

Stadium Australia Redevelopment

Waste Management Strategy

Infrastructure NSW

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1 Introduction

This report supports a State Significant Development (SSD) Development Application (DA) for the refurbishment of Stadium Australia, which is submitted to the Minister for Planning pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). Infrastructure NSW is the proponent of the SSD DA.

1.1 Background

Stadium Australia opened in 1999 for the 2000 Sydney Olympic and Paralympic Games and, at the time, was the largest Olympic Stadium ever built and the second largest stadium in Australia. In March 2018, the NSW Premier announced plans to refurbish Stadium Australia to address deficiencies with the existing infrastructure and ensure that the stadium retains its status as a premier venue within a network of stadia and events infrastructure in NSW.

The NSW Stadia Strategy 2012 provides a vision for the future of stadia within NSW, prioritising investment to achieve the optimal mix of venues to meet community needs and to ensure a vibrant sports and event environment in NSW. A key action of the strategy includes developing Tier 1 stadia and their precincts covering transport, integrated ticketing, spectator experience, facilities for players, media, corporate and restaurant and entertainment provision. Stadium Australia is one of three Tier 1 stadia within NSW, the others being Sydney Football Stadium and the Sydney Cricket Ground.

In order to qualify for Tier 1 status, a stadium is required to include:

- seating capacity greater than 40,000;
- regularly host international sporting events;
- offer extensive corporate facilities, including suites, open-air corporate boxes and other function/dining facilities; and
- be the home ground for sporting teams playing in national competitions.

The refurbishment of Stadium Australia will address deficiencies in the existing infrastructure and improve facilities to be in line with contemporary Australian venue standards. The works ensure the stadium remains a modern, globally competitive venue that achieves the requirements for a Tier 1 stadium. The refurbishment of Stadium Australia addresses the following project objectives:

- transform the stadium into a 'fan favourite' destination for experiencing and enjoying sports and entertainment events;
- maximise the direct and indirect economic, social and cultural benefits to NSW from the project, including securing major, economically beneficial events within NSW to ensure the economic sustainability of the stadium into the future;
- deliver a multi-use contemporary rectangular venue that meets the needs of patrons, hirers and other users for rugby, football, concerts and other new forms of entertainment, and reaffirms the status of the stadium as Australia's largest purpose-built rectangular venue in Australia;
- improve the facility's sensitivity to the environmental conditions of the site by providing a roof which provides cover to 100% of seats (to the drip line);
- provide new and refurbished corporate areas, members areas and general admission areas to enhance the patron experience;
- promote universal accessibility, safety and security such that the stadium is welcoming, inclusive and safe for all stadium users, including persons requiring universal access;

- promote environmental sustainability and embrace a whole of life approach to operations and maintenance; and
- achieve a high standard of design and reinforce the Stadium's status and identity within the NSW stadia network, and more broadly, nationally and internationally.

1.2 Site description

The site is located at 15 Edwin Flack Avenue within the Sydney Olympic Park. It is bound by Edwin Flack Avenue to the west, Dawn Fraser Avenue to the south, Olympic Boulevard to the east and Qudos Bank Arena to the north. The site is located within the City of Parramatta Local Government Area.

The site is legally described as Lot 4000 in DP 1004512 and part of Lot 4001 in DP 1004512. In 2017, the Minister for Sport assigned Venues NSW as the trustee of Stadium Australia under the Sporting Venues Authorities Act 2008.

In a broader context, the site forms part of Sydney Olympic Park which is a sporting and economic centre in metropolitan Sydney that covers 680 hectares. Sydney Olympic Park comprises a range of sports and entertainment venues, parklands, and commercial, retail and residential developments. It benefits from convenient access to Homebush Bay Drive, Parramatta Road and the M4 Western Motorway, as well as Olympic Park railway station. The Parramatta Light Rail Stage 2 and Sydney Metro West will also significantly increase accessibility.

The locational context of the Site is shown in Figure 1, whilst the site boundaries and existing site features are shown in Figure 2.



Figure 1 Locality map of Stadium Australia



Figure 2 Site area and local context

1.3 Overview of proposed development

In March 2018 the NSW Government announced its commitment to refurbish the existing Stadium Australia and retain its status as a premier venue within a network of stadia and events infrastructure in NSW. This comprises the following:

- Reconfiguring the field of play to a permanent rectangular configuration.
- Redeveloping the lower and middle seating bowl to locate seating closer to the field and increase the pitch (steepness) of the seating bowl, which has the effect of reducing the capacity to approximately 70,000 seats (plus up to 20,000 persons on the field during concerts).
- Providing 100% drip-line roof coverage to all permanent seats by replacing the northern and southern sections of the roof and extending the existing eastern and western sections of the roof.
- Providing a new northern and southern public stadium entrance, including a new stadium facade and double-height concourse
- Renewing the food and beverage concessions, bathrooms, team facilities including new gender neutral changerooms, members and corporate facilities, press and broadcast facilities, and back of house areas.
- Providing new signage, high-definition video replay screens, LED lighting, and other functional improvements.
- Retaining the public domain areas surrounding the stadium that deliver a range of publicly accessible, event and operational areas, with minor works for tree removal.

Part of the existing stadium forecourt will be used as a construction compound during the construction phase and reinstated following the completion of works and prior to commencement of stadium operations. An indicative render of the Stadium is presented in Figure 3.



Figure 3 Indicative photomontage of proposed stadium

1.4 Existing infrastructure

The Stadium operates and maintains the following waste management infrastructure:

- 3 x 21 cubic metre waste compactors – located on the Stadium’s basement level in the SW, SE and NE quadrants. The compactors sit at the bottom of each of the three quadrant’s spiral ramps. Nominally, the NW compactor receives general (or landfill) waste material; and the SW and SE compactors receive commingled (or recyclable) waste stream material;
- Waste chutes (i.e. from levels 6 down to 1) which carry waste from each level of the Stadium building to each of the waste compactors in the SW, SE and NE quadrants of the Stadium. Each of the waste chutes are in secure / lockable waste management rooms and are accessible for trained staff to operate;
- Waste receptacles – the Stadium maintains a large inventory of waste receptacles or bins for the short-term storage and movement of waste material. Receptacles range in size / volume and are colour-coded and have appropriate signage for ease of use by patrons and other users.

A key component of the Stadium’s event and non-event waste management strategy is the interaction between the Stadium’s cleaning services and waste management services contractors who perform specific but related roles as part of the overall presentation of the Stadium building. In conjunction with the core venue cleaning tasks performed, the cleaning services contractor is responsible for the manual handling and collection of waste / waste receptacles and the consolidation of waste material for the waste contractor to collect and convey from the Stadium site. The waste management services contractor is responsible for installing and maintaining the waste compactor infrastructure, and the collection, transportation, sorting and (to the extent possible), the recycling of the Stadium’s event and non-event waste material.

1.5 Existing waste management planning

The Stadium has been in operation since 2000 and has an existing waste management strategy and plan. From a waste consolidation and management perspective, the Stadium operates across two distinct categories of business activity:

- a) Non-event / normal business operations – a period of generally minimal waste generation, which is managed completely within the confines of on-site infrastructure and permanent staff resources;

- b) Event day operations (incorporating immediate pre-event, during event and immediate post-event periods) – a period of significant to large scale generation of waste, which is managed with a combination of on-site and off-site infrastructure and resources for sorting and separating waste streams and transporting waste from the site as quickly as other Stadium activities allow.

