Broome and Halls Creek Truck Wash Down Facility Feasibility Assessment Report

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Abbreviations

Aboriginal Heritage Inquiry System	AHIS	Kimberley Regional Biosecurity Group	KRBG
Agriculture Secretaries Committee	ASCOG	Kilowatt	KW
Australian Standards for the Export of Livestock	ASEL	Mobile Elevated Work Platforms	MEWPs
Australian Water Balance Model	AWBM	Meat and Livestock Australia	MLA
Biosecurity and Agriculture Management Act	BAM	Northern Beef Futures	NBF
Bovine Johnes Disease	BJD	Northern Beef Infrastructure Review	NBIR
Bureau of Meterology	BOM	Net Present Value	NPV
Benzene, Toluene, Ethylbenzene and Xylene	BTEX	Northern Territory	NT
Cost Benefit Analysis	CBA	Organisation for Animal Health	OIE
Coalescing Plate Separator	CPS	Occupational Safety and Health Act	OSH
Commonwealth Scientific and Industrial Research Organisation	CSIRO	Protected Matters Search Tool	PMST
Department of Agriculture and Food, Western Australia	DAFWA	Road Trains of Australia	RTA
Department of Agriculture and Water	DAWR	Standard Cattle Unit	SCU
Department of Environment and Resources	DER	State Environmental Policies	SEPs
Department of Water	DoW	Total Petroleum Hydrocarbons	TPH
Environmental Protection Act	EPA	Transport Network Strategic Investment Tool	TraNSIT
Enviromental Protection Policies	EPP	Vegetative Filter Strips	VFS
Environmentally Sensitive Area	ESA	Vertical Gravity Separator	VGS
Indigenous Land Corporation	ILC	Western Australia	WA
Koongie Elvira Aboriginal Corporation	KEAC	Work Health and Safety Regulation	WHS

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1. Executive Summary

The Northern Beef Infrastructure Review recommended that a feasibility study be conducted for the construction of truck wash down facilities at Broome and Halls Creek to reduce the risk of weed and disease spread from cattle entering Western Australia.

Estimating the costs of constructing and operating these facilities has been based on existing truck wash facilities across Australia. Consideration has been given to the remote location (particularly for Halls Creek) and the additional costs that may be associated with transport of materials and access to necessary equipment and expertise.

The benefits of constructing truck wash facilities are more difficult to measure since they are a risk mitigation tool. Thus, the benefit is the avoided loss created by preventing future weed and disease management costs. Estimates of these avoided losses have been based on the best available data, but they should be considered in conjunction with the industry tolerance for risk.

In Halls Creek, three possible locations were considered and assessed on their location, soil, access to water and electricity and land tenure. Of the three locations, the site on the Great Northern Highway, which is owned by the Halls Creek Shire, is the preferred location as it is conveniently located close to the Halls Creek town, within an appropriately zoned area and in immediate proximity to water and electricity supplies.

In Broome, two sites were evaluated using the same variables. Both sites have good access to water and are located in convenient positions. Planning considerations in consultation with the Shire of Broome would likely determine the final preferred location.

Estimated construction costs for a 2-bay wash facility including site preparation works, lighting and an AvData payment system are expected to be approximately $601,000. For the Halls Creek site, additional holding yards would be required at a cost of approximately $130,000.

The base user charge is set at $0.73 per minute which equates to approximately $263 for a six deck roadtrain.

A review of current and forecast cattle movements showed that up to 34,000 head of cattle could be passing through Halls Creek each year, which would equate to just over 1,000 decks. The avoided loss benefits for this location are based around the prevention of weed entry. Using gamba grass as an example, if the probability of incursion is 1% and annual treatment costs are estimated at $6 million, the avoided loss benefits are in the order of $60,000. Based on the construction and operating costs estimated for the Halls Creek location, the expected level of usage would likely be insufficient to justify investment in a facility unless the risk of weed incursion is much higher than given estimates. If a facility was deemed necessary, government or industry funding would likely be required to cover the construction cost at a minimum.

In Broome, the construction costs would be slightly lower as there is no need for additional holding yards and expected usage would be higher, both from trucks using the facility for regular maintenance cleaning and particularly if requirements to wash trucks between each shipment were enforced. Washing trucks between shipments has the potential to protect market access in the event of a disease outbreak. As a result, the avoided loss of this facility has been conservatively valued as the value of one live export shipment, approximately $5 million. Based on the assumed operating costs and user charges and considering the greater avoided loss potential, this facility is viable and robust under varying usage rates. However, a final investment decision should only be made on the basis of final detailed engineering plans and costs for the preferred location.

2. Introduction

2.1. Structure/Scope of Report

This report fulfils the recommendations from the Northern Beef Infrastructure Review to examine the feasibility of constructing a truck wash and quarantine facility at Broome and Halls Creek. The report first reviews the demand for these facilities and the drivers of demand then outlines the relevant engineering and legislative considerations that will impact design and operation. A review of possible sites in both locations is provided and a cost benefit analysis done for the short-listed site options.

2.2. Background information

Northern Beef Futures (NBF) is a project led by the Department of Agriculture and Food, Western Australia (DAFWA). NBF aims to boost capabilities, build value, strengthen relationships with existing supply chains, recognise and embrace relationships with new supply chains, and align products to suit new and expanding markets (DAFWA 2016). NBF projections shows that there are significant growth opportunities from the live export market.

As part of NBF, a review of the infrastructure supporting the northern beef industry in the Pilbara and Kimberley regions (referred to as the northern beef region) was commissioned by DAFWA and Meat and Livestock Australia (MLA), with the aim of encouraging and supporting the development of the beef industry in the northern beef region (ACIL Allen Consulting 2016). Phase four of the review (referred to as the Northern Beef Industry Review; NBIR) involved development of a 10-year Northern Beef Infrastructure Plan to create a framework for implementing identified priority projects.

The development of wash down and holding yard infrastructure in Broome and Halls Creek to support live export out of the ports of Broome and Wyndham were identified as priority projects. Specifically, a wash down facility in Broome was considered one of the highest priority projects for development of a business case and a wash down facility in Halls Creek was considered as requiring a feasibility assessment. An overview of the priority infrastructure projects suggested that the Broome and Halls Creek facilities would potentially be associated with substantial transport cost savings, improved value adding capacity in the northern beef region, and would meet market and regulatory standards such as biosecurity obligations.

By identifying the need for a truck wash, the NBF project highlighted the gradual change in quarantine standards which must be met when exporting cattle to various countries. While disinfection of trucks is not currently required for all countries receiving Australian cattle, it is becoming a more widespread requirement. This is identified in the Organisation for Animal Health's (OIE) Terrestrial Animal Health Code Article 7.3.5 – Planning the Journey (OIE 2016). Section 4(c) of this code discusses the need to minimise disease spread in trucks. The article states:

> *"In order to minimise the likelihood of the spread of infectious disease during transport, vehicles and containers should be designed to permit thorough cleaning and disinfection, and the containment of faeces and urine during a journey".*

While the current environment dictates that only some countries require truck disinfection, this may change to a blanket rule in years to come. Additionally, as current regulation varies from country to country, some trucks only require washing before taking cattle from the holding yards to the port, while others may require trucks to also be washed before taking cattle from farms to holding facilities. The location of the truck wash facility(s) must be conveniently located for trucks travelling to and from the holding (quarantine) facility.

Based on the demand identified in the ACIL Allen report, the need for a truck wash is basically as a biosecurity risk mitigation measure. The benefits of this will be more evident in the situations it prevents rather than direct, immediately measurable benefits.

2.2.1. Northern Beef Infrastructure Review

The NBIR reviewed infrastructure supporting the northern beef industry in the NBR and identified wash down and holding yard infrastructure in Broome and Halls Creek as priority projects. This was based on the perception that wash-down and quarantine facilities in Broome and Halls Creek would add to the northern beef industry by:

- helping to address biosecurity issues (providing the ability to separate cattle with different market requirements and in the event of a disease outbreak);
- improving or sustaining the performance of cattle by reducing soiling;
- improving transport efficiencies by removing waste from trucks; and
- by better meeting market export requirements.

2.2.2. Cattle numbers

The number of cattle exported out of the ports of Broome and Wyndham in 2016 were 125,013 and 27,781 respectively. Prior to the 2011 live export ban, exports out of Wyndham had been as high as 79,000 per annum. The operators of the Wyndham port believe they could comfortably handle 100,000 per year. There are currently constraints around water and waste management in the yards, which limit their capacity in the wet season. There is also no accommodation for agents/exporters in Wyndham.

Exact cattle numbers travelling from the NT to Wyndham, Broome and beyond are difficult to ascertain. DAFWA reported in 2014 that 16,485 head of livestock (including cattle, horses, and sheep) were inspected at Kununurra during the period from May 2012 to March 2013 (Randall 2014). DAFWA have since reported that, from January to July 2015:

- 3,835 head of cattle were inspected for weed seed either on property or at the Kununurra quarantine yards;
- 3,442 head of cattle destined for immediate slaughter travelled to Broome via the Duncan Road and Halls Creek;
- Wyndham received 9,594 head of cattle for export;
- 2,125 head of cattle went direct to Broome via Duncan and Tanami Road for export; and
- A further 4,559 came from interstate under interim protocols (Loo et al. 2015).

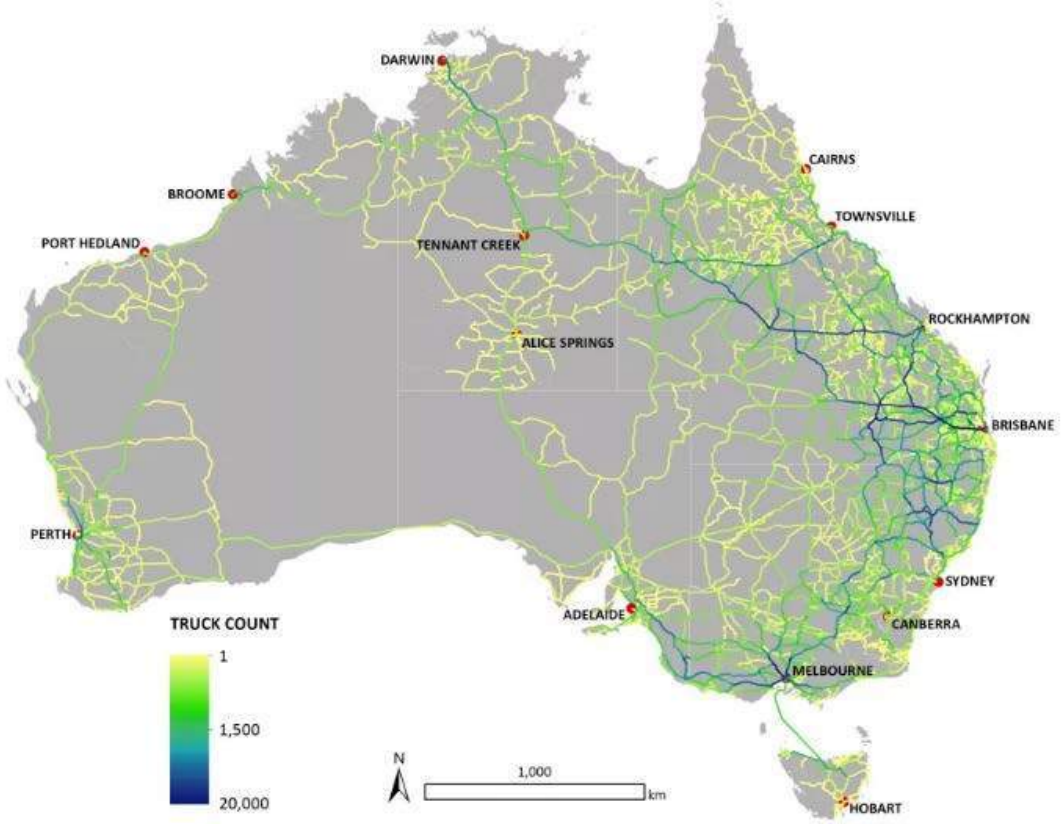
Based on these numbers it is expected that up to 34,000 head per year may travel from the NT to WA through Halls Creek.

Both the Tanami and Duncan roads have been considered for major upgrades and were included in the modelling of key livestock routes undertaken by CSIRO through their Transport Network Strategic Investment Tool (TraNSIT). This model estimated the number of current and forecast trailer movements for key routes in the NT and Kimberley as shown in Table 1 (CSIRO 2016). While these estimates would suggest that higher numbers of cattle transit through Halls Creek than estimated above, the TraNSIT model does not specify direction of travel thus these estimates likely include cattle travelling from WA into the NT.

A major driver of the number of cattle entering WA from the NT and further east is relative prices. Between 2006 and 2016, prices out of Broome were on average 12-15 cents lower than Darwin (MLA 2017). Broome is approximately 1,000km further from the Victoria River District of the NT than Darwin, hence live export prices in Broome would need to be significantly higher than Darwin to attract significantly increased numbers of cattle.

Table 1: Estimates of trailer movements from CSIRO Transit model - NB model does not indicate direction of movements. Source: CSIRO (2016).

Road	No. Trailers		No. head (300kg/head, 34/deck)	
	Current	Upgraded	Current	Upgraded
Duncan b/w HC & NT border	58	66	3,944	4,488
Tanami	184	298	12,512	20,264
Buntine Hwy – Vic River to HC	426	664	28,968	45,152



TRANSIT has now been used to map all cattle movements Australia-wide. Image: CSIRO

2.2.2.1. Broome

The projections identified in the NBIR modelled Broome as the key port for export of live cattle out of the NBR, with the ports of Port Hedland and Wyndham also increasing in throughput to accommodate the expected increases in market demand. Broome has been earmarked as a prime location for an abattoir and the Kimberley Ports Authority have committed to improving the access road and constructing a truck stop adjacent to the Port.

The NBIR identified that a new holding yard and wash-down facility in Broome were required to meet market standards and strengthen biosecurity preparedness. This is based on the following factors:

- The only common wash-down facility in the northern beef region is at Kununurra and some trucking companies need to detour a significant distance to comply with biosecurity regulations;
- Expected increase in demand for wash-down facilities in the NBR due to factors such as:

- Development of mosaic agriculture in the region;
- Increased cross border traffic associated with improved road, port and processing infrastructure in the NBR and northern Australia; and
- Potential requirement by overseas markets for trucks to be washed down prior to vessel loading.

- Modelling of projected throughput of export cattle through the Port of Broome suggests a future throughput potential of 89,000 to 138,000 per annum. The lower limit assumes that some of the cattle currently exported through Broome will be exported instead through the Port of Port Hedland due to increased use of Port Hedland by southern Pilbara producers.

2.2.2.2. Halls Creek

Almost all the cattle that are transported out of Broome originate from the NBR and, specifically, properties in the area surrounding the Great Northern Highway from Halls Creek to Broome, in the region to the north of Halls Creek, and in the area around Marble Bar. From Halls Creek, most of the cattle destined for Broome travels along the Great Northern Highway. A truck wash-down facility and quarantine yards in Halls Creek were also identified as priority projects, as were upgrades to the Tanami Road and Duncan Highway, which are the routes for cattle travelling towards Broome from areas to the east of Halls Creek, including the Northern Territory (NT). There are holding yards and wash-down already existing in Halls Creek, however, these are not operational and would need to be upgraded prior to reestablishment. Consultation for the NBIR suggested a suitable site for a Halls Creek wash-down facility would be on the Great Northern Highway close to the intersection of the Tanami Road near Halls Creek to service traffic travelling along the Great Northern Highway, the Tanami Road, and the Duncan Highway.

The feasibility of the truck wash-down and quarantine yards in Halls Creek is confounded by two main factors. First, the current and future demand for these facilities in Halls Creek is unlikely to justify the capital and operational expenditure on the project. Second, the biosecurity risk (i.e., the risk of weed and disease spread from cattle originating interstate and importing country biosecurity requirements) might be adequately addressed by the infrastructure located at Broome and Wyndham, particularly while the Tanami Road and Duncan Highway are not upgraded. The NBIR suggested that these uncertainties be initially addressed through a limited feasibility study, which should be conducted at the same time as the business cases for the Broome holding yards and wash-down facility and the Wyndham holding yards are developed. These uncertainties are discussed further in Section 1.2.2. The NBIR found that a Halls Creek facility would cost around $1.8 million and should be owned by a private operator and operated on a cost recovery basis.

2.3. Biosecurity risk analysis

Western Australia has a very strong agriculture sector and, as such, weed seed and disease prevention and management are key to continued operating of the agricultural economy. Livestock carriers are currently rated as an 'Extreme' biosecurity risk pathway (Randall 2014). Specific species which could enter WA through this pathway include gamba grass (*Andropogon gayanus)*, several species of mesquite (*Prosopis* spp.) and tropical soda apple (*solanum viarum* Dunal). It has been estimated that gamba grass alone could cost over $6 million per year to control if it were to enter WA.

In response to these and other concerns, regulations imposed by the Biosecurity and *Agricultural Management Act 2007* require that cattle entering WA are required to be inspected and cleared of disease and weeds prior to entering the state (DAFWA 2016). For the Kimberley, this currently occurs at the permanent quarantine station at Kununurra, however, there is no quarantine station at the border crossing on the Duncan and Tanami roads leading into Halls Creek. As there is no DAFWA stock inspector permanently stationed in Halls Creek, cattle entering the state via these routes can be granted an exception if being transported direct to Broome or Wyndham for export or to Broome for slaughter. Inspection occurs at Broome if cattle are to be transported further south for slaughter.

However, since there is also no truck wash down facility in Broome, the trucks delivering these cattle must then return immediately to the NT without collecting more livestock or return to Kununurra to wash-down before loading WA cattle.

At inspection, there are two potential sources of weed seeds; in dung which has been excreted during transit and is still on the truck and seeds which have not yet been excreted but which remain within the cattle (Randall 2014). Wash-down requirements mitigate the risk of spread from seeds present in dung already excreted but do not mitigate the risks from un-excreted seed. Mitigation of this occurs when cattle are held in export yards prior to export, at dipping yards prior to transport south and on property if quarantined on arrival.

It is estimated to take up to seven days for feed to completely travel through the rumen of cattle (Randall 2014). Hence, if cattle were to be loaded in the NT and then unloaded at Halls Creek for wash down, it is likely that additional weed seeds would be excreted on the truck prior to the cattle reaching their final destination. In this instance, trucks would still need to be re-washed prior to loading WA cattle, negating the purpose of the initial wash.

In addition to weed seed mitigation, there are a number of other reasons for the construction of truck washing facilities including:

- Livestock export requires that livestock be clean at the point of sale and some importing countries have specific requirements for pre-export truck washing procedures;
- To maintain an acceptable level of cleanliness for animal welfare purposes;
- To comply with applicable occupational and environmental health and safety standards; and
- To prevent disease (including footrot), slipping injury, algae growth in roadway drainage systems, widespread nutrient pollution, manure drying (and becoming more difficult to remove), and increased fuel costs (from transporting the extra weight of manure (Government of Western Australia 2004; Commonwealth of Australia 2011).

2.3.1. Biosecurity risk consultation

DAFWA has identified a number of potential pathways for undesirable plants and pest species to enter WA both deliberately and accidentally (Randall 2014). The greatest risk to agriculture is the importing of plants and seeds for both agricultural and garden use, but strict quarantine regulations and inspections are applied to these products with little evidence of major gaps in the system. Randall (2014) estimated that up to 80 million seeds annually are imported in the dung and stomachs of cattle transiting via the Kununurra border crossing alone. This figure would suggest a high risk of incursion, however, as Randall also stated, it would appear that other factors, such as travel time to the border and holding period before loading, are also helping to mitigate this risk as there have been no reported major weed incursions in Kimberley or Pilbara. A draft transport protocol for the Kimberley suggests that further sampling of dung be undertaken to quantify the risk from this pathway with a potential strengthening of regulations to require cattle to be held in quarantine for a longer period of time (DAFWA 2015).

The Kimberley Regional Biosecurity Group (KRBG) has also identified trucks travelling from the NT through WA a key source of potential weed spread. Of particular concern to the KRBG was the fact that trucks entering WA via the Duncan and Tanami roads are not inspected for weeds or disease prior to crossing the Kimberley. Ideally, the group would prefer a wash down facility to be constructed in Halls Creek to reduce the distance travelled through WA before cleaning. However, the group also recognises that the small number of trucks using these routes would make the facility less cost effective to construct and operate. In addition, Halls Creek is located 184 kilometres from the NT border via the Duncan road and 326 kilometres from the border via the Tanami track. Neither of these roads are currently sealed and both pass through areas of steep hills which means that if waste is to fall out of the truck this is more likely to occur in these sections. Constructing separate wash down facilities at each of these border crossings would be impractical

and unlikely to be economic. Therefore, the current roadside surveillance for weeds is deemed to be sufficient.

Other weed pathways identified by DAFWA which would not be mitigated by a livestock truck wash facility include seeds on passenger and general freight vehicles, on shoes and clothing, and carried by wind, water and animals (Randall 2014).

2.4. Stakeholder consultation

Industry stakeholders were consulted regarding the need for the proposed wash-down and quarantine yards in Broome and Halls Creek (Appendix G). Stakeholders included operators of existing quarantine yards in Broome, live export transport operators, local and state government agents, and those expressing interest in having certain properties considered as feasible locations for the facilities.

Stakeholders in general believed that the primary function of the wash-down facilities would be to satisfy the weed-seed wash down requirements set out by DAFWA and that secondary functions would include live export biosecurity requirements and general truck maintenance. However, the following concerns were raised about the current industry wash-down protocols:

- Under the current system, cattle trucks entering Western Australia from the Northern Territory are required to be washed prior to entering the state and then do not need to be washed until the trucks are reloaded with another consignment of cattle.
- Trucks that enter from places such as Tanami Track (in the Halls Creek region) can get a permit allowing them to bypass the requirement to wash at Kununurra because the detour would add hundreds of kilometres to the journey.
- Trucks can bring cattle into Broome from the Northern Territory without washing, but, because they need to wash-down before reloading, they must return to the Northern Territory empty.
- Because seeds persist in the rumen, the weed seed issue continues until 7 days after cattle have been removed from an area. Therefore, even when trucks use the Kununurra truck wash, manure that contains Northern Territory weed seeds is still going to build in the trucks.
- The system is setup so that cattle brought in from the Northern Territory can be delivered to the export depot prior to the truck being washed. If the truck wash was located at the endpoint (i.e., the export depot), then the truck would be able to pick up another cattle consignment.
- The solids removed from the weed seed wash-down require composting to ensure the seeds have been destroyed.

