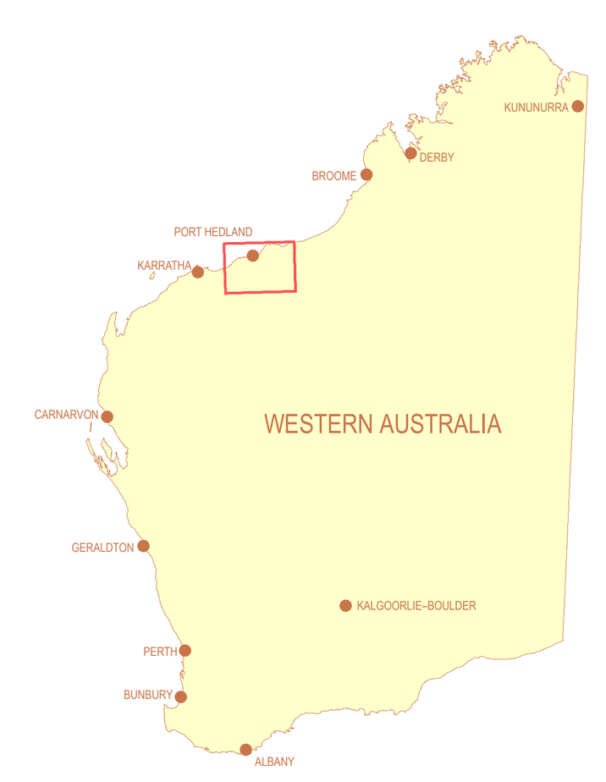
SCALE 1:200 000

0 5 10 15 20 Kilometres

UNIVERSAL TRANSVERSE MERCATOR PROJECTION
HORIZONTAL DATUM: GEOCENTRIC DATUM OF AUSTRALIA 1994
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM

Grid lines indicate 40 000 metre interval of the Map Grid Australia Zone 50

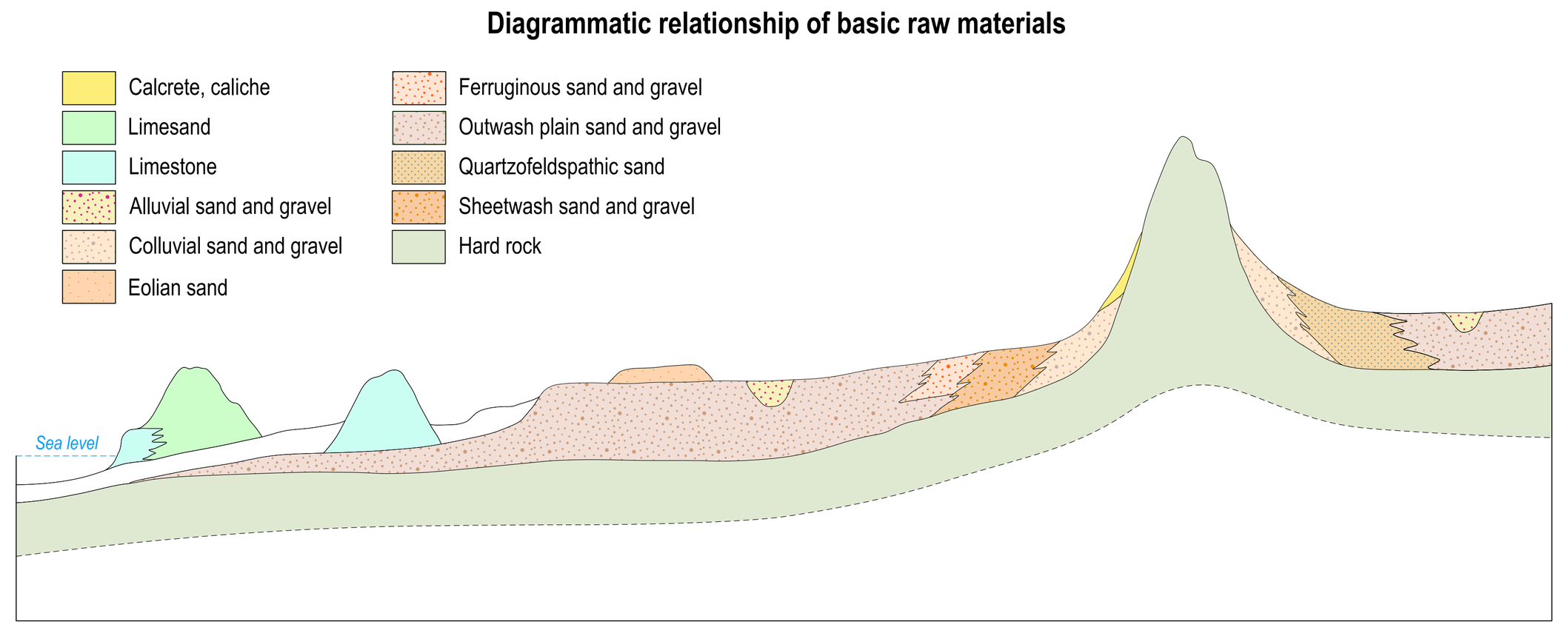
GDA The Map Grid Australia (MGA) is based on the Geocentric Datum of Australia 1994 (GDA94)
GDA94 positions are compatible within one metre of the datum WGS84 positions



