Strategic Waste Infrastructure Planning Working Group

Facilities and Sites
Background paper

PART 1: Existing Infrastructure and Waste Generation Projections

PART 2: Distribution and Characteristics of Waste Facility Sites

The purpose of this document is to provide an update on the work undertaken by the Strategic Waste Infrastructure Planning Working Group on the Facilities and Sites component of the Waste and Recycling Infrastructure Plan for the Perth Metropolitan and Peel Region, due to be completed in June 2014. Please note that this is an ongoing project, and components of the Plan will change and develop over time.

Providing Feedback: The SWIPWG would welcome your input. Please email comments or feedback to swipwg@der.wa.gov.au
The Western Australian Waste Strategy: “Creating the Right Environment” was released by the Waste Authority in March 2012. The Strategy aims to engage the Western Australian community over the next decade in moving to a low-waste society by providing the required knowledge, infrastructure and incentives to change behaviour.

In the Waste Strategy, among other major initiatives, the Waste Authority committed to developing a Waste and Recycling Infrastructure Plan for the Perth Metropolitan and Peel Region. A Strategic Waste Infrastructure Planning Working Group has been set up to assist with the development of the Plan.

The aim of the Plan is to determine the waste management infrastructure required to meet the needs of the Perth and Peel ‘3.5 million city’ and to assist in achieving the targets of the Waste Strategy. The Plan will also set out the planning, governance and funding instruments required to establish the infrastructure required.

The Waste and Recycling Infrastructure Plan for the Perth Metropolitan and Peel Region has four interrelated parts:

Planning and Approvals
The purpose of this section is to provide information and recommendations on:

- The land use planning system in WA, as it relates to waste facilities
- Environmental and planning opportunities and constraints for waste facilities in the Perth metropolitan and Peel regions, and how these may be increased or minimised respectively
- Existing land use planning mechanisms which may be used to integrate waste management issues into the WA planning framework, and secure sites for waste facilities.

Facilities and Sites
The purpose of this section is to provide information and recommendations on:

- The existing capacity of waste facilities in the Perth metropolitan and Peel regions, and likely waste infrastructure needs for 2015, 2020 and the 3.5 million city
- Potential and preferred sites for development of new waste facilities, including opportunities for co-location, waste precincts, and industrial ecology.

Technology
The purpose of this section is to provide information and recommendations on suitable waste management facilities and technologies for the Perth metropolitan and Peel regions, and assess their potential contribution to achieving the targets of the Waste Strategy.

Governance and Funding
The purpose of this section is to provide information and recommendations on:

- The settings that influence waste management in the Perth metropolitan and Peel regions
- Potential changes to current governance arrangements which may be required to meet the infrastructure needs of the region and contribute to achieving the Waste Strategy targets
- Potential changes to current funding arrangements which may be required to deliver the required infrastructure and contribute towards achieving the Waste Strategy targets.
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PART 1: Existing Infrastructure and Waste Generation Projections

1.0 Waste Streams and Sources
Waste is often divided into three categories or ‘streams’ based on its source (Hyder 2013). The types of waste found in each stream may be similar, however the waste may be processed differently according to its source. These source streams are:

- **Municipal solid waste (MSW):** Solid waste generated from domestic (household) premises and local government activities;
- **Commercial and industrial waste (C&I):** Solid waste generated by the business sector, State and Federal Government entities, schools and tertiary institutions; and
- **Construction and demolition waste (C&D):** Solid waste from residential, civil and commercial construction and demolition activities.

There are other kinds of waste that do not fall within the definitions of these three waste streams, including liquid waste, sewage, clinical waste, hazardous waste, radioactive waste and other specific types of waste that may require specialised treatment and disposal. These types of waste are not covered in this report.

Table 1 gives some general information about some of the most common types of waste produced in the Perth metropolitan and Peel regions (waste that fits within the scope of MSW, C&I or C&D waste), its main source(s), and the route through which it is usually recycled or disposed of. This is not intended to give specific information about the processing and disposal mechanisms for each type of waste, but a general outline of where and how common waste types are recycled/disposed of.

The different types of recycling/disposal facilities are further explained in section 2.

As Table 1 shows the same types of waste may come from several different sources (e.g. recyclable packaging waste may come from the municipal waste stream or the commercial and industrial sector). The source of the waste is an important factor in determining how it is collected and processed.

It is important to note that, overall, most waste produced in the Perth metropolitan and Peel regions is not recycled or recovered, with around 65% of waste currently disposed of to landfill (see section 4.1, Table 7).

**Table 1:** Main source and recycling/disposal process for some examples of common waste types in the Perth metropolitan and Peel regions.

<table>
<thead>
<tr>
<th>Type of Waste</th>
<th>Main Source Waste Stream</th>
<th>Recycling/Disposal Process</th>
</tr>
</thead>
</table>
| Organic Waste (e.g. food scraps, green waste) | MSW | - Local governments collect green waste through verge-side green waste collections or some offer residents a separate MGB for source separated kerb-side green waste collection. Most household organic waste is disposed of with mixed waste in mobile garbage bins (MGB’s).  
- Some mixed waste is diverted from landfill and is processed through resource recovery facilities (RRF), utilising alternative waste treatment (AWT) technology to separate the organic waste and turn it into compost.  
- Green waste may be shredded and turned into mulch, used to make compost or it may go to putrescible landfill. |
<table>
<thead>
<tr>
<th>Category</th>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C&amp;I</td>
<td>Organic waste (e.g. food scraps from restaurants, garden trimmings) may</td>
<td>be collected through arrangements with local government waste service providers, or by private contractors.</td>
</tr>
<tr>
<td></td>
<td>Source separated organic waste in some instances is processed into</td>
<td>compost by composting facilities, but most goes to putrescible landfill.</td>
</tr>
<tr>
<td></td>
<td>Green waste may be shredded and turned into mulch, used to produce</td>
<td>compost or it may go to putrescible landfill.</td>
</tr>
<tr>
<td></td>
<td>Organic waste from agriculture (e.g. wineries, market gardens) is usually</td>
<td>disposed of on the premises, or may be sent to composting facilities or putrescible landfill.</td>
</tr>
<tr>
<td>Construction &amp; demolition</td>
<td>Small quantities of household C&amp;D materials may be disposed of at local</td>
<td>government drop-off facilities.</td>
</tr>
<tr>
<td>materials (asphalt, soil, concrete, bricks,</td>
<td>This may be recycled or sent to inert landfill.</td>
<td></td>
</tr>
<tr>
<td>clay, fines, rubble)</td>
<td>Most C&amp;D materials are disposed of to inert landfill.</td>
<td></td>
</tr>
<tr>
<td>Recyclable Packaging, Paper and Cardboard</td>
<td>Mixed recyclables disposed of through local government waste collection</td>
<td>services (e.g. in ‘yellow top’ bins) may be sorted at a Materials Recovery Facility (MRF), with the recyclable packaging/paper and cardboard separated and sent to recyclers.</td>
</tr>
<tr>
<td>(e.g. steel and aluminium cans,</td>
<td>Recyclable packaging/paper and cardboard disposed of with mixed</td>
<td>waste may be separated from non-recyclable waste at a RRF or go to putrescible landfill.</td>
</tr>
<tr>
<td>plastic and glass bottles,</td>
<td>waste will normally go to putrescible landfill.</td>
<td></td>
</tr>
<tr>
<td>newspaper, office paper, cardboard boxes)</td>
<td>Mixed recyclables disposed of through local government or privately</td>
<td>contracted waste collection services may be sorted at a MRF, with the recyclable packaging, paper and cardboard separated and sent to recyclers.</td>
</tr>
<tr>
<td></td>
<td>Recyclable packaging, paper and cardboard disposed of with mixed</td>
<td>waste will normally go to putrescible landfill.</td>
</tr>
<tr>
<td>Metal (e.g. scrap steel, aluminium)</td>
<td>Scrap metal resulting from construction and demolition activities may be</td>
<td>collected and processed through WA scrap metal businesses (e.g. shredded and baled) and exported for recycling.</td>
</tr>
<tr>
<td>E-waste (electronic waste e.g. TV’s,</td>
<td>Some local governments accept e-waste from residents and small</td>
<td>business owners at drop-off facilities or pick it up from verge-side collections.</td>
</tr>
<tr>
<td>computers and peripherals e.g. mouse,</td>
<td>E-waste that is collected for recycling is dismantled and sorted in WA</td>
<td>and transported to the eastern states for recycling.</td>
</tr>
<tr>
<td>screen)</td>
<td>and exported for recycling.</td>
<td>Most e-waste goes to putrescible landfill.</td>
</tr>
<tr>
<td></td>
<td>There is a small market for reuse of second hand electronic items.</td>
<td></td>
</tr>
<tr>
<td>Mixed Solid Waste (i.e. waste not separated</td>
<td>Waste disposed of by householders in garbage bins is collected through</td>
<td>local government collection services, and sent to putrescible landfill or processed through a RRF (to remove organic waste) with residuals landfill.</td>
</tr>
<tr>
<td>for recycling)</td>
<td>Mixed solid waste (bulk items) disposed of by householders at verge-side</td>
<td>hard waste collections is picked up through local government collection services, and may be sent to landfill or sorted and recyclable materials recycled.</td>
</tr>
<tr>
<td></td>
<td>There is a small market for reuse of second hand electronic items.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mixed solid waste disposed of by businesses through local government or</td>
<td>privately contracted collection services may be sent to landfill.</td>
</tr>
<tr>
<td></td>
<td>privately contracted collection services may be sent to landfill.</td>
<td></td>
</tr>
</tbody>
</table>
1.1 Municipal Solid Waste
Municipal solid waste (MSW) is the solid waste generated from domestic (household) premises and local government activities. Under the Waste Avoidance and Resource Recovery Act 2007 local governments (or groups of local governments forming Regional Councils) have jurisdiction over ‘local government waste’, which includes all waste from residential sources (excluding sewage). All local governments provide waste services for their residents, or contract outside organisations to provide these services.

All local governments in the Perth metropolitan and Peel regions provide recycling services to their residents. Most commonly, this takes the form of the ‘two bin’ collection system, where residents have a ‘yellow topped’ bin for disposal of recyclable materials, and a ‘green topped’ bin for all other waste.