There are mixed opinions regarding the suitability/need for a wash down in Halls Creek versus Broome. Some producers in the east Kimberley would prefer that the facility be built in Halls Creek to minimise the risk of weeds being spread across the Kimberley and avoid the need for trucks to travel via Kununurra. They also raised concerns over the lack of a DAFFWA stock inspector located in Halls Creek.

However, other industry stakeholders questioned the feasibility of Halls Creek as a wash-down site because:

- it is not an endpoint in the system. The process would involve:
    - Trucks stopping in Halls Creek;
    - Cattle unloading;
    - Truck washing;
    - Cattle re-loading;
    - Trucks resume travel to the destination (such as Broome); and
    - Cattle unloading again.
- The requirement to wash out in Halls Creek would add additional expense;

- There is also a concern that additional unloading and reloading of cattle increases stress on animals, putting them and their handlers at an increased risk of injury; and
- Halls Creek is too far away from the ports to be considered a viable site for a cattle quarantine depot because, unless a large enough number of trucks were available to transport the entire consignment, the distance for re-loading is prohibitive.

Other comments and questions raised by industry included:

- The truck wash should be co-located with an existing complementary facility, such as quarantine yards, because staff would be available to operate the truck wash;
- The truck wash facility would be best operated by someone with an interest to ensuring it is operating correctly; and
- There are questions around who is going to pay for the truck wash. It is generally considered that government/industry should pay for these facilities through existing levies; the private sector should not be expected to pay for the facility because the venture is not considered to be profitable.

2.4.1. Truck wash demand

Broome loads about 35-40 boats/year, which equates to about 90,000 – 110,000 head/year. Cattle exported from Broome are held in either the Roebuck Plains or the Broome Common yards prior to export. On average, there are 10 trucks/load out. Assuming 35 boats per year and the requirement to wash trucks between each shipment a total of 350 'local' trucks would require washing. In addition, if there is no truck wash at Halls Creek and trucks entering from the NT are required to wash down after unloading in Broome this would add approximately 160-170 trucks per year. On this basis, a minimum of two bays would be required to accommodate a total of 500+ trucks per year. During the wet season, very few cattle are exported. Therefore, assuming the majority of demand occurs from March to November, the average usage would be approximately 13 trucks per week. Since it can take up to 6 hours to wash a truck and it is unlikely that demand will be evenly spread across a week, the ability to wash more than one truck at a time is essential. On this basis, sufficient lighting is also required to enable safe and effective washing at night – particularly if trucks are required to wash out between shipments when there may be only a day or two between ships.

At Halls Creek, the potential throughput of the facility would include those trucks crossing the border from the Northern Territory enroute to Broome and Wyndham for export or slaughter plus smaller numbers to various properties in the Kimberley or Pilbara.

In both Broome and Halls Creek, the truck wash could be used by export carriers as well as other agricultural or other vehicles as part of their weed seed hygiene practices. In addition, there are benefits of frequent washing, which include extension of crate life by up to 30% and reduced washing times. Trucks would potentially use the wash at least once/month and as often as once/fortnight. Road Trains Australia (RTA) has 18 permanent trucks in Broome. At the worst-case scenario, use by RTA alone would equate to 216 truck washes per year in Broome. The number of trucks using a facility in Halls Creek requires further investigation.

2.5. Truck wash operation and logistics

It can take up to about 6 hours to wash down a type 2 Common Road Train (National Heavy Vehicle Regulator 2016). Ideally, the system would initially require two wash bays, with the possibility of expanding to three or four. This will limit trucks having to wait to access the wash. The bays will need to be separated to avoid cross contamination between bays. The bay needs to be 2 trailers long, or drivers would have to unhitch or move time and again to wash all 3 trailers. A gantry is a requirement of workplace health and safety regulations.

3. Legislative context

Unlike some other Australian states, there is currently no regulatory requirement in Western Australia for trucks to be washed for intrastate freight movements. However, the benefits of routine truck cleaning, particularly in weed control, are recognised. As a result, there are truck washing facilities available in many of the key agricultural regions of Western Australia. The Western Australian cattle industry considers that it is desirable and economically advantageous to develop a best practice network of specifically designed truck wash-down facilities located close to principal transport corridors.

The following section presents some of the main legislative and design requirements that must be considered in site selection, design and development of the potential truck wash.

3.1. Truck wash-down facilities

3.1.1. Environmental Protection Act 1986

Intrastate truck wash-down facilities should be designed and constructed to meet contemporary standards of industry best practice, consistent with obligations under the *Environmental Protection Act, 1986* (EP Act) and should consider the specific needs and requirements of all involved in the Western Australian cattle industry. The object of the EP Act is to:

> "*prevent, control, and abate pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing*".

Along with the EP Act, development in Western Australia is subject to Environmental Protection Policies (EPPs) and State Environmental Policies (SEPs) (Environmental Protection Authority 2016). EPPs are statutory policies developed under Part III of the EP Act. Their purpose includes establishing environmental values and environmental quality objectives for an environment or component of the environment. SEPs are non-statutory policies developed by the EPA under Part II Section 17(3)(d) of the EP Act. Like EPPs, they establish environmental values and environmental quality objectives for an environment or component of the environment. There are not currently any EPPs or SEPs that are relevant to Kimberley Pilbara regions.

Chemicals and fuel must be stored and used to ensure they do not impact on surface water, groundwater and soil and the provisions of the EP Act.

3.1.2. Biosecurity and Agriculture Management Act 2007

Spread of weeds in Western Australia is controlled by the Department of Parks and Wildlife in accordance with the *Biosecurity and Agriculture Management Act (BAM) 2007* and under Part IV of the EP Act.

The *BAM Act 2007* and its regulations aim to:

- Prevent new animal and plant pests (vermin and weeds) and diseases from entering Western Australia;
- Manage the impact and spread of those pests already present in the state;
- Safely manage the use of agricultural and veterinary chemicals; and
- Increase control over the sale of agricultural products that contain violative chemical residues.

For the purposes of the *BAM 2007*, livestock and other agricultural vehicles are "prescribed potential carriers". While regulations associated with these are generally applicable only where the prescribed potential carrier is entering Western Australia from another state, territory, or country, the importance of

spreading weeds and other pests within Western Australia is still a major objective of the *BAM Act 2007* and its regulations.

3.1.3. Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974

All works in relation to the design and construction of truck wash facilities must comply with the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974.*

3.1.4. Occupational Safety and Health Act 1984

The *Occupational Safety and Health Act 1984* (OSH Act) sets out the laws about the health and safety requirements affecting most workplaces, work activities and specified elevated risk plant in Western Australia. The OSH Act provides for "the promotion, co-ordination, administration and enforcement of occupational health and safety in Western Australia". Under the Act, certain duties of care for workplace safety and health and the prevention of accidents and injury or harm are placed on employers, principal/main contractors, sub-contractors, people involved in labour hire, employees, self-employed people, manufacturers, designers, importers and suppliers. The Act is supported by the *Occupational Safety and Health Regulations 1996* as well as codes of practice.

3.1.5. Work Health and Safety Regulation 2011

Chemicals must be stored and used in accordance with the *Work Health and Safety Regulation 2011* (WHS Regulations; Commonwealth Government) and the Western Australian *Occupational Safety and Health Act 1984* and subordinate legislation, and any local government requirements. The WHS Regulations cover workplace hazardous substances and dangerous goods under a single framework for hazardous chemicals and introduce a new hazard classification and hazard communication system

3.1.6. Standards and codes of practice

All works in relation to the design and construction of truck wash facilities must comply with the *Australian Standard AS/NZS 3500.2:2003 Plumbing and Drainage*.

Furthermore, the bases of fuel storage areas must be compacted or concreted and bunding provided around these in accordance with the *Australian Standard AS1940:2004 (Storage and handling of flammable and combustible liquids)*. Fuel storage will only be required if power supply is to be via generator. Both the sites in Broome have existing generators and fuel storage on site and all the potential sites in Halls Creek have mains power access.

The Agriculture Secretaries Committee (ASCOG) have recommended the endorsement of the *Australian Animal Welfare Standards and Guidelines – Livestock at Saleyards and Depots* (Agriculture Victoria 2015). These standards outline requirements for truck wash facilities in saleyards. The standards and guidelines are not statutory, but are pending endorsement by the state and territory Agriculture Ministers. It will be up to jurisdictions to adopt the standards and guidelines into their respective legislation. Therefore, the requirements of the standards and guidelines should be considered during design of truck washes for vehicles used for livestock transport. Under the standards and guidelines, truck cleaning facilities should be provided at all saleyards or within a reasonable distance from saleyards and should meet the following specifications:

- Slope should be 1 in 20 to facilitate drainage;
- Pressure should be 160 PSI at 100 litres per minute at the tap; and
- The facility should be large enough to cater for B-double trucks (27 metres) and also cater for road trains in areas in which these are allowed on the road network.

3.2. Quarantine Yard facilities

3.2.1. Live export quarantine standards and legislation

Live export holding yards must be accredited and registered in accordance with the *Export Control Act 1982.* They provide secure assembly premises for pre-export animals. Holding cattle in registered premises allows time for the animals to recover from land transport, be tested and treated by Biosecurity Australia (BA) personnel to ensure that they meet importing country requirements, and be inspected and deemed fit to travel by appropriately qualified veterinarians. Registered premises need to meet a number of requirements in order to obtain and maintain a Department of Agriculture and Water Resources (DAWR) licence as a registered facility (Commonwealth of Australia 2011). For example, the facility must:

- Be within 8 hours' journey (~ 800 km) from the port of embarkation;
- Employ sufficient staff to ensure effective day to day operation of the facility;
- Have the capacity to provide the minimum feed requirements which, for cattle, equates to 2.5% of their body weight of a quality feed able to meet daily requirements;
- Have enough contingency water for 2 days;
- Be constructed and located in such a manner as to control drainage, surface water, groundwater, and effluent run-off;
- Be constructed or located in such a manner as to provide animals with protection from extreme climatic conditions by means of shade, windbreaks, shelter etc.; and
- Have fences that are appropriate to hold livestock and prevent the entry of livestock and that are maintained in a good state of repair (this requires inspection before entry of each consignment and twice a week while livestock are occupying the registered premises).

Exporters must be able to demonstrate to the Australian Government that the management of the livestock at the registered premises is in accordance with the risk management plan for the consignment and the importing country requirements for the registered premises.

Design of live export holding yards must comply with the *Australian Standards for the Export of Livestock (Version 2.3) 2011 and the Australian Position Statement on the Export of Livestock* (ASEL). Where ASEL does not cover a particular aspect of holding yard design and operation, such as separation distances to sensitive receptors, the *National Guidelines for Beef Cattle Feedlots in Australia* (MLA 2012) is often referred to for applicable criteria.

3.2.1.1. Stocking density and duration

Under ASEL, Section S3.11 (a), cattle held for 30 days or more must be stocked at a density of no less than 9 m^2 per beast based on a 500 kg animal. If held for less than 30 days, the stocking density can be reduced to 4 m^2 per beast based on the same size animal. The stocking density can be varied by 0.09 m^2 for each 5 kg change in individual live weight in both cases. Cattle with horns need additional space.

A long-haul voyage is a loaded voyage greater than 10 and not exceeding 30 days in length. A short haul voyage is a loaded voyage that will not exceed 10 days in length. ASEL stipulate that cattle on long haul voyages (generally to the Middle East and having a duration of 10-30 days; Banney, Henderson, & Caston, 2009) need to be kept in a pre-export facility for at least two clear days. For short haul voyages (generally to Asia and having a duration less than 10 days; Banney et al., 2009), the minimum number of days is reduced to one clear day.

3.2.1.2. Separation distances

ASEL do not provide standards for required separation distances between live export depots and environmental (such as waterways and remnant vegetation) and other sensitive receptors (such as

residences and schools). Additionally, the *National Guidelines for Beef Cattle Feedlots in Australia* (MLA 2012) do not provide separation distances for facilities with densities <9 m^2/Standard Cattle Unit (SCU). Therefore, the appropriate separation distances for live export depots will be on a case specific basis depending on facility capacity, how often the facility is operational, the environmental characteristics of the location, and the proximity to sensitive receptors.

3.2.1.3. Soil

ASEL do not provide soil requirements and the *National Guidelines for Beef Cattle Feedlots in Australia* (MLA 2012) do not apply to facilities operated exclusively for the assembly of cattle for live export. ASEL do require that the livestock confinement area of the registered premises is free draining and remains firm under foot (Commonwealth of Australia 2011).

Therefore, the base/bedding of the export depot would need to be prepared and maintained to ensure it is sustainable, does not impact the health or well-being of the animals, and does not cause any offsite environmental impacts. Appropriate preparation and maintenance measures would be identified on a case specific basis depending on soil type at the facility, cattle and vehicle traffic intensity, pen layout, drainage, soil type, and environmental and other sensitive receptors.

3.2.1.4. Topography

ASEL do not provide requirements for topographic considerations and the *National Guidelines for Beef Cattle Feedlots in Australia* (MLA 2012) do not apply to facilities operated exclusively for the assembly of cattle for live export. Therefore, topographic characteristics should be considered on a case specific basis depending on environmental and other sensitive receptors.

3.2.1.5. Water requirements

Under ASEL, all livestock must always have access to drinking water. Water troughs must be kept clean and positioned away from hay and feed sources to prevent fouling. The water must be of a suitable quality for the livestock and there must be sufficient back storage or a contingency plan to ensure that there is enough water to supply the peak demand water requirement for 2 days (Commonwealth of Australia 2011).

The National Guidelines for Beef Cattle Feedlots in Australia (MLA 2012) suggest that approximately 24 ML of high-security water per annum per 1,000 SCU is required for beef cattle feedlots. Due to the smaller animal size of the cattle held in live export depots, this water allocation requires adjustment. An annual supply of approximately 18 ML of high security water per 1,000 400 kg animals should be adequate.

3.2.1.6. Feed requirements

In registered premises, the principal aim is to feed the animals a maintenance ration to ensure they do not lose weight and to introduce them to the diet they will be fed on transport ships (Rinehart, Pers Comm., 2016).

ASEL require that:

- Feeders, self-feeders and water troughs are designed to allow for complete cleaning of all surfaces, prevent spoilage of feed during inclement weather, and prevent or minimise contamination and injuries; and
- Feed is stored in a manner that ensures the integrity and nutritional value of the feed is maintained and protected from weather, pests, external contaminants, and direct access by animals.

The majority of the ration for export boats is produced and sourced in Australia and consists of a high forage component, but some companies bring in a portion of their ration requirements from the importing countries (Rinehart, Pers Comm., 2016).

The operator of the registered premises must ensure that unauthorised entry and access to feed when livestock are being prepared for export is prevented. All entry points to feed and premises must be clearly signed, only those persons necessary for the day to day operation of the premises and state government officials can have direct access, and all non-employees need to report to reception for appropriate biosecurity checks relevant to the requirements of the facility.

3.2.1.7. Management requirements

Under ASEL, the operator of premises registered for the assembly of cattle prior to live export must employ sufficient appropriately-trained staff for the effective day to day operation of the premises and management of livestock (Commonwealth of Australia 2011).

3.2.1.8. Infrastructure and engineering requirements

Under ASEL, registered premises must include the following infrastructure as a minimum:

- Sheds that are constructed with sufficient drainage and ventilation to ensure the shed is free draining and slatted or meshed floors designed and maintained to prevent entrapment of feet;
- Livestock handling facilities constructed to handle the peak number of livestock with a minimum of stress and injury; and
- Non-slip surfaces on all floors of yards, sheds, pens, and loading ramps (Commonwealth of Australia 2011).

The facility must also be located and constructed to ensure that surface water and livestock effluent are directed away from laneways, livestock handling areas, livestock confinement areas, and feed storage areas; that the confinement area is free draining and remains firm under foot; and that the surfaces around feeders and water troughs are evenly graded and compacted to form a hard, durable surface that readily sheds surface water (Commonwealth of Australia 2011).

Animals need to be protected from extreme climatic conditions by installation of adequate shade, windbreaks, shelter, or other protection. In addition, to hold and prevent entry of livestock, appropriate fencing must be erected and must be maintained in a good state of repair, inspected prior to the entry of each consignment and twice a week during livestock occupation, and consistent with importing country requirements (Commonwealth of Australia 2011).

3.2.1.9. Breeds and weight gain potential

The purpose of a registered premises is to assemble cattle and prepare them for export rather than to fatten them. However, in many cases, particularly in northern Australia, cattle are observed to gain weight both in live export depots and on board export vessels (Leftwich, Pers. Comm., 2016). This is because cattle that have been started and grazed on native pastures are not used to the higher nutritional content of processed hay or grain feeds and can undergo compensatory weight gain when exposed to the feeds used at depots and on vessels. Regardless, the main aim of feed at the export depot is to maintain the cattle weight and ensure that the cattle are delivered to the importing country at the appropriate live weight.

3.2.1.10. Odour

ASEL do not provide odour separation requirements and the *National Guidelines for Beef Cattle Feedlots in Australia* (MLA 2012) do not apply to facilities operated exclusively for the assembly of cattle for live export. However, it is recommended that any holding facility be located and constructed in such a manner as to minimise or prevent odour impacts on sensitive receptors, including places of human habitation.

3.2.2. Federal

The Commonwealth Government *Export Control Act 1982* sets parameters around the requirement for livestock to be assembled at Department of Agriculture and Water Resources (DAWR) registered premises for preparation for export. Additional importing country requirements are also required to be complied with under this Act. Registered premises activities include inspection by accredited third party veterinarians as well as DAWR veterinarians, who must issue a 'permit to leave for loading' before the consignment can be transported to the Port (Pilbara Ports Authority 2015).

The *Animal Health Australia Act, 2012* sets out loading rates for cattle of various live weights. Other Federal legislation that must be considered includes:

- *Australian Meat and Livestock Industry Act 1997*
- *Australian Meat and Livestock Industry (Export Licencing) Regulations 1998*
- *Australian Meat and Livestock Industry Regulations 1998*
- *Export Control (Animals) Order 2004*
- *Australian Meat and Live-stock Standards Order 2005*
- *Environment Protection and Biodiversity Conservation Act 1999.*

3.2.3. State

3.2.3.1. Code of practice for the transportation of cattle in Western Australia 2003

The *Code of practice for the transportation of cattle in Western Australia* (Department of Agriculture and Food, Western Australia, 2003) guides the transportation of cattle in order to minimise transport stress and injury. It promotes reducing the distances between properties and feedlots and feedlots and ports as important for improving animal welfare, reducing driver fatigue, improving safety, and saving on transport costs. It includes the following recommendations:

- Cattle should be transported as quickly as possible within legal requirements;
- Only cattle fit for travel are to be selected by the owner or agent; and
- Cattle need access to water unless the total transportation time is less than 36 hours.

3.2.3.2. Water quality protection note 68, 2013 – Mechanical equipment wash-down

The Department of Water's (DoWs) *Water quality protection note 68 – Mechanical equipment wash-down* outlines DoWs responsibilities for managing and protecting the state's water resources and offers guidance on acceptable practices and statutory measures employed to protect the quality of our water resources from the impacts of truck wash facilities (DoW 2013). It includes information on acceptable separation distances from various receptors, construction and design considerations and indicative wastewater discharge criteria.

3.2.3.3. Other state legislation

Other State legislation that must be considered includes:

- *Environmental Protection Act 1986*
- *Planning and Development Act 2005*
- *Environmental Protection (Noise) Regulations 1997*
- *Agriculture and Related Resources Protection Act 1976*
- *Agricultural and Veterinary Chemicals (WA) Act 1995*
- *Animal Welfare Act 2002*
- *Biological Control Act 1986*
- *Biosecurity and Agriculture Management Act 2007*
- *Soil and Land Conservation Act 1945*

- *Veterinary Chemical Control and Animal Feeding Stuffs Act 1976*
- *Western Australian Meat Industry Authority Act 1976*
- Department of Planning and Western Australian Planning Commission *Planning in Bushfire Prone Areas Bushfire Policy Framework Factsheet – Developing mixed-use, commercial, industrial buildings or public facilities (class 4 to 9 buildings).*

3.2.4. Local

3.2.4.1. Broome

Development in Broome must be in accordance with the following planning documents:

- *Shire of Broome Local Planning Scheme no 6*
- *Shire of Broome local Planning Strategy Parts 1 and 2*
- *Relevant Local Development Plans & Structure Plans*

The Broome Shire have advised that the truck wash-down facility may be permitted in areas zoned:

- Industry;
- Port;
- Rural Small Holdings;
- General Agriculture; and
- Light and Service Industry.

Depending on the zoning and the lot sizes, the need to address waste water may have some limitations. The Shire have also advised that the truck wash-down will require planning approval.

3.2.4.2. Halls Creek

Development in Halls Creek must be in accordance with the following planning documents:

- *Shire of Halls Creek Town Planning Scheme No. 1 – Halls Creek*
- *Shire of Halls Creek Local Planning Strategy 2016 (Halls Creek LPS)*

Under the Halls Creek Planning Scheme Zoning Table, a truck wash may be considered as Commercial Development (Motor Vehicle Wash Station), or Industrial Development (Industry – General or Industry-Rural). Motor Vehicle Wash Stations are permitted at Council's discretion in Mixed Use and Industrial zones, and with Council approval in the Town Centre and Rural Pastoral zones. Industry-General is permitted in the Industrial zone and is permitted subject to Council's approval in accordance with Clause 9.2 in the Rural Pastoral zone. Industry-Rural is permitted at Council's discretion in the Industrial, Rural Pastoral, and Rural Residential zones. The quarantine yards are likely to be considered as Animal Husbandry, which is permitted in the Rural Pastoral zone subject to Council's approval under Clause 9.2.

The Halls Creek LPS has been developed to guide future planning and development in Halls Creek. Relevant zones described in the LPS include:

- General Industry (which is related to storage, transport activities, mining related uses, and hazardous and noxious industry on large lots);
- Light Industry (which is related to smaller light industry activities);
- Mixed Use; and
- Pastoral (which is a land use classification intended to formalise pastoral activities). Land designated as Pastoral generally provides for pastoral use and agricultural opportunities or large land holdings to accommodate land uses which may require isolation from closer urban development. The

Pastoral Land classification allows for other economic activities on Pastoral Land through Diversification Permits.