1.5.1 Waste management strategy

The waste management strategy for each business activity is described below.

- a) The Non-event day waste management strategy:
 - i) Generally, the accumulation of non-event day waste is managed by the permanent on-site cleaning contractor staff, using the ‘standard’ permanent waste infrastructure (i.e. waste chutes, waste compactors, receptacles) to manage the day-to-day waste output from the Stadium business.
- b) Event day waste management strategy:
 - i) The accumulation of waste in the lead up to, during and immediate post-event periods occurs on an escalated basis compared with non-event periods.
 - ii) Significant external resources supplement the Stadium’s permanent cleaning staff and infrastructure to enable event related waste to be consolidated, separated (where on-site separation occurs), and placed in agreed areas for collection by the waste management services contractor to convey from the site for sorting and / or disposal.
 - iii) Additional staff resources engaged to manage event accumulated waste include pre-event cleaning crews, during event waste management staff, and post-event litter picking / sorting crews. In addition to these event specific cleaning resources, the Stadium’s waste management services contractor provides transport resources to collect and convey the Stadium waste compactor contents to a materials recovery facility, and to collect the event waste material sorted and bagged on the Stadium site by the post-event cleaning crews.
 - iv) The transport function supporting the waste management program operates on both the basement level of the building (i.e. level 0) for the collection of compactor, turf, food, cardboard and grease trap waste; and at street level (i.e. level 1) where waste collection trucks drive to nominated exit gates on the perimeter of the building to collect the bagged waste consolidated by the post-event cleaning crews.

2 Study criteria

The Department of Planning, Industry and Environment (DPIE) has issued Secretary’s Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement (EIS) for the proposed development. This WMS has been prepared having regard to the relevant SEARs (Services and Waste) as follows:

1. Identify, quantify and classify the likely waste streams to be generated during operation of the development and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.
2. Identify appropriate servicing arrangements (including but not limited to, waste management, loading zones and mechanical plant) for the site.

The WMS considers and complies with the relevant legislation and codes where it is relevant to activities at Stadium Australia. The legislation and codes that may be applicable to waste management at Stadium Australia are described in the section that follows.

For details on construction waste refer to the Construction Management Plan (CMP) prepared by Aver.

2.1 Legislative requirements

The NSW EPA is the primary regulator of waste and pollution in NSW. The EPA manages the transport and disposal of hazardous waste and works with industry to find sustainable solutions to minimise the amount of waste going to landfill. The EPA provides leadership to ensure NSW has a fair, modern and well-regulated waste industry as well as reducing the impact of waste on the environment. In NSW, acts and regulations govern waste management, supplemented by codes and guidelines. Anyone who handles, stores, transports, processes, recycles or disposes of waste must follow these rules to minimise harm to human health and the environment.

The key legislative instruments administered or implemented by the EPA relevant to this WMS include:

- Protection of the Environment Operations Act 1997
- Protection of the Environment Operations (Waste) Regulation 2014
- Contaminated Land Management Act 1997
- Waste Avoidance and Resource Recovery Act 2001
- National Environment Protection Council (New South Wales) Act 1995
- Environmentally Hazardous Chemicals Act 1985
- Pesticides Act 1999
- Radiation Control Act 1990
- Dangerous Goods (Road and Rail Transport) Act 2008
- NSW EPA – Waste Classification Guidelines, 2014
- NSW Waste Strategy (2019)

Table 1 below summarises this legislation and their important features relative to the project.

Table 1 Summary of legislation relevant to Stadium Australia's WMS

Legislation	Summary
Protection of the Environment Operations Act 1997	<p>The principal environmental protection legislation for NSW is the Protection of the Environment Operations Act 1997 (POEO Act). The act:</p> <ul style="list-style-type: none"> ■ defines 'waste' for regulatory purposes ■ establishes management and licensing requirements for waste ■ defines offences relating to waste and sets penalties ■ establishes the ability to set various waste management requirements via the Protection of the Environment Operations (Waste) Regulation 2014 (Waste Regulation)
Protection of the Environment Operations (Waste) Regulation 2014	<p>The Waste Regulation allows the EPA to protect human health and the environment and provides a platform for a modern and fair waste industry.</p> <p>It includes strict thresholds for environment protection licences and outlines the waste levy system.</p>

Contaminated Land Management Act 1997	<p>The EPA uses its powers under the Contaminated Land Management Act 1997 (CLM Act) to deal with site contamination that is significant enough to warrant regulation under the Act, given the site's current or approved use.</p> <p>Local councils deal with other contamination under the planning and development framework, including State Environmental Planning Policy No. 55 - Remediation of Land and the Managing Land Contamination - Planning Guidelines, on sites which, though contaminated, do not pose an unacceptable risk under their current or approved use. In these cases, the planning and development process determines what remediation is needed to make the land suitable for a different use.</p>
Waste Avoidance and Resource Recovery Act 2001	<p>This Act promotes waste avoidance and resource recovery to achieve a continual reduction in waste generation. The Act provides for the development of a state-wide Waste Strategy and introduces a scheme to promote extended producer responsibility for the life-cycle of a product.</p>
National Environment Protection Council (New South Wales) Act 1995	<p>This Act provides for the establishment of a National Environment Protection Council that has power to make national environment protection measures. The NSW Government will implement National Environment Protection Measures (NEPMs) in NSW in a variety of ways, including via legislation. The EPA is one agency that will administer the implementation of NEPMs in NSW.</p> <p>NEPMs implemented using EPA legislation include those relating to:</p> <ul style="list-style-type: none"> ■ monitoring of ambient air quality ■ assessment of site contamination ■ use of packaging materials ■ movement of controlled waste ■ national pollutant inventory
Environmentally Hazardous Chemicals Act 1985	<p>This Act sets up the Hazardous Chemicals Advisory Committee. Its functions include advising the EPA on the assessment and control of chemicals that are environmentally hazardous.</p> <p>The EPA may declare substances to be chemical wastes for the purposes of the Act. Examples of substances that have been declared include dioxin contaminated waste materials and polychlorinated biphenyl (PCB) wastes.</p> <p>Chemical control orders.</p> <ul style="list-style-type: none"> ■ The EPA may make chemical control orders (CCOs) with respect to assessed chemicals or declared chemical wastes. These CCOs may regulate activities such as the manufacture, processing, conveying, buying, selling or disposal of the chemical or declared waste. Chemicals for which a CCO has been made are referred to as environmentally hazardous chemicals. ■ A CCO may prohibit activities in relation to environmentally hazardous chemicals or declared chemical wastes, except under the authority of a licence issued by the EPA
Pesticides Act 1999	<p>The EPA regulates the safe and correct use of pesticides in NSW, from the point of sale, under the Pesticides Act 1999 and the Pesticides Regulation 2017 to protect the environment and community.</p>