Local governments provide annual verge-side collections of large waste items (green waste and hard waste) which may be recycled or disposed of to landfill. Local governments also manage the waste generated by their activities (e.g. green waste from parks and gardens maintenance, waste generated at local government facilities).

In general, MSW is processed for recycling through alternative waste treatment (AWT) facilities (also called resource recovery facilities or RRFs) or Material Recovery Facilities (MRFs), or disposed of to putrescible landfill (for more information regarding different types of recycling/processing/disposal facilities see section 2).

1.2 Commercial and Industrial Waste
Commercial and industrial (C&I) waste is generated by the business sector, state and federal government entities, schools and tertiary institutions. Many private contractors, as well as some local governments, provide C&I waste management services. As with MSW, C&I waste may be recycled or disposed of to putrescible landfill.

1.3 Construction and Demolition Waste
Construction and demolition (C&D) waste is the solid waste resulting from residential, civil and commercial construction and demolition activities. These activities, and thus the generation of C&D waste, fluctuate considerably with economic activity and market demand.

C&D waste may be recycled or disposed of to inert landfill (with a small proportion sent to putrescible landfill).

C&D waste is generally bulky and heavy to transport, therefore recycling rates are affected by transport costs (i.e. the cost of fuel and distance between sites of generation and recycling).
2.0 Waste and Recycling Facilities in Perth and Peel

The major waste disposal and recycling/recovery facilities in the Perth metropolitan and Peel regions are described in this section. Waste facilities may be prescribed premises (as described in Schedule 1 of the Environmental Protection Regulations 1987) as well as unlicensed facilities. The types of facilities found in the Perth Metropolitan and Peel Region include:

- Landfills (inert and putrescible)
- Alternative Waste Treatment (AWT) facilities – mechanical biological treatment
- Materials Recovery Facilities (MRFs) – ‘clean’ (processing mixed, source separated recyclable material)
- Composting facilities (mixed organic and/or green waste)
- Construction and demolition (C&D) material processors
- Recyclers (including facilities which sort, dismantle, decontaminate and/or aggregate recyclable materials for transport to recycling facilities) – e-waste, scrap metal, paper, glass, timber, plastic
- Transfer stations (putrescible, inert, or mixed inert/recyclable)
- Drop-off facilities.

Figure 1 gives a simplified illustration of the flow of waste between facilities in the Perth metropolitan and Peel regions, from source to final disposal/recycling end point. It is not intended to show every possible disposal/recycling route that waste may take, but instead give a basic idea of how the waste management facilities discussed in this section interrelate. As Figure 1 shows, the relationship between waste management facilities can be complex, and there are many different pathways waste may take.

Waste disposal and recycling/recovery facilities are located in all of the planning sub-regions in the Perth metropolitan and Peel regions, although they are not evenly distributed, with a greater number of facilities in the outer metropolitan area (Figures 2-6).

Waste facilities may ‘stand alone’ (located independently of any other waste facilities), however there are also many examples of co-location of waste facilities in the Perth metropolitan and Peel regions (two or more waste facilities accommodated at a single site, where all the facilities are owned/managed/operated by the site owner). Co-location of waste facilities is particularly common at local government-owned sites (see section 5.3, Table 9). Some co-location examples include:

- All local government landfill sites in Perth and Peel are co-located with drop-off facilities, and may also include green waste drop-off and mulching.
- There are several examples of privately owned inert landfill sites (or inert transfer stations) which are co-located with green waste mulching and/or C&D waste processing facilities.

There are currently no true examples of ‘waste precincts’ in Perth and Peel (areas (which may be sub-divided into smaller sites) that accommodate two or more waste processing facilities which are owned/managed/operated by separate entities, which may be independent of the site owner), although the JFR (Jim) McGeough Resource Recovery Facility operates like a waste precinct in some ways (see section 5.3).
2.1 Landfills

2.1.1 Putrescible Landfills
Putrescible waste is the component of the waste stream likely to become putrid (and thus decompose) (DEC 2009). Putrescible landfills are those facilities licensed to accept waste under Category 64 or 89 in Schedule 1 of the Environmental Protection Regulations 1987.

Putrescible landfills (Class II or III) are the main disposal option for MSW and C&I waste. Putrescible waste generated in the Perth metropolitan and Peel regions is disposed of at 12 landfill sites (Table 2, Figure 2). Four of these are outside the Perth metropolitan and Peel regions, and receive waste from the Wheatbelt and Southwest as well as Perth and Peel.
Table 2: Putrescible landfills receiving waste generated in the Perth metropolitan and Peel regions.

<table>
<thead>
<tr>
<th>Landfill</th>
<th>Location (Suburb, local government)</th>
<th>Planning Region/Sub-Region</th>
<th>Managed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamala Park Waste Disposal Facility</td>
<td>Mindarie City of Wanneroo</td>
<td>Metro – North West</td>
<td>Mindarie Regional Council</td>
</tr>
<tr>
<td>Red Hill Waste Management Facility</td>
<td>Gidgegannup City of Swan</td>
<td>Metro – North East</td>
<td>Eastern Metropolitan Regional Council</td>
</tr>
<tr>
<td>Henderson Waste Recovery Park</td>
<td>Henderson City of Cockburn</td>
<td>Metro – South West</td>
<td>City of Cockburn</td>
</tr>
<tr>
<td>Millar Road Landfill Facility</td>
<td>Baldivis City of Rockingham</td>
<td>Metro – South West</td>
<td>City of Rockingham</td>
</tr>
<tr>
<td>Armadale Landfill and Recycling Facility</td>
<td>Brookdale City of Armadale</td>
<td>Metro – South West</td>
<td>City of Armadale</td>
</tr>
<tr>
<td>Shale Road Landfill (South Cardup)</td>
<td>South Cardup Shire of Serpentine-Jarrahdale</td>
<td>Metro – South West</td>
<td>SITA</td>
</tr>
<tr>
<td>Boddington Refuse Disposal Site</td>
<td>Boddington Shire of Boddington</td>
<td>Peel</td>
<td>Shire of Boddington</td>
</tr>
<tr>
<td>Buller Road Refuse Site</td>
<td>Waroona Shire of Waroona</td>
<td>Peel</td>
<td>Shire of Waroona</td>
</tr>
<tr>
<td>Inkpen Road Landfill</td>
<td>Wundowie Shire of Northam</td>
<td>Wheatbelt</td>
<td>Shire of Northam</td>
</tr>
<tr>
<td>Old Quarry Road Landfill</td>
<td>Northam Shire of Northam</td>
<td>Wheatbelt</td>
<td>Shire of Northam</td>
</tr>
<tr>
<td>Stanley Road Waste Management Facility</td>
<td>Australind Shire of Harvey</td>
<td>Southwest</td>
<td>Bunbury Harvey Regional Council</td>
</tr>
<tr>
<td>Banksia Road Landfill</td>
<td>Crooked Brook Shire of Dardanup</td>
<td>Southwest</td>
<td>Trans Pacific Industries (TPI)</td>
</tr>
</tbody>
</table>

In addition to the landfills listed in Table 2, a new putrescible landfill is planned for the Peel region. The North Bannister Waste Facility has been proposed by Perthwaste Pty Ltd for a site approximately 30km north of the Boddington Refuse Disposal Site. The landfill has EPA, DER, Main Roads and Shire of Boddington approvals, and construction was due to commence in September 2012. It is not known when the landfill will be operational.

A high proportion of residents of Perth and Peel live in the Metro-Inner and Metro-Middle sub-regions (approximately 42% in 2010/11. This proportion is projected to decrease to 37% by 2025/26, although the overall total will increase from 769,500 to 889,300, WAPC 2012c). These sub-regions have no putrescible landfills (Figure 2), so the waste generated here must be transported to other sub-regions. Waste transport in these relatively densely populated areas can have both environmental and social impacts (e.g. greenhouse gas emissions by trucks, increased traffic congestion in already crowded areas). Transport of waste over long distances is also inefficient as it increases costs and collection times. Transport distances may be reduced by strategically located transfer stations (see section 2.2), materials recovery facilities (see section 2.3.1) and/or resource recovery facilities (see section 3.3.2).

2.1.2 Inert Landfills
Inert waste is non-hazardous and non-biodegradable (DEC 2009). Inert (Class I) landfills are those licensed under Category 63 in Schedule 1 of the Environment Protection Regulations 1987, and are the main disposal route for C&D waste. 17 inert landfill sites receive waste from Perth and Peel, three of which are outside these regions (Table 3, Figure 2).
Table 3: Inert landfills receiving waste generated in the Perth metropolitan and Peel regions.