3.2.5. Permits and approvals

3.2.5.1. Trade waste permits

Truck wash areas that are connected to sewers are required to apply for approval to discharge trade waste (Water Corporation 2016). Approval requires compliance with the acceptance criteria for trade waste and must meet other design requirements including:

- Wastewater generated from any wash down area will be required to discharge to a pre-treatment fixture. All pre-treatment fixtures used must be accepted for use within the operating areas;
- Sites must have an accepted oil water separator such as a vertical gravity separator (VGS), coalescing plate separator (CPS), hydro cyclone or other pre-treatment fixture that is accepted for use for the waste being discharged;
- CPS, VGS and hydro cyclone units must have a written maintenance contract for servicing in line with the manufacturer's requirements;
- Single, double or triple interceptors will not be accepted as the final pre-treatment before discharge to sewer;
- Where the wash down process is limited to cleaning of road grime from the exterior of cars, and the concentrations of total petroleum hydrocarbons (TPH) and of benzene, toluene, ethylbenzene and xylene (BTEX) in the wastewater are within the acceptable limits in IWPUB06, a solids arrestor of an accepted type is appropriate pre-treatment;
- Only quick breakdown detergents are to be used;
- Wash down areas are to have a bund or be designed in such a way as to prevent excess rainwater entering the sewerage system. Areas adjacent to the wash down are to be graded away from the wash bay;
- Unroofed wash down areas are not to be greater than 20 m^2. Areas larger than 20 m^2 are required to be roofed. In exceptional circumstances this requirement may be waived, but conditions will apply.
- All open areas which are unroofed will attract a charge based on m^2 of the unroofed catchment unless their discharge to sewer is through a flowmeter (Water Corporation 2016).

As an alternative to sewer connection, truck wash facilities can include alternative solutions, such as evaporation ponds, to prevent the need for approval to discharge trade waste. Further information on trade waste discharge approval requirements can be obtained from the Water Corporation Website (Water Corporation 2016) or by contacting tradewaste@watercorporation.com.au

3.2.5.2. Other permits and approvals

Other permits and approvals that may be required include:

- Clearing permit from the Department of Environmental Regulation;
- Water Licence from the Department of Water
- Diversification Permit from the Department of Lands, if the proposed activity is on a pastoral lease
- If there is an Aboriginal Heritage site where the land use activity is proposed, the *Aboriginal Heritage Act 1972* will need to be complied with, which is administered by the Department of Aboriginal Affairs.

4. Truck wash design and location considerations

Selection of an appropriate site for a truck wash facility needs to take physical, regulatory, economic, constructional, and operational aspects into consideration. These are discussed below.

4.1. Water

The volume and quality of water required for truck wash facilities will vary depending on the vehicle and machinery size and configuration of the machinery to be cleaned down, levels of cleanliness required and water dispensing equipment, and the truck wash pad area.

Temporary facilities and mobile truck wash plants often utilise high pressure water. The use of low volume/high pressure is adequate for these situations. However, high volume/high pressure water is preferred for removing significant quantities of mud/manure and organic material build-up from agricultural machinery, earthmoving equipment and vehicles.

Recently developed truck wash facilities in Queensland use the high volume/high pressure concept with differing flow rates depending on the intended use of the facility. As a guide, these facilities have a hose flow rate of 2 L/s @ 60m head. Therefore about 3.6 kL would be required for each half hour (7.2 kL/hour) of clean down time. As an example, if the wash down time for a Type 2 road train (3 trailers) is 6 hours, the total water consumption would consist of up to 43.2 kL/truck.

The supply may be available from a local municipal or privately owned system or it may be necessary to utilise surface, subsurface or recycled water sources. In this case, it is essential to confirm that a sufficient supply of suitable quality water is available. This would include:

- Analysis of groundwater resources and geology of the site including details of any bores on the subject property. Pump testing of bores is recommended;
- Analysis of possible sources of surface water;
- Consideration of water licensing. If water rights are required, it will be necessary to ensure that an agreement for water rights provides sufficient quantity for present and future use. Water licensing requirements vary between states and regions within states. It is essential to confirm that water can legally be used. It should be remembered that the holding of a water allocation may not guarantee the supply of that volume; and
- Analysis of water quality. Water quality and type of treatment required will need to be compatible with the equipment used at the facility.

Water will be required to be stored in a balancing tank to ensure water is always available for operation of the facility.

4.2. Land

Land constraints must be taken into consideration when selecting the location for the truck wash. Selection of an appropriate site may greatly decrease both construction and operational costs.

4.2.1.Access

The following recommendations apply to access considerations for the truck wash site selection:

- Truck wash facilities that are conveniently located close to major roads are more likely to be used by industry;
- The truck wash facility will require all weather access;

- Due to the all-weather access requirement, a wash down facility located on an existing gravel road will likely require a road upgrade;
- Access roads should be located to minimise erosion and the alteration of drainage lines;
- Layout of access roads will be based on volume and type of traffic, traffic speed, and traffic patterns;
- Access roads to the facility should be designed and constructed to minimise costs, while providing easy access for the expected traffic under the various conditions affecting the site; and
- Design and construction criteria including sight distance, road standard geometry and design of turn outs from highways will usually be governed by the local government authority in the area.

Ideally the facility is to be located outside of the built-up areas of the Halls Creek and Broome townships, but located close to the main roads as this will likely increase facility uptake. All weather access is essential for the proposed truck wash. Therefore, it would be more cost effective to construct the facility closer to existing main roads as developing and/or upgrading an inferior road into an all-weather road infrastructure is likely to be cost prohibitive.

4.2.2.Land availability

The proposed facility location should have ample location for all associated infrastructure including: the proposed number of washing bays, waste treatment equipment, clean water storage, and truck waiting bays.

The availability of the land needs to be considered during the site selection process. In particular:

- The current and future land zoning of the subject property and surrounding land with the local government authority should be investigated. This may quickly identify properties that are unsuitable because of land use, zoning or legal constraints.
- Property size is an important consideration. Ideally, the subject property should be large enough to contain the washing facility and all other associated infrastructure including vehicle parking during busy periods, waste treatment and any waste utilisation areas.
- Land buffers around the facility complex prevent encroachment by other developments on nearby land and the land should be adequately sized to ensure that area for land buffers area is available.

4.2.3.Siting and construction

The facility should be located in a strategic location that can capture the largest proportion of cattle trucks requiring washing.

The siting and construction of the facility needs careful consideration of the local landforms surrounding the facility as they may influence:

- The type of wastewater disposal method that can be utilised;
- The suitability of the site for construction of service facilities;
- Surface water management and contamination risk;
- Groundwater management and contamination risk;
- Flood risk;
- Soil erosion risk;
- Access to the site; and
- Ability to provide visual screening of the site.

4.2.4.Soils

The range and distribution of soil types on a subject site should be confirmed during the site selection process. The surrounding soil types will influence the requirement for earthworks or gravel to establish foundations for the concrete pads, water tanks and access roads into the facility. Furthermore, soil structure

should be assessed to determine suitability for construction of truck wash pads and drainage works, as well as for excavation of storage ponds if required. For example, loam soils are often preferred for construction as they are stable and do not exhibit excessive shrink-swell characteristics. Soils with high clay content best suit storage ponds and solid waste storage sites, since these soils have good workability and can be compacted to provide a low permeability.

For example, loam soils are often preferred for construction as they are stable and do not exhibit excessive shrink-swell characteristics. Soils with high clay contents best suit storage ponds and solid waste storage sites, since these soils have good workability and can be compacted to provide a low permeability.

4.2.5.Topography

A flat to slight (2.0 – 4.0 %) fall across the site is ideal for the development of the facility. This fall minimises the requirement for pumping as water can be gravity fed through the site.

Finding a site with ideal topography reduces the likelihood of community amenity complaints and can reduce design and construction costs.

4.3. Electricity

The type of equipment to be installed will determine the electricity requirements at the site. This factor may also help determine the facility location. Truck wash facilities may require single or three phase power to operate equipment such as water pumps, lighting, and air compressors.

The use of mains power is the recommended option. Extension of power lines to a facility is cost prohibitive and therefore the facility should be located as close as possible to existing power infrastructure.

4.4. Flora and fauna

Environmental impacts to flora and fauna, areas of remnant vegetation, wildlife movement corridors/habitats and natural wetlands should be avoided when selecting a site and waste disposal area. This also minimises the impact on the environment of unintentional escape of weed seeds. Relevant local and state authorities should be consulted to determine any vegetation clearing restrictions if required. This should also be considered for future expansion plans.

4.5. Protection of community amenity

Design and siting of effective and efficient truck wash facilities will occur in consultation with the community. If conflicts arise between facilities and neighbours, they can often be very emotive. The people involved sometimes experience great personal stress. In the long-term interests of facility survival, conflicts must be resolved. Community amenity issues prevent unreasonable interference with the use and enjoyment of property rights and avoiding these problems involves a combination of appropriate site selection, layout, design, management and communication. Community amenity issues may arise from:

- Excessive noise - activities including equipment use and vehicle movement inherently generate noise. Each state has its own regulations or guidelines pertaining to noise. Careful route selection and suitable driving may assist to reduce traffic noise nuisance.
- Excessive dust generation - most dust is generated from traffic movements along unsealed roads or off gravelled truck wash pads. Traffic dust can be reduced through road watering, using sealed routes (if available) and driving at suitable speeds.

- Attraction of flies and vermin – proper management of solid waste collection and disposal will avoid any potential problems with flies and vermin. Mosquito breeding relies on protected water habitats for the wriggler stage. Liquid waste disposal ponds with steep banks, flat bases and absence of vegetative growth do not provide suitable habitats.
- Reduction of visual amenity - the development of a facility may be the subject of negative community perception. Shielding the facility from public view may be desirable and vegetation around the complex can significantly improve the visual appeal and can help in dispersing noise and dust.
- Odour nuisance - odour from sludge scraped from sediment traps and treatment of wastewater may present problems for nearby receptors. This may be exacerbated in facilities with a heavy usage of cattle transport trucks as the manure that they remove contains an elevated level of volatile solids. The breakdown of volatile solids can result in the release of offensive odours.
- Lighting nuisance - inappropriate lighting in terms of location, timing, intensity and design can cause public nuisance.

4.6. Protection of sensitive land uses

Care should be taken to ensure that the establishment of a truck wash facility will not jeopardise any environmentally sensitive areas or have a negative impact on existing or future land uses. Long term planning projections will be of help in assessing this. Risks to public health and impacts on the areas surrounding the truck wash facility can be limited by providing buffer zones between the facility and sensitive areas. Local authorities may have specific by-laws or other planning instruments that stipulate separation distances and buffers for facilities. Appropriate planning is needed to maintain these separation distances and buffers between facilities and environmentally sensitive and land use areas. Sensitive environmental and land use areas include:

- Watercourses (both surface and groundwater);
- National Parks;
- Cultural significance –Aboriginal/European sites;
- Public roads;
- Industrial developments;
- Urban residential/commercial areas; and
- Rural residential areas.

Appropriate design, construction and management are the most crucial factors for preventing impacts to sensitive locations. However, providing adequate separation and buffer distances between facilities and sensitive locations are important secondary measures for minimising the risk of environmental degradation and avoiding conflicts relating to community amenity issues.

Protection of surface waters can be achieved by buffers which provide secondary protection against liquid waste entry to surface waters through runoff. Liquid waste may be nutrient rich from manures and other organic contaminants. Maintaining vegetative cover, particularly riparian vegetation, wherever possible, will minimise the movement of runoff and eroded soil into surface waters.

The appropriate buffer width depends on the vegetative cover of the buffer area and the presence of other stormwater control devices such as diversion banks and terminal ponds. Vegetative filter strips (VFS) planted with runner developing, non-clump forming grass can very effectively reduce nutrient entry to watercourses

by reducing the nutrient concentration of runoff through particle trapping and by reducing runoff volumes by promoting increased infiltration. Generally, the wider a VFS, the greater the reduction in soil loss rate. However, for the same soil loss rate, areas with higher slopes need a wider VFS than areas with lower slope. To be most effective, VFS should be located as close as possible to the by-product utilisation area to minimise additional runoff through the vegetative filter strip. It is also critical to locate the VFS before any convergence of stormwater runoff.

A watercourse is a naturally occurring drainage channel that includes rivers, streams and creeks. It has a clearly defined bed and bank, with water flows at any time. Major potable water supply storages and watercourses within drinking water catchments generally need the greatest protection.

4.7. Flooding and drainage

Flood management is an important consideration in the siting, design and construction of a truck wash facility. Due to the flat topography experienced around Broome and Halls Creek, this is of concern. While the facility is expected to have minimal use during the period of the highest rainfall, to limit any potential damage to infrastructure and to limit the required size of the effluent treatment system, the facility is to be located outside of any Q_{20} flood impact zones.

4.8. Waste collection treatment and disposal

Wastes produced from the truck wash process include water, dirt from the exterior of vehicles, manure, tree bark, oil that has spilled or leaked onto vehicle exterior surfaces, lubricants and other fluids from the vehicle interior, and various floating debris resulting from poor hygiene.

The proposed facility will require some form of wastewater treatment. There are essentially three main approaches to final effluent disposal at a truck wash facility. These are:

1) Minimal level effluent treatment and direct discharge into the municipal sewer system;
2) Medium level effluent treatment and final effluent disposal through evaporation or irrigation; and
3) Elevated level effluent treatment for effluent recycling and reuse within the truck wash.

For the proposed facility, there are two treatment options for consideration

Option A: The manure contaminated truck wash effluent will be captured and treated through simple cost effective technologies. This system combines a static screen to remove large solids, a sedimentation basin to further reduce the total solids loading and a final aerobic storage pond. The final quality of the effluent determines the final disposal method. In this treatment option, effluent will not reach a water quality above Class C and is, therefore, unsuitable for recycling. The effluent would require treatment at another facility, discharge via sewerage or irrigation, or excess effluent would need to be evaporated.

Option B: The manure contaminated truck wash effluent will be captured and treated through a complex series of modern technologies that are capable of a greater solid and nutrient removal than Option A. This system combines a static screen, sedimentation basin, hydro-cyclone, oil and grease separator, a zeolite ultrafiltration unit and UV disinfection. This treatment option will produce Class A water that can be reused by the truck wash facility.

Estimated costs and recommendations on the preferred option for each site are provided in section 6.1 and 6.2.

4.8.1. Oil and grease traps

Pollution prevention is a major design consideration when siting a truck wash facility. Oils and grease are removed in traps that skim the less dense grease materials floating on the water. This requires low flow rates

through the trap to allow separation of the oil from the general water column. Many heavily used facilities have found that grease traps tend to be ineffective due to the significant quantities of water flowing through them, which increases water spend and reduces the hydraulic retention time. Blockages and clogging up of these traps is another issue due to excessive amounts of manure, straw and other material from cattle trucks and other agricultural vehicles.

4.8.2. Sediment traps

Sediment traps act to detain runoff water in the trap for long enough to allow sediment and heavy course material contained in the wastewater to settle through the water column. Ideally, design of sediment traps needs to cater for the access of a bobcat/front end loader, backhoe or equivalent for cleaning. It is important to ensure the sediment trap is large enough in volume to accommodate expected sludge accumulation and cleaning. Consideration must be made to ensure the sedimentation trap is sized adequately for both current and future demand, or alternatively the option for expansion is available.

4.8.3. Holding Ponds

Wastewater is usually drained from the sediment trap/sumps into holding ponds. The number of ponds will be determined by the demand on the facility and water usage. These ponds act as treatment and/or evaporation ponds.

Ponds need to be accessible for desludging and maintenance. Batters should be designed to maintain the pond integrity based on a soil stability assessment. Adequate soil compaction and correct moisture content are required to produce a maximum design permeability of less than 1 X 10-9 m/s for a depth of 300 mm for ponds up to 2 m deep or 450 mm for deeper ponds (compacted layers should not exceed 150 mm depth). Ponds constructed using soils containing less than 20 % clay will require sealing with clay. For treatment and storage ponds, the base ground level (base of works) should always be at least 2 m above the water table.

The pond system must have sufficient storage capacity to contain the inflow of wastewater, plus rainfall and runoff during extended periods of wet weather, such that overtopping would not occur on average more than once every twenty years (i.e. system design for Q_{20} weather event). To limit the size of the effluent management system, the entry of clean stormwater runoff should be avoided or minimised. Diversion banks should be used around the wash bays and around the wastewater treatment system to reduce the amount of rainfall runoff entering the system, therefore ensuring the ponds only collect contaminated stormwater runoff. Roofed facilities are sometimes used and can be a requirement depending on facility size.

4.8.4. Final discharge

Depending on the effluent system utilized, effluent water may be discharged into an existing sewer network. If this is the case, the water should be cleaned as best as possible to prevent shock loading events to the system. An approval to discharge trade waste into the sewer network may also be required. Alternatively, water may be evaporated from the effluent ponds or used for irrigation.

Depending on the available water supply and ability to discharge wastewater, recycling and reuse is the preferred method of wastewater management. The ability to recycle water, increases capital expense and increases the operating expense, through increased power consumption and chemical additives, but decreases clean water requirements and has a range of environmental benefits.

4.8.5. Solid waste

The sludges and solids removed from sediment traps exhibit certain characteristics. Sludge and solids are generally disposed of in deep pits or stockpiled for later disposal at earth fill refuse tips. Consideration needs

to be given to the possibility of weed seed contaminants or oil and grease as possible environmental pollutants.

4.9. Industry preferences

Different industries have different priorities in terms of truck wash operation and performance. For example, the general agricultural weed seed wash downs will place a greater emphasis on the wheel arch and undercarriage than the cattle truck wash operators will.

The proposed truck wash is to be primarily used by the cattle trucking industry and, therefore, the main requirement is to provide adequate cleaning of the trailer frames and decks to remove the potential of disease spread from one load to another. The live export industry is currently experiencing greater scrutiny from importing countries and, as such, there is a growing requirement for the disinfection of trailers. Therefore, the ability to disinfect trailers after the bulk of material has been removed should be included in the final facility design.

4.10. Staffing

On-site personnel are not required for the ongoing operation of a truck wash facility, but in the event of unloading and loading cattle from the truck, staff availability would be ideal. However, in the event of failure, maintenance staff would be required to visit the site. Therefore, the truck wash is best located within 20 minutes from the townships of Halls Creek and Broome, or alongside an existing export depot (Broome).

4.11. Technology and innovation

4.11.1. Recycling of waste water

There are a range of technologies available in varying complexity and the level of treatment for wastewater resuse and recycling. However, all the sites considered in this study have sufficient water supply such that recycling is not required.

4.11.2. AvData compatibility

The AvData centralised billing service was developed in 1990 and provides billing, reporting, monitoring and access control services for airport, truck wash, water standpipe and other facilities across Australia

The system is currently operated in over 100 truck washes of varying scales throughout Australia (AvData Australia 2017). AvData is a complete system that manages the entire billing process, including:

- Maintaining a database of truck owners and operators;
- Collecting and processing truck wash data;
- Calculating charges;
- Printing and mailing statements/tax invoices

The system provides key benefits, which include:

- All facilities throughout Australia are accessible;
- Regardless of how many different AvData truck wash facilities are used, each customer receives one statement/tax invoice per month for all charges;
- AvData handles all customer queries, receipts and payments on behalf of the truck wash;
- AvData provides an online database of facility usage which is used to generate reports that can aid in improving facility management, ongoing planning and adjusting cost structure.

Due to the widespread use of AvData throughout Australia, the AvData truck wash billing service will be utilised in the development of an operating model that can be provided to potential stakeholders to gauge the level of potential use.

4.11.3. Elevated platform and hose gantry for upper and lower deck cleaning

The primary reason for the proposed truck wash is to remove manure from the cattle decks within the trailers. Therefore, to aid cleaning of the upper decks, an elevated platform is proposed. At most existing truck wash facilities, there is no platform and operators must climb into the top deck to effectively clean it.

The proposed facility will provide high pressure/high flow hose lines that are suspended from a gantry. The elevated hoses are to be access from the elevated platform, which will provide a safe and easily accessible approach to cleaning the upper deck of a cattle trailer. The elevated platform will also allow better spray angles for cleaning the top decks.

Working from heights can be subject to workplace safety and health compliance measures at some sites, such as mines. Depending on the classification of the type of work site, consideration should be given to the safety measures required to ensure safety of all users of the facility. These may include appropriately designed mobile elevated work platforms (MEWPs) or fixed elevated infrastructure.

4.11.4. Disinfection

With the increased number of live export cattle throughout the world, importing countries are beginning to implement tighter regulations around quarantine and disease control. As a result, there is a growing list of importing countries that require cattle trucks to be washed and disinfected prior to the transportation of cattle from export holding yards to ports. Live export cattle that are sent to China may also require trucks to be washed when transporting cattle from the farm gate to the export holding yards. Specific pre-export requirements associated with trade agreements with China are still being negotiated, but it is possible that this requirement will be enforced and that other countries may adopt this requirement as well.

To ‘future proof’ the proposed truck wash, allowances will be made to alternate from bulk cleaning with clean water, to rinsing and final washing with chemically dosed water for disinfection.

4.12. Economic and social considerations

The construction of a truck wash will provide temporary jobs for the local area and there will be a demand for contractors to clean and maintain the facility on an annual basis. However, since the truck wash is designed to be operated independently by the truck driver, there will be no permanent jobs created at the actual facility. At the expected level of use, the additional labour hours for truck drivers is expected to be absorbed by the existing truck drivers although during peak usage times there may be a slight increase in demand for casual drivers.

It is industry’s preference that the facility is operated by an industry partner on a cost-recovery basis.

5. Potential sites

Each site below is assessed against a list of development considerations as having one of three overall assessment outcomes:

1. Acceptable;
2. Information required; and
3. Of concern.

In addition to the site investigation and truck wash site suitability investigation, the following available environmental information was assessed to determine the suitability of the all sites for the potential truck wash and holding yards:

- Matters of National Environmental Significance
    - World heritage public areas
    - Ecological communities of significance
    - National heritage protected
    - National important wetlands
    - RAMSAR wetlands
    - Collaborative Australia protected areas
- Matters of State Environmental Significance
    - Environmentally sensitive areas
    - Aboriginal heritage places
    - Wild rivers
    - Acid sulfate soils (no mapping)
    - Elevation
    - Bushfire prone areas (all of it is)

5.1. Site selection options - Halls Creek

In Halls Creek, a truck wash-down facility should be located close to the Great Northern Highway, Duncan Road, or Tanami Road to facilitate accessibility of trucks travelling north and south. This would increase potential use of the new facility. Based on the findings of the stakeholder consultation and other limited information on the potential throughput for a quarantine facility in Halls Creek, the size of the quarantine facility should be sufficient to hold a total of 5,000 head of cattle at any one time.