Radiation Control Act 1990	<p>The Environment Protection Authority (EPA) administers the Radiation Control Act 1990 (the Act) and Radiation Control Regulation 2013 (the Regulation).</p> <p>The EPA has certain regulatory powers under the Act and Regulation which include regulating the use, sale, giving away, disposal, storage, possession, transport, installation, maintenance or repair, remediation or clean-up of regulated material (radioactive substances, ionising radiation apparatus, non-ionising radiation apparatus of a kind prescribed by the Regulations and sealed source devices) in NSW.</p> <p>The objects of this Act are as follows:</p> <ul style="list-style-type: none"> ■ to secure the protection of persons and the environment from exposure to ionising and harmful non-ionising radiation to the maximum extent that is reasonably practicable, considering social and economic factors and recognising the need for the use of radiation for beneficial purposes ■ to protect security enhanced sources from misuse that may result in harm to people or the environment ■ to promote the radiation protection principles.
Dangerous Goods (Road and Rail Transport) Act 2008	<p>The EPA regulates the transport of dangerous goods in NSW. Dangerous goods are substances and objects that pose acute risks to people, property and the environment due to their chemical or physical characteristics.</p> <ul style="list-style-type: none"> ■ When transporting dangerous goods, training is required as well as a licence for both the driver and the vehicle ■ If you are transporting waste, a waste transporter's licence may be needed ■ All licence holders are listed in the dangerous goods public register <p>This legislation controls the transport of all dangerous goods except:</p> <ul style="list-style-type: none"> ■ Class 1 (explosives), regulated under the Explosives Act 2003 and administered by Safework NSW ■ Class 7 (radioactive substances), regulated under the Radiation Control Act 1990 and administered by the EPA ■ Dangerous goods are classified under the Australian Dangerous Goods Code (ADG Code) and the United Nations Manual of Tests and Criteria (UN Manual)
NSW EPA – Waste Classification Guidelines, 2014	<p>The Waste Classification Guidelines covers the classification of wastes into groups that pose similar risks to the environment and human health. These classifications are:</p> <ul style="list-style-type: none"> ■ special waste ■ liquid waste ■ hazardous waste ■ restricted solid waste ■ general solid waste (putrescible) ■ general solid waste (non-putrescible)

NSW Waste Strategy (2019)	<p>The NSW EPA is leading the development of a 20-year Waste Strategy for NSW in partnership with Infrastructure NSW which is expected to be complete by the end of this year (2019). The Strategy will set a 20-year vision for reducing waste, driving sustainable recycling markets and identifying and improving the state and regional waste infrastructure network. The aim of the Strategy is to provide industry with certainty and set goals and incentives, so the right infrastructure investments are made to meet community needs. The 20-year Waste Strategy will create a long-term vision and roadmap for waste and resource recovery in NSW, and will include:</p> <ul style="list-style-type: none"> ■ New long term 20-year goals for waste generation, resource recovery and landfill diversion ■ New policy positions and strategic directions in relation to waste avoidance and resource recovery ■ A plan for new or enhanced policies and programs to improve waste collection and distribution ■ A framework for the delivery of an integrated state infrastructure network ■ An alignment of policy and regulation to achieve long-term strategic objectives ■ A plan to strengthen data quality and access <p>The goals of this WMS can take into consideration the NSW 20-year Waste Strategy and can be used to provide guidance in setting targets for waste reduction.</p>
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3 Methodology

3.1 Key waste management principles

The aim of this WMS is to ensure that all waste resulting from all activities is managed in an effective and environmentally responsible manner. The overarching aims of this WMS are to:

- Promote an integrated approach to waste management
- Promote sustainable waste management
- Estimate types and quantities of waste generated
- Provide recommendations for management of the waste streams identified
- Provide guidance on the appropriate storage, collection, transport and disposal of waste

The WMS does this by following international best practice by moving away from traditional waste management practices to more sustainable solutions to minimise the waste volumes produced by the operation of Stadium Australia.

To reduce the types and quantities of waste produced and improve the environmental, social, and financial outcomes of the project, the strategies proposed in this WMS follow the principles of the waste hierarchy as shown in Figure 4.



Figure 4 The waste hierarchy

3.2 Waste types

The waste types that can be expected to be generated during the operation of Stadium Australia are anticipated to be amongst the following classes, as classified under the NSW EPA Waste Classification Guidelines, namely:

- Special waste
- Liquid waste
- Hazardous waste
- General solid waste - putrescible (GSWp)
- General solid waste - non-putrescible (GSWnp)

Table 2 below summarises the main waste classifications applicable to this WMS.

Table 2 Summary of waste classifications

Waste Classification	
Special waste	<p>'Special waste' is a class of waste that has unique regulatory requirements. The potential environmental impacts of special waste need to be managed to minimise the risk of harm to the environment and human health. Special waste means any of the following:</p> <ul style="list-style-type: none"> ■ clinical and related waste. ■ asbestos waste. ■ waste tyres. ■ anything classified as special waste under an EPA gazettal notice.
Liquid waste	<p>Liquid waste means any waste (other than special waste) that:</p> <ul style="list-style-type: none"> ■ has an angle of repose of less than 5 degrees above horizontal. ■ becomes free-flowing at or below 60°C or when it is transported. ■ is generally not capable of being picked up by a spade or shovel. ■ is classified as liquid waste under an EPA gazettal notice.

<p>Hazardous waste</p>	<p>The following waste types (other than special waste or liquid waste) have been pre-classified by the EPA as 'hazardous waste':</p> <ul style="list-style-type: none"> ■ containers, having previously contained a substance of Class 1, 3, 4, 5 or 8 within the meaning of the Transport of Dangerous Goods Code, or a substance to which Division 6.1 of the Transport of Dangerous Goods Code applies, from which residues have not been removed by washing or vacuuming. ■ coal tar or coal tar pitch waste (being the tarry residue from the heating, processing or burning of coal or coke) comprising of more than 1% (by weight) of coal tar or coal tar pitch waste. ■ lead-acid or nickel-cadmium batteries (being waste generated or separately collected by activities carried out for business, commercial or community services purposes). ■ lead paint waste arising otherwise than from residential premises or educational or child care institutions. ■ any mixture of the wastes referred to above. <p>A waste must be classified as 'hazardous waste' if it is a dangerous good under any of the following classes or divisions of the Transport of Dangerous Goods Code:</p> <ul style="list-style-type: none"> ■ Class 1: Explosives. ■ Class 2: Gases (compressed, liquefied or dissolved under pressure). ■ Class 3: Flammable Liquids. ■ Class 4: Flammable Solids. ■ Class 5: Oxidising agents and organic peroxides. ■ Class 6: Toxic substances. ■ Class 7: Radioactive substances. ■ Class 8: Corrosive substances. <p>Waste generators must chemically assess their waste to determine the waste's classification. If the waste generator does not undertake chemical assessment of the waste, the waste must be classified as hazardous waste. The chemical assessment process is based on the waste's potential to release chemical contaminants into the environment through contact with liquids, which leads to the production of leachates.</p>
<p>General solid waste - putrescible (GSWp)</p>	<p>The following wastes (other than special waste, liquid waste, hazardous waste or restricted solid waste) have been pre-classified by the EPA as 'general solid waste (putrescible) (GSWp)':</p> <ul style="list-style-type: none"> ■ household waste that contains putrescible organics. ■ waste from litter bins collected by or on behalf of local councils. ■ manure and night soil. ■ disposable nappies, incontinence pads or sanitary napkins. ■ food waste. ■ animal waste. ■ grit or screenings from sewage treatment systems that have been dewatered so that the grit or screenings do not contain free liquids. ■ any mixture of the wastes referred to above.