<table>
<thead>
<tr>
<th>Landfill</th>
<th>Location (Suburb, local government)</th>
<th>Planning Region/Sub-Region</th>
<th>Managed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlas RRF and Inert Landfill</td>
<td>Mirrabooka City of Stirling</td>
<td>Metro – Middle</td>
<td>Atlas Pty Ltd</td>
</tr>
<tr>
<td>Lefroy Rd Quarry Landfill</td>
<td>Beaconsfield City of Fremantle</td>
<td>Metro – Inner</td>
<td>City of Fremantle</td>
</tr>
<tr>
<td>Cell 6*</td>
<td>Lansdale City of Wanneroo</td>
<td>Metro – North West</td>
<td>Non-Organic Disposals</td>
</tr>
<tr>
<td>Quinn’s Quarry Landfill</td>
<td>Neerabup City of Wanneroo</td>
<td>Metro – North West</td>
<td>RCG Technologies</td>
</tr>
<tr>
<td>Eclipse Wanneroo Rd Landfill</td>
<td>Neerabup City of Wanneroo</td>
<td>Metro – North West</td>
<td>Eclipse Resources</td>
</tr>
<tr>
<td>Northsands Resources Novergup</td>
<td>Novergup City of Wanneroo</td>
<td>Metro – North West</td>
<td>Brodan (WA) Pty Ltd</td>
</tr>
<tr>
<td>Mathieson Rd Transfer Station and Inert Landfill</td>
<td>Chidlow Shire of Mundaring</td>
<td>Metro – North East</td>
<td>Shire of Mundaring</td>
</tr>
<tr>
<td>Hazelmere Inert Landfill</td>
<td>Hazelmere City of Swan</td>
<td>Metro – North East</td>
<td>Bronzewing Investments Pty Ltd</td>
</tr>
<tr>
<td>Eclipse Abercrombie Rd Landfill</td>
<td>Postans Town of Kwinana</td>
<td>Metro – South West</td>
<td>Eclipse Resources</td>
</tr>
<tr>
<td>Moltoni Bibra Lake RRC and Landfill</td>
<td>Bibra Lake City of Cockburn</td>
<td>Metro – South West</td>
<td>Moltoni Corporation</td>
</tr>
<tr>
<td>Wastestream Management Landfill</td>
<td>Kwinana Beach Town of Kwinana</td>
<td>Metro – South West</td>
<td>Wastestream Management</td>
</tr>
<tr>
<td>Tim’s Thicket Septage and Inert Waste Disposal Facility</td>
<td>Dawesville City of Mandurah</td>
<td>Peel</td>
<td>City of Mandurah/TPI</td>
</tr>
<tr>
<td>Corio Road Transfer Station</td>
<td>Ravenswood Shire of Murray</td>
<td>Peel</td>
<td>Shire of Murray</td>
</tr>
<tr>
<td>Peel Resource Recovery Landfill</td>
<td>Australind Shire of Harvey</td>
<td>Southwest</td>
<td>Peel Resource Recovery Pty Ltd</td>
</tr>
<tr>
<td>Instant Waste Management Landfill</td>
<td>Toodyay Shire of Toodyay</td>
<td>Wheatbelt</td>
<td>Opal Vale Pty Ltd</td>
</tr>
<tr>
<td>Buckingham Road Inert Landfill</td>
<td>Jelcobine Shire of Brookton</td>
<td>Wheatbelt</td>
<td>STEG Pty Ltd</td>
</tr>
<tr>
<td>Lightrange Landfill (NOT SHOWN IN FIGURE 4)</td>
<td>Meekatharra Shire of Meekatharra</td>
<td>Midwest</td>
<td>Lightrange Pty Ltd</td>
</tr>
</tbody>
</table>

* Note: This facility has a Class I Landfill License but is not currently landfilling inert waste (processing C&D waste for recycling only). It is anticipated to landfill inert waste in the future.

2.1.2 Secure and Intractable Landfills

As well as inert (Class I) and putrescible (Class II and III) landfills, there are also two further categories, for more specialised types of waste (which are not included in this report):

- **Secure landfills** (Class IV) are licensed under Category 65 in Schedule 1 of the *Environment Protection Regulations 1987*. They can accept solid waste that cannot be accepted by Class I, II or III landfills e.g. contaminated soils, hazardous waste encapsulated in concrete. The Eastern Metropolitan Regional Council manages the only Class IV landfill in the Perth metropolitan and Peel regions at the Red Hill Waste Management Facility (Figure 2).

- **Intractable landfills** (Class V) are licensed under Category 66 in Schedule 1 of the *Environment Protection Regulations 1987*. They can accept intractable waste, which is not suitable for disposal at Class I-IV landfills. Intractable waste is waste which is a management problem by virtue of its toxicity or chemical or physical characteristics, which make it difficult to dispose of or treat safely e.g. industrial sludge, significantly contaminated soil (DEC 2009). The Mount Walton East Intractable Waste Disposal Facility, 480km northeast of Perth, is WA’s only Class V disposal site.
Figure 2: Putrescible and inert landfills that receive waste from the Perth metropolitan and Peel regions (not shown: Lightrange Landfill in the Shire of Meekatharra).
2.2 Transfer Stations and Drop-Off Facilities

2.2.1 Transfer Stations
The term ‘transfer station’ is often used to refer to the small scale drop-off facilities that local governments provide for their residents to dispose of domestic waste (see Section 2.2.2). For the purposes of this report, however, a transfer station is defined as an aggregation point for bulk quantities of waste prior to recycling or disposal. Transfer stations cannot be accessed by the general public (commercial vehicles only).

Strategically located transfer stations are important because they enable collection vehicles to travel shorter distances and empty full loads regularly. The waste or recyclable materials may be sorted, baled or compacted at the transfer station, and trucks with a larger capacity are used to transport aggregated quantities to recycling/disposal points.

There are different types of transfer stations in the Perth metropolitan and Peel regions, accepting different types of waste and recyclable materials:

**Putrescible Transfer Stations**: Receive and aggregate bulk quantities of putrescible waste (mainly from MSW and/or C&I waste streams) for transport to AWT facilities or landfills (putrescible waste is not transported from putrescible transfer stations to materials recovery facilities (MRFs). These facilities accept only source separated recyclable waste – see Section 2.3.1). There are eight licensed putrescible transfer stations in Perth and Peel (Table 4, Figure 3).

As Figure 4 illustrates, not all putrescible waste goes through a transfer station before it is disposed of to landfill. The relationship between transfer stations and landfills is also not simply based on geographical proximity or transport efficiency. For example:

- Local governments and Regional Councils that manage putrescible transfer stations (City of Stirling, Western Metropolitan Regional Council, City of Canning) have established contracts with landfills operated by Regional Councils, local governments and privately owned landfills to accept their waste
- The City of Mandurah has a 15 year ‘Alliance’ with private contractor Trans Pacific Industries (TPI) for the provision of all waste management services, so putrescible waste from the Mandurah Waste Management Centre is landfilled at the TPI Banksia Rd Landfill in the Shire of Dardanup
- Companies TPI and SITA own both putrescible transfer stations and landfills, and the waste from their transfer stations is transported to their own landfills. In the case of TPI, this means transporting waste from Bayswater and Mandurah to the Banksia Rd landfill in the Shire of Dardanup. SITA transports waste from its Welshpool Transfer Station to the Shale Road landfill in South Cardup.

The Perthwaste Bibra Lake transfer station does not send waste to a putrescible landfill. The transfer station aggregates green waste which is sent to a composting facility (as well as aggregating recyclable materials which are transported to the Perthwaste MRF in Bunbury – see section 2.3.1).

**Inert Transfer Stations**: Receive and aggregate bulk quantities of inert waste for transport to recyclers or landfills. Waste received by inert transfer stations is generally sourced from the C&I or C&D waste streams. There are at least 16 inert transfer stations in the Perth metropolitan and Peel regions (Table 4, Figure 3).
The type of waste received by inert transfer stations may vary widely, depending on the facility licence. Some inert transfer stations are licensed to receive only Type 1, 2 and or 3 Inert Waste, and may also accept Special Waste type 1:

- **Inert Waste Type 1:** Non-hazardous, non-biodegradable wastes containing contaminant concentrations less than Class I landfill acceptance criteria but excluding paper and cardboard or materials that require treatment to render them inert (e.g. peat, acid sulfate soils)
- **Inert Waste Type 2:** Waste consisting of stable non-biodegradable organic materials such as tyres and plastics which require special management to reduce the potential for fires
- **Inert Waste Type 3:** Waste material from DER licensed secondary waste treatment plants, subject to appropriate assessment and approval of that waste and the specified inert landfill
- **Special Waste Type 1:** Waste which includes asbestos, asbestos cement products.

Some inert transfer stations may also receive other recyclable materials in addition to those listed above, including:

- Green waste
- Scrap metal
- Paper and Cardboard
- Plastics
- Tyres
- Steel and plastic drums
- Car batteries.

Paper, cardboard and green wastes are putrescible materials, but inert transfer stations may have licenses to receive them, with conditions regarding storage time and circumstances (e.g. green waste may be required to be removed from the facility within 48 hours of receipt).

### 2.2.2 Drop-Off Facilities

For the purposes of this report, ‘drop-off facilities’ are the facilities operated by local governments and Regional Councils which allow residents to deliver small loads/volumes of waste (domestic or small scale commercial waste). Unlike transfer stations, they are not designed for commercial MSW collection vehicles or large loads/volumes of C&I waste.

(Note: Drop-off facilities are commonly called ‘transfer stations’ by local governments and Regional Councils, however in this report the term transfer station refers to large scale waste aggregation facilities used by commercial waste collection vehicles – see Section 2.2.1).

There are 21 drop-off facilities in the Perth metropolitan and Peel regions (Figure 5). Most are located at local government landfills or transfer stations. Almost all of these drop-off facilities accept all types of municipal solid waste and recyclables, however the Wanneroo Greens Recycling Centre is limited to green waste and recyclables, and the Tim’s Thickett facility accepts only inert waste.

The waste collected at drop-off facilities is aggregated and transported to transfer stations, material recovery facilities (MRFs), Alternative waste treatment facilities or landfills (inert or putrescible).
Table 4: Transfer stations in the Perth metropolitan and Peel regions.