The proposed upgrades to the Tanami Road and Duncan Highway, which were also recognised as priority projects in the NBIR (although the costs of development far outweigh potential economic benefits), may lead to increased interstate traffic through Halls Creek. Consultation undertaken during the NBIRs development found that a suitable site for a Halls Creek wash-down facility would be on the Great Northern Highway close to the intersection of the Tanami Road because this would service traffic travelling along the Great Northern Highway, the Tanami Road, and the Duncan Highway. However, the distance from Tanami Road to Duncan

Road is only about 15 minutes, therefore, several locations along any of the three roads mentioned above would reasonably be able to service all three roads.

Three sites were investigated during a site visit to Halls Creek on 28th March as follows:

1. Tanami Track on corner of Tanami and Great Northern Highway;
2. Old Dip Yards on Duncan Road; and
3. Halls Creek Shire site on Great Northern Highway.

These sites were all deemed highly desirable due to location on major highways.

5.1.1. Halls Creek environmental considerations

If works such as construction of a truck wash are conducted on already prescribed premises (as defined by categories under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations)), then approvals are usually required by DER. This is in accordance with section 53 of the *Environmental Protection Act 1986*. A truck wash by itself does not require approvals from DER. Approval is only required from DER if the truck wash is constructed on prescribed premises that meets the definitions of one of the categories listed in the table below (taken from Schedule 1 of the EP Regulations). This means that the truck wash in Halls Creek will likely require approval if it is developed in association with a quarantine facility, which is a prescribed premises. If it were to be located separately from the quarantine facility, DER approval may not be required.

Table 2: Categories of prescribed premises. Source: Schedule 1 of EP Regulations.

Category number	Description of category	Production or design capacity
1	Cattle feedlot: premises on which the watering and feeding of cattle occurs, being premises — (a) situated less than 100 m from a watercourse; and (b) on which the number of cattle per hectare exceeds 50.	500 animals or more
55	Livestock sale yard or holding pen: premises on which live animals are held pending their sale, shipment or slaughter.	10 000 animals or more per year
68	Cattle feedlot: premises on which the watering and feeding of cattle occurs, being premises — (a) situated 100 m or more from a watercourse; and (b) on which the number of cattle per hectare exceeds 50.	500 animals or more

5.1.2. Site 1 – Tanami Corner

5.1.2.1. Location and site description

Tanami Corner is located at the intersection of the Great Northern Highway and Tanami Road (Figure 1). It is ideally located for a truck wash and is already used informally as a truck parking areas for trucks travelling the Tanami Road and the Great Northern Highway. It is also used by trucks waiting to access the road when it becomes impassable during high rainfall events. The Koongie Elvira Aboriginal Corporation (KEAC) holds the pastoral lease over the site and has expressed interest in operating the truck wash. KEAC have identified

the following key features of the potential opportunity for using Tanami Corner for the development of the truck wash and holding yards:

- The location is at the intersection of two key highways and facilitates access for trucks travelling west from Tanami and Duncan Roads;
- The site has access to mains power, which runs along the Great Northern Highway;
- The site has a secure water supply from the bore at the Koongie Community (2.45 km away);
- There is an alternative water supply possibly available from the main roads bore at “Rock Hole” (1 km away); and
- The Koongie Community would provide labour and staff accommodation within a short distance of the site.

The following additional features of the site contribute to its feasibility for use as a truck wash-down and holding yards:

- There is ample space for the siting of a truck wash and a quarantine facility;
- Vegetation across the site is limited and would be easily cleared prior to any development;
- The soils at the surface of the site contain pea gravel and shale rock and traces of clay, indicating that the site could likely have the materials required to construct a durable surface;
- Staff are available to operate the facility during set operational hours (however, it is uncertain whether staff availability would be 24 hours per day);
- Space required for effluent management is ample; and
- There is a slight fall of approximately 1% across the property, generally running west to east and south to north.

Figure 1: Location of potential site at Tanami Corner. Source: Nearmaps (2017)

5.1.2.2. Planning approval issues and tenure matters

There are some tenure matters which need to be considered during the feasibility assessment of this site. Currently, the proposed site is within a pastoral lease. Therefore, an s122 Non-pastoral permit would be required if KEAC were to operate the facility at this location. If a third party were to operate the facility, an alternative lease would have to be granted.

In addition, the Tanami Track, which passes through the site, has not been excised from the pastoral lease. It has been suggested that the area excised from the pastoral lease for the truck wash-down and quarantine facilities be confined to the area east of the Tanami and south of the Great Northern Highway and no building construction should be planned within 100 m of the Tanami Track.

Other planning approval issues for this site include:

- Subject to the *Rights in Water and Irrigation Act 1914*, which means that a water licence may be required to take water from a watercourse or spring on the site;

5.1.2.3. Aboriginal heritage sites

An Aboriginal site was identified approximately 750 m to the north east of the site (Figure 2). According to the Aboriginal Heritage Inquiry System (AHIS), this identified Aboriginal site is a "Other Heritage Place" (ID: 13868; Name: Quartzite Hill) and the Department of Aboriginal Affairs do not need to be notified regarding development at this site. Furthermore, the proximity of the Aboriginal site is unlikely to pose a constraint to the potential development of the truck wash-down facility.

5.1.2.4. Design and operation constraints

The following potential constraints to the design and operation have been identified:

- While the site has access to a potential water supply from the community bore 2.45 km further to the west, the yield of this needs to be tested to determine whether the facility is required to recycle water. Ideally, water recycling should be avoided, due to the high CAPEX and increased OPEX.
- The line of sight for vehicles travelling from the east was very good, but the site from the west is somewhat limited by the curve in the road, which may pose a safety concern. However, this could be eliminated by moving the entrance to the proposed facility further to the east.

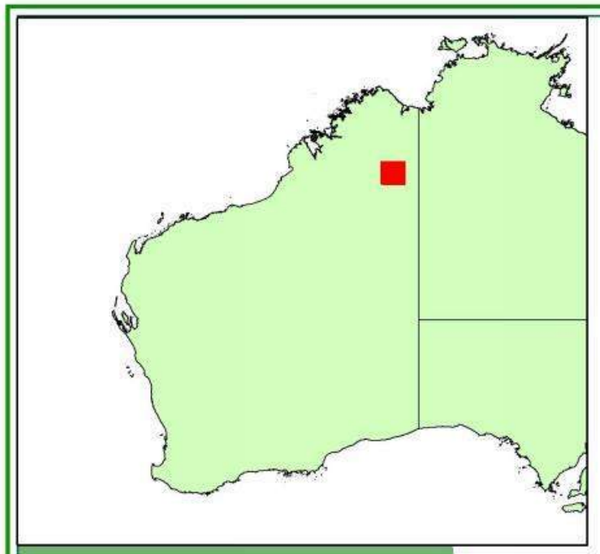
5.1.2.5. Potential complementary uses

KEAC has also investigated potentially developing a road house and caravan services facility at Tanami Corner. The specific services would include:

- Caravan dump point and water refilling station
- Information boards with links to proposed tourism attractions on Koongie Elvira
- Roadhouse

5.1.2.6. Compliance with truck wash development considerations

Based on stakeholder consultation, site information, and the site investigation, Tanami Corner is a suitable location for the proposed truck wash-down and holding yards and should be investigated further in this feasibility assessment.



Halls Creek
Moyle Cr
Bridge St
Downing St
Nicholson Rd
Duncan Rd
Beckett St
Cox St
Rubbish Tip Rd
Halls Creek Shire Site
Old dip site
China Wall Access
Great Northern Hwy
Unknown Rd
Tanami Corner
Tanami Rd
FSA CONSULTING
17TOO-1117
FIG02
Potential Halls Creek Sites & Aboriginal Heritage Places
N
0 1 2
Kilometers
Towns
Tanami Corner
Old Dip Site
Halls Creek Shire Site
Roads
Drainage
Aboriginal Heritage Places

Table 3: Site Selection Assessment - Option 1 – Tanami Corner

Section	Criteria	Outcome
Strategic Location (Regional)	Facility is located in an area that will meet the demands of a large catchment	Acceptable
Strategic Location (Local)	Facility is located close to major road	Acceptable
Land availability	There is sufficient land for the truck wash and associated infrastructure	Acceptable
Access - Location	Location is at the intersection of two main highways	Acceptable
Access - All weather access	Access is directly from Great Northern Highway	Acceptable
Access - Road size	Access road is currently capable of managing b-double trucks	Acceptable
Access - Road line of site	Ample straight flat road in both directions	Of concern
Access - Turning lanes	Road would likely require turning lane to be constructed in northern and southern directions	Acceptable
Staffing	Staffing is available but it is unknown whether the staff availability is 24 hours per day	Information required
Topography	Site is flat with slopes of <3.0%	Acceptable
Soils	Soils contain material potentially suitable for construction of surfaces, but further investigation required	Information required
Water source	Water potentially available but information required	Information required
Waste management	Potential to sewer and irrigate	Information required
Power Supply	Mains power is located adjacent to the property	Acceptable
Flora & Fauna	Limited vegetation on-site, but further investigation required	Information required
Community Amenity	Located away from town	Acceptable
Sensitive Land Uses	Presumed non-sensitive but information regarding tenure required	Information required

5.1.3. Site 2 – Old dip yards

5.1.3.1. Location and site description

The old dip yards are located on Duncan Road approximately 6.5 km from the Great Northern Highway (Figure 3). The yards were previously operated by DAFWA and have been closed for several years due to lack of demand and the proximity to the Halls Creek water supply and treatment plant.

Characteristics of the site which contribute to its feasibility as a potential truck wash and holding yards include:

- The facility is located on Duncan Road, which is a major thoroughfare for cattle entering Western Australia from the Northern Territory. It is located 5 km south of Halls Creek and would allow access from Tanami Road without much back tracking.
- The old dip yards are currently over grown and have not been used in a long time. However, the site inspection indicated that the infrastructure seems to be in reasonable condition. This would require confirmation through a more detailed audit of the infrastructure.
- The loading ramp was in a reasonable condition, but would require upgrading to allow unloading from the top deck.
- Power runs directly beside the site and would be easily accessed if required.
- The soils at the surface of the site contain pea gravel, shale rock and traces of clay, indicating that the site could likely have the materials required to construct a durable surface.
- The Halls Creek WWTP, which could be a potential water supply (if effluent quality is adequate) for the truck wash, is located to the north of the site. This requires further information.
- The site seems very flat, however, the amount of overgrowth made it hard to determine slope through the site during the site inspection.
- The existing dip seemed in reasonable condition. However, a sump for the dip runoff was not identified, nor was there an effluent pond in place.
- The line of sight is very good in both directions and would not be an issue with any proposed development or expansion.

Figure 3: Proposed location of truck wash-down at the old dip yards south east of Halls Creek. Source: Nearmaps (2017)

5.1.3.2. Planning approval issues and tenure matters

Under the *Shire of Halls Creek Town Planning Scheme No. 1* and the Halls Creek LPS, the site is within the pastoral zone. Therefore, the development would need Council approval to proceed and the site may need to be excised from the pastoral lease and operation of the facility subject to an alternative lease agreement. This will need to be investigated further should the development proceed at this site.

Other potential planning approval issues for this site include:

- Subject to the *Rights in Water and Irrigation Act 1914*, which means that a water licence may be required to take water from a watercourse or spring on the site.

5.1.3.3. Aboriginal heritage sites

Six Aboriginal sites were identified immediately within 1 km of the site (Figure 2). These are described in the individual reports for each site in Appendix B and listed in . The Department of Aboriginal Affairs should be consulted prior to proceeding with a development at this site.

Table 4: Summary of Registered Aboriginal Sites found within 1 km of the proposed Old Dip Yards truck wash-down facility site.

Site ID	Site Name	Status	Type
13872	Halls Creek	Registered Site	Artefacts/Scatter
16011	Halls Creek East 1	Registered Site	Artefacts/Scatter
16012	Halls Creek East 2	Registered Site	Artefacts/Scatter
16013	Halls Creek East 3	Registered Site	Artefacts/Scatter
16015	Halls Creek East 5	Registered Site	Artefacts/Scatter
16014	Halls Creek East 4	Registered Site	Artefacts/Scatter

5.1.3.4. Design and operation constraints

The following potential constraints to the design and operation have been identified:

- While there is a bore on site that was used for the previous operation, it would require renovations and testing to confirm the quantity of supply and any contamination from the dip.
- The yards would require renovations before use.
- There is no power connected into the existing yards.
- The pen surface is excessively weedy and would require maintenance if the facility was to be re-established.
- The existing facility could possibly hold approximately 700 head based on visual inspection. This would require expanding, but the land available is currently unknown.

5.1.3.5. Potential complementary uses

The site is surrounded by the 'Burke's Park' pastoral lease which currently operates an agricultural skills training facility. The operators of Burke's Park have expressed interest in absorbing the yards into their operation to use as a further training facility. However, the operators currently do not have the funding for this proposed extension.

5.1.3.6. Compliance with development considerations

Based on limited site information and the site investigation, the Old Dip yards' site is a suitable location for the proposed truck wash-down and holding yards and should be investigated further in this feasibility assessment.

Table 5: Site Selection Assessment - Option 2 – Old dipping yards

Section	Criteria	Outcome
Strategic Location (Regional)	Facility is located in an area that will meet the demands of a large catchment	Acceptable
Strategic Location (Local)	Facility is located close to major road	Acceptable
Land availability	There is sufficient land for the truck wash and associated infrastructure	Information required
Access - Location	Location is within 20 minutes of Halls Creek	Acceptable
Access - All weather access	Access is directly from Duncan Road	Acceptable
Access - Road size	Access road is currently capable of managing b-double trucks	Acceptable
Access - Road line of site	Ample straight flat road in both directions	Acceptable
Access - Turning lanes	Road would likely require turning lane to be constructed in northern and southern directions	Information required
Staffing	Location is within 20 minutes of Halls Creek; however, it is unknown if staff are available 24 hours per day	Information required
Topography	Site is flat with slopes of <3.0%	Acceptable
Soils	Soils contain material potentially suitable for construction of surfaces, but further investigation required	Information required
Water source	Water potentially available but information required	Information required
Waste management	Potential to sewer and irrigate	Information required
Power Supply	Mains power is located adjacent to the property	Acceptable
Flora & Fauna	Limited vegetation on-site, but further investigation required	Information required
Community Amenity	Located away from town	Acceptable
Sensitive Land Uses	Presumed non-sensitive but information regarding tenure required	Information required

5.1.4. Site 3 – Halls Creek Shire Site

5.1.4.1. Location and site description

The Halls Creek Shire has identified another site for the proposed truck wash-down and quarantine facility on the Great Northern Highway approximately 3 km west of the town (Figure 4).

Characteristics of the site which contribute to its feasibility as a potential truck wash and holding yards include:

- The Shire has expressed interest in operating the facility and, since the site is located opposite the Shire waste management facility, staff resources could be shared between the two facilities.
- The land parcel inspected during the site investigation had a good line of site in both directions.
- The area would require some clearing of vegetation, but this is minimal and would not be a major expense.
- The site is located 4 km from town and would catch trucks passing west on Duncan Road from the Northern Territory, and located 15 km east of Tanami Road, which would require a short loop from trucks that are eventually going to head west.
- The soils showed signs of clay and pea gravel was present.
- Mains power runs beside the proposed property and would provide easy access.
- The Halls Creek town water supply is located on the northern site of the Great Northern Highway, and would provide a sufficient pressure head if it could be used as a potential water source for the facility. Whether this water can be used for the facility requires further investigation.
- The site is flat with minimal slope.
- Space requirements are sufficient.

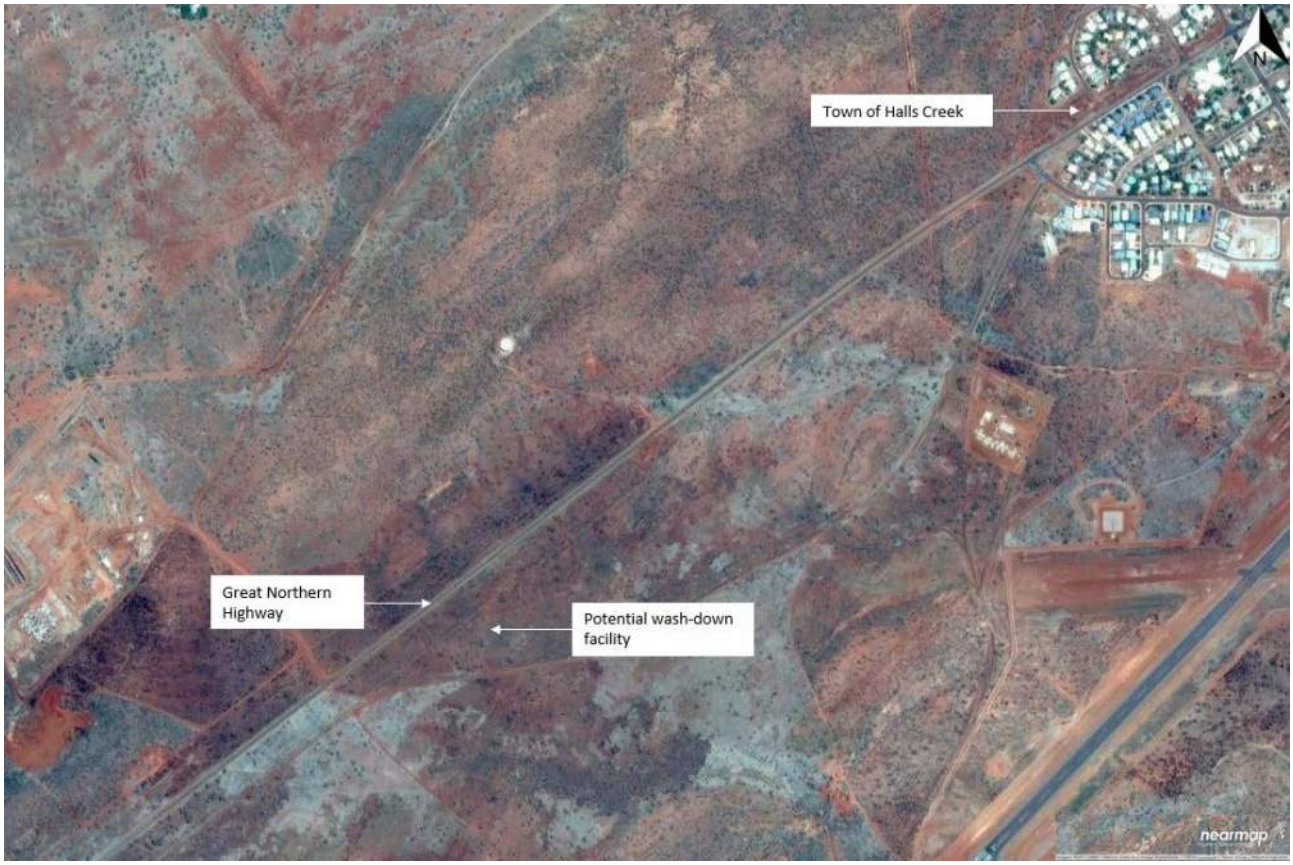


Figure 4: Proposed location of the truck wash-down facility at the Shire owned site west of Halls Creek. Source: Nearmaps (2017)

5.1.4.2. Planning approval issues and tenure matters

The site is within an area which has been identified for general industry in line with the Shire's desire to move several transport companies from their current locations on Duncan Road, which is within a residential zone. This is outlined in the Halls Creek LPS and is not likely to be fully operational as an industrial zone for at least two years. The site is currently owned by the Shire and a lease would have to be negotiated with the proposed operator. Alternatively, the Shire has expressed interest in operating the facility themselves. The industrial use zone will be suitable for the operation of the truck wash-down facility. However, animal husbandry is not currently a permitted use in the industrial zone. Therefore, if the quarantine yards are to be built in association with the truck wash-down, they may need to be located on adjacent pastoral zoned land.

5.1.4.3. Environmental approval issues

An Aboriginal site was identified immediately to the west of the site (Figure 2). According to the AHIS, this is a "Registered Aboriginal Site" (ID: 12617; Name: Rubbish Tip) and is described as Skeletal Remains. The Department of Aboriginal Affairs should be notified regarding development at this site. The AHIS report for this site is included in Appendix B.

5.1.4.4. Design and operation constraints

The following potential constraints to the design and operation have been identified:

- Trucks entering Western Australia from the Northern Territory along Tanami Road would be required to back track 15 km to utilise the facility if it were constructed.
- The proposed space is adequate, but is straddled between the two roads.

5.1.4.5. Potential complementary facilities

Potential complementary facilities are yet to be determined.

5.1.4.6. Compliance with development considerations

Based on limited site information and the site investigation, the Shire owned site is a suitable location for the proposed truck wash-down and holding yards and should be investigated further in this feasibility assessment.

Table 6: Site Selection Assessment - Option 3 – Shire owned site

Section	Criteria	Outcome
Strategic Location (Regional)	Facility is located in an area that will meet the demands of a large catchment	Acceptable
Strategic Location (Local)	Facility is located close to major road	Acceptable
Land availability	There is sufficient land for the truck wash and associated infrastructure	Information required
Access - Location	Location is within 20 minutes of Halls Creek	Acceptable
Access - All weather access	Access is directly from Great Northern Highway	Acceptable
Access - Road size	Access road is currently capable of managing b-double trucks	Acceptable
Access - Road line of site	Ample straight flat road in both directions	Acceptable
Access - Turning lanes	Road would likely require turning lane to be constructed in northern and southern directions	Information required
Staffing	Staff may be available from Shire owned Waste Transfer Station, but further information is required	Information required
Topography	Site is flat with slopes of <3.0%	Acceptable
Soils	Soils contain clay and pea gravel, further information required to determine suitability for surface construction	Information required
Water source	Water source unknown at this stage	Information required
Waste management	Potential to sewer and irrigate	Information required
Power Supply	Mains power is located adjacent to the property	Acceptable
Flora & Fauna	Limited vegetation on-site, but further investigation required	Information required
Community Amenity	Located away from town	Acceptable
Sensitive Land Uses	Presumed non-sensitive but information regarding tenure required	Information required

5.2. Site selection options - Broome

The location of the wash down facility should be located close to the highway to facilitate truck accessibility. There are already two accredited holding yards in Broome, each of which are good locations for the proposed truck wash-down facility. Locating the proposed facility at existing yards eliminates the requirement for new spelling yards and ensures staff are available at all times to help in the unloading/loading of cattle if it is required.

The following existing holding yards were investigated during a site visit to Broome on 29th March 2017:

1. Roebuck Plains Holding Yards; and
2. Broome Common Holding Yards.

These sites were both deemed highly desirable due to location on major highways and at existing Holding Yards sites.

Other sites that may be in Broome would be those mapped as industry, port, and light and service industry. The potential use of these sites for the truck wash would require consultation with Council to assess their suitability.