<p>General solid waste - non-putrescible (GSWnp)</p>	<p>The following wastes (other than special waste, liquid waste, hazardous waste, restricted solid waste or GSWp) are pre-classified as 'general solid waste (non-putrescible) (GSWnp)':</p> <ul style="list-style-type: none"> ■ glass, plastic, rubber, plasterboard, ceramics, bricks, concrete or metal. ■ paper or cardboard. ■ household waste from municipal clean-up that does not contain food waste. ■ waste collected by, or on behalf of, local councils from street sweepings. ■ grit, sediment, litter and gross pollutants collected in, and removed from, stormwater treatment devices and/or stormwater management systems, that has been dewatered so that they do not contain free liquids. ■ grit and screenings from potable water and water reticulation plants that has been dewatered so that it does not contain free liquids. ■ garden waste. ■ wood waste. ■ waste contaminated with lead (including lead paint waste) from residential premises or educational or child care institutions. ■ containers, previously containing dangerous goods, from which residues have been removed by washing or vacuuming. ■ drained oil filters (mechanically crushed), rags and oil-absorbent materials that only contain non-volatile petroleum hydrocarbons and do not contain free liquids. ■ drained motor oil containers that do not contain free liquids. ■ non-putrescible vegetative waste from agriculture, silviculture or horticulture. ■ building cavity dust waste removed from residential premises or educational or child care institutions, being waste that is packaged securely to prevent dust emissions and direct contact synthetic fibre waste (from materials such as fibreglass, polyesters and other plastics) being waste that is packaged securely to prevent dust emissions but excluding asbestos waste. ■ virgin excavated natural material. ■ building and demolition waste. ■ asphalt waste (including asphalt resulting from road construction and waterproofing works). ■ biosolids categorised as unrestricted use, or restricted use 1, 2 or 3, in accordance with the criteria set out in the Biosolids Guidelines (EPA 2000). ■ cured concrete waste from a batch plant. ■ fully cured and set thermosetting polymers and fibre-reinforcing resins. ■ fully cured and dried residues of resins, glues, paints, coatings and inks. ■ any mixture of the wastes referred to above.
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4 Results

The wastes that can be expected to be generated during the operation of Stadium Australia are identified, quantified (where possible), characterised and classified in this section.

4.1 Operational waste

Stadium Australia has been in operation since 2000, therefore the types, quantities, character and classification of the wastes generated over its operational life to date are well known. From a waste generation perspective, the Stadium operates across two distinct categories of business activity:

- Non-event / normal business operations – a period of generally minimal waste generation
- Event day operations (incorporating immediate pre-event, during event and immediate post-event periods) – a period of significant to large scale generation of waste

The past ten years attendance figures and corresponding waste volume generated are presented in Table 3, they show the split between landfilled waste and recycled waste. These figures have been used to calculate an average waste generation rate per annum.

NOTE: Several unique events have skewed some of the results, where this has happened, these figures have been omitted from the calculation of the average annual waste generation rate.

Table 3 Events attendances (2009-2018) and the annual landfill and recycled waste quantities

Year	Number of events	Total attendance	General waste (to landfill) tpa	Comingled waste (recycled) tpa	Total waste generated tpa
2009	44	1,203,711	No data	No data	-
2010	45	1,601,269	No data	No data	-
2011	41	1,025,453	No data	No data	-
2012	45	1,334,158	286 (89%)	35 (11%)	321
2013	46	1,634,469	504 (76%)	154 (24%)	658
2014	50	1,522,137	328 (51%)	315 (49%)	643
2015	51	1,616,395	282 (48%)	302 (52%)	584
2016	41	1,102,090	391 (10%)	3,861 (90%)	4,252*
2017	58	1,672,615	324 (20%)	1,366 (80%)	1,690*
2018	54	1,366,280	No data	No data	-
Average annual waste generation rate			350 (63%)	201 (37%)	552

* Outlying result omitted from the average calculation

The following waste streams are managed and separated either by the Stadium, its cleaning contractor, or the Stadium's waste management contractor:

- Special waste – clinical and medical
- Hazardous wastes – fuels and chemicals, lighting, chemicals
- General waste – this stream of waste is contaminated or non-recyclable waste and is sent to landfill.
- Commingled waste – this waste stream consists of comingled recyclables, generally consisting of:
 - Cardboard and paper waste
 - Grass / turf waste
 - Glass and canned waste
 - Food waste
 - Pallets
 - Metal waste
 - Grease trap waste
 - Electronic waste

Typical wastes that can be expected to be generated and their classification are detailed in Table 4.

Table 4 Identified operational waste

Waste classification	Waste identified	Waste description	Estimated quantity
Special	Clinical and related waste	Clinical and medical waste from onsite medical facilities for players and patrons	<1 tpa
Hazardous	Fuels, lubricants and chemicals	Containers that previously contained Class 1, 3, 4, 5 or 8 substances.	<1 tpa
	Waste mineral oils	Used oil from vehicles and equipment, spills and leaks	~1 tpa
	Lamp ballasts	Steel, copper wiring, plastic and E-waste. May contain PCB	~2 tpa
	Lamps and HID light bulbs	Fluorescent bulbs, high-intensity discharge (HID) bulbs and any other specialty bulbs which also may contain mercury	~2 tpa
	Mercury containing equipment	Thermostats, tilt switches, pressure gauges, displacement/plunger relays, flow meters and float switches	<1 tpa
	Batteries	Storage batteries and other batteries which contain hazardous metals such as mercury, lead, silver and cadmium	~1 tpa
	Aerosol cans	Steel, rubber and plastic	<1 tpa
	Chemicals	Hazardous chemicals (fertilizers, cleaning, etc)	~2 tpa
	Electronics	E-waste	~ 1 tpa
	Ionizing smoke detectors	Ionizing type smoke detectors contain an ionizing radiation source.	<1 tpa
GSWp	Offices, amenities, maintenance workers, corporate areas and food and beverage kiosks	Food waste	~300 tpa
		Grease trap waste	
GSWnp	Green waste	Turf and grounds maintenance	~40 tpa
	Offices, amenities, maintenance workers, advertising, corporate areas and food and beverage kiosks	Cardboard and paper waste	~ 200 tpa
		Glass, canned and metal waste	
		Plastic waste from beverages and food containers	
		E-waste	
	Deliveries and storage	Pallets, timber and metal	~ 5 tpa
	Grit, sediment, litter and gross pollutants	Collected in, and removed from, stormwater treatment devices and/or stormwater management systems	~ 5 tpa
Hydrocarbon contaminated soils	Oil spills from vehicles and equipment	~ 1 tpa	

5 Impact assessment

Potential impacts to the existing environment may result from excessive waste generation from the inefficient use of resources or from the improper management of wastes generated during the operation of Stadium Australia. The potential impacts are presented in Table 5.