<table>
<thead>
<tr>
<th>Transfer Station</th>
<th>Location (Suburb, local government)</th>
<th>Planning Region/Sub-Region</th>
<th>Managed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranford Rd Transfer Station</td>
<td>Canning Vale City of Canning</td>
<td>Metro – Middle</td>
<td>City of Canning</td>
</tr>
<tr>
<td>Bayswater Transfer Station and MRF</td>
<td>Bayswater City of Bayswater</td>
<td>Metro – Middle</td>
<td>TPI</td>
</tr>
<tr>
<td>Balcatta Recycling Centre</td>
<td>Balcatta City of Stirling</td>
<td>Metro – Middle</td>
<td>City of Stirling</td>
</tr>
<tr>
<td>SITA Welshpool Transfer Station</td>
<td>Welshpool City of Canning</td>
<td>Metro – Middle</td>
<td>SITA</td>
</tr>
<tr>
<td>Total Waste Management Welshpool</td>
<td>Welshpool City of Canning</td>
<td>Metro – Middle</td>
<td>Total Waste Management Pty Ltd</td>
</tr>
<tr>
<td>JFR (Jim) McGeough RRF and DiCom</td>
<td>Shenton Park City of Nedlands</td>
<td>Metro – Inner</td>
<td>Western Metropolitan Regional Council</td>
</tr>
<tr>
<td>Perthwest Bibra Lake Transfer Station</td>
<td>Bibra Lake City of Cockburn</td>
<td>Metro – South West</td>
<td>Perthwest</td>
</tr>
<tr>
<td>Waste Management Centre</td>
<td>Meadow Springs City of Mandurah</td>
<td>Peel</td>
<td>City of Mandurah/TPI</td>
</tr>
<tr>
<td>Brajkovich Stockpile Removal Premises</td>
<td>Henderson City of Cockburn</td>
<td>Metro – South West</td>
<td>Brajkovich Demolition and Salvage Pty Ltd</td>
</tr>
<tr>
<td>Welshpool Central Waste</td>
<td>Welshpool City of Canning</td>
<td>Metro – Middle</td>
<td>Wastestream Management Pty Ltd</td>
</tr>
<tr>
<td>Waste Care WA</td>
<td>Bayswater City of Bayswater</td>
<td>Metro – Middle</td>
<td>Resource Recovery Solutions Pty Ltd</td>
</tr>
<tr>
<td>Coastal Waste Management</td>
<td>Rockingham City of Rockingham</td>
<td>Metro – South West</td>
<td>Southerly Ocean Pty Ltd</td>
</tr>
<tr>
<td>Eclipse Flynn Drive</td>
<td>Carramar City of Wanneroo</td>
<td>Metro – North West</td>
<td>Eclipse Resources</td>
</tr>
<tr>
<td>Pericho Investments Building Development</td>
<td>Welshpool City of Canning</td>
<td>Metro – Middle</td>
<td>Brajkovich Demolition and Salvage Pty Ltd</td>
</tr>
<tr>
<td>Pinjarra Transfer Recycling Station</td>
<td>Pinjarra Shire of Murray</td>
<td>Peel</td>
<td>Peel Resource Recovery Solutions Pty Ltd</td>
</tr>
<tr>
<td>Jandakot Transfer Station</td>
<td>Jandakot City of Cockburn</td>
<td>Metro – South West</td>
<td>Westmore Corporation Pty Ltd</td>
</tr>
<tr>
<td>Naval Base Recycling Transfer Station</td>
<td>Naval Base Town of Kwinana</td>
<td>Metro – South West</td>
<td>Eco Resources Pty Ltd</td>
</tr>
<tr>
<td>Schutz DSL (Australia)</td>
<td>South Fremantle City of Cockburn</td>
<td>Metro – South West</td>
<td>Schutz DSL (Australia) Pty Ltd</td>
</tr>
<tr>
<td>Advance Waste Disposal</td>
<td>Malaga City of Swan</td>
<td>Metro – North East</td>
<td>Advance Waste Disposal Pty Ltd</td>
</tr>
<tr>
<td>Redoak Corporation and West Bins</td>
<td>Malaga City of Swan</td>
<td>Metro – North East</td>
<td>Redoak Corporation and West Bins</td>
</tr>
<tr>
<td>Instant Waste Management Transfer Station</td>
<td>Bayswater City of Bayswater</td>
<td>Metro – Middle</td>
<td>Opal Vale Pty Ltd</td>
</tr>
<tr>
<td>Perth Bin Hire</td>
<td>Bayswater City of Bayswater</td>
<td>Metro – Middle</td>
<td>Jack Kailis</td>
</tr>
<tr>
<td>Matera Waste Recycling Facility</td>
<td>Postans Town of Kwinana</td>
<td>Metro – South West</td>
<td>Matera 3 Pty Ltd</td>
</tr>
<tr>
<td>Pinjarra Resource Recovery Centre</td>
<td>Ravenswood Shire of Murray</td>
<td>Peel</td>
<td>Resource Recovery Solutions Pty Ltd</td>
</tr>
</tbody>
</table>
Figure 3: Putrescible and inert/recyclable transfer stations in the Perth metropolitan and Peel regions.
Figure 4: Transport of putrescible waste from putrescible transfer stations to putrescible landfills.
2.3 Recycling/Reprocessing Facilities

2.3.1 Materials Recovery Facilities
A materials recovery facility (MRF) is plant and equipment for sorting and pre-processing materials from the waste stream for resource recovery (WMAA publication date unknown). MRFs may be ‘clean’ (a facility where source separated recyclable waste is sorted and separated into different material types for recycling) or ‘dirty’ (a facility where mixed waste is sorted to separate recyclable and non-recyclable waste). Both types of MRFs may produce non-recyclable residue, which is disposed of to putrescible landfill.

There are eight ‘clean’ MRF’s processing the C&I and MSW waste generated in the Perth metropolitan and Peel regions (including one outside the regions, in the City of Bunbury) (Table 5, Figure 5). There are no ‘dirty’ MRFs currently operating in Perth and Peel.

Table 5: Material Recovery Facilities processing MSW and C&I waste generated in the Perth metropolitan and Peel regions.

<table>
<thead>
<tr>
<th>MRF</th>
<th>Location (Suburb, local government)</th>
<th>Planning Region</th>
<th>Managed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wangara MRF</td>
<td>Wangara City of Wanneroo</td>
<td>Metro – North</td>
<td>City of Wanneroo</td>
</tr>
<tr>
<td>Bayswater Transfer Station and MRF</td>
<td>Bayswater City of Bayswater</td>
<td>Metro – Middle</td>
<td>TPI</td>
</tr>
<tr>
<td>Visy MRF</td>
<td>Kewdale City of Belmont</td>
<td>Metro – Middle</td>
<td>Visy</td>
</tr>
<tr>
<td>AMCOR MRF</td>
<td>Canning Vale City of Canning</td>
<td>Metro – Middle</td>
<td>AMCOR</td>
</tr>
<tr>
<td>Maddington MRF</td>
<td>Maddington City of Gosnells</td>
<td>Metro – South-East</td>
<td>TPI</td>
</tr>
<tr>
<td>Hive MRF</td>
<td>North Coogee City of Cockburn</td>
<td>Metro – South-West</td>
<td>Hive Resource Recovery</td>
</tr>
<tr>
<td>Waste Management Centre</td>
<td>Meadow Springs City of Mandurah</td>
<td>Peel</td>
<td>City of Mandurah/TPI</td>
</tr>
<tr>
<td>Perthwaste Bunbury MRF</td>
<td>Picton City of Bunbury</td>
<td>Southwest</td>
<td>Perthwaste</td>
</tr>
</tbody>
</table>

MSW and C&I waste collected for recycling (e.g. mixed recyclables disposed of by householders in ‘yellow topped’ bins; paper and cardboard segregated for recycling by businesses) are generally sent to MRFs for sorting prior to recycling.

MSW collected for recycling is generally co-mingled (i.e. all types of recyclable materials mixed together e.g. glass, plastic, cardboard), and is sorted into different material types at MRF’s for further processing at other facilities.

C&I waste collected for recycling may be taken to MRFs for sorting or directly to a specialist recycler (see section 2.3.3), depending on the waste material and how it is collected (i.e. co-mingled or source separated).

2.3.2 Alternative Waste Treatment and Resource Recovery Facilities
Alternative Waste Treatment (AWT) is waste treatment technology designed to recover resources from the waste stream. Mixed solid waste may be treated using mechanical, biological (aerobic or anaerobic) or thermal processes and converted into energy or useful by-products (e.g. compost). AWT facilities divert waste from landfill however AWT processes generally result in some residual waste which must be disposed of to landfill.
Figure 5: Drop off facilities, Material Recovery Facilities (MRFs) and Alternative Waste Treatment (AWT) Facilities in the Perth metropolitan and Peel regions.
Waste treatment facilities that incorporate AWT technology to recover resources from waste are often referred to as resource recovery facilities (RRFs). There are four AWT facilities in the Perth metropolitan and Peel regions (Table 6, Figure 5), all of which use mechanical and biological treatment processes to produce compost from mixed solid waste (and in the case of the DiCom facility at the JFR (Jim) McGeough RRF, bio-gas is also produced, which is used as an energy source for the facility).

<table>
<thead>
<tr>
<th>Resource Recovery Facility</th>
<th>Location (Suburb, local government)</th>
<th>Planning Region</th>
<th>Managed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>JFR (Jim) McGeough RRF and DiCom</td>
<td>Shenton Park City of Nedlands</td>
<td>Metro – Inner</td>
<td>DiCOM AWT Operations Pty Ltd</td>
</tr>
<tr>
<td>Neerabup RRF</td>
<td>Neerabup City of Wanneroo</td>
<td>Metro – North</td>
<td>Mindarie Regional Council</td>
</tr>
<tr>
<td>Atlas RRF</td>
<td>Mirrabooka City of Stirling</td>
<td>Metro – Middle</td>
<td>Atlas Pty Ltd</td>
</tr>
<tr>
<td>SMRC Regional Resource Recovery Centre</td>
<td>Caning Vale City of Canning</td>
<td>Metro – Middle</td>
<td>Southern Metropolitan Regional Council</td>
</tr>
</tbody>
</table>

Each AWT facility uses different technology and processes, however the general method for producing compost from mixed waste is similar at each facility:
- Mechanical processes are used to screen out recyclables and/or large or dangerous non-organic items;
- Aerobic and/or anaerobic processes to convert organic waste to compost; and
- Remaining residual waste is sent to landfill.

The Eastern Metropolitan Regional Council and Rivers Regional Council are currently in the preliminary planning stages for new AWT facilities in the Perth metropolitan and Peel regions.

2.3.3 Recycling Facilities
In 2011/12 all C&D materials (asphalt, bricks, concrete and sand, soil, clean fill and rubble) and organic waste collected for recycling in the Perth metropolitan and Peel regions is recycled in WA (Hyder 2013). Very little of the other materials collected for recycling, however, are processed in WA to a point where they can be used as a manufacturing feedstock or product. In this report, therefore, the definition of a ‘recycling facility’ is expanded to include the waste treatment facilities where contamination is removed and material is sorted, processed, aggregated and/or baled ready for export interstate or overseas for recycling.

A range of materials are recycled (or processed in preparation for recycling) in the Perth metropolitan and Peel regions:
- C&D materials
- Glass
- Timber
- Mattresses
- Plastics
- E-waste
- Tyres
- Scrap metal
- Paper/cardboard
- Organic materials (green waste, food scraps)
- Packaging (cardboard, glass, steel, aluminium)

Construction and Demolition Materials Recycling: In 2011/12 C&D materials (asphalt, bricks, concrete and sand, soil, clean fill and rubble) made up 91% of the C&D waste recycled in Perth and Peel. The remaining 9% was metals (8%) and organics (1%) (Hyder 2013).
In the Perth metropolitan and Peel regions there are four major C&D materials recycling facilities (Figure 6). The recycling process for C&D materials generally involves sorting, screening and crushing it to produce construction and landscaping products (e.g. road base, aggregate, drainage material, clean fill and sand) all of which are reused in WA. There are also other smaller-scale facilities that transport, salvage, sort and aggregate all types of construction and demolition waste (i.e. asphalt, concrete, bricks, rubble, steel, glass, timber and reusable items such as doors, windows, bricks and tiles).