5.2.1.Site 1 – Roebuck Plains

5.2.1.1. Location and site description

Roebuck Plains is located approximately 30 km from Broome on Broome Road just to the west of the intersection with the Great Northern Highway (Figure 5). It is ideally located for a truck wash and is already used as holding yards for cattle being exported out of Broome. A property description of the site is given in Table 7. The site is within a Bushfire Prone Area and additional planning and building requirements may apply to development on the site.

Table 7: Property description of the Roebuck Plains proposed Truck Wash-down Facility site. Source: (Shire of Broome (2017)

Attribute	Description
Lot Number	382
Plan Number	P193561
Street	Broome Road
Scheme 6 Zoning	Rural Small Holdings

The following additional features of the site contribute to its feasibility for use as a truck wash-down and holding yards:

- The site has ample space for the proposed development. The development is proposed to go in the north-western corner of the currently tree filled block. The block is to be cleared in the coming months and it is currently proposed that a small lot feeding facility will be constructed, along with a weighbridge that will be owned and operated by the Indigenous Land Corporation (ILC).
- The site does not have access to mains power and is therefore operated entirely on Genset power. This would be sufficient to supply the lighting and pumping costs for the proposed truck wash facility.

- Roebuck plains staff believe the existing pressure pump would probably be adequate to meet the demand of the facility.
- The water licence is ample and would not be considered a concern for the proposed development.
- The site has recently constructed a new effluent holding pond that is 250 m x 100 m and 2.5 m deep. This was supposedly designed for a 1 in 10 year rainfall event, but it is believed by Roebuck Plains staff to be much larger than was required and would adequately support the wastewater treatment requirements of the proposed truck wash.
- Staff would be available during the predetermined operation hours (6:30 – 18:30) to help unload and load cattle if required and would be able to issue weed seed wash down compliance certificates post washing. If trucks arrived outside of these hours, it is proposed one staff member would help unload cattle, but the weed seed wash down certificate would not be issued until 6:30 the following morning.
- Onsite staff believe the facility should have a single, double trailer length, bay. It should be a straightforward design that would allow for expansion to two or four bays once demand for the facility increases.

Figure 5: Proposed location of the truck wash-down facility within the Roebuck Plains holding yards site. Source: Nearmaps (2017)

5.2.1.2. Planning approval issues and tenure matters

The site is zoned as Rural Small Holdings, under which a truck wash would potentially be permitted (with Council approval) as an Industry-Rural use or other use in consultation with Council.

5.2.1.3. Environmental approval issues

As outlined in section 5.1.1 if works such as construction of a truck wash are conducted on an already prescribed premises (as defined by categories under Schedule 1 of the *Environmental Protection Regulations 1987*) then approvals are usually required by DER. A truck wash by itself does not require approvals from

DER, however, because the truck wash at Roebuck Plains is proposed to be developed on the existing holding yards site, DER approval will likely be required.

5.2.1.4. Design and operation constraints

Potential constraints to the development include:

- The soils are very sandy with limited clay content and no gravel onsite.

5.2.1.5. Potential complementary uses

The site is an existing holding yard and staff and facilities would be able to be shared between operations.

5.2.1.6. Compliance with truck wash development considerations

Based on stakeholder consultation, site information, and the site investigation, Roebuck Plains is a suitable location for the proposed truck wash-down and should be investigated further in this feasibility assessment.

5.2.2. Site 2 – Broome Common Yards

5.2.2.1. Location and site description

The Broome Common Yards are located close to the town of Broome and can be accessed from an access Road off Broome Road. The Common Yards are already used as holding yards for cattle being exported out of Broome. The site proposed to be considered in this feasibility study is owned by RTA and is ideally located for a truck wash (Figure 6). A property description of the site is give in Table 8. The site is within a Bushfire Prone Area and additional planning and building requirements may apply to development on the site. The site is also mapped within the "Future Broome International/Airport Environs" area.

Table 8: Property description of the Broome Common Yards proposed truck wash-down facility site. Source: (Shire of Broome (2017)

Attribute	Description
Lot Number	530
Plan Number	P073704
Street	Broome Road
Scheme 6 Zoning	General Agriculture

The following additional features of the site contribute to its feasibility for use as a truck wash-down and holding yards:

- The existing site has 4 bores; 2 are freshwater and 2 are salty. These are shandied to get suitable water for cattle and the wash-down, without increasing risk of infrastructure rusting.
- A triangular site in the industrial zone could be set aside for the development (Figure 5). The mains water passes through this site, which may be accessible for the project.
- Regardless of the eventual water supply (mains or bore water), the facility will have no water supply issues.
- Recycling water is unlikely to be a viable option due to the associated increase in CAPX and OPEX.
- Mains power (underground cable) is also available at the proposed site. The cost of connection for this is unknown and needs further investigation.

- There is an existing and conveniently located trailer drop off just up the road that is already in use.
- If the facility was associated with RTA, it would provide an incentive to keep the truck wash maintained, primarily because most of the trucks using it would be RTA trucks.
- The site has vegetation, but it would be easily cleared.
- The site has clear line of sight in both directions.
- The site is close to town, allowing good access from trucks head to or from either the Common Yards or the Roebuck Plains Yards.
- There is ample space for the truck wash and an effluent holding pond.

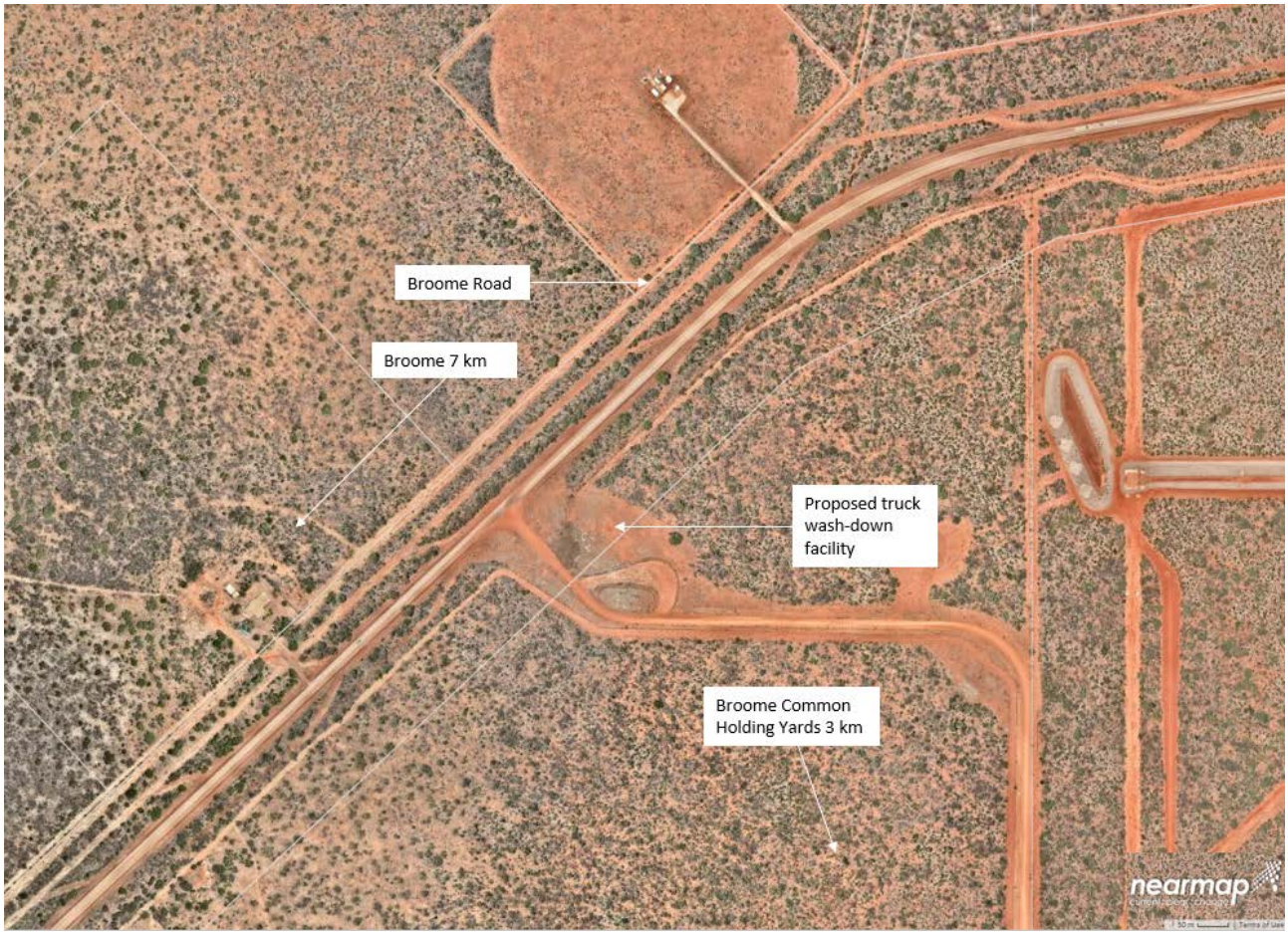


Figure 6: Proposed location of the Broome Common Yards truck wash-down facility site. Source: Nearmaps (2017)

5.2.2.2. Planning approval issues and tenure matters

The site is zoned as General Agriculture under which a truck wash would potentially be permitted (with Council approval) as an Industry-Rural use or other use in consultation with Council.

5.2.2.3. Environmental approval issues

As outlined in section 5.1.1, if works such as construction of a truck wash are conducted on an already prescribed premises (as defined by categories under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations)) then approvals are usually required by DER. Because the truck wash is proposed to be located on the triangular shaped land parcel, which is a vacant block adjacent to the existing holding yards, DER approval may not be required.

A desktop search showed that the site is zoned within an area mapped as an Environmentally Sensitive Area (ESA) (Figure 7; Western Australian Land Information Authority 2017). The mapping within an ESA means

that the development is likely to require a clearing permit. The site is also within close proximity to an area mapped as Ecological Communities of National Significance (Figure 8). According to the EPBC Act Protected Matters Search Tool (PMST), this is the Monsoon vine thickets on the coastal sand dunes of Dampier Peninsula Ecological Community. If the development is likely to have any impacts on this ecological community, referral under the EPBC Act may be required.

Figure 2 also shows that the site is an area mapped as Aboriginal Heritage Places. A search of the AHISshows that there the closest registered site is more than 500 m from the proposed site and that the site is within an area marked as "Other Heritage Place" (ID: 30274; Name: LSC11; Appendix B). AHIS states that the Western Australian Department of Aboriginal Affairs should be consulted before proceeding with the development.

5.2.2.4. Design and operation constraints

Potential constraints to the development include:

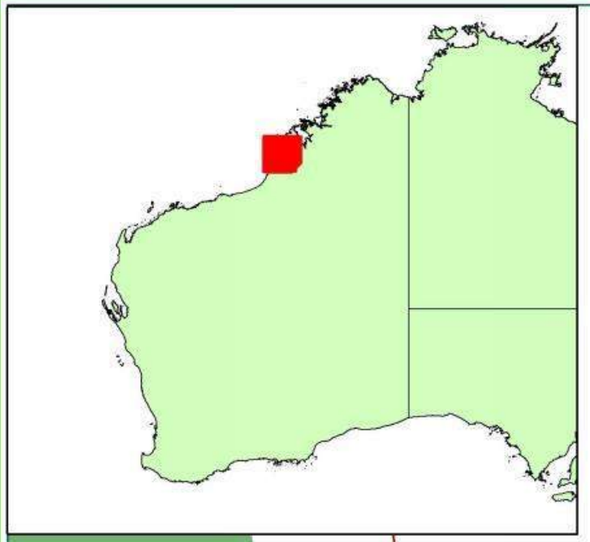
- Ideally, the facility would not be built at the common yards facility otherwise there would be a huge increase in truck movements along the site access which would then require upgrading. However, a small triangular area closer to the Broome road could be set aside. This is next to an area that is zoned as industrial in the future and may be the site of a new road house facility.

5.2.2.5. Potential complementary uses

The site is an existing holding yard and staff and facilities would be able to be shared between operations.

5.2.2.6. Compliance with truck wash development considerations

Based on stakeholder consultation, site information, and the site investigation, the Broome Common yards are a suitable location for the proposed truck wash-down and should be investigated further in this feasibility assessment.



Roebuck plains

Great Northern Hwy

Chi St

Kanagae Dr

Yamashita St

Fong St

Broome Hwy

Roebuck Plains Rd

McGuigan Rd

Broome Common Yards

Buckleys Rd

Locke St

Fairway Dr

Sariago Tce

Kassim St

Lorikeet Dr

Old Broome Rd

Jigalong Dr

Crab Creek Rd

Broome

Short St

Frederick St

Anne St

17TOO-1117
FIG07

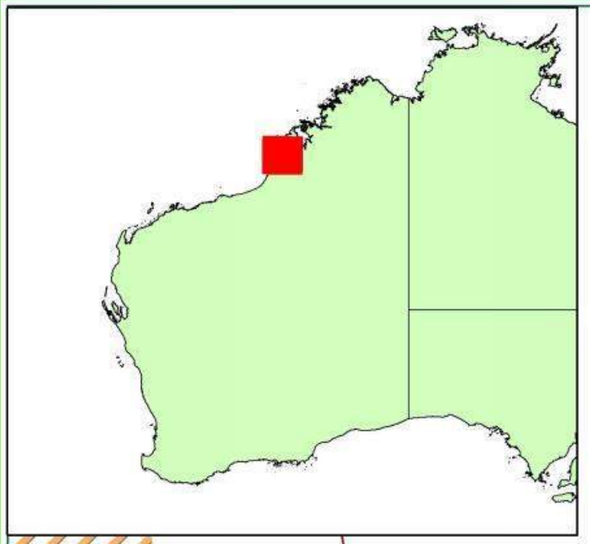
Potential Sites & State Restrictions

N

0 1 2

Kilometers

- Towns
- Roebuck Plains
- Broome Common Yards
- Roads
- Drainage
- Environmentally Sensitive Areas
- Aboriginal Heritage Places



Roebuck plains

Great Northern Hwy

Chi St

Kanagae Dr

Yamashita St

Fong St

Broome Hwy

Roebuck Plains Rd

17TOO-1117
FIG08

McGuigan Rd

Broome Common Yards

Buckley's Rd

Locke St

Fairway Dr

Uranami Dr

Old Broome Rd

Jigalong Dr

Crab Creek Rd

Broome

Short St

Frederick St

Potential Sites & Matters of National Environmental Significance

N

0 1 2

Kilometers

- Towns
- Roebuck Plains
- Broome Common Yards
- Roads
- Drainage
- Ecological Communities of National Significance
- National Heritage Protected
- Nationally Important Wetlands
- Collaborative Australia Protected Areas Database

Table 9: Site Selection Assessment - Option 1 – Roebuck Plains

Section	Criteria	Outcome
Strategic Location (Regional)	Facility is located in an area that will meet the demands of a large catchment	Acceptable
Strategic Location (Local)	Facility is located close to major road	Acceptable
Land availability	There is sufficient land for the truck wash and associated infrastructure	Acceptable
Access - Location	Location is near the intersection of two main highways	Acceptable
Access - All weather access	Access is directly from Broome Road	Acceptable
Access - Road size	Access road is currently capable of managing b-double trucks	Acceptable
Access - Road line of site	Ample straight flat road in both directions	Acceptable
Access - Turning lanes	Road would likely require turning lane to be constructed in northern and southern directions	Acceptable
Staffing	Staffing is available from operation of the holding yards	Acceptable
Topography	Site is flat with slopes of <3.0%	Acceptable
Soils	Soils are very sandy with limited clay content and no gravel on site	Information required
Water source	Water is ample	Acceptable
Waste management	Potential to sewer and irrigate	Acceptable
Power Supply	Mains power is located adjacent to the property	Acceptable
Flora & Fauna	Clearing is required and is to be conducted in the coming months	Acceptable
Community Amenity	Located away from town	Acceptable
Sensitive Land Uses	Presumed non-sensitive but information regarding tenure required	Information required

6. Wash-down facility and wastewater design

6.1. Climate in Broome and Halls Creek

Broome and Halls Creek are both located in Western Australia's Kimberley region, with Broome on the Indian Ocean coast and Halls Creek approximately 680 km inland to the east. The Kimberley region is subject to climatic variability both within and between years. In most years, there is a distinct wet season in Northern Australia from November to April that includes very heavy rainfall, storms, and cyclones. From May to September, there is usually an extreme dry season of very little rainfall. Potential evaporation generally remains high throughout the year, with the monthly evaporation averages exceeding monthly mean rainfall throughout the year. The summaries of statistics for rainfall, maximum temperature, minimum temperature, and evaporation for Broome and Halls Creek are presented in Table 10 and Table 11 respectively.

Table 10: Climate summary statistics for Broome Airport. Source: BOM (2017) and DSITIA (2017).

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean rainfall (mm)	181.7	177.4	99.9	25.9	27.6	19.1	6.8	2.2	1.4	1.4	9.1	62.3
Mean Max. Temp. (°C)	33.0	33.0	34.0	34.3	31.6	29.2	28.9	30.3	31.8	32.9	33.7	33.9
Mean Min. Temp. (°C)	26.3	26	25.5	22.7	18.3	15.2	13.7	14.9	18.5	22.4	25.2	26.5
Mean Evaporation (mm)	256.4	205.1	229.7	224.3	208.6	182.7	197.9	223.8	247.8	281.9	288.9	286.4

Table 11: Climate summary statistics for Halls Creek Meteorological Office. Source: BOM (2017) and DSITIA (2017).

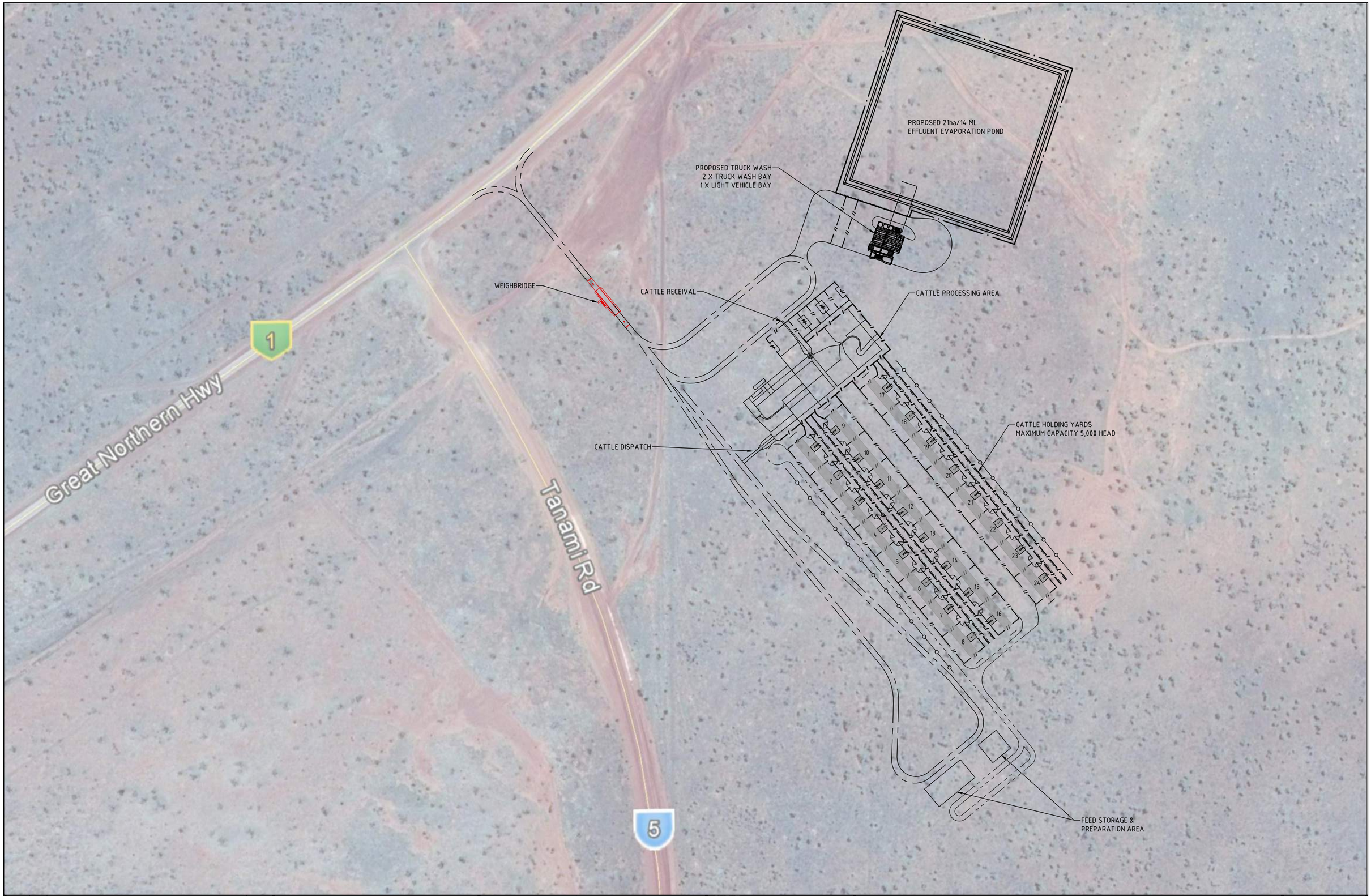
Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean rainfall (mm)	159.8	143.5	82.9	21.6	12.9	5.2	6.1	2.1	4.4	17.9	39.5	83.9
Mean Max. Temp. (°C)	36.7	35.6	35.4	33.8	30	27.3	27.2	30.0	34.1	37.1	38.3	37.8
Mean Min. Temp. (°C)	24.3	23.7	22.8	20.4	16.8	13.7	12.6	14.8	19.0	22.7	24.5	24.7
Mean Evaporation (mm)	273.9	220.1	246.1	238.4	204.3	172.8	188.6	232.9	284.8	338.2	326.9	309.1

6.2. Truck wash-down design plans

High level layout plans have been prepared for each of the truck wash facilities (Figure 9 to Figure 13). These indicate the proposed locations within each of the potential sites for truck wash infrastructure. The proposed facilities consist of the infrastructure described in Section 3, including locations of proposed wastewater treatment and evaporation ponds.
Plans showing the dimensions of the heavy and light vehicle truck washes in more detail are provided in Appendix C.

Plans showing the dimensions of the truck washes including quarantine yards for the Halls Creek sites are provided in Appendix D.

Appendix E contains plans showing the typical layout of the holding yard pens in more detail and a typical cross section then the holding yard facility.