Table 5 Potential impacts from operation

Source of potential impact	Classification	Impact
Clinical and medical waste	Special	<ul style="list-style-type: none"> ■ Generation of clinical and medical wastes requiring disposal; ■ Reduction on local landfill airspace; ■ Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Carboard and paper waste	GSWnp	<ul style="list-style-type: none"> ■ Generation of cardboard and paper materials requiring treatment or disposal; ■ Reduction on local landfill airspace; ■ Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Grass / turf waste	GSWnp	<ul style="list-style-type: none"> ■ Generation of green waste requiring treatment or disposal; ■ Reduction on local landfill airspace; ■ Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Glass and canned waste	GSWnp	<ul style="list-style-type: none"> ■ Generation of inert glass and canned waste requiring treatment or disposal; ■ Reduction on local landfill airspace; ■ Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Food waste	GSWp	<ul style="list-style-type: none"> ■ Generation of putrescible food waste requiring treatment or disposal; ■ Reduction on local landfill airspace; ■ Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Plastic waste	GSWnp	<ul style="list-style-type: none"> ■ Generation of plastic wastes requiring treatment or disposal; ■ Reduction on local landfill airspace; ■ Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Pallets	GSWnp	<ul style="list-style-type: none"> ■ Generation of timber and metal waste requiring treatment or disposal; ■ Reduction on local landfill airspace; ■ Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Metal waste	GSWnp	<ul style="list-style-type: none"> ■ Generation of metal waste requiring treatment or disposal; ■ Reduction on local landfill airspace; ■ Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.

Grease trap waste	GSWp	<ul style="list-style-type: none"> ■ Generation of putrescible grease trap waste requiring treatment or disposal; ■ Reduction on local landfill airspace; ■ Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.
Electronic waste	Hazardous GSWnp	<ul style="list-style-type: none"> ■ Generation of general and hazardous e-waste waste requiring treatment or disposal; ■ Reduction on local landfill airspace; ■ Release of waste (controlled or uncontrolled) causing contamination of air, land, surface or groundwater.

6 Mitigation

In order to prioritise waste management strategies to avoid waste generation, a hierarchical approach to waste management would be used, from the most preferable (reduce, reuse or recycle wastes) to the least preferable (disposal).

To prevent unnecessary waste disposal to landfill during the operational phase, measures will need to be undertaken to ensure that as much solid waste as possible is recycled or reused. This would be undertaken using this WMS to generate an Operation Waste Management plan for the site, which would include:

- measures to promote the use of materials with minimal packaging requirements
- removal of packaging off site by suppliers

Where waste is unavoidable, licensed contractors will segregate waste materials based on type for collection and removal (for processing or disposal).

To minimize and manage waste generated from Stadium Australia, the mitigation measures listed in this section would need to be applied. A list of mitigation strategies for the avoidance, recycling and disposal of Stadium Australia waste is detailed in Table 6.

Table 6 Mitigation strategies for identified wastes

Waste type	Classification	Avoidance / Mitigation	Reuse / Recycle	Disposal
Green waste from landscaping and turf maintenance	GSWnp	Where practical minimise disturbance and clearing required	Deliver to licensed waste facility for recycling	Not preferred
Coolants, paints, solvents, lubricants, chemicals, etc.	Hazardous	Maintain detailed inventories of products to minimise over-stocking and wastage; Keep Material Safety Data Sheets available on-site to identify correct and safe means of disposal; Ensure correct storage and handling to minimise leaks and spills.	Segregate and store in suitable containers with appropriate signage; Removal and transport by a licensed waste transporter for recycling at licensed facility where possible	Treatment or disposal at licensed facilities where recycling is not viable; Waste tracking systems to be maintained

Waste type	Classification	Avoidance / Mitigation	Reuse / Recycle	Disposal
Liquid wastes (oily water, solvents, wash waste)	Liquid	Avoid excessive wash-down in oil contaminated areas; Provide extra care and attention to avoid spillages of oil where possible; Prioritise alternative clean-up methods for spills other than water use	Collect for pre-treatment by an oil water separator; If on-site treatment is not viable, licensed transporters to remove waste for recycling at a licensed waste facility.	If reprocessing not viable, licensed transporters to remove waste for disposal at a licensed waste facility; Waste tracking systems to be maintained
General office type recyclable materials from operation (aluminium, cardboard, paper, glass, rigid plastics, etc)	GSWnp	Buy in bulk to minimise packaging waste.	Segregate and store in suitable containers with appropriate signage; Licensed transporters to remove recyclable materials for recycling at a licensed waste facility.	Not preferred
Timber (pallets, formwork, etc)	GSWnp	Precisely specify material needs to avoid over estimating requirements; Source reliable, good quality materials to minimise defects and inappropriate material	Reuse or re-purpose for applications on site; Store on-site in designated areas for removal by licensed transporter for recycling at licensed facilities	Not preferred
Tyres	Special	Ensure adequate training of staff members to maximise lifespan of tyres	Store on-site in designated areas for removal by licensed transporter for recycling at licensed facilities	Not preferred
Waste oil	Hazardous	Ensure adequate training of staff members to understand when oil becomes waste oil	Store in suitable containers with appropriate signage; Licensed transporters to remove recyclable materials for recycling at a licensed waste facility	Treatment or disposal at licensed facilities where recycling is not viable; Waste tracking systems to be maintained
Stormwater management wastes	GSWnp	Ensure proper operation of equipment to minimise maintenance requirements	Segregate and store in suitable containers with appropriate signage; Removal and transport by a licensed waste transporter for recycling at licensed facility where possible	Treatment or disposal at licensed facilities where recycling is not viable; Waste tracking systems to be maintained

Waste type	Classification	Avoidance / Mitigation	Reuse / Recycle	Disposal
Food waste	GSWp	Minimise packaging waste	Segregate and store in suitable containers with appropriate signage; Removal and transport by a licensed waste transporter for recycling at licensed facility where possible	Licensed transporters to remove waste for disposal at a licensed waste facility; Waste tracking systems to be maintained
Plastic wastes from beverage and food containers	GSWnp	Minimise packaging waste	Segregate and store in suitable containers with appropriate signage; Licensed transporters to remove recyclable materials for recycling at a licensed waste facility.	If reprocessing not viable, licensed transporters to remove waste for disposal at a licensed waste facility; Waste tracking systems to be maintained
Clinical and medical waste	Special	Ensure adequate training of staff members to reduce wastage	Not possible	Licensed transporters to remove waste for disposal at a licensed waste facility; Waste tracking systems to be maintained

6.1 Separation at source

In order to differentiate all waste and recycling streams, clear signage should be used on all equipment, bins and walls within the waste storage areas. Figure 5 gives an example of appropriate signage combining textual information, pictures and colour-coding to communicate the message and create a more user-friendly system. Signage would be used throughout the Stadium to ensure consistent messaging is delivered from the point of generation through to the disposal/storage point.



Figure 5 Typical examples of appropriate waste segregation signage

6.2 Storage of waste

6.2.1 Waste receptacles

- General solid waste, recyclables, green waste and hazardous waste would be segregated and temporarily stored in different receptacle types at various generation points
- The receptacles for the various waste types will be colour coded and properly labelled to avoid co-mingling of waste and potential cross contamination.
- All liquid waste would be stored in receptacles with secondary containment bunds to catch any spills and labelled accordingly.
- Battery recycling, mercury-containing lamp recycling and e-waste would be segregated and stored specialised receptors for collection.
- E-waste would be segregated and stored specialised receptors for collection.
- Oily rags / gloves, contaminated soil, and used oil filters would also be stored in receptacles with secondary containment.
- All receptacles containing hazardous wastes would be labelled using HAZMAT symbols.
- All receptacles would be serviced regularly to avoid pests and vermin.

Typical types of receptacles are described in Table 7.