RESOURCE POTENTIAL FOR LAND USE PLANNING
Basic Raw Material Resources
PORT HEDLAND

This map was produced at the request of the Western Australian Planning Commission specifically to identify potential basic raw material resources within 100 km of Port Hedland, with funding from the Government of Western Australia through the State Natural Resource Management Program.

Diagrammatic relationship of basic raw materials



Surficial materials

Calcrete, caliche

Calcrete is found in two forms — as groundwater calcrete, as level slightly raised platforms distributed along drainages in the southwest of the area, and as residual or pedogenic calcrete derived from the weathering of underlying bedrock lithologies. Large outcrops are found at *Mallina*, 90 km southwest of *Port Hedland*. Several old workings are found along the *Northwest Coastal Highway* near *Mallina*. $CaCO_3$ values range between 35% and 64%. Groundwater is generally less than 5 m below the ground surface.

Ferricrete

Ferricrete is found in two forms — in the southwest of the area as small, widely-scattered outcrops of reddish brown, hard, rubbly, pisolitic or massive lateritic duricrust up to 3 m in thickness, and as small, isolated occurrences along *Pardoo Creek*, between *Indee* and *Wallareenya* and near *Poondano Well*. These are pisolitic limonite deposits developed along paleodrainage lines. Several inactive pits are found in this material.

Limesand

Dunes and storm ridges of pale pinkish grey quartz sand and shell debris occur along the whole coastline at the seaward and landward margins of the tidal flats. They are up to 8 m in height with gently inclined slopes and undulating surfaces. Ridges have been worked at *Boodarie* and to the east of *Port Hedland*. The more seaward dunes are susceptible to wave and wind erosion. $CaCO_3$ values are generally very low. Groundwater is generally less than 10 m below the ground surface.

Limestone

Low-relief ridges of calcareous sandstone up to 100 m wide and several kilometres long are found along the whole coastline. The limestone is pale yellowish brown, contains quartz and shell debris and is variably lithified. $CaCO_3$ values, range between 43% and 72%. There are no active workings, but material has been extracted at *Boodarie* and between *Port Hedland* and the *Ridley River*. These ridges have limited potential as a source of lime.

Surficial materials

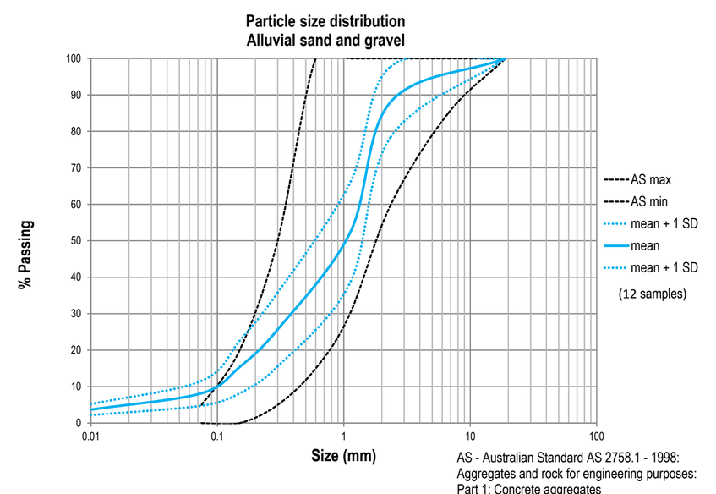
Sand and gravel

Eight main categories of sand and gravel are defined: (i) alluvial, (ii) colluvial, (iii) eolian sand, (iv) ferruginous, (v) outwash plain, (vi) quartzofeldspathic sand, (vii) sheetwash, (viii) spoil bank.