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TOOWOOMBA, QLD 4350
PH: (07) 4632 8230

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PART OF O2UDP

DESIGNED	TCG	APPROVED	DATE
DRAWN	TCG		
CHECKED	DATE	SCALE	0 30 60 90m
DATE	13/04/2017	SCALE 1:1500 (A1)	

CLIENT
KIMBERLEY PILBARA
CATTLEMAN'S ASSOCIATION

PROJECT: TRUCK WASH DOWN FEASIBILITY
LOCATION: BROOME & HALLS CREEK, WA
SHEET TITLE: HALLS CREEK SITE 1 - TANAMI ROAD

JOB CODE: 17TOO1117
SHEET NUMBER: FIG09
REV: A

FORM E027
10 AUG 2006

NOTES:

1. EXISTING FACILITY FEATURES MAY HAVE BEEN DIGITISED FROM PLANS OR AERIAL PHOTOGRAPHS AND ACCURACY IS LIMITED.
2. IMAGE SOURCED FROM GOOGLE EARTH PRO™.

PROPOSED YARDS (7080 Head @ 400kg 3.2m² per head)

Proposed 21ha/14ML Effluent Evaporation Pond

EXISTING YARDS (920 Head @ 400kg 3.2m² per head)

PROPOSED HV & LV WASHDOWN FACILITY

Duncan Rd

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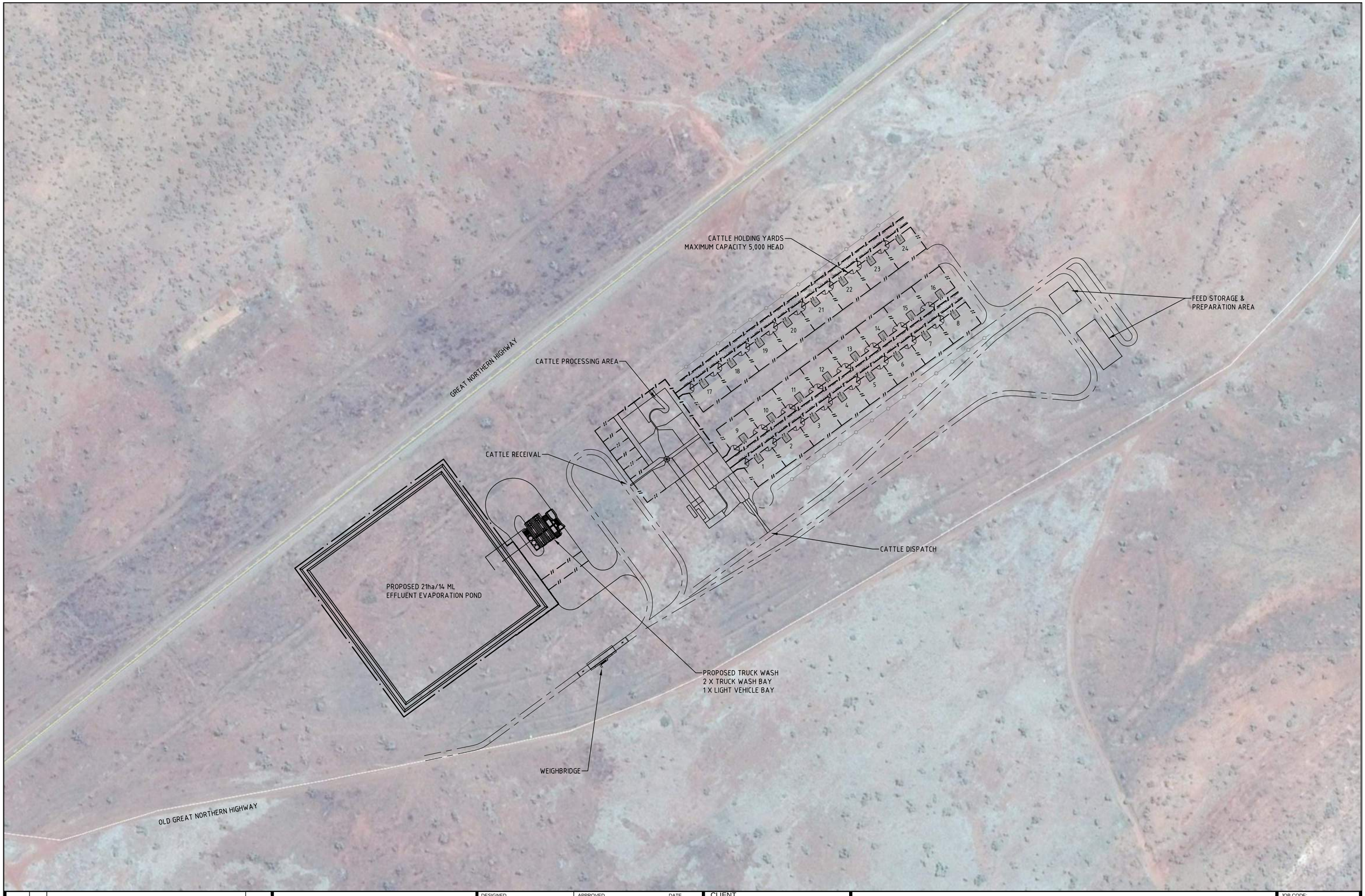
KIMBERLEY PILBARA CATTLEMAN'S ASSOCIATION

PROJECT: TRUCK WASH DOWN FEASIBILITY
LOCATION: BROOME & HALLS CREEK, WA
SHEET TITLE: HALLS CREEK SITE 2 - OLD DIP

JOB CODE: 17TOO1117
SHEET NUMBER: FIG10
REV: A

FORM E027 10 AUG 2006



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CHECKED / DATE		SCALE	0 30 60 90m
DATE	13/04/2017	SCALE 1:1500 (A1)	

CLIENT
KIMBERLEY PILBARA
CATTLEMAN'S ASSOCIATION

PROJECT: TRUCK WASH DOWN FEASIBILITY
LOCATION: BROOME & HALLS CREEK, WA
SHEET TITLE: HALLS CREEK - SITE 3 OLD DUMP

JOB CODE: 17TOO1117
SHEET NUMBER: FIG11
REV: A

FORM E027 10 AUG 2006

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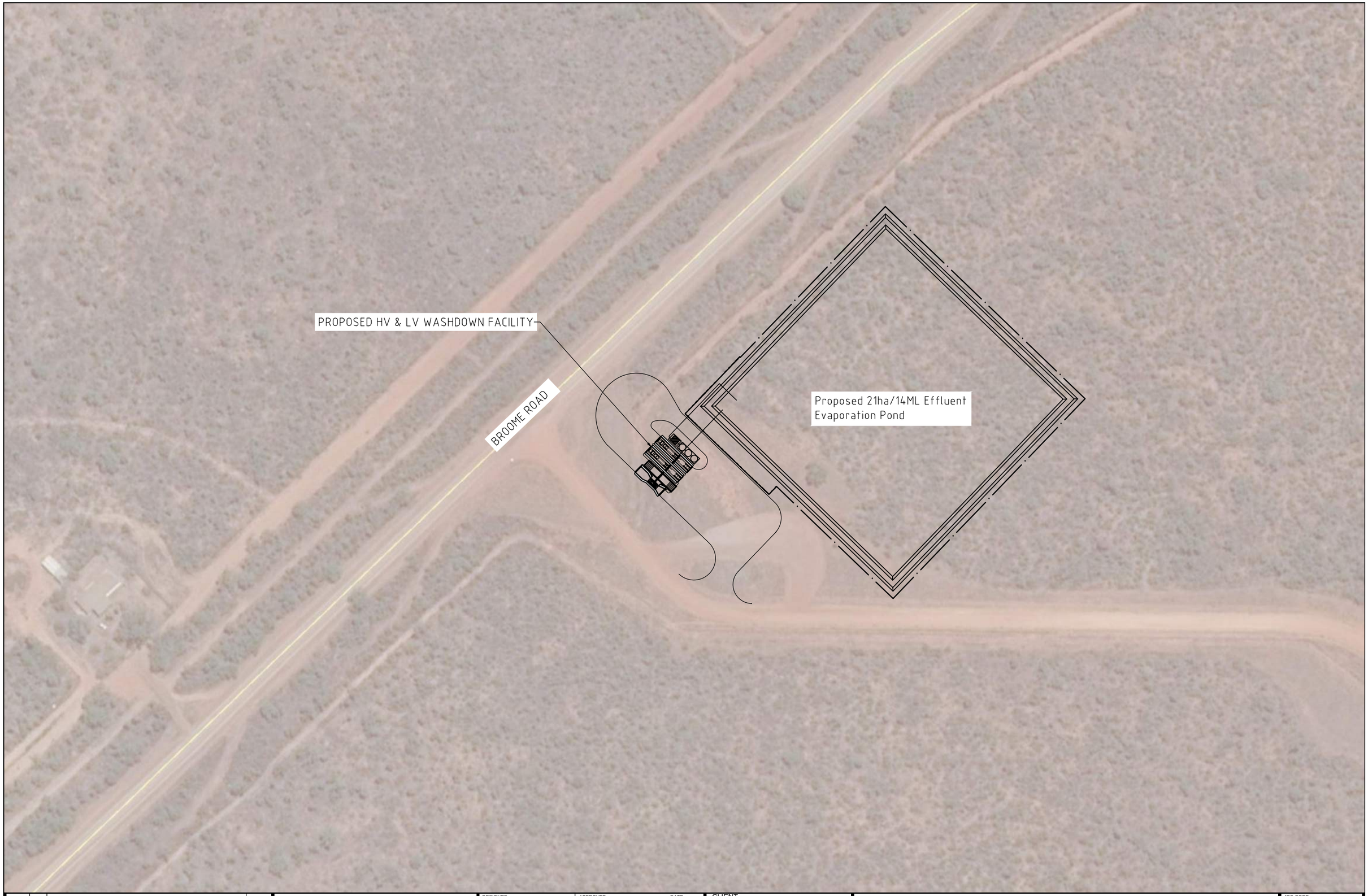
KIMBERLEY PILBARA
CATTLEMAN'S ASSOCIATION

PROJECT TRUCK WASH DOWN FEASIBILITY
LOCATION BROOME & HALLS CREEK, WA
SHEET TITLE ROEBUCK PLAINS YARDS TRUCK WASHDOWN

JOB CODE: 17TOO1117
SHEET NUMBER: FIG12
REV: A

FORM E027
10 AUG 2006



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CHECKED	DATE	SCALE	
DATE 13/04/2017		SCALE 1:1000 (A1)	

CLIENT
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CATTLEMAN'S ASSOCIATION

PROJECT TRUCK WASH DOWN FEASIBILITY
LOCATION BROOME & HALLS CREEK, WA
SHEET TITLE BROOME COMMON YARDS TRUCK WASHDOWN

JOB CODE: 17TOO1117
SHEET NUMBER: FIG13
REV: A

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6.3. Truck wash-down infrastructure requirements and costing

A detailed list of anticipated infrastructure and indicative costs required for the truck wash-down is provided in Appendix A and summarised in Table 12. These costs are based on a similar facility in eastern Australia and have been adjusted for anticipated sizing requirements for the Broome and Halls Creek facilities. The costs are indicative only and will be refined once the specific details associated with each potential location are identified.

Table 12: Indicative costs of wash-down facility infrastructure. Note that costs are based on Queensland estimates and may be higher in remote Western Australia locations. Costs exclude GST.

Item description	Indicative cost
Preliminaries	$ 29,901.00
Evaporation pond	$ 79,130.00
Road pavement	$ 147,580.00
General	$ 73,400.00
Sedimentation pit	$ 73,428.00
Light vehicle – manual wash-down bay	$ 37,599.00
Two Heavy equipment wash-down bays	$ 147,440.00
Total	**$ 588,478.00**

6.4. Truck wash-down water management

6.4.1. Inflow volume

Water volume requirements for truck wash-down facilities depend on a range of parameters including throughput, wash-down capacity, truck size and wash durations. The volume of water required for the potential truck wash-down facilities in Broome and Halls Creek has been estimated to be approximately 22.5 ML per year based on the following assumptions:

- The truck wash-down facility includes 2 wash pads.
- The truck wash-down will be operational 260 days per year (5 days per week).
- Two road trains (three double-deck trailers) will be washed each day.
- Each truck wash takes 6 hours.
- Water use is approximately 7.2 kL per hour of clean down time (refer to Section 3.1).

6.4.2. Outflow disposal options

Water treatment, recycling, and re-use is likely to be an unviable option based on the high capital expenditure and ongoing maintenance costs associated with infrastructure. This is based on indicative capital costs for a unit capable of producing Class A water at a rate of 3.0 kL/hour being approximately $160,000. Furthermore, the two potential sites in Broome have adequate water supplies and do not need to re-use water as a water efficiency strategy. Whether this is the case in Halls Creek still needs to be confirmed.

Installation and maintenance costs related to disposal of effluent by irrigation is also likely to be cost-prohibitive for the truck wash-down facilities being proposed in this analysis. In eastern Australia, effluent irrigation is commonly used in similar facilities. These usually comprise a series of treatment ponds feeding effluent irrigation system and require labour, energy, land area suitable for irrigation and relatively high initial and ongoing capital input. They also generally require detailed soil and water modelling to determine appropriate irrigation rates and areas, as well as sophisticated crop selection to accommodate for climate, soil, and water variability.

Given that the annual average rainfall is far less than the annual average evaporation in both Broome and Halls Creek (refer to Section 7.1), an evaporation pond is a practical solution for disposing of contaminated water. The concept of an evaporation pond requires the pond to have a high surface area to storage ratio, which results in a large footprint.

6.5. Evaporation pond sizing

The required size of the evaporation ponds for the facilities was estimated using a water balance model, eWater SOURCE (SOURCE). SOURCE allows the user to configure a catchment area (i.e., the truck wash pad) and apply a water balance algorithm to calculate the runoff volume given area specific meteorological data. For this model, the Australian Water Balance Model (AWBM) was chosen as the most suitable algorithm, with meteorological data – daily rainfall and evaporation – sourced from Queensland Government's SILO climate data website, www.longpaddock.qld.gov.au, which interpolates historical meteorological data from surrounding Bureau of Meteorology weather stations. SOURCE was then used to combine the calculated outflow from the catchment and the outflow from the truck-wash water use and add this to a storage model. The storage model also incorporates meteorological inflows and outflows affecting the storage itself, that is, rainfall directly onto the storage area and evaporation removing water from the storage. The storage was sized to achieve a 20 year ARI, that is pond overtopping events are limited to a 20 year average recurrence interval. The modelling determined that the required size for the evaporation ponds at all potential sites would be 145 m x 145 m at Crest Level. Rectangular configurations are also possible so long as the same surface area is achieved. Evaporation ponds have been included in the plans presented in Figure 9 to Figure 13.

The evaporation pond design has been based on a design assumptions of 6 hours of constant use by both bays. If the truck wash is required to wash at an extreme rate of 24 hours of constant use by both bays, so that 8 - 10 trucks could be washed in 24 hours, the evaporation pond would require additional hydrological modeling and an increased storage capacity.

6.6. Halls Creek quarantine yard infrastructure requirements and costing

The Halls Creek Truck Wash-Down Facility is required to be built in association with quarantine yards. This study assumes that the holding yards should have a capacity to hold 5,000 head of cattle. High level layout plans have been prepared for the holding yard facilities and these are included in Figure 9 to Figure 11.

Plans showing dimensions of the holding yards are included in Appendix D. These indicate the proposed locations within the site for holding yard infrastructure and the truck wash facilities. Specific effluent management has not been included in the existing facility or the expansion design of the proposed holding yards. The primary reason for this is that the facilities are only to be operated during the dry season and potential runoff is not expected to be transported offsite, nor is it expected to have significant impacts downstream. It is proposed that run-off from the holding yards would be directed into the co-located truck wash evaporation pond.

A detailed list of anticipated infrastructure and indicative costs required for the truck wash-down is provided in Appendix A and summarised in Table 13. These costs are based on a similar facility in eastern Australia and have been adjusted for anticipated sizing requirements for the Broome and Halls Creek facilities. The costs are indicative only and will be refined once the specific details associated with each potential location are identified.

Table 13: Indicative costs of holding yard facility infrastructure. Costs exclude GST.

Item description	Indicative cost
Site preparation	$ 51,025.00
Bulk earthworks	$ 36,550.00
Road infrastructure	$ 128,705.00
Yard component – working centre	$ 674,261.00
Yard component – feed yard	$ 593,926.00
Water supply	$ 120,720 .00
Associated infrastructure	$ 168,475.00
Onsite equipment	$ 670,000.00
Facility licencing	$ 21,700.00
Detailed design	$ 30,534.00
Contingency	$ 249,601.00
Total	**$ 2,745,616.00**

7. Cost benefit Analysis

Cost Benefit Analysis (CBA) is a structured way of analysing a decision, to determine objectively whether it is the best use of the available funds and resources. This is done by converting all the costs and benefits back to the same unit (dollars). CBA is a recognised methodology commonly used by governments and private industry to analyse investment decisions and has been extensively applied to analyse investments in biosecurity prevention and containment measures (Kompas 2017).

To account for future flows of costs and benefits which occur over differing time periods all costs and benefits are typically discounted back to present values. The rate used to discount values may vary but is usually based on a conservative estimate of the cost of capital (i.e commercial interest rates). For the purposes of this study the base discount rate used is 6% with sensitivity analysis conducted above and below that rate.

By discounting these values the 'Net Present Value' (NPV) can be calculated. The NPV is a robust indicator that can be used to determine both whether or not an investment is likely to return a positive outcome and to rank alternative projects.

In many investment decisions, there are both public and private costs and benefits to be considered. In this case the private costs and benefits will accrue to the owner/operator of the truck wash and quarantine yards, while public costs and benefits may impact on the broader industry. Some components beneficial to the owner/operator represent a cost to industry (i.e., the fee for washing trucks). Other public benefits are difficult to quantify, such as the avoided losses from preventing weed incursions or preventing market lock outs. Where possible, estimates have been made of these costs and benefits, However the assumptions made should be carefully noted.

On this basis, the costs and benefits are considered from the perspective of both a private operator running these facilities and the WA pastoral industry.

Three scenarios are considered as outlined in Table 14. Detailed assumptions for each scenario are provided in the following sections.

Table 14: Truck wash investment options

Scenario	Usage	Industry Benefits
Construct wash down facility at Halls Creek **only**	Require only trucks entering via Duncan/Tanami to wash out.	Weed incursion prevention
Construct wash down facility at Broome **only**	Require trucks arriving from NT via Duncan/Tanami to wash down plus all trucks to wash between each live export shipment.	Benefit is some weed incursion risk reduction plus prevention of market access loss.
Construct wash down facilities at both Halls Creek and Broome –	Trucks arriving from NT via Duncan/Tanami would wash at Halls Creek plus trucks loading export ships would wash in Broome between shipments.	Benefit would be weed incursion prevention plus prevention of market access loss.

It should be noted that these analyses are best used to evaluate the comparative merits of the possible alternative locations and to determine the relative benefit of constructing these facilities against the biosecurity risks they are designed to ameliorate. Further detailed budgeting would be required once a preferred site is chosen and the design finalised.

7.1. Assumptions

7.1.1. Construction cost

The estimated construction cost for truck wash down facilities at Halls Creek is $598,000 plus $115,000 for a holding yard facility to allow trucks to unload prior to washing. The holding yard was designed to hold and water approximately 3 road trains worth of cattle. If cattle were required to be fed, this would significantly increase the costs due to the additional space required, additional infrastructure for storing and handling hay and provision of labour to facilitate the feeding. These costs have not been modelled.

The construction cost includes:

Truck wash

- Preliminaries (mobilisation, surveying, site office and amenities, erosion and sediment control, insurance and fees etc).
- Evaporation pond (clearing and grubbing, strip topsoil, ground surface preparation, removal of unsuitable material, bulk earthworks, compaction, spread topsoil).
- Road pavement (gravel, bitumen, concrete pipe).
- General (water tanks, supply and install crusher dust, concrete slab, drainage channel, pit, and pipe, height gauge).
- Heavy truck wash-down bay (excavate, crusher dust and concrete slab, concrete wall, drainage channel, pit, and pipe, gantry).
- Lighting towers

Holding yards

- Yard infrastructure to hold approximately 600 head including water troughs and loading ramps

It does not include:

- Water recycling.
- Perimeter security fence
- Land purchase or associated tenure change costs

As outlined in section 6.6 additional costs would be incurred for the construction of a quarantine yard alongside the truck wash at Halls Creek. Including the site preparation, infrastructure and facility licencing, these costs are estimated at approximately $2.7 million.

Quarantine yards and unloading yards are not required in Broome. For a truck wash only in Broome, the total construction costs are estimated at $598,000, including all the same elements as Halls Creek.

7.1.2. Annual usage - trucks

The feasibility of any user-pays facility is contingent primarily on the anticipated demand and use of the facility. For the Halls Creek and Broome truck washes, the forecast usage was estimated based on the following assumptions.

As discussed in section 2.2.2 a total of 19,720 head of cattle entered WA through Halls Creek between January and July 2015. If these numbers are assumed to be stable and consistent with the numbers expected in the

second part of the year, a total of approximately 34,000 could be expected on an annual basis. The weights of these animals vary depending on their intended market. Therefore, the number of trucks required to transport them will also vary. A summary of the truck loading densities and assumed number of animals per weight class is provided below.

All usage is estimated as the number of decks based on the assumption that it takes an hour to wash one deck. The majority of trucks using these facilities will be Type 2 road trains which are 6 deck units.

Table 15: Truck wash usage estimates

	No. head Jan – July 2015	No. head est'd total year	No. head/deck	No. decks
Duncan/Tanami direct to Broome for slaughter	3,442	5,901	24	246
Duncan/Tanami direct to Broome for export	2,125	3,643	34	107
Direct to Wyndham for export	9,594	16,447	34	484
Under other protocols – final destination on property	4,559	7,815	30	261
Total through HC	**19,720**	**33,806**		**1097**

The figures presented in Table 15 represent the total annual usage expected for a facility at Halls Creek.

In Broome, annual usage is estimated at:

- In the absence of a facility at Halls Creek trucks travelling to Broome via the Duncan and Tanami would also use the Broome facility. Estimated at 353 decks.
- If trucks are required to wash out between shipments, with 10 trucks per shipment, 35 ships per year, total of 350 trucks (equates to 2,100 decks)

Usage could increase if key operators chose to use the site on a regular, voluntary basis to extend the life of their crates. This usage is likely to vary considerably and the benefits are difficult to measure, hence usage not been modelled directly. As an indication however, if the major operator (who currently has 18 trucks operating) washed each truck per month, it would equate to an additional 1,296 decks per year.