**Metal Recycling:** Currently, there is no major metal recycler located in WA. Metals collected for recycling are exported interstate or overseas, therefore metal recycling facilities in WA consist mainly of sorting, shredding and aggregation processes. There are many companies collecting metal for recycling in the Perth metropolitan and Peel regions.

**Organic Waste Recycling:** Organic waste may include any material of animal or vegetable origin (e.g. food waste, garden trimmings, timber, sawdust, bark, straw/animal bedding, manure, paper/cardboard, and oils from grease traps – Recycled Organics Unit 2007). The main organic materials recycled in Perth and Peel include:

- **Timber:** The Hazelmere Recycling Centre managed by Eastern Metropolitan Regional Council is the major timber recycling facility in Perth and Peel (Figure 6). The Centre accepts untreated timbers, soft woods and hard woods which is sorted, ground and screened to produce bedding for the poultry industry, particle board, compost, wood chips and mulch. There are also smaller-scale businesses that salvage and reuse timber (e.g. reclaiming timber for floor boards and decking, reuse of wooden pallets)

- **Green waste:** Green waste (garden waste) may be shredded to create mulch, or composted. Some Regional Councils and local governments produce mulch from the green waste collected through verge-side collections, drop-off facilities, and parks and gardens maintenance. There are also commercial recyclers producing mulch and compost products from green waste

- **Food waste:** The process used to recycle food waste (and mixed food and green waste) into compost or compost products (e.g. soil conditioner, potting mix) depends on the method of collection. Where it is mixed in with other types of waste, it may be separated and recycled through an AWT to produce compost (see Section 2.3.2). Source separated organic waste is less contaminated and easier to recycle, and compost is most commonly produced through aerobic windrow composting.

Most organic waste comes from the MSW and C&I waste streams, with a small proportion from the C&D waste stream. In 2011/12 all organic waste collected for recycling was recycled in WA (Hyder 2013).

Organic waste recycling facilities in Perth and Peel operate at a range of scales, accept a range of different organic waste types and treat it in a variety of ways (including AWT (MBT) facilities, green waste shredding/mulching facilities, green waste composting facilities and mixed organic waste composting facilities) (Figure 6).

**Paper/Cardboard Recycling:** Paper and cardboard (e.g. white office paper, packaging, news print, liquid paperboard) is sorted, aggregated and transported interstate/overseas for reprocessing (e.g. at the Visy MRF in Figure 5).
Figure 6: Major C&D materials recyclers, timber recyclers and organic waste recyclers in the Perth metropolitan and Peel regions.
2.4 Site Characteristics of Existing Waste Facilities

Most existing waste facilities in the Perth metropolitan and Peel regions have a site size of 12ha or less. The exceptions to this are composting facilities and landfills, which generally require larger sites (see Appendix 1 for the site sizes and characteristics of existing waste management facilities in the Perth metropolitan and Peel regions).

It is therefore generally not the large size of waste facility sites which may make them difficult to find and secure, but buffer requirements, approvals processes, and opposition from the surrounding community. For existing facilities, buffer encroachment from surrounding urban areas can limit operation or expansion. It is therefore important that potentially suitable waste infrastructure sites are proactively identified and secured, with their buffers protected.

Some features of existing waste facilities types are summarised in Appendix 1. Some general characteristics of these facilities include:

- Most require a DER licence to operate (however MRFs and some smaller-scale recyclers do not require a licence).
- Most have an estimated site requirement of 12ha or less, and many may operate on a site of 3ha or less (with the exception of facilities that compost organic waste in outdoor windrows and landfills, which require larger sites).
- Most are generally well suited to development in Industrial zoned areas (with the exception of facilities which compost organic waste in outdoor windrows and putrescible landfills, which are generally located in Rural zoned areas).
- Noise, dust and odour the most common potential impacts of waste facilities on sensitive land uses (EPA 2005).
3.0 Population Growth in Perth and Peel

3.1 Data Sources
In this report the Western Australian Planning Commission (WAPC) *Western Australia Tomorrow – Population Report No. 8* (WAPC 2012c) Band C population projections have been used to estimate the current and future population of the Perth metropolitan and Peel regions. *Population Report No. 8* gives a range of projections, from low growth rate (Band A) to high growth rate (Band E), however Band C is used here as it is the closest WAPC population projection to the most recent Estimated Residential Population (ERP) data released by the Australian Bureau of statistics (ABS).

The ERP is the most accurate population estimate available, and is used by the Commonwealth Government as the official estimate of Australia’s population (ABS 2011). It is based on Census counts which are adjusted for:
- place of usual residence (rather than location on Census night)
- exclusion of overseas visitors in Australia
- allowance for net undercount in the Census
- allowance for the number of Australian residents estimated to have been temporarily overseas at the time of the Census.

The ERP is recalculated after every Census, however it is only available retrospectively, and does not give projections of future population growth. The *Western Australia Tomorrow – Population Report No. 8* (WAPC 2012c) uses 2006-2010 ABS data (including ERP) and other inputs to give population projections for 2006 to 2026.

3.2 Population Projections
The Department of Planning has divided the Perth metropolitan and Peel regions into seven sub-regions for planning purposes. These sub-regions vary in population size, and are projected to grow at different rates (Figures 7 and 8).

The population of the Perth metropolitan and Peel regions is projected to increase from an estimated 1.84 million in 2010/11 to around 2.43 million by 2026 (WAPC 2012c). If these growth trends continue, it is extrapolated that the population could reach 3.5 million in around 2043 (Hyder 2012) (Figure 7).

The growth in population is not projected to be evenly spread across the Perth metropolitan and Peel regions, with higher rates of growth predicted some local government areas, and slower growth in others (Figure 8).

There is a general trend of lower population growth in the Metro-Inner and Metro-Middle sub-regions and outer Peel local governments, and higher growth in outer metropolitan local governments, particularly to the north and south of the city centre. The City of Wanneroo is projected to have the highest population growth between 2010/11 and 2025/26, with an increase of over 116,000 residents (WAPC 2012c).
Figure 7: Population projections for the Perth metropolitan and Peel regions 2005/06 to 2049/50 by planning region. Source: Solid lines indicate Population Report No. 8 Band C projections (WAPC 2012c), dashed lines indicate an extrapolation of the Band C 2006-2026 growth trends (Hyder 2012).

Future population growth will be accommodated by a combination of urban infill and the creation of new urban areas (WAPC 2010). Population growth, and the expansion of both residential and non-residential development, will lead to an increase the amount of waste generated. This, in turn, will increase pressure on/exceed the capacity of existing waste management infrastructure, and increase waste transport distances (with associated economic, social and environmental costs).

The provision of effective waste management is an important service to the community which preserves both health and environment values, and can have considerable economic benefits. Planning for Western Australia’s waste infrastructure needs supports the development of well-functioning communities, and the Waste Authority has given waste infrastructure strategic priority.
Figure 8: Projected population growth between 2010/11 and 2025/26 by local government area (difference between estimated 2011 population and estimated 2026 population). Source: Population Report No. 8 Band C projections (WAPC 2012c).
4.0 Waste Generation in Perth and Peel

4.1 Current Waste Generation Rates

The Waste Management Branch of the Department of Environment Regulation (DER) collates data about the type and amount of waste disposed of to landfill in the Solid Waste Database. Under the *Waste and Resource Recovery Regulations 2008* all licensed landfills in the Perth metropolitan region (and those that receive waste generated in the Perth metropolitan region) must pay a Levy on waste disposed of to landfill, and must report the type and amount of waste disposed of to the DER.

The DER, on behalf of the Waste Authority, also contracts consultants to undertake an annual *Recycling Activity in Western Australia* survey, to collect data on the amount of waste recycled in the Perth metropolitan region and across the State (Hyder 2013).

Landfill, recycling and population data for the Perth metropolitan region has been used to determine an annual per capita rate of waste generation. For the purposes of this report the 2010/11 data has been used to determine this generation rate, as it is considered the most complete and accurate data set. Total waste generation is divided by population to give a per capita waste generation rate of 2.77 tonnes for the Perth metropolitan region for 2010/11 (Table 7) (NOTE: per capita rates have been rounded to two decimal places).

**Table 7**: Waste generation (recycling and landfill) in the Perth metropolitan region, 2010/11.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MSW</td>
<td>475,436</td>
<td>735,452</td>
<td>1,210,888</td>
<td>1,742,700</td>
<td>0.27</td>
<td>0.42</td>
<td>0.69</td>
</tr>
<tr>
<td>C&amp;I</td>
<td>365,228</td>
<td>777,577</td>
<td>1,142,805</td>
<td></td>
<td>0.21</td>
<td>0.45</td>
<td>0.66</td>
</tr>
<tr>
<td>C&amp;D</td>
<td>889,454</td>
<td>1,593,660</td>
<td>2,483,114</td>
<td></td>
<td>0.51</td>
<td>0.91</td>
<td>1.42</td>
</tr>
<tr>
<td>Total</td>
<td>1,730,118</td>
<td>3,106,689</td>
<td>4,836,807</td>
<td>1,742,700</td>
<td>0.99</td>
<td>1.78</td>
<td>2.77</td>
</tr>
</tbody>
</table>

3. Total of estimated recycling plus actual tonnes to landfill (column 1 + column 2).
5. Tonnes divided by population.

Consistent waste generation data is not publicly available across Australia for 2010/11, however some comparisons with other states can be made:

- **Perth metropolitan region**: 2.77 tonnes per capita, 35% diverted from landfill (Table 7)
- **Victoria**: 2.15 tonnes per capita, 68% diverted from landfill (Sustainability Victoria 2011)
- **South Australia**: 3.25 tonnes per capita 2010/11, 80% diverted from landfill (Rawtec 2012).
4.2 Projected Waste Generation

The waste generation rate per capita for the Perth metropolitan region for 2010/11 (Table 7) has been used to estimate future waste generation for the Perth and Peel regions (Figure 9). These estimations are based on several assumptions:

- It is assumed that per capita waste generation is the same in the Peel region as in the Perth metropolitan region.
- It is assumed that the rate of waste generation per capita will remain consistent (no significant increase or decrease over time).
- It is assumed that population in the Perth metropolitan and Peel regions will grow as shown in Figure 7, based on WAPC projections to 2026 (WAPC 2012c) and extrapolations of these projections from 2027 to 2050 (Hyder 2012).