Alluvial sand and gravel

Floodplains and river terraces are subject to regular flooding from watercourses that are generally less than 300 m wide and contain bedloads of dark red sand and waterworn gravel and cobbles. The floodplains and lower terraces comprise red and dark red sands and silty sands with occasional mantles of waterworn pebbles and cobbles. Upper terraces comprise reddish brown or red silty sands and sandy clays with a sparse mantle of waterworn pebbles and cobbles. Several active and inactive pits are found along the *Turner River*. Thicknesses of material are generally less than 5 m. Groundwater is generally less than 5 m below the ground surface but, in places can extend substantially lower.

Particle size distribution
Alluvial sand and gravel

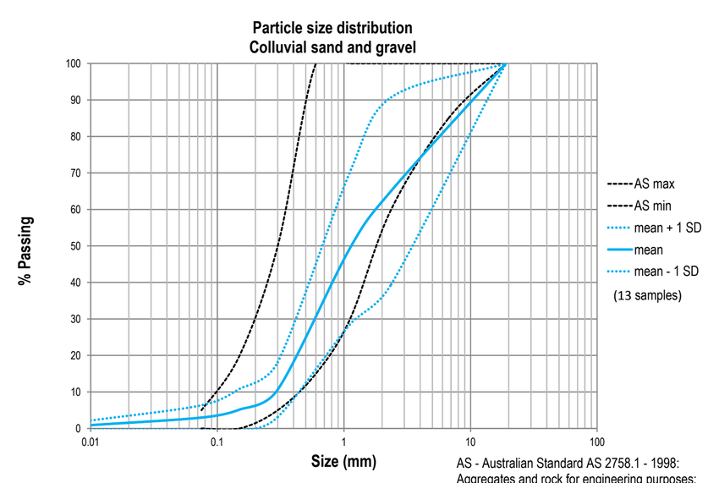


AS - Australian Standard AS 2758.1 - 1998: Aggregates and rock for engineering purposes: Part 1: Concrete aggregates

Colluvial sand and gravel

Colluvial slopes occur below and around most hills and rock outcrops, principally in the south and west of the area, and generally comprise reddish brown gravelly sands and silts and red clays and silty clays with a mantle of gravel of ironstone, chert, quartz and other rocks. The composition of individual units depends on the source rocks. Thicknesses of material generally average about 5 m. Groundwater is generally less than 10 m below the ground surface, but in places up to 15 m below the ground surface.

Particle size distribution
Colluvial sand and gravel



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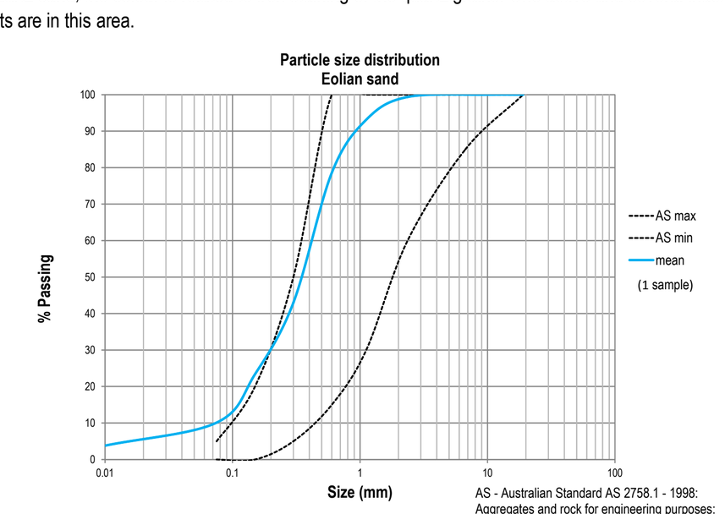
Eolian sand

Level to gently undulating sandplains are found east of the *De Grey River* and as scattered longitudinal dunes in the southwest of the area. The sand is red to yellow, fine- to medium-grained quartz sand; the colour is related to iron staining of the quartz grains. One active and several inactive pits are in this area.