Sensitivity analysis will be conducted to evaluate how these usage estimates would impact on feasibility.

Note that these estimates have been made based on the assumption that cattle from Queensland and the Northern Territory will continue to have access to Western Australia under updated Bovine Johnes Disease (BJD) protocols.

7.1.3. Annual usage – light vehicles

To optimise the efficiency of constructing and maintaining these facilities, one wash bay could be made to be suitable for light vehicles. Both the Duncan and Tanami roads are currently unsealed, but the Tanami in particular is becoming a popular tourist route. Providing facilities for tourists to wash vehicles either entering/exiting or within WA would further assist in controlling weed seed spread.

The most recent estimates available for the Halls Creek area indicate that, on average, approximately 18 tourist vehicles traverse the Tanami Track at the Halls Creek end each day (Cummins Economics 2011). These numbers would vary significantly over the year with almost zero tourists expected during the wet season. A conservative assumption would be that 300 vehicles per year may take advantage of the wash down facility. There are proposals in place to seal the Tanami track however no firm funding allocations or timelines have been made. In the event that the road is sealed, tourist numbers are expected to increase significantly. However, the portion choosing to use a wash down facility (if voluntary) is likely to decrease significantly.

There is already a car wash in Broome, however, access for caravans and large boats is difficult. The most likely users of a light vehicle wash down would be visitors to the Dampier Peninsula as the majority of roads are unsealed. A conservative estimate is made that, on average, 3 vehicles per day would use the facility.

The challenge with including access for light vehicles is how to charge these casual users. The proposed AvData system is based on users having a 'key' which is either linked to an account and billed monthly or prepaid for the desired numbers of minutes of use. Using the current AvData system, the only way to allow for casual users would be to provide a facility where users can purchase a prepaid key at a shop front (could be a shop, shire office or tourist information centre) during business hours. Providing a manned shopfront for the sole purpose of selling these keys would not be viable.

7.1.4. Variable operating costs

The two key operating costs of the wash down facilities are water and electricity. The proposed design includes two 3kilowatt pumps per site to deliver the required water quantity and pressure. Current electricity prices for north-west WA are 46.1185 cents per day connection charge and 30.3104 cents per kilowatt hour. These prices are used as a proxy for electricity costs in the scenarios in which a diesel generator is used. While generator costs are typically higher than mains power, in both cases, where a generator is possible, it will be shared with the other users of the site, thereby reducing the per unit cost.

Water costs will vary significantly depending on the source of water chosen and the operator of the site. In Broome, mains water is available at one site, which is estimated to be approximately $1,500 per year connection charge plus $2.256 per kilolitre.

7.1.5. Annual maintenance costs

Annual maintenance costs for the truck washes are expected to be minimal, requiring only cleaning out of sedimentation pits and minor general repairs. Assuming that the facility is unmanned, it is conservatively estimated that annual maintenance would be equivalent to 2% of construction costs, in round figures approximately $12,000.

7.1.6. User charges

Table 16: User charges for analysis

Component	Value	Comment
Construction costs		
Truck wash	$598,000	
Holding yards (Halls Creek only)	$115,000	Assumed to all occur in the first year
AvData	$3,000	
Truck wash variable operating costs		Based on use of mains power. Water supplied from bore & waste water treated in evaporation ponds
Water usage (kL/hr) 7.2		
Electricity usage KW/hr 3		
Electricity cost ($/KW) 0.303		
Truck wash annual maintenance costs	$12,000	2% of construction costs
Truck wash fees $/deck	$43.80	Based on a charge rate of $0.73/minute and 60 mins per deck
Usage (decks per year)		
Halls Creek	1,097	Based on figures outlined in Table 15
Broome	3,197	Assuming no facility at Halls Ck plus requirement to wash between shipments
Labour costs	$30/hr	Based on median award wage. Assumes 6 hours per truck plus an additional 2 hours for unloading and reloading at the Halls Creek facility.

The price charged for use of a truck wash will determine both its profitability to the operator and the willingness of industry to use the facility. Across Australia there are 109 truck wash facilities which use the AvData system. AvData charges 10% of the total billable amount as a service fee which covers all administration and billing. Current user charges for these facilities range from $0.20 per minute to $2.00 per minute. The average charge is $0.73 per minute which if a Type 2 road train is estimated to take 6 hours to wash would equate to $262.80 or between $1.29 and $1.83 per head depending on load densities. Sensitivity and break even analysis will be conducted on the user charge rate.

Assuming a light vehicle/caravan takes 20 minutes to wash the charge would be $14.60.

7.1.7. Public benefits

Identifying and quantifying the public costs and benefits of an investment decision such as this is complex and some factors may not be able to be quantified. In this instance, the majority of public benefits will accrue to industry, which is defined to include pastoralists, transport operators, agents, exporters and processors. The major benefit to industry is the risk mitigation service which is provided by these facilities. This can be measured by estimating the level of 'avoided loss' i.e. the loss of value to industry which would be caused by a weed or disease incursion and which could be avoided by construction of truck wash facilities.

The benefits of biosecurity risk mitigation also extend to the broader public through the avoided cost of future government expenditure on weed and disease management.

The avoided loss from preventing weed incursion can be measured by the estimated annual control costs for that weed. In Western Australia, one weed species, which could be introduced from the Northern Territory is gamba grass. While gamba grass is a palatable and productive cattle feed, it also has the potential to change fire regimes and impact negatively on biodiversity and socio-cultural values. The additional fire management costs of gamba grass have been estimated at over $6 million per year (Randall 2014).

The avoided losses from a livestock disease are potentially much higher than the cost of weed incursions, particularly if those losses were to extend to reduced market access. If an average ship carries 4,000 head of cattle, at an average weight of 350kg valued at $3/kg, plus $200/head handling costs, the average shipment is worth in the order of $5 million to the WA industry.

As stated in the assumptions, washing trucks between shipments is one potential use of these facilities. On this basis, if washing trucks prevented just one shipment per year from being rejected by an importing market, the avoided loss could be estimated as $5 million.

7.2. Private operator

This analysis just looks at whether the investment required to construct and operate a truck wash facility at Broome and/or Halls Creek provides sufficient returns to a private operator to justify the investment. Three scenarios are considered as outlined in Table 17.

Table 17: Truck wash scenarios

Scenario	Usage
Construct wash down facility at Halls Creek **only**	Trucks entering WA via Duncan/Tanami
Construct wash down facility at Broome **only**	Trucks arriving from NT via Duncan/Tanami plus all trucks washed between each live export shipment.
Construct wash down facilities at both Halls Creek and Broome –	Trucks arriving from NT via Duncan/Tanami would wash at Halls Creek plus trucks loading export ships would wash in Broome between shipments.

Halls Creek

The costs and revenue (benefits to the private operator) of a Halls Creek facility are shown in Table 18.

Table 18: Halls Creek facility base scenario

Component	Year 0	Years 1 -10
Construction costs		
Truck wash (including AvData)	$601,000	
Holding yards	$135,000	
Usage (decks per year)		1,097
Truck wash operating and maintenance costs		$20,692
Truck wash revenue ($0.73/minute)		$48,059

Based on the costs and benefits outlined above, based on an investment period of 10 years with a discount rate of 6% and no light vehicle usage, the NPV for the Halls Creek truck wash including holding yards would be -$534,574. To 'breakeven' over that period over 3000 decks would have to pass through the facility each year or, the user charge would have to increase to almost $2/minute which is much higher than the current equivalent charge at the Kununurra yards of $1.35/minute.

For the transport operator, at $2 per minute, the total cost for a road train would be much less than having to travel an additional 700km round trip to Kununurra therefore would still be preferable. However, the costs of truck washing are likely to be passed back to the vendor, either in the form of a higher freight bill which may make markets in Western Australia less attractive or simply prevent Western Australian buyers from sourcing interstate cattle.

Changing the investment period to 20 years or varying the assumed interest (discount) rate does not change the viability of the investment for the operator.

If, however, the construction costs were covered by public funds and the private operator were only responsible for the operating costs, the investment would become viable from a private perspective. Under this scenario a minimum of 400 decks @$0.73/minute would need to be washed each year.

Table 19: Halls Creek NPV without construction costs

Investment period	Discount rate		
	4%	6%	8%
10 years	$387,979	$352,065	$320,972
20 years	$628,253	$533,741	$459,382

The annual maintenance costs for the facility were originally estimated at 2% of capital costs. Given the remote location, these costs might be higher than normal. If maintenance costs are higher than anticipated the minimum charge rate will need to increase further – see Table 20.

Table 20: Sensitivity on maintenance cost – Halls Creek

	Annual maintenance costs (% of capital)		
	2% ($14,720)	5% ($36,800)	10% ($73,600)
Break-even charge rate ($/minute)	$1.96	$2.33	$2.95

Broome

The costs and revenue (benefits to the private operator) of a Broome facility are shown in Table 21.

Table 21: Broome base scenario

Component	Year 0	Years 1 -10
Construction costs		
Truck wash	$601,000	
Usage (decks per year)		3,197
Truck wash operating and maintenance costs		$29,098
Truck wash revenue ($0.73/minute)		$140,039

Based on the costs and benefits outlined above, based on an investment period of 10 years with a discount rate of 6% and no light vehicle usage, the NPV for the Broome truck wash would be $215,598. To 'breakeven' over that period a minimum of 2,436 decks would have to be washed each year.

Increasing the investment period to 20 years increases the viability of this investment, but varying the assumed interest (discount) rate does not have a significant impact.

Table 22: Broome sensitivity on investment period and discount rate

Investment period	Discount rate		
	4%	6%	8%
10 years	$298,744	$215,457	$143,352
20 years	$855,952	$636,774	$464,330

As for Halls Creek, the maintenance costs for Broome were originally estimated at 2% of capital costs. If maintenance costs increased to 5% of capital costs, net returns would still be positive at a charge rate of $0.73 per minute. However, if maintenance costs were 10% of capital costs, the minimum charge rate would need to increase to $0.84 per minute just to breakeven.

Table 23: Sensitivity on maintenance cost - Broome

	Annual maintenance costs (% of capital)		
	2% ($12,020)	5% ($30,050)	10% ($60,100)
Break-even charge rate ($/minute)	$0.56	$0.66	$0.84

Halls Creek and Broome

If one private entity were to construct and operate both facilities, the estimated costs and revenues would be as follows.

Table 24: Estimated costs and revenues for private construction of both facilities

Component	Year 0	Years 1 -10
Construction costs		
Truck wash	$1,337,000	
Usage (decks per year)		3,197
Truck wash operating and maintenance costs		$43,496
Truck wash revenue ($0.73/minute)		$140,039

Under these assumptions and based on an investment period of 10 years with a discount rate of 6% the NPV would be -$534,460. To 'breakeven' over that period the user charge would have to increase to $1.15/minute.

In this scenario, if the investment 'life' of the facilities was expected to be 20 years rather than 10, the investment becomes marginally viable with a slight reduction in interest rates.

Table 25: Broome and Halls Creek combined NPV

Investment period	Discount rate		
	4%	6%	8%
10 years	-$451,428	-$534,460	-$606,318
20 years	$105,880	-$113,068	-$285,281

Based on these results, the likely only viable investment for a purely private operator would be the facility in Broome and only then if a minimum level of use could be guaranteed. If a facility in Halls Creek was deemed necessary, it is likely that public funds would be necessary to cover the construction costs.

As for the individual scenarios, an increase in the annual maintenance cost would require a corresponding increase in the minimum charge rate in order to break-even.

Table 26: Sensitivity on maintenance cost – Halls Creek & Broome

	Annual maintenance costs (% of capital)		
	2% ($26,740)	5% ($30,050)	10% ($60,100)
Break-even charge rate ($/minute)	$1.15	$1.18	$1.28

7.3. Public perspective

As outlined in section 7.1.7, the major beneficiary of Kimberley truck wash facilities is the WA pastoral industry. The public benefits provided by biosecurity risk mitigation also extend to the broader WA population and economy through improved tourism, environmental and socio-cultural values.

In this business case, the costs and benefits from an industry perspective are considered. The same 3 scenarios as the previous section are also considered.

The ongoing cost to industry would be the cost of using the washing facility plus the additional labour cost for drivers undertaking the wash down process. The award wage for long distance truck drivers is between $28 and $32 per hour, therefore, a median value of $30 per hour is used to account for the time taken to wash. For the Halls Creek location, an additional 2 hours is allowed to account for unloading and reloading time.

The user charges would be used to cover the operating costs of the facility and additional benefits are provided by the avoided loss which varies for each scenario.

Halls Creek

The relevant costs and benefits of constructing a facility at Halls Creek only are shown below. In this scenario, the avoided loss is based on the assumed cost of controlling one additional weed (gamba grass) with an assumed likelihood of incursion of 1% per year.

Table 27 Halls Creek Public model assumptions

Component	Year 0	Years 1 -10
Construction costs		
Truck wash	$598,000	
Holding yards	$135,000	
Usage (decks per year)		3,197
Truck wash operating and maintenance costs		$41,246
Usage costs (per minute charge + labour)		$112,133
Truck wash revenue ($0.73/minute)		$48,059
Avoided loss		$60,000

As shown in Table 28, the Halls Creek facility is not viable even when conservative avoided loss benefits are considered. This result is important as it demonstrates that, while public funding of the construction cost would make the investment attractive to a private operator, the expected avoided loss benefits are insufficient to justify the investment from the public perspective. The avoided lost benefits would have to increase to between $200,000 and $250,000 to make the net returns to the public funds positive.

Table 28: Halls Creek NPV - Public model

Investment period	Discount rate		
	4%	6%	8%
10 years	-$770,871	-$767,643	-$764,849
20 years	-$792,467	-$783,972	-$777,289

Broome

The relevant costs and benefits of constructing a facility at Broome only are shown below. In this scenario, the avoided loss is based on a minor amount of weed prevention (10% of what would be provided by the Halls Creek facility) plus ensuring full market access is maintained, which is measured by the value of one live export shipment.

Table 29 Broome Public model assumptions

Component	Year 0	Years 1 -10
Construction costs		
Truck wash	$598,000	
Usage (decks per year)		3,197
Truck wash operating and maintenance costs		$20,409
Usage costs (per minute charge + labour)		$235,957
Truck wash revenue ($0.73/minute)		$140,039
Avoided loss		$5,006,000

Based on the above assumptions, the viability of the Broome facility is robust under varying discount rates. Even if the avoided loss benefits were only 5% of the original assumption, the NPV would still be positive.

Table 30 Broome NPV Public model

Investment period	Discount rate		
	4%	6%	8%
10 years	$38,991,307	$35,326,608	$32,153,928
20 years	$63,508,799	$53,864,801	$46,277,197

Halls Creek and Broome

The combined costs and benefits of constructing facilities at both Halls Creek and Broome are shown below. In this scenario, the avoided loss is both the disease risk mitigation which would be achieved at Broome and the weed risk reduction which would be achieved at Halls Creek.

Table 31 Dual facility public model assumptions

Component	Year 0	Years 1 -10
Construction costs		
Truck wash	$1,337,000	
Holding yards	$135,000	
Usage (decks per year)		3,197
Truck wash operating and maintenance costs		$41,246
Usage costs (per minute charge + labour)		$246,929
Truck wash revenue ($0.73/minute)		$140,039
Avoided loss		$5,060,000

As shown in the Table below, from an industry perspective, the avoided loss benefits are more than sufficient to cover the costs of constructing and operating both truck wash facilities. However, the additional costs of constructing two facilities means that the result is not as robust under varying confidence in the magnitude of avoided loss benefits. If these benefits were to be only 10% of the original assumption, the result remains positive. However, if the benefits were only 5% of the original, the result becomes negative.

Table 32 Dual facility public model NPV

Investment period	Discount rate		
	4%	6%	8%
10 years	$38,589,599	$34,892,814	$31,692,379
20 years	$63,323,219	$53,594,428	$45,940,150

7.4. Quarantine yards CBA

Construction of quarantine yards in Halls Creek is estimated to cost in the order of $2.7 million.

There are two possible uses for quarantine yards at Halls Creek, firstly as a replacement for the yards at Wyndham or, alternatively as holding yards if there was to be a disease outbreak and cattle in transit needed to be quarantined.

While the existing yards at Wyndham have some challenges associated with run-off during the wet season, there are additional privately-operated yards not far out of Wyndham and the yards at Kununurra are also quarantine accredited. Further expansion of these facilities will be driven by market demand. Using Halls Creek as an export depot would be logistically infeasible due to the number of trucks that would be required to transport cattle from the yards to the ship in a reasonable amount of time.

The probability of disease outbreak occurring is unknown and the likely number of cattle needing to be held would depend entirely on the timing of the outbreak. Since these values are almost impossible to estimate, the analysis has been done on a 'break-even' basis to determine what the minimum level of benefits would have to be to justify the investment.

From an industry perspective, the avoided loss benefits would have to be at least $400,000 per year to make the initial construction investment viable. This allows for only minimal maintenance costs while the yards are not in use and does not account for the costs of handling and feeding cattle while in use.

8. Conclusion & Recommendations

This report presents preliminary findings of a feasibility assessment into options for a truck wash facility in Broome and a truck wash facility combined with quarantine yards in Halls Creek. Five site options were identified; two in Broome and three in Halls Creek, which all appear to be suitable locations based on preliminary findings.

Table 33 lists the advantages and disadvantages of locating the truck wash and holding yards at the sites assessed in this analysis.

The results of cost benefit analysis for both sites indicate that there are net benefits to both a private operator and the industry of constructing a facility at Broome. The viability of constructing a facility at Halls Creek alone is challenging due to the lower expected throughput and value of the biosecurity risk mitigation which are likely to be insufficient to cover the cost of construction and operation. Constructing facilities at both sites is feasible if the assumed avoided loss benefits for the Broome site are considered accurate.

Table 33: Advantages and disadvantages of locating the truck wash at the sites assessed in Broome and Halls Creek.

Site	Advantages	Disadvantages
Halls Creek		
Tanami Corner	• Ideal location on major highways • Access to mains power • Water available within 2.5 km • Staff available • Good soil and topography characteristics • Able to get s122 Non-pastoral lease if KEAC operate the truck wash • No environmental constraints identified through the desktop search	• Potential water yield is unknown and access is 1-2.45 km away, which may require expensive infrastructure to access • New water source would require water identification, infrastructure development, and potentially, a water licence under the *Rights in Water and Irrigation Act 1914* • While staff will be made available from KEAC, this workforce is not already existing at the site and may not be available 24 hours • Planning constraints include requirement to excise from pastoral lease and, if a third party are to operate the site, would need alternative lease arrangement • Limited site visibility for vehicles travelling from the west so would need to include safe truck turning considerations in the design • Need to construct evaporation pond
Old Dip Yards	• Ideal location on major highways • Existing infrastructure may be able to be used for the development • Access to mains power • Good soil and topography characteristics • Good line of sight for vehicles travelling from both directions	• Water supply needs to be determined • The site has existing dip yards that have not been used in a long time and site is overgrown. • Arsenic and other persistent chemicals from the old dip treatments may exist in the local environment • Potentially too close to the WWTP • Planning constraints include requirement to excise from pastoral lease and would likely need alternative lease arrangement • New water source would require water identification, infrastructure development, and potentially, a water licence under the *Rights in Water and Irrigation Act 1914* • Need to construct evaporation pond
Shire Owned Site	• Ideal location on major highways • Access to mains power • Good soil and topography characteristics • Good line of site for vehicles travelling from both directions • Shire has expressed interest in operating the facility, which would potentially alleviate some planning constraints • Located near the Shire Waste Management Facility	• New water source (if required) would require water identification, infrastructure development, and potentially, a water licence under the *Rights in Water and Irrigation Act 1914* • If a third party are to operate the site, would need alternative lease arrangement • The site is zoned for future industrial use under the *Halls Creek Town Planning Strategy, 2016*, which will come into effect within approximately 2-4 years. This would allow development of the truck wash at the site without the requirement for Council approval. However, animal husbandry is not a permitted use on the proposed industrial zone. Therefore, if a quarantine yard is proposed to be developed in association with the truck wash, this may need to be located on adjacent pastoral zoned land. This needs to be confirmed with Council. • Need to construct evaporation pond

	so access to staff from that facility • Possible access to mains power	
Broome		
Roebuck Plains	• Ideal location on major highways • Ample space • Good line of sight for vehicles travelling from both directions • Ample water available under existing water licence • Staff present at existing holding yards and available to work at both facilities 24 hours per day • Existing evaporation pond that may be large enough for the truck wash effleunt	• Requires clearing • No access to mains power – though the existing generator will likely be sufficient for the truck wash-down facility • Soil is marginal and a source of fill may need to be imported from elsewhere • Potential zoning issues unless the truck wash-down can be defined as "industry-rural". • Council approval likely required
Broome Common	• Ideal location on major highways • Existing bores could potentially be used • Access to mains water • Access to mains power • Proximal to existing trailer drop off site • Good line of site for vehicles travelling from both directions • Ample space	• Requires clearing • Water licence potentially required • Power connection required • Potential zoning issues unless the truck wash-down can be defined as "industry-rural". • Council approval likely required • Need to construct evaporation pond • Consultation with DAA required • Consultation with DER required
Broome Common	• Ideal location on major highways • Existing bores could potentially be used • Access to mains water • Access to mains power • Proximal to existing trailer drop off site • Good line of site for vehicles travelling from both directions • Ample space	• Requires clearing • Water licence potentially required • Power connection required • Potential zoning issues unless the truck wash-down can be defined as "industry-rural". • Council approval likely required • Need to construct evaporation pond • Consultation with DAA required • Consultation with DER required

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Appendix A Broome and Halls Creek truck wash-down facility cost estimate