It is estimated that in 2011/12 total waste generation in the Perth metropolitan and Peel regions will be 5.23 million tonnes, increasing to 5.58 million tonnes in 2014/14 and 6.10 million tonnes in 2019/20. When the population of Perth and Peel reaches 3.5 million people (in around 2043 – see Figure 7), waste generation could be approximately 9.72 million tonnes per year (Figure 9).

**Figure 9:** Estimated waste generation by waste stream, Perth metropolitan and Peel regions, 2011/12 to 2049/50. Source: Solid lines indicate waste generation calculated using Population Report No. 8 Band C projections (WAPC 2012c), dashed lines indicate waste generation calculated using an extrapolation of the Band C 2006-2026 growth trends (Hyder 2012).
The Western Australian Waste Strategy: “Creating the Right Environment” (the Waste Strategy) (Waste Authority 2012) sets out targets for the increased diversion of waste from landfill for each waste stream (Table 8).

Table 8: Landfill and diversion targets for WA as stated in the Western Australian Waste Strategy.

<table>
<thead>
<tr>
<th>Year</th>
<th>MSW Metro Diversion</th>
<th>MSW Metro Landfill</th>
<th>MSW Non-Metro Diversion</th>
<th>MSW Non-Metro Landfill</th>
<th>C&amp;I Diversion</th>
<th>C&amp;I Landfill</th>
<th>C&amp;D Diversion</th>
<th>C&amp;D Landfill</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009/10</td>
<td>36%</td>
<td>64%</td>
<td>15%</td>
<td>85%</td>
<td>46%</td>
<td>54%</td>
<td>29%</td>
<td>71%</td>
</tr>
<tr>
<td>2014/15</td>
<td>50%</td>
<td>50%</td>
<td>30%</td>
<td>70%</td>
<td>55%</td>
<td>45%</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>2019/20</td>
<td>65%</td>
<td>35%</td>
<td>50%</td>
<td>50%</td>
<td>70%</td>
<td>30%</td>
<td>70%</td>
<td>30%</td>
</tr>
</tbody>
</table>


Achieving these targets will mean a significant increase in recycling and recovery of waste, from an overall Perth and Peel landfill diversion rate of around 35% in 2010/11 increasing to 56% in 2014/15 and 69% in 2019/20 (Figure 10).

Figure 10: Estimated waste generation by disposal (landfill or diversion from landfill) assuming Waste Strategy landfill diversion targets are achieved (* indicates Waste Strategy landfill diversion target years).

The Waste Strategy landfill diversion targets do not currently go beyond 2020 however for the purposes of this project it is important to look beyond this timeframe, to when the population of the Perth metropolitan and Peel regions is 3.5 million people (around 2050).

It is the aim of the Strategic Waste Infrastructure Planning Working Group to plan for future waste requirements in a way that is consistent with the principles and targets of the Waste Strategy, as well as the strategies and policies of the Western Australian Planning Commission (WAPC). The draft State Planning Strategy (WAPC 2012b), Directions 2031 and Beyond (WAPC 2010) and the sub-regional structure plans which are currently under development are all based around this ‘3.5 Million City’ concept.
PART 2: Characteristics and Distribution of Waste Facility Sites

5.0 A Proactive Approach to Planning for Waste Facilities

The Western Australian Waste Strategy: “Creating the Right Environment” (the Waste Strategy) (Waste Authority 2012) identifies the importance of long term planning for waste and recycling infrastructure, and the need for a long-term plan that outlines the number and types of waste facilities likely to be required, as well as their optimum location. A long-term approach that identifies and secures suitable waste facility sites in Perth and Peel with adequate buffers, in a coordinated manner, will contribute, in a strategic way, to the achievement of the landfill diversion targets of the Waste Strategy.

The Waste Authority is currently developing a Waste and Recycling Infrastructure Plan for the Perth Metropolitan and Peel Region, and has established the Strategic Waste Infrastructure Planning Working Group (SWIPWG) to assist its development. The aim of the Plan is to determine the waste management infrastructure required to meet the needs of the Perth and Peel ‘3.5 million city’ and set out the planning, governance and funding instruments required to establish the infrastructure required.

In the past, there has been no coordinated approach to the siting of waste facilities in Perth and Peel, with proponents of new facilities (local governments or private industry) choosing locations according to land availability and their own evaluations of site suitability. Construction and operation of waste facilities requires state and local government licenses and approvals, which may vary according to the type of waste facility and selected location.

Planning for future waste requirements should be done in a way that is not only consistent with the principles and targets of the Waste Strategy, but also with the strategies and policies of Department of Planning and Western Australian Planning Commission (WAPC).

Directions 2031 and beyond (WAPC 2010) recognises that lack of planning can lead to a lack of access to essential infrastructure and services. By proactively identifying potential infrastructure and land requirements, the Waste Authority aims to provide access to waste disposal and recycling services across the Perth metropolitan and Peel regions into the future. Working towards meeting the Waste Strategy landfill diversion targets is also consistent with the Directions 2031 and beyond strategy of encouraging reuse and recycling.

The Economic and Employment Lands Strategy (WAPC 2012a) advocates a proactive approach to industrial land use planning, and recognises the need to ensure industrial land development meets state needs efficiently. Strategies of Directions 2031 and beyond (WAPC 2010) include minimising conflict between land use and key infrastructure assets, and maximising essential urban infrastructure efficiency and equity and the balanced distribution of industrial centres across the city to reduce freight handling and improve the provision of products and services to the broader community.

The draft State Planning Strategy (WAPC 2012b) recognises that physical infrastructure with appropriate capacity is essential for WA’s development, and includes waste facilities as essential infrastructure. It outlines aspirations for the state, including securing strategic sites, buffers and corridors for waste management facilities, and development of industrial precincts that are zoned, structured and operate to facilitate industrial ecology and ensure integration between waste producers and reprocessors/recyclers.
5.1 Characteristics of Potential Waste Facility Sites

It is anticipated that development of waste management infrastructure will be staged over time, as population growth and development in an area creates a need for new waste management capacity, and as suitable land becomes available (e.g. as proposed industrial land is assembled and service infrastructure is developed).

Regardless of how waste facilities may be located (stand alone facilities, co-located facilities, or waste precincts) similar issues must be considered when identifying suitable sites for waste management infrastructure, which are common to all facility types, include:

1. Access to Transport Corridors

In the waste industry there is a heavy reliance on road transport. Materials are likely to enter and leave a facility via a variety of vehicles:

- Waste or recycling collection trucks: collect waste from MGB’s or bulk bins and deliver it to a facility
- Larger trucks: deliver or remove bulk quantities of materials from the facility (e.g. mixed waste picked up from transfer stations)
- Cars/trailers: residents or small scale commercial operators deliver small loads of waste or remove recycled products (e.g. mulch) from the facility.

It is therefore important that waste management facilities are located within easy access to primary/other regional roads. There is also potential for transport of waste by rail, and for future export of waste types overseas through ports, so access to these transport options should also be considered when locating waste facilities.

2. Access to Waste Sources and End Points

Locating waste management infrastructure close to sources of waste generation can reduce the need to transport waste over long distances (reducing traffic congestion, truck noise, cost, and the carbon footprint of waste management). This means waste management facilities are ideally located near to the sources of waste they process. For example:

- Areas of high population growth produce C&D waste (construction of new urban areas or urban infill) and MSW (ongoing domestic waste produced by residents)
- Where Activity Centres (WAPC 2010) or new industrial areas (WAPC 2012a) are developed, increasing C&I waste will be produced.

It is important to consider both the waste produced by new residents or businesses (e.g. in greenfield sites to be developed in the metro northwest or metro southwest sub-regions), and the ongoing waste produced by existing residents/businesses (e.g. in the metro inner and metro middle sub-regions).

Access to waste end points is also important, as waste delivered to facilities is likely to be processed and then transported off site (e.g. recyclable materials transported by truck to recycling facilities in other states, AWT residues transported to landfill, or green waste transported off site for composting).
3. Protection from Buffer Encroachment and Zoning
While proximity to the urban and commercial areas where waste is generated is advantageous, it is also important that waste facilities are protected from buffer encroachment by sensitive land uses. Waste management facilities may create noise, dust, or odour issues, and face community opposition and complaints.

Locating waste management infrastructure within industrial areas (e.g. existing industrial areas or potential industrial areas as identified in the Economic and Employment Lands Strategy, WAPC 2012a), surrounded by compatible land uses, can reduce the likelihood of problems caused by buffer encroachment. Co-location with compatible existing land uses or facilities (such as existing waste facilities, quarries, closed landfills or Water Corporation sites) may be beneficial for both the existing facility and the waste management infrastructure.

4. Access to Services/Utilities
Waste management facilities, like most general industrial facilities, require access to waste, power, gas and sewage services. Some facilities, such as anaerobic alternative waste treatment and waste-to-energy facilities, may also produce electricity, so it is important that these can access the power grid to supply electricity to it.

5. Environmental Protection
All industrial land uses, including waste management facilities, should be located in environmentally suitable areas. This includes consideration of Bush Forever sites, Public Drinking Water Source Areas, wetlands (especially Conservation Category wetlands), flora and fauna (TEC’s, DRF’s etc.), acid sulphate soils etc.

6. Potential Workforce
Proximity to a potential workforce is one of the criteria use in the Economic and Employment Lands Strategy (WAPC 2012a) in identifying areas which are may be potentially suitable for development as Industrial zones in the future. This also applies to sites which may be suitable for waste management facilities.

5.2 How Much Land is needed for Waste Facilities in Perth and Peel?
The Waste Management Infrastructure Requirements 2050 Background Information for Development of Sub-Regional Structure Plans – November 2012 report (DEC unpublished) indicates that by 2050 approximately 34ha to 273ha of land may be needed in the Perth metropolitan and Peel regions to accommodate the waste facilities required to meet the landfill diversion targets of the Waste Strategy. This estimate is for the sites needed for stand alone facilities, but does not include the area needed for buffers.