Particle size distribution
Eolian sand



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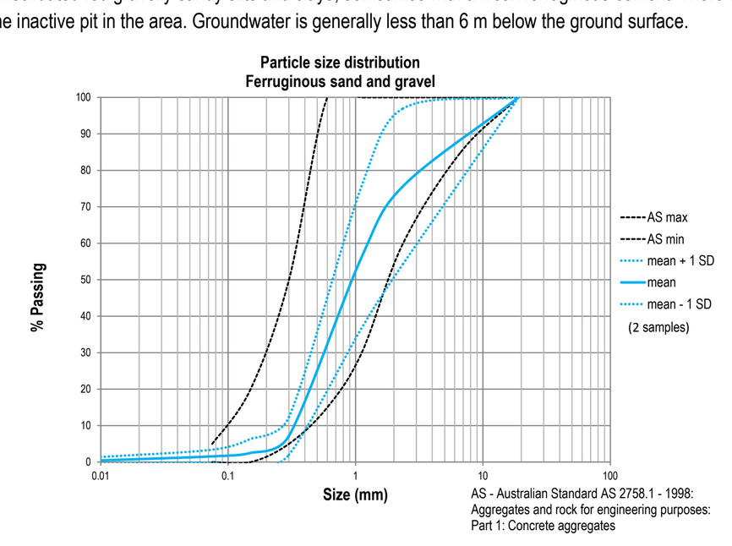
Ferruginous sand and gravel

Small sheetwash plains are found in restricted areas around *Tabba*. The material comprises loosely consolidated red gravelly sandy silts and clays, sometimes with a weak ferruginous cement. There is one inactive pit in the area. Groundwater is generally less than 6 m below the ground surface.

Particle size distribution
Ferruginous sand and gravel



AS - Australian Standard AS 2758.1 - 1998: Aggregates and rock for engineering purposes: Part 1: Concrete aggregates

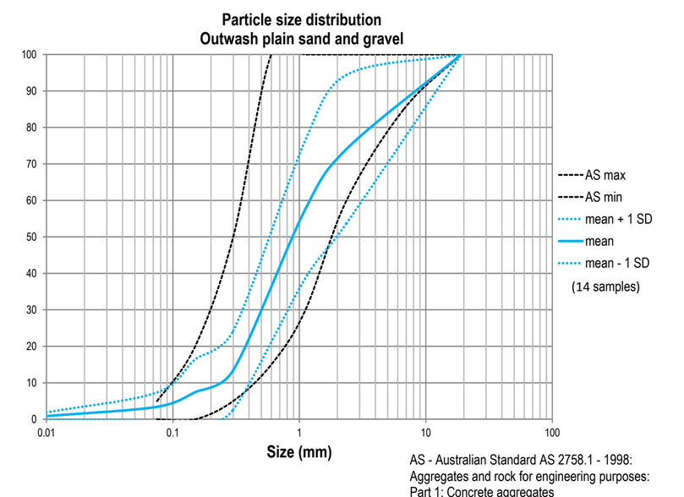
Surficial materials

Sand and gravel

Outwash plain sand and gravel

Extensive outwash plains extending for many kilometres flank the major river systems and creeks. These plains comprise red or reddish brown sandy silts and sandy clays with sparse mantles of pebbles and gravel of ironstone, basalt and other rocks. Over 170 pits are known but there are only 11 active pits. Thicknesses vary markedly, even on the local scale, but are generally about 5–20 m, although material greater than 30 m thick has been proved. Groundwater is generally less than 10 m below the ground surface.