Table 7 Typical receptacle types for waste storage

Bin size (litres)	Detail	Examples
80 / 240	Red lid bin - General waste Yellow lid bin - recyclable plastics, metals and glass Green lid bin - green organic waste	
240	Hazardous waste container	
240	Hazardous waste container - Contaminated soil spills – equipment such as shovels and absorbent materials to be kept on site	
240 / 100	Spill kit example	

10 to 205	Liquid waste container	
6 m ³	Bins for large amounts of green waste	
10L / 6m ³	Battery bins (for offices and large generators)	
	Lamp recycling (box and crate)	
120	E-waste	

6.2.2 Central waste storage area

The main waste store and the satellite waste store are located on the basement level and are the primary waste management areas for the Stadium's operations.

All bins deployed throughout public areas will be brought back to the waste stores as required by cleaning staff for disposal / processing into the relevant equipment / compactor prior to collection by the external waste contractor. Garbage chutes are located on higher levels for quick and easy dispersal of waste to the designated central waste storage areas as shown in Figure 6 below.

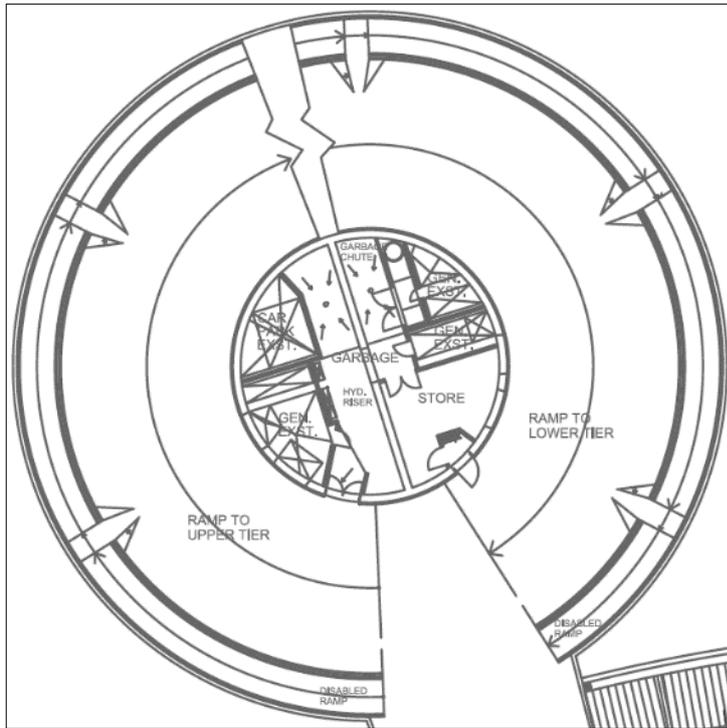


Figure 6 Central waste storage area on level 2

As a guide, all waste areas have the following features:

- Blockwork internal walls
- Non-slip epoxy floor and wall finishes to a height of approximately 2500mm
- Covered wall and floor intersections
- Graded floor drains connected to onsite retention sump – fitted with in-floor dry basket arrestor
- Mechanical exhaustion in accordance with AS 1668.2
- Cold water and hose connections
- Graded bin wash area within waste storage areas

Below are images of the Stadium’s SW spiral ramp waste management rooms as currently configured. They provide space for approximately 40 x 240 litre plastic wheelie bins (neatly stacked in twos) and 4 x 1,100 litre plastic wheelie bins.



Figure 7 Level 1 south-west waste management room

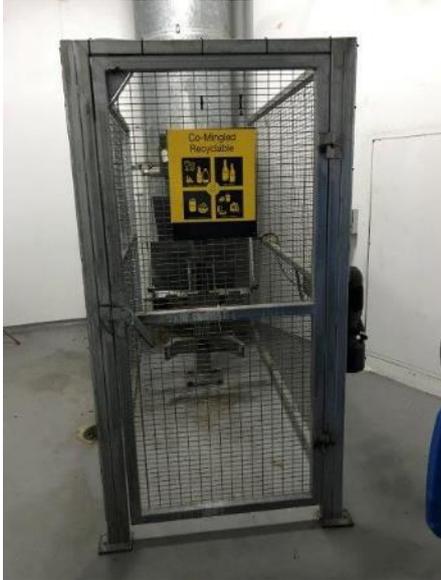


Figure 8 Level 1 south-west waste management room bin lifter cage (above)

6.2.3 Interim bin stores

Located on each level of the Stadium for easy access, interim bin stores have been positioned to provide additional bin storage capacity and conveniences to operators and cleaners servicing these floors. Waste from these stores will originate from Corporate areas and the satellite kitchen activities associated with servicing these function areas.

Operational staff such as cleaners, kitchen staff and waiters will utilise the bins stored in the interim waste storage rooms as required. Once full, these bins will be transferred to the central waste storage area to be stored ready for collection, empty bins can then be collected from the central waste storage area and brought back to the interim bin stores for continued use as required.