The exact number of hectares given in this initial estimate should not be taken as a precise evaluation of land requirements. A more detailed level of modelling is required to determine this more accurately. It is indicative, however, that when the population of Perth and Peel reaches around 3.5 million, potentially up to several hundred hectares of land may be needed for development of new waste facilities (not thousands or tens of thousands of hectares).
The types of facilities incorporated into this estimate include:

- Inert landfills
- Alternative Waste Treatment (AWT) facilities including waste-to-energy, mechanical biological treatment
- Materials Recovery Facilities (MRFs) – ‘clean’ and ‘dirty’
- Composting facilities (mixed organics, green waste)
- Construction and demolition (C&D) material processors – mixed and source separated materials.

Other facilities that may be required (but which are not included in the land estimates above) are:

- Recyclers (including facilities which sort, dismantle, decontaminate and/or aggregate recyclable materials for transport to recycling facilities) – e-waste, scrap metal, paper, glass, timber, plastic
- Transfer stations (putrescible, inert, or mixed inert/recyclable)
- Drop-off facilities
- Putrescible landfills.

The Economic and Employment Lands Strategy (WAPC 2012a) identifies approximately 12,990ha of Potential Industrial Sites and 13,737ha of zoned industrial land in the Perth metropolitan and Peel Regions, of which 1,211ha is vacant. Compared with this potential availability, the tens to several hundred hectares of land estimated to be required for waste facilities is relatively small.

This does not mean, however, that waste facility sites will necessarily be easy to identify and secure. Waste facilities will have to compete with other industrial facilities for a limited supply of land, the timing of land availability is important as development of waste facilities must keep pace with increasing waste generation, and there are many factors which make identifying strategic waste infrastructure sites a complex process.

5.3 Distribution of Waste Facilities: Potential Use of Waste Precincts and Waste Facility Co-location

5.3.1 Defining Waste Facility Co-location and Waste Precincts

It is important to clarify the use of the terms “waste facility co-location” and “waste precinct” for the purposes of this document:

**Waste facility co-location:** two or more waste facilities are accommodated at a single site, where the facilities are owned/managed/operated by the site owner.

In the Perth metropolitan and Peel regions are there are some examples of co-located waste facilities at sites owned and operated by private companies (Table 9). Most sites include an inert landfill or transfer station in combination with other waste facilities.

There are also numerous examples of co-located waste facilities at sites owned by local governments or Regional Councils, where the facilities are operated by the local government/Regional Council or their contracted staff (Table 9). Drop-off facilities are included at all local government/Regional Council sites with co-located waste facilities, in combination with other facility types which process municipal solid waste (which may be dropped off by residents or collected by the local government/Regional Council).
One atypical Regional Council site is the Western Metropolitan Regional Council (WMRC) JFR (Jim) McGeough Resource Recovery Facility (see Case Study 1). This site is a Crown Reserve vested in the WMRC and initially included only facilities owned and operated by the WMRC. In 2007, however, the WMRC signed an agreement with DiCOM AWT Operations Pty Ltd (Anaeco and Palisade Investment Partners) to construct a DiCOM alternative waste treatment (mechanical biological treatment) facility at the site. The WMRC owns and operates other waste facilities at the site, but does not own or operate the DiCom facility. In this way the JFR (Jim) McGeough Resource Recovery Facility now operates in some ways like a waste precinct (Case Study 1).

**Waste Precinct:** an area (which may be sub-divided into smaller sites) that accommodates two or more waste processing facilities which are owned/managed/operated by separate entities, which may be independent of the site owner.

The ownership and governance structure of waste precincts is potentially more complicated than that of co-located waste facilities, as it may involve one (or more) land owner(s) and more than one organisation owning and operating waste facilities, leasing sites from the landowner. One example of this structure, from the Wingfield Waste and Recycling Centre in South Australia, can be seen in Case Study 2.

Potential waste precinct ownership, governance and operational models (and their advantages and disadvantages) require further investigation, to determine which is preferable in the context of the Perth metropolitan and Peel regions.

There are currently no examples of waste precincts operating in the Perth metropolitan and Peel regions, although the JFR (Jim) McGeough Resource Recovery Facility operates like a waste precinct in some ways (see Case Study 1).

Facilities within a waste precinct may operate cooperatively or completely independently. It is important, however, that these facilities are compatible.
Table 9: Co-located waste facilities operated by local governments/Regional Councils and private industry.

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Operator</th>
<th>Drop-off facility</th>
<th>Green waste mulching</th>
<th>Putrescible landfill</th>
<th>Putrescible transfer station</th>
<th>Materials Recovery Facility (MRF)</th>
<th>AWT facility</th>
<th>Inert landfill</th>
<th>Inert transfer station</th>
<th>C&amp;D materials processing</th>
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<td>Stanley Rd Waste Management Facility</td>
<td>Bunbury Harvey Regional Council</td>
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</tr>
<tr>
<td>Tim’s Thicket Septage &amp; Inert Waste Disp. Facility</td>
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<tr>
<td>Waste Management Centre</td>
<td>City of Mandurah/Transpacific Cleanaway</td>
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<td>Red Hill Waste Management Facility</td>
<td>Eastern Metropolitan Regional Council</td>
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<td>X</td>
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<td>Shire of Waroona</td>
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<td>JFR (Jim) McGeough Resource Recovery Facility</td>
<td>Western Metropolitan Regional Council**</td>
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<td>Eclipse Resources</td>
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</table>

* The Red Hill Waste Management Facility does not currently have an AWT facility, but the Eastern Metropolitan Regional Council is in the planning stages for an AWT facility at this site.

** The Western Metropolitan Regional Council owns the JFR (Jim) McGeough Resource Recovery Facility site and all waste facilities except the AWT – see Case Study 1.
Case Study 1: JFR (Jim) McGeough Resource Recovery Facility, Shenton Park WA

This approximately 1.5ha site, a crown reserve vested in the Western Metropolitan Regional Council (WMRC), accommodates a drop-off facility, green waste storage and mulching area, putrescible transfer station and the DiCOM alternative waste treatment facility (which sorts waste to extract recyclables, and uses anaerobic digestion and aerobic composting to produce biogas and compost from organic waste). These facilities process mainly municipal solid waste.

The WMRC owns and operates the drop-off facility, green waste storage and mulching area, and putrescible transfer station. WMRC supplied the land for the construction of the DiCOM facility and is contracted to supply waste. The DiCOM facility is owned and operated by DiCOM AWT Operations Pty Ltd (infrastructure fund manager Palisade Investment Partners). WA companies AnaeCo Limited and Monadelphous are contracted to design, construct and operate the facility.


Case Study 2: Wingfield Waste and Recycling Centre, South Australia

Wingfield Waste and Recycling Centre is a waste precinct owned and developed by Adelaide City Council. It is a 96ha former landfill site located approximately 9km north of the Adelaide CBD. The precinct is located within an industrial area, with industrial land to the south and undeveloped potential industrial land to the north, which protects it from encroachment from sensitive land uses. It is within an area zoned Industrial (Resource Recovery) by the SA State government.

The Wingfield Landfill closed in 2004, and the Adelaide City Council redeveloped the site as a waste processing and recycling centre, putting all service infrastructure in place and selecting four compatible/complimentary primary tenants for the precinct through an expression of interest process:

- Amcor: Paper and cardboard waste
- Adelaide resource Recovery (ARR): Construction & demolition waste and clean fill
- Jeffries Group: Green waste
- TPI: Residual waste (transfer station)

The Adelaide City Council leases sites within the precinct to these tenants, and owns the common weighbridge for the site, which enables it to collect data on all of the materials entering and leaving the site. In 2007 almost one million tonnes of waste was accepted at the precinct, approximately 87% of which was recycled. 84 people are employed within the precinct.

5.3.2 Potential Advantages and Disadvantages of Co-location and Precincts

Grouping compatible waste facilities together through the use of co-location or precincts can have many potential benefits:

- **Land use efficiency:** Use of co-location and precincts may require less land overall, as land at well designed sites can potentially be used more efficiently (e.g. shared buffers, access points, parking, and boundaries). This is consistent with the *Economic and Employment Lands Strategy* (WAPC 2012a) aim of making industrial land development meet state needs as efficiently as possible.

- **Flexibility:** Sites that could potentially accommodate a number of waste facility types, to enable maximum flexibility into the future are likely to be the most useful. Larger sites that could be subdivided into smaller lots (or accommodate several facilities within a single site) may be more flexible than smaller sites, and may also allow more capacity to change waste facilities over time as needed.

- **Coordination and staging:** Waste precincts or co-location sites may give the state government a greater ability to coordinate the development of different combinations of waste facilities, and ensure the facilities are developed when and where they are needed. Larger sites allow for scheduling of the development of different parts of the precinct over time.

- **Data collection:** Use of a single weighbridge for the various facilities within a waste precinct or co-location site could enable increased data collection related to waste and recycling materials and efficiency (see Case Study 2).

- **Buffer efficiency and protection:** Compatible facilities grouped together can share buffers. Some of the potentially less publicly-accepted facility types and those facilities with larger buffer requirements may be surrounded by other compatible waste facilities or other compatible land uses.

- **Planning efficiency:** The WAPC anticipates increasing competition for industrial land in the Perth metropolitan and Peel regions (WAPC 2012a). It is therefore likely that smaller sites for more easily-located waste facilities (such as small scale recyclers) may be secured by proponents. However, larger sites and sites for more difficult to locate facilities may be increasingly difficult to secure. Proactively considering co-location or precinct sites, and securing/developing them over time, as land becomes available, will ensure waste facilities are not ‘out competed’ by other industrial land uses.

- **Landfill diversion efficiency:** The strategic grouping of waste management facilities can potentially improve recycling and recovery rates, as facilities have the capacity to work cooperatively. The outputs of one process may form the inputs of another process. For example, mixed waste may be processed through an AWT to separate recyclables from organic waste; the recyclables may then be processed through a MRF to sort them into different material types; different recyclers may then clean/bale/shred etc. the recyclable materials for recycling.