Particle size distribution
Outwash plain sand and gravel



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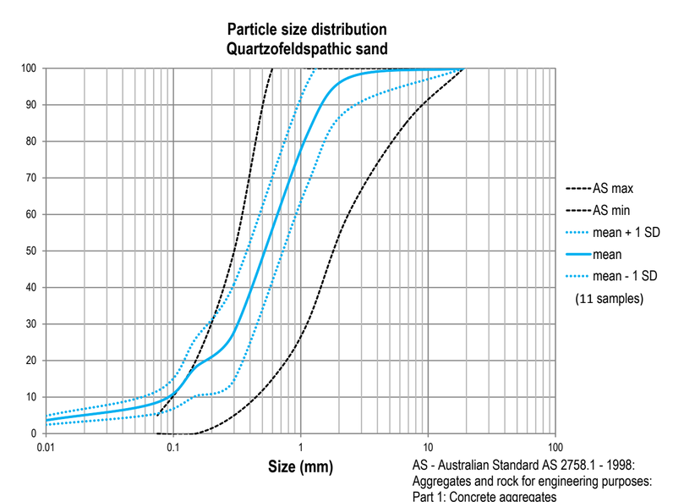
Quartzofeldspathic sand

Deposits of red to yellow, fine- to medium-grained quartzofeldspathic sand, occasionally containing quartz and rock fragments, are found between *Tabba Tabba Creek* and the *East Strelley* and *De Grey Rivers*. The sand is derived from the weathering of the underlying granite or nearby outcrops. Some of the material is in situ whereas other deposits have been deposited in distal outwash fans. Over 60 inactive pits occur in this material, especially along the *Marble Bar Road*. The material is rarely more than 2 m thick. Groundwater is generally less than 10 m, but in places up to 20 m below the ground surface.

Particle size distribution
Quartzofeldspathic sand



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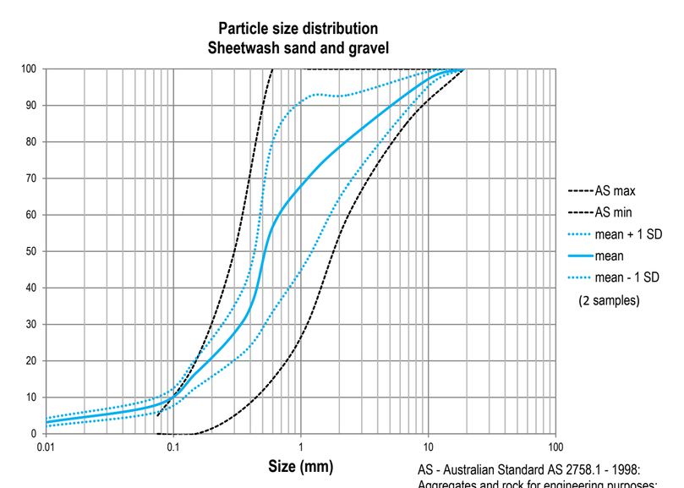
Sheetwash sand and gravel

Sheetwash plains, deposited as distal outwash fans, occur adjacent to the major rivers and streams and their tributaries in the south and east of the area. They are subject to occasional flooding and generally comprise red and reddish brown sandy silts, sandy clays and red non-cracking clays. Only two inactive pits are known. Material generally averages 3 m or less in thickness.

Particle size distribution
Sheetwash sand and gravel



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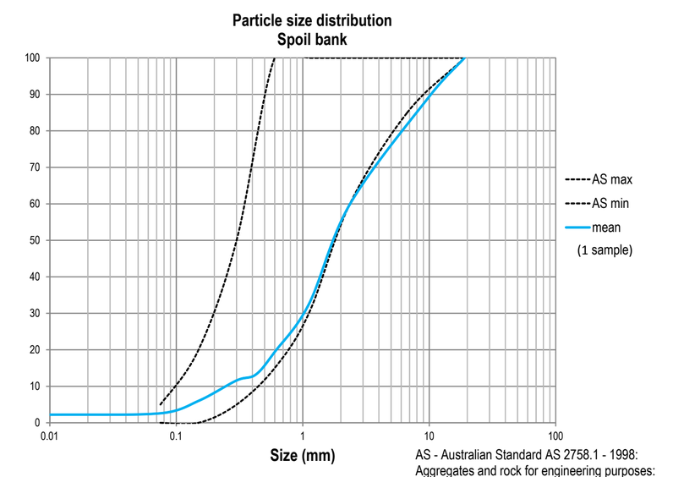
Spoil bank

The spoil bank is an elongate, tidally-emergent structure up to 3 km long and 400 m wide, orientated to the north and resting on the nearshore shelf. It comprises dredge spoil from the *Port Hedland* shipping channel and occurs as a series of cusps, spits and lobes of sand overlying a core of coarse to very coarse sand with scattered gravel or gravel layers. Thicknesses of material are generally less than 3 m.