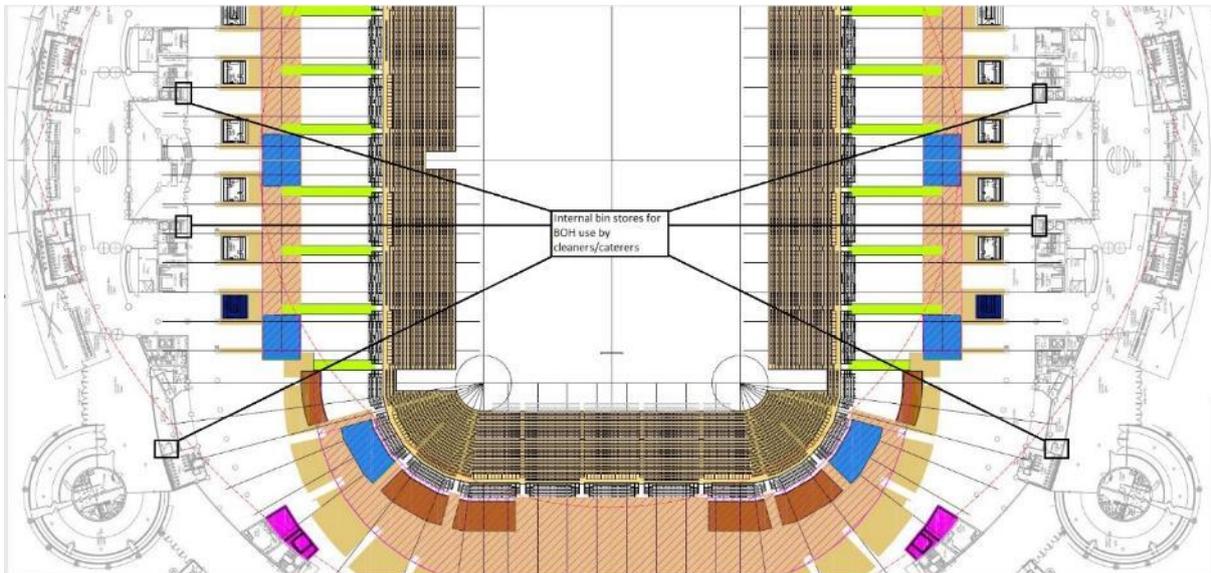


Figure 9 Typical interim bin storage areas per level

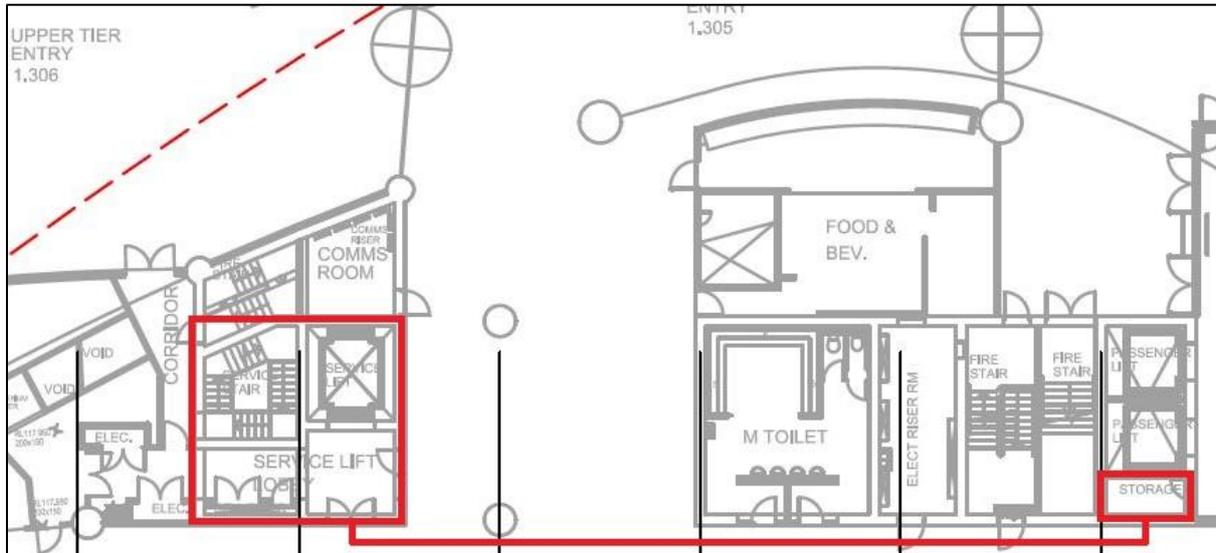


Figure 10 Indicative access to goods lift from internal bin stores

6.2.4 Public place bins

To provide convenient access for patrons to dispose of waste and recycling on event days, public place bin hubs will be located on all levels at regular intervals throughout the public domain. These bin hubs will typically be located adjacent to food and beverage kiosks and stadium entry / exit points. The standard bin hub configuration consists of a covered bin enclosure with 2 x 240L bins for the general waste and mixed recycling streams.

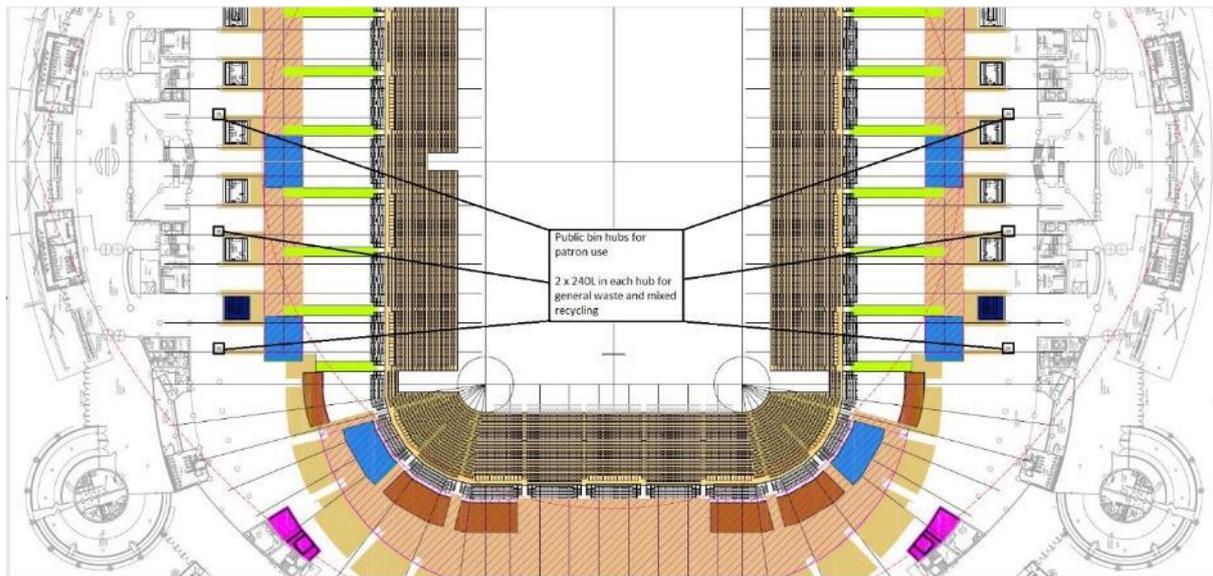


Figure 11 Typical arrangement of bin hubs per level

Cleaners will be responsible for monitoring the public place bins and transferring full bins to the nearest internal bin store. These full bins will then be swapped for a spare empty bin which will be returned to the bin housing for continued use as required. Each bin housing should be clearly signed indicating the stream and acceptable materials for each bin.

6.3 Waste collection, handling, treatment and disposal

6.3.1 Waste collection

During operation, a licensed service provider will need to be appointed to collect all waste streams. Once receptacles are full and require removal, the waste operator will be notified. These waste streams would be stored in the designated waste storage area until collected by the service provider.

A summary of the anticipated waste streams and their storage and collection management is shown in Table 8.

Table 8 Anticipated waste streams storage and collection management

Waste stream	Storage requirements	Removal protocol
Green waste from landscaping turf maintenance	Separate skip bins or 240 l bins for green waste	Call when required
General solid waste (p and np)	240 l bins	Regular removal
General office type recyclable materials from operation (aluminium, cardboard, paper, glass, rigid plastics, etc)	Separate 240 l bins, labelled according to waste stream	Regular removal
Recyclable materials - hazardous	Separate 240 l or 100 l containers, labelled according to waste stream	Call when required
Coolants, paints, solvents, lubricants, chemicals, etc.	240 l bins in bunded area	Call when required
Hydrocarbon contaminated soils	240 l bins	Call when required (usually in the case of a spillage)
Oily water, waste oil	1000 l container or 240 l / 100 l drums in bunded area with appropriate signage	Call when required
Stormwater management wastes	240 l or 6 m ³ skip in bunded area	Call when required
Timber (pallets, formwork)	6 m ³ or 11 m ³ skip	Call when required
Tyres	6 m ³ skip or segregate and store on-site in designated areas	Call when required
Chemicals	210 l drum	Call when required
E-waste	120 l bin	Call when required
Clinical and medical waste	Medical bin	Regular removal

The Stadium has highly sensitive areas containing high pedestrian traffic and valuable infrastructure, consequently waste contractors need to follow a dedicated route during waste collection, detailed in Figure 12.