- **Transport efficiency:** The location of compatible waste management facilities on the same site can reduce the need for road/rail transport of waste (as in the example above, the outputs of one process may form the inputs of another process). Grouping waste facilities together in areas appropriately located on transport corridors may also help reduce waste-related truck movements through sensitive areas (e.g. residential areas).
**Business/employment opportunities:** Larger sites which could accommodate a range of facilities types, both large and small scale may create opportunities for smaller companies as well as larger ones.

**Long term security/stability:** Although the specific businesses or facility types may change over time, the establishment of waste precincts or co-location sites can help give more certainty to the waste industry regarding the amount and location of land available in the long term.

Potential disadvantages or limitations to the use of waste precincts and co-location sites may include:

- **Community perceptions:** If there are problems with one facility within a precinct or co-location site (e.g. odour, litter) the whole precinct or co-location site may face community opposition and complaints.

- **Community acceptance:** There may potentially be greater community opposition to the development of a waste precinct or co-location site (which will house a number of different waste facilities together) than to a stand alone waste facility. Significant public consultation and education may be required to mitigate this.

- **Traffic congestion:** A waste precinct or co-location site could potentially have a high volume of traffic, with a range of users and vehicle types. Traffic would have to be managed to ensure that the site can operate safely (e.g. by separating trucks from the cars of residents dropping off waste) and efficiently (e.g. by designing the site for efficient flow of vehicles). The impact of potentially increased traffic on the surrounding area would also need to be considered to minimise potential problems (e.g. congestion, noise).

- **Management and administration:** There are many different ways in which a waste precinct or co-location site could operate, however they often require some level of centralised management and administration. The issues of who would do this, how it would be done, and how it would be funded must be considered.

- **Finding and securing sites:** It may potentially be more difficult to find and secure the larger, more flexible sites needed for precincts or co-location sites compared with the smaller sites needed for stand alone facilities.

- **Attracting and sustaining businesses:** The precinct or co-location site must be located, managed and marketed in such a way as attract to the appropriate types of waste facilities. Mechanisms such as economic incentives or a streamlining of the planning and approvals process may be considered to attract operators to the site. A waste precinct will not be successful if the waste industry does not consider it a desirable location for building new facilities, if there are barriers to the construction or operation of waste facilities at the site, if it is not economically competitive with other location options, or if an incompatible combination of waste facilities and other businesses are established at the site.

- **Local amenity:** Like any industrial area, a waste precinct or co-location site has the potential to impact negatively on the amenity of its local area. This can be mitigated with the implementation of design guidelines for the precinct or co-location site however it is important to ensure that all facilities comply with these guidelines.

It is likely that the future land requirements for waste facilities will be met by a combination of precincts, co-location sites and stand alone facilities.
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APPENDIX 1: Site Characteristics of Existing Perth Metropolitan and Peel Region Waste Facilities

<table>
<thead>
<tr>
<th>Facility</th>
<th>Description</th>
<th>Prescribed Premises Category(1)</th>
<th>Buffer(2)</th>
<th>Potential Impacts(2)</th>
<th>Size of Site</th>
<th>MRS/PRS/GBRS Zoning</th>
<th>LPS Zoning</th>
<th>Co-location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative Waste Treatment (AWT): Mechanical Biological Treatment</td>
<td>A type of AWT facility where mechanical and biological treatment of mixed waste is used. Aerobic processes (or a combination of aerobic and anaerobic processes) are used to break down the organic fraction of mixed waste to produce low-grade compost. Recyclable waste is separated and recycled, residual waste is disposed of to landfill. Composting is generally done in an enclosed (indoor) facility on site.</td>
<td>61A waste resource recovery plant&lt;br&gt;67A recycling-compost</td>
<td>67A: 150m-1000m&lt;br&gt;61A: case by case</td>
<td>Gaseous, noise, dust, odour, risk.&lt;br&gt;10ha stand alone; co-located AWT's 1.5ha, 11.4ha and 36.3ha</td>
<td>Industrial, Parks and Recreation, PP – Commonwealth Government</td>
<td>Industrial Development, Mixed Business</td>
<td>Stand alone or co-located with drop-off, putrescible transfer station, green waste mulching facility or inert landfill.</td>
<td></td>
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<tr>
<td>Materials Recovery Facility (MRF)</td>
<td>A facility where mixed recyclable waste is sorted and separated into different material types for recycling. (e.g. waste collected from households in yellow-lidded bins).</td>
<td>Does not require DER licence</td>
<td>n/a</td>
<td>Not covered in EPA Guidance.&lt;br&gt;0.3-2.4ha stand alone (average 1.9ha)</td>
<td>Industrial (mostly), Urban, PP – Special Uses</td>
<td>Industrial type zonings</td>
<td>Usually stand alone facilities.</td>
<td></td>
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<tr>
<td>Compost Facilities (Mixed Organics, Green Waste)</td>
<td>Facilities which process organic waste (e.g. green waste, food waste, grease trap waste) to create mulch and/or compost. Composting may be done inside a covered facility, or outdoors in windrows. Buffer depends on type of composting and type of materials composted.</td>
<td>67A compost manufacturing and soil blending (may also have 61 liquid waste facility and/or 61A solid waste facility)</td>
<td>67A: 150m-1000m&lt;br&gt;61A: case by case</td>
<td>Noise, dust, odour.&lt;br&gt;32-250ha stand alone (average 91ha, most facilities 32-41ha)</td>
<td>Rural, Rural – Water Protection, PP – Water Authority</td>
<td>Rural, Resource</td>
<td>Green waste mulching facilities are co-located with drop-offs, transfer stations, or landfills. Composters are usually stand alone.</td>
<td></td>
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<tr>
<td>Construction and Demolition (C&amp;D) Waste Processor</td>
<td>Facilities which sort, screen and crush C&amp;D materials (e.g. bricks, concrete, asphalt, rubble) and other types of C&amp;D waste (e.g. metals, timber, plastic) for recycling.</td>
<td>12 screening&lt;br&gt;13 crushing&lt;br&gt;62 solid waste depot</td>
<td>12: 500m&lt;br&gt;13: 1000m&lt;br&gt;62: 200m</td>
<td>Noise, dust, odour.&lt;br&gt;1.8-3.7ha stand alone (average 2.8ha)</td>
<td>Industrial (mostly), Urban</td>
<td>General Industry, Industrial Development, Urban Development</td>
<td>Stand alone or co-located with inert landfill or composter. Stand alone C&amp;D processors can be located at small sites, however larger sites may be preferred to include stockpile space.</td>
<td></td>
</tr>
<tr>
<td>Recycler (E-waste, Scrap Metal, Paper, Glass, Timber, Plastic)</td>
<td>A facility where solid waste is recycled or where solid waste is processed (e.g. decontaminated, shredded, sorted, baled, and/or aggregated) for recycling. Most materials collected for recycling in WA are sent interstate or overseas for recycling.</td>
<td>May have: 47 scrap metal recovery&lt;br&gt;62 solid waste depot (smaller facilities are unlicensed)</td>
<td>47: 300-500m&lt;br&gt;62: 200m (or n/a if unlicensed)</td>
<td>Noise, dust, odour.&lt;br&gt;0.4-9.8ha stand alone (average 3.1ha)</td>
<td>Industrial</td>
<td>Industry, General/Light Industry, General Industry, Industrial Development</td>
<td>Usually stand alone facilities.</td>
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<tr>
<td>Transfer Station (Putrescible, Inert, Recyclables)</td>
<td>A facility which acts as a temporary aggregation and storage point for bulk quantities of solid waste, before it is transported to a waste processing facility or landfill.</td>
<td>62 solid waste depot</td>
<td>62: 200m</td>
<td>Noise, dust, odour.&lt;br&gt;0.1-3.4ha stand alone (average 1.2ha)</td>
<td>Industrial, Rural, Urban, PP</td>
<td>Industrial type zonings, Rural type zonings, Urban Development</td>
<td>Usually stand alone facilities.</td>
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<tr>
<td>Drop-off Facilities</td>
<td>A facility operated by a local government or Regional Council which allows residents to deliver small volumes of solid waste (from domestic or small scale commercial sources).</td>
<td>57 used tyre storage&lt;br&gt;62 solid waste depot</td>
<td>57: 100-200m&lt;br&gt;62: 200m</td>
<td>Noise, dust, odour.&lt;br&gt;2-16ha stand alone (average 9ha)</td>
<td>Industrial, Rural, State Forest, Parks and Recreation, PP</td>
<td>Rural and Industrial type zonings</td>
<td>Generally co-located with putrescible landfill or putrescible transfer station.</td>
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<tr>
<td>Landfill – Inert</td>
<td>Landfills which accept inert (non-hazardous, non-biodegradable) waste. Some landfills also have facilities on site for storing, screening, and crushing C&amp;D materials (to reduce volume or for reuse).</td>
<td>63 Class I inert landfill (may also have 12 screening, 13 crushing, and/or 62 solid waste depot)</td>
<td>63: 150m&lt;br&gt;12: 500m&lt;br&gt;13: 1000m&lt;br&gt;62: 200m</td>
<td>Noise, dust.&lt;br&gt;1.5-220ha stand alone (average 53.3ha)</td>
<td>Industrial, Rural, Urban, Parks and Recreation, PP – Public Utilities</td>
<td>Rural type zonings, Industrial type zonings</td>
<td>Usually stand alone or co-located with composter or C&amp;D recycler.</td>
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<tr>
<td>Landfill – Putrescible</td>
<td>Landfills which accept putrescible waste (the component of the waste stream likely to become putrid i.e. decompose/decay).</td>
<td>64 Class II or III putrescible landfill&lt;br&gt;89 putrescible landfill</td>
<td>64 or 89: 150-500m depending on sensitive land use</td>
<td>Gaseous, noise, dust, odour.&lt;br&gt;15-250ha co-located or stand alone (average 95ha)</td>
<td>Rural (mostly), PP – Special Use</td>
<td>Rural, Special Use, Public Purpose</td>
<td>Stand alone (private) or co-located with drop-off, green waste mulching sites (Local Govt.).</td>
<td></td>
</tr>
</tbody>
</table>

(1) Sourced from Environmental Protection Regulations 1987.
(2) Determined by Prescribed Premises Category.
(3) Sourced from Guidance for the Assessment of Environmental Factors (EPA 2005).