Particle size distribution
Spoil bank



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Hard rocks

Igneous and metamorphic rocks

Five main categories of igneous and metamorphic rock are defined: (i) basalt, (ii) felsite, (iii) gabbro, (iv) granite, and (v) ultramafics.

Basalt

Basalt outcrops as extensive rugged and rounded rocky hills and ridges up to 100 m high in the southern and western parts of the area. Basalt is mainly a dark grey, fine-grained, massive rock but columnar jointed, vesicular and porphyritic varieties are found. Locally, volcaniclastic sandstone, agglomerate and other rock types may be found within the overall succession. This unit has not been worked.

Felsite

Felsite includes rhyolite, dacite, and other felsic lavas, felsic volcaniclastic sediments, pyroclastic tuffs and agglomerates. They are exposed east of *Whim Creek* and *Mount York* as a series of hills and ridges with steep rocky upper slopes and stony lower slopes. Felsites are generally dense, pale-coloured and fine-grained, although some may be porphyritic. A single inactive quarry is found at *Illincotherra Hill*, 60 km southwest of *Port Hedland*.

Gabbro

Gabbro and dolerite (microgabbro) crop out on *Depuch Island* and between *Strelley Mine* and *Indee* as a series of bedrock strike ridges with abundant rock outcrop. Gabbro is a dense, greenish or dark-coloured, coarse-grained, intrusive igneous rock. A single active quarry is found 6 km north of *Tabba*.

Granite

Granite includes a range of intrusive igneous rocks — granite, granodiorite, monzogranite, leucogranite and granophyre. They are found principally in the central part of the area where they outcrop as low hills and domes with extensive rock outcrop and boulder strewn slopes. Granites are generally pink to grey, medium- to coarse-grained, equigranular rocks, although porphyritic and other textures are common. Granite is extracted from large quarries at *Tabba Tabba Creek Mine and Pippingarra Mine*. Several smaller quarries have extracted granite in the past.

Ultramafics

Ultramafic rocks — peridotite, amphibolite, pyroxenite, komatiite and other ultramafic volcanic rock — outcrop in the *Mount York* area, along *Tabba Tabba Creek* and at the headwaters of the *Yule* and *Peewah Rivers* in a series of elongate strike ridges with steep rocky and stony slopes. All rock types are dark-coloured, dense and vary in texture from medium- to coarse-grained. No outcrops have been worked.

Sedimentary rocks

Three main categories of sedimentary rock are defined: (i) BIF–jaspilite–chert, (ii) sandstone, minor conglomerate, and (iii) silicified carbonate and clastic rocks.

BIF–jaspilite–chert

Extensive rugged rocky hills and strike ridges with 20–80 m relief, composed mainly of BIF and associated jaspilite and chert are found in the *Ord Ranges* and near *Kangan Pool*. Other lithologies associated with this unit include shale, siltstone, felsic volcaniclastic rocks and minor carbonate sedimentary rocks. A single quarry, previously worked for crushed rock, occurs north of *Goldsworthy*.

Sandstone, minor conglomerate

Sandstone occurs in the east of the area, north and west of *Goldsworthy* and in the southwest between *Yandeyarra* and *Mallina*. The sandstone outcrops as subdued topography with few rugged strike ridges. Conglomerate, siltstone, shale and volcaniclastic sandstone are interbedded with the sandstone. An inactive quarry is located 15 km west of the *Ord Ranges*.

Silicified carbonate and clastic rocks

Small, linear outcrops of silicified rocks of the *Strelley Pool Formation* occur at the headwaters of the *East Strelley River*. They comprise silicified carbonate rocks, sandstone, conglomerate, chert and dolomite. This unit has not been worked.