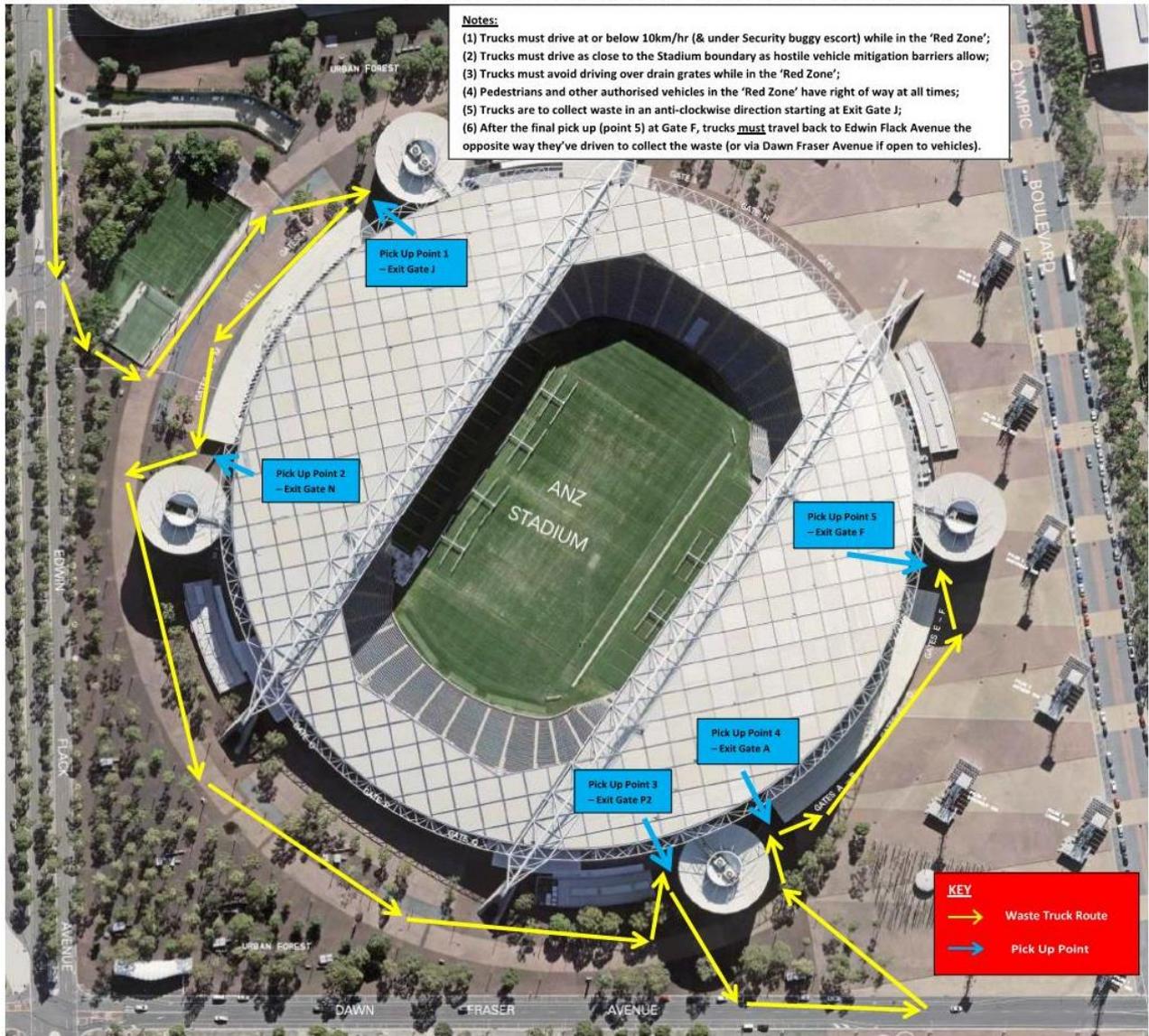


Figure 12 Major event waste collection route

This operational process for waste collection is currently in use at Sydney Olympic Park and will continue to apply to the refurbished stadium (Stadium Australia).

6.3.2 Handling

To avoid incorrect handling, each waste type will be classified for transport. Hazard groups for each waste type would be identified. Details of how to manage the waste (treat or immobilise) to render it suitable for transport and disposal would be provided if it possesses hazardous characteristics.

Detailed records of all procedures and protocols will be crucial to ensure that any waste leaving the site is transported and disposed of lawfully and does not pose a risk to human health or the environment

6.3.3 Treatment and disposal

Any waste that cannot be recovered or recycled will need to be treated and disposed of according to its classification. This waste will need to be sent to a licensed treatment or disposal facility, where options to treat the waste to render it less hazardous would be considered.

Details of the current solid waste management facilities in proximity to Stadium Australia that could accept solid waste from the Stadium are listed in Table 9. Available and permissible annual capacity would be confirmed in consultation with the relevant operator once the actual operation and timing for development of Stadium Australia are confirmed.

Table 9 NSW EPA licensed waste management facilities

Facility	Owner	Waste types able to receive
Cleanaway Sydney Olympic Park Industrial Waste Services	Cleanaway	General waste and recycling Liquid wastes Hazardous regulated wastes Health and biohazardous wastes Waste oil Organic wastes E-wastes
SUEZ Auburn Resource Recovery Centre	SUEZ	Batteries, building materials, paint/oil, glass, garden waste, mattresses, metal, food waste, paper and cardboard, plastic, white goods, wood and rubber
Sydney Recycling Services	Sydney Recycling Services	Cooking oil – storage and collection
Toxfree Silverwater	Cleanaway	General Solid Wastes (np and p) Green Wastes Liquid Wastes Special Wastes E-wastes
Sydney Transwaste Industries PTY Ltd.	Transwaste Industries	General house hold waste, demolition and building site waste, asbestos skip bins (This must be specified on order), garden waste skips, brick and concrete
Bingo Recycling Centre - Auburn	Bingo Industries	General waste, paper & cardboard, co-mingled, compactor waste, grease trap cleaning, oil disposal, septic tank cleaning, organics, batteries, fluorescent tubes and lamps, ink cartridges, medical waste and secure documents
Dirt Cheap Rubbish Removal Inner West	Dirt Cheap Rubbish Removal	General wastes E-wastes

In order to monitor and manage the waste streams, a record of the types, quantities and destination of all waste materials taken off-site during the operational phase of Stadium Australia will need to be retained. A digital record of any Safe Disposal Certificates issued will be maintained.

7 Residual impact

Some wastes, which cannot be reused or recycled, would be disposed within appropriately licensed landfills. It has been shown in Table 9 that there are several facilities licensed to accept these residual wastes within an economical haulage distance from Stadium Australia.

8 Monitoring requirements

Compliance audits would be conducted in accordance with the requirements of this WMS as well as relevant legislation, license and permit conditions as well as industry standards. The following typical auditing regime should be implemented:

- During the operational phase, internal audits of environmental compliance against statutory approvals would be undertaken on a regular basis.

Monitoring activities associated with the management of waste would include:

- Volumes and types of waste being sent off site for reuse, recycling and disposal would be monitored and recorded.
- Waste materials and reusable and recyclable materials storage areas would be monitored to ensure appropriate disposal contractors are engaged and to ensure materials are removed as required to minimise potential for cross contamination of materials.
- Regular assessment of contractor treatment and disposal services to ensure compliance.
- Regular assessment of waste generation, segregation, storage and collection practices to see whether improved practices can be implemented.

9 Conclusion

This WMS lists the types and quantities of waste that can be expected to be generated at Stadium Australia during its operation after redevelopment. It describes the impacts these wastes could have on the environment and proposes effective mitigation measures to reduce any identified potential impacts

It provides monitoring and auditing requirements to ensure adherence to the WMS. The regular monitoring requirements also allow for 'route correcting' should situations change on site.

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