Item No.	Description	Unit	Quantity	Rate	Amount	Total
1	**PRELIMINARIES**					**$29,901.00**
1.1	Mobilisation	Item	1			
1.2	Surveying & Set-out	Item	1			
1.3	Provision of site office & Amenities	Item	1			
1.4	Erosion & sediment control measures	Item	1			
1.5	Insurances & fees	Item	1			
1.6	Performance bonds (i.e. costs incurred in provision of Retention, security etc.)	Item	1			
1.7	Progressive and Final Cleanup and disposal of Rubbish & waste	Item	1			
1.8	Workplace Health and Safety requirements.	Item	1			
1.9	Compliance Testing	Item	1			
1.10	Accommodation	Item	1			
1.11	Any other item(s) shown on the drawings and/or specified or considered necessary for the completion of the works. (Tenderers to list items below)	Item	1			
2	**Evaporation Pond**					**$79,130.00**
2.1	Clearing and grubbing as required (Provisional Quantity)	ha	2.5	$1,000.00	$2,500.00	
2.2	Strip topsoil (100mm) & stockpile on site as directed by Superintendent.	m^3	2500	$2.50	$6,250.00	
2.3	Ground surface preparation to pond base, including compaction of the Subgrade, prior to placement of fill.	m^2	0	$1.00	$0.00	
2.4	Ground surface preparation to embankment, including compaction of the Subgrade, prior to placement of fill.	m^2	6600	$2.45	$16,170.00	
2.5	Removal of Unsuitable material at Subgrade level & replacement with selected fill material. (Provisional Quantity).	m^3	100	$5.00	$500.00	
2.6	Bulk Earthworks - Cut to fill, from within the pond area, including compaction etc.- to bank around retention pond	m^3	5000	$5.00	$25,000.00	
2.7	Bulk Earthworks - Cut to fill, from within the pond area, including compaction etc.- to Pavement area	m^3	0	$5.00	$0.00	
2.8	Bulk Earthworks - Cut to Spoil, to areas as indicated on drawings or as otherwise directed by Superintendent.	m^3	0	$4.00	$0.00	
2.9	Bulk Earthworks - From borrow pits, as indicated on drawings or as otherwise directed by Superintendent, including compaction.	m^3	0	$4.00	$0.00	
2.10	Compaction of 'Clay Liner" 300mm thick to floor & internal batters of pond below natural ground surface level, including ripping of existing material, addition of water as required & compaction of material to 98% RDD within +2 & -0% of Optimum Moisture Content.	m^2	18500	$1.50	$27,750.00	

Item No.	Description	Unit	Quantity	Rate	Amount	Total
2.11	Spread topsoil 100mm thick to batters as directed by Superintendent. (Provisional Quantity).	m^2	4800	$0.20	$960.00	
3	**ROAD PAVEMENT**					**$147,580.00**
3.1	Gravel pavement to trafficked areas 300mm thick CBR 65min	m^3	1921	$50.00	$96,050.00	
3.2	Bitumen sealing to trafficked areas 2 coat seal	m^2	6204	$7.50	$46,530.00	
3.3	450mm Dia RC pipe Class 4 with Precast concrete head walls to suit.	Item	1	$5,000.00	$5,000.00	
4	**GENERAL**					**$73,400.00**
4.1	23,000L Water tanks	Item	4	$4,100.00	$16,400.00	
4.2	4m x 3.6m shed on 150mm concrete slab	Item	1	$8,000.00	$8,000.00	
4.3	Supply & Install Pressure pump , suction & delivery lines (Provisional Sum)	Item	1	$15,000.00	$15,000.00	
4.4	Supply & install spray lines & nozzle	Item	1	$5,000.00	$5,000.00	
4.5	Supply & install Electrical Switchboard & submains from Service pole	Item	1	$10,000.00	$10,000.00	
4.6	Coin Box Kit	Item	1	$3,500.00	$3,500.00	
4.7	AvData System - including data modem	Item	1	$3,000.00	$3,000.00	
4.8	Air Compressor	Item	1	$12,500.00	$12,500.00	
6	**SEDIMENTATION PIT**					**$73,428.00**
6.1	Excavate to sub grade level	Item	1	$4,000.00	$4,000.00	
6.2	Supply & install crusher dust to underside of slab	Item	1	$1,000.00	$1,000.00	
6.3	200mm thick concrete slab on ground with 1 layer F92 mesh	m^2	92	$164.00	$15,088.00	
6.4	300 mm thick concrete wall up to 1500mm high with N12 bars at 200mm spacing	m^2	54	$620.00	$33,480.00	
6.5	150mm Dia PVC drainage pipe to retention basin up to 2.0m depth	lin m	80	$150.00	$12,000.00	
6.6	Stainless Steel screen at inlet to pipe	Item	2	$600.00	$1,200.00	
6.7	Monowills hand rails to edge of Sedimentation pit	lin m	38	$130.00	$4,940.00	
6.8	3.8m wide gates to sedimentation pit	Item	2	$860.00	$1,720.00	
7	**LIGHT VEHICLE - AUTOMATIC WASH DOWN BAY**					**$37,599.00**
7.1	Excavate to sub grade level	Item	1	$2,920.00	$2,920.00	
7.2	Supply & install crusher dust to underside of slab	Item	1	$500.00	$500.00	
7.3	150mm thick concrete slab on ground with 1 layer F82 mesh	m^2	146	$140.00	$20,440.00	
7.4	200 mm thick concrete wall up to 300mm high with N12 bars at 200mm spacing	lin m	23	$293.00	$6,739.00	
7.5	Supply & install drainage channel Webforge WS20 with Class C Galvanised steel grate	lin m	1	$300.00	$300.00	

Item No.	Description	Unit	Quantity	Rate	Amount	Total
7.6	Supply & install 600 x 600 drainage pit with steel grate Class C	Item	1	$600.00	$600.00	
7.7	150mm Dia PVC drainage pipe	lin m	2	$50.00	$100.00	
7.80	Height Gauge over entry to wash area	Item	2	$3,000.00	$6,000.00	
8	**HEAVY TRUCK WASHDOWN BAY**					**$147,440.00**
8.1	Excavate to sub grade level	Item	2	$3,200.00	$6,400.00	
8.2	Supply & install crusher dust to underside of slab	Item	2	$1,000.00	$2,000.00	
8.3	200mm thick concrete slab on ground with 1 layer F92 mesh	m²	225	$164.00	$36,900.00	
8.4	200 mm thick concrete wall up to 300mm high with N12 bars at 200mm spacing	lin m	100	$293.00	$29,300.00	
8.5	150mm thick concrete slab on ground with 1 layer F82 mesh	m²	76	$140.00	$10,640.00	
8.6	Supply & install drainage channel Webforge WS20 with Class C Galvanised steel grate	lin m	5	$300.00	$1,500.00	
8.7	Supply & install 600 x 600 drainage pit with steel grate Class C	Item	1	$600.00	$600.00	
8.8	150mm Dia PVC drainage pipe	lin m	2	$50.00	$100.00	
8.9	Gantry/mezzanine floor 3.5m high, 2.0m wide x 25.0m long, with safety rails, stairs x 2, made from grid steel.	Item	1	$60,000.00	$60,000.00	
9	**TOTAL**					**$588,478.00**

Item No	Description	Unit	Quantity	Rate Per Unit (Inc. Fuel) (GST Inc)	Fixed Total Price (Inc. Fuel) (GST Inc)
SECTION 1 - SITE PREPARATION					
1.1	Land clearing	ha	0.3	$ 600	$ 180
1.2	Facility fencing (fence)	lin.km	0.36	$ 6,650	$ 2,394
1.3	Facility fencing (end assembly and gates)	Item	6	$ 220	$ 1,320
1.4	High voltage power connection (3 phase)	lin.m	0	$ 90	$ -
1.5	25kva three phase transformer	Item	0	$ 30,000	$ -
1.6	Diesel Backup Generator (50 kva)	Item	0	$ 21,800	$ -
			SUB TOTAL		**$ 3,894**

SECTION 2 - BULK EARTHWORK		**Unit**	**Quantity**	**Rate**	**Fixed Price**
2.1	Site survey	Item	0	$ 5,000	$ -
2.2	Topsoil stripping	m2	2700	$ 2	$ 5,400
2.3	Ground compaction of insitu material	m2	2700	$ 2	$ 5,400
2.4	Bulk earthwork	m3	0	$ 8	$ -
			SUB TOTAL		**$ 10,800**

SECTION 3 - ROAD INFRASTRUCTURE		**Unit**	**Quantity**	**Rate**	**Fixed Price**
3.1	Main access road	m2	0	$ 38	$ -
3.2	Internal roads (inc. turning circles)	m2	0	$ 9	$ -
3.3	Staff parking area	m2	0	$ 8	$ -
3.4	Hardstand truck parking area (40m x 80m)	m2	0	$ 4	$ -
3.5	Entrance grid (8m wide 18t/axel)	Item	0	$ 16,250	$ -
3.6	B-double weighbridge	Item	0	$ 160,000	$ -
			SUB TOTAL		**$ -**

SECTION 4 - YARD COMPONENT - WORKING CENTRE		**Unit**	**Quantity**	**Rate**	**Fixed Price**
4.1	Crushes (Including auto drafting pneumatic controls)	Item	0	$ 47,841	$ -
4.2	Equipment	Item	1	$ 12,000	$ 12,000
4.3	Yard Components (gates, fences) Supply	Item	0	$ 253,594	$ -
4.4	Civil components (post hole digging and concrete)	Item	0	$ 170,579	$ -
4.5	Water troughs	Item	0	$ 992	$ -
4.6	Installation costs	Item	0	$ 235,032	$ -
4.7	Site costs (Hire, Job Fixed Costs Employee Costs (Accom, Travel, Food)	Item	0	$ 82,168	$ -
4.8	Freight	Item	0	$ 7,842	$ -
4.9	Administration	Item	0	$ 32,136	$ -
4.10	Shed over processing area	Item	0	$ 85,000	$ -
4.11	Shed over cattle exit area	Item	0	$ 85,000	$ -
4.12	Lighting tower poles	Item	0	$ 2,000	$ -
4.13	Electrical supply connection, and materials	Item	0	$ 84,000	$ -
			SUB TOTAL		**$ 12,000**

SECTION 5 - YARD COMPONENT - FEED YARDS		**Unit**	**Quantity**	**Rate**	**Fixed Price**
5.1	Yard Components (gates, fences) Supply	Item	0	$ 465,444	$ 46,544
5.2	Civil components (feed apron 100mm thick)	Item	0	$ 398,124	$ -
5.3	Civil components (post hole digging and concrete)	Item	0	$ 87,778	$ 8,778
5.4	Netpro Shade (7.5m wide)	Item	0	$ 640,000	$ -
5.5	Feed bunks (poly belt)	Item	0	$ 133,508	$ -
5.6	Water troughs	Item	3	$ 992	$ 2,976
5.7	Installation costs	Item	0	$ 414,278	$ 20,714
5.8	Site costs (Hire, Job Fixed Costs Employee Costs (Accom, Travel, Food)	Item	0	$ 147,954	$ -
5.9	Freight	Item	0	$ 29,929	$ -
5.10	Administration	Item	0	$ 25,171	$ -
			SUB TOTAL		**$ 79,012**

SECTION 6 - WATER SUPPLY		**Unit**	**Quantity**	**Rate**	**Fixed Price**
6.1	Drill groundwater bore - Main supply	lin. m	0	$ 200	$ -
6.2	Drill groundwater bore - Contingency measures	lin.m	0	$ 200	$ -
6.3	Bore pump x 2	Item	0	$ 4,000	$ -
6.4	1 x Tank for gravity feed to water troughs	Item	0	$ 20,000	$ -
6.5	2 x Backup storage tanks	Item	0	$ 20,000	$ -
6.6	2 x Pressure pump to pump water to sprinklers and bore if required	Item	0	$ 3,000	$ -
6.7	Water reticulation to facilities, troughs and dust sprinklers	lin.m	150	$ 40	$ 6,000
			SUB TOTAL		**$ 6,000**

SECTION 7 - EFFLUENT MANAGEMENT		**Unit**	**Quantity**	**Rate**	**Fixed Price**
7.1	Sewer line from troughs (100 mm uPVC)	lin.m	N/A	$ 80	$ -

7.2	Sedimentation basin	m3	N/A	$ 10	$ -
7.3	Sedimentation basin concrete entry	Item	N/A	$ 10,000	$ -
7.4	Sedimentation weir	Item	N/A	$ 20,000	$ -
7.5	Evaporation holding pond	m3	N/A	$ 10	$ -
7.6	Sedimentation basin and evaporation pond fence	lin.km	N/A	$ 6,650	$ -
7.7	Facility fencing (End assembly and gates)	Item	N/A	$ 220	$ -
			SUB TOTAL		**$ -**

SECTION 8 - ASSOCIATED INFRASTRUCUTRE		**Unit**	**Quantity**	**Rate**	**Fixed Price**
8.1	Commodity storage shed + mixing area (40m x 20m x 6.0m)	Item	0	$ 75,000	$ -
8.2	Commodity Storage Concrete Pad	m3	0	$ 300	$ -
8.3	Hay storage shed (20m x 20m x 6.0m)	Item	0	$ 50,000	$ -
8.4	Hay Storage Concrete Pad	m3	0	$ 300	$ -
8.5	Workshop shed with roller door (6m x 8m)	Item	0	$ 25,500	$ -
8.6	Workshop shed concrete pad	m3	0	$ 300	$ -
8.7	Office & administration donga with foyer, administration area, manager's office, kitchenette & ablution	Item	0	$ 82,300	$ -
8.8	Staff accommodation, kitchen area, dining room area & ablution	Item	N/A	$ 208,300	$ -
			SUB TOTAL		**$ -**

SECTION 9 - ONSITE EQUIPMENT		**Unit**	**Quantity**	**Rate**	**Fixed Price**
9.1	Mixer tractor	Item	0	$ 80,000	$ -
9.2	Mixer Wagon	Item	0	$ 150,000	$ -
9.3	Telehandler	Item	0	$ 170,000	$ -
9.4	Second Loader	Item	0	$ 70,000	$ -
9.5	Second tractor & feed wagon	Item	0	$ 100,000	$ -
9.6	Utes	Item	0	$ 60,000	$ -
9.7	Quad bikes	Item	0	$ 10,000	$ -
9.8	Front end loader	Item	0	$ 30,000	$ -
			SUB TOTAL		**$ -**

SECTION 10 - FACILITY LICENCING		**Unit**	**Quantity**	**Rate**	**Fixed Price**
10.1	Preparation of Development Application	Item	0	$ 15,000	$ -
10.2	Development Application advertising cost	Item	0	$ 500	$ -
10.3	Preparation of the Vegetation Clearing Application	Item	0	$ 5,000	$ -
10.4	Native Vegetation Clearing Permit	Item	0	$ 200	$ -
10.5	Environmental Protection Licence	Item	0	$ 1,000	$ -
10.6	Department of Agriculture Licence Fee	Item	0	$ -	$ -
			SUB TOTAL		**$ -**

SECTION 11 - DETAILED DESIGN		**Unit**	**Quantity**	**Rate**	**Fixed Price**
11.1	Detailed engineering design	Item	1	$ 0	$ 3,000
11.2	Bill of Quantities	Item	0	$ 6,000	$ -
			SUB TOTAL		**$ 3,000.00**

SECTION 12 - CONTINGENCY		**Unit**	**Quantity**	**Rate**	**Fixed Price**
12.1	Contingency (10%)	Item	0	$ -	$ -
			SUB TOTAL		**$ -**

SUMMARY OF COSTS	**COST (GST INC.)**
SECTION 1 - SITE PREPARATION	$ 3,894
SECTION 2 - BULK EARTHWORK	$ 10,800
SECTION 3 - ROAD INFRASTRUCTURE	$ -
SECTION 4 - YARD COMPONENT - WORKING CENTRE	$ 12,000
SECTION 5 - YARD COMPONENT - FEED YARDS	$ 79,012
SECTION 6 - WATER SUPPLY	$ 6,000
SECTION 7 - EFFLUENT MANAGEMENT	$ -
SECTION 8 - ASSOCIATED INFRASTRUCUTRE	$ -
SECTION 9 - ONSITE EQUIPMENT	$ -
SECTION 10 - FACILITY LICENCING	$ -
SECTION 11 - DETAILED DESIGN	$ 3,000
SECTION 12 - CONTINGENCY	$ -
TOTAL	**$ 114,706**

Item No	Description	Unit	Quantity	Rate Per Unit (Inc. Fuel) (GST Inc)	Fixed Total Price (Inc. Fuel) (GST Inc)
SECTION 1 - SITE PREPARATION					
1.1	Land clearing	ha	7.5	$ 600	$ 4,500
1.2	Facility fencing (fence)	lin.km	0.9	$ 6,650	$ 5,985
1.3	Facility fencing (end assembly and gates)	Item	7.5	$ 220	$ 1,650
1.4	High voltage power connection (3 phase)	lin.m	100	$ 90	$ 9,000
1.5	25kva three phase transformer	Item	0.5	$ 30,000	$ 15,000
1.6	Diesel Backup Generator (50 kva)	Item	0.5	$ 21,800	$ 10,900
			SUB TOTAL		**$ 47,035**

SECTION 2 - BULK EARTHWORK		**Unit**	**Quantity**	**Rate**	**Fixed Price**
2.1	Site survey	Item	0.5	$ 5,000	$ 2,500
2.2	Topsoil stripping	m2	42500	$ 1	$ 21,250
2.3	Ground compaction of insitu material	m2	25600	$ 1	$ 12,800
2.4	Bulk earthwork	m3	0	$ 8	$ -
			SUB TOTAL		**$ 36,550**

SECTION 3 - ROAD INFRASTRUCTURE		**Unit**	**Quantity**	**Rate**	**Fixed Price**
3.1	Main access road	m2	1600	$ 38	$ 60,800
3.2	Internal roads (inc. turning circles)	m2	4648	$ 9	$ 53,220
3.3	Staff parking area	m2	20	$ 8	$ 160
3.4	Hardstand truck parking area (40m x 80m)	m2	1600	$ 4	$ 6,400
3.5	Entrance grid (8m wide 18t/axel)	Item	1	$ 16,250	$ 8,125
3.6	B-double weighbridge	Item	0	$ 160,000	$ -
			SUB TOTAL		**$ 128,704.60**

SECTION 4 - YARD COMPONENT - WORKING CENTRE		**Unit**	**Quantity**	**Rate**	**Fixed Price**
4.1	Crushes (Including auto drafting pneumatic controls)	Item	1	$ 47,841	$ 47,841
4.2	Equipment	Item	1	$ 409,585	$ 204,793
4.3	Yard Components (gates, fences) Supply	Item	1	$ 253,594	$ 126,797
4.4	Civil components (post hole digging and concrete)	Item	1	$ 170,579	$ 85,289
4.5	Water troughs	Item	4	$ 992	$ 3,968
4.6	Installation costs	Item	1	$ 235,032	$ 117,516
4.7	Site costs (Hire, Job Fixed Costs Employee Costs (Accom, Travel, Food)	Item	0	$ 82,168	$ -
4.8	Freight	Item	1	$ 7,842	$ 3,921
4.9	Administration	Item	1	$ 32,136	$ 32,136
4.10	Shed over processing area	Item	0	$ 85,000	$ -
4.11	Shed over cattle exit area	Item	0	$ 85,000	$ -
4.12	Lighting tower poles	Item	5	$ 2,000	$ 10,000
4.13	Electrical supply connection, and materials	Item	1	$ 84,000	$ 42,000
			SUB TOTAL		**$ 674,261**

SECTION 5 - YARD COMPONENT - FEED YARDS		**Unit**	**Quantity**	**Rate**	**Fixed Price**
5.1	Yard Components (gates, fences) Supply	Item	1	$ 465,444	$ 232,722
5.2	Civil components (feed apron 100mm thick)	Item	0	$ 398,124	$ -
5.3	Civil components (post hole digging and concrete)	Item	1	$ 87,778	$ 43,889
5.4	Netpro Shade (7.5m wide)	Item	0	$ 640,000	$ -
5.5	Feed bunks (poly belt)	Item	1	$ 133,508	$ 66,754
5.6	Water troughs	Item	16	$ 992	$ 15,872
5.7	Installation costs	Item	1	$ 414,278	$ 207,139
5.8	Site costs (Hire, Job Fixed Costs Employee Costs (Accom, Travel, Food)	Item	0	$ 147,954	$ -
5.9	Freight	Item	1	$ 29,929	$ 14,965
5.10	Administration	Item	1	$ 25,171	$ 12,585
			SUB TOTAL		**$ 593,926**

SECTION 6 - WATER SUPPLY		**Unit**	**Quantity**	**Rate**	**Fixed Price**
6.1	Drill groundwater bore - Main supply	lin. m	10	$ 200	$ 2,000
6.2	Drill groundwater bore - Contingency measures	lin.m	10	$ 200	$ 2,000
6.3	Bore pump x 2	Item	1	$ 4,000	$ 4,000
6.4	1 x Tank for gravity feed to water troughs	Item	1	$ 20,000	$ 10,000
6.5	2 x Backup storage tanks	Item	1	$ 20,000	$ 20,000
6.6	2 x Pressure pump to pump water to sprinklers and bore if required	Item	1	$ 3,000	$ 3,000
6.7	Water reticulation to facilities, troughs and dust sprinklers	lin.m	1793	$ 40	$ 71,720
			SUB TOTAL		**$ 112,720**

SECTION 7 - EFFLUENT MANAGEMENT		Unit	Quantity	Rate	Fixed Price
7.1	Sewer line from troughs (100 mm uPVC)	lin.m	N/A	$ 80	$ -
7.2	Sedimentation basin	m3	N/A	$ 10	$ -
7.3	Sedimentation basin concrete entry	Item	N/A	$ 10,000	$ -
7.4	Sedimentation weir	Item	N/A	$ 20,000	$ -
7.5	Evaporation holding pond	m3	N/A	$ 10	$ -
7.6	Sedimentation basin and evaporation pond fence	lin.km	N/A	$ 6,650	$ -
7.7	Facility fencing (End assembly and gates)	Item	N/A	$ 220	$ -
			SUB TOTAL		**$ -**

SECTION 8 - ASSOCIATED INFRASTRUCUTRE		Unit	Quantity	Rate	Fixed Price
8.1	Commodity storage shed + mixing area (40m x 20m x 6.0m)	Item	1	$ 75,000	$ 56,250
8.2	Commodity Storage Concrete Pad	m3	0	$ 300	$ -
8.3	Hay storage shed (20m x 20m x 6.0m)	Item	1	$ 50,000	$ 25,000
8.4	Hay Storage Concrete Pad	m3	0	$ 300	$ -
8.5	Workshop shed with roller door (6m x 8m)	Item	1	$ 25,500	$ 25,500
8.6	Workshop shed concrete pad	m3	0	$ 300	$ -
8.7	Office & administration donga with foyer, administration area, manager's office, kitchenette & ablution	Item	1	$ 82,300	$ 61,725
8.8	Staff accommodation, kitchen area, dining room area & ablution	Item	N/A	$ 208,300	$ -
			SUB TOTAL		**$ 168,475**

SECTION 9 - ONSITE EQUIPMENT		Unit	Quantity	Rate	Fixed Price
9.1	Mixer tractor	Item	1	$ 80,000	$ 80,000
9.2	Mixer Wagon	Item	1	$ 150,000	$ 150,000
9.3	Telehandler	Item	1	$ 170,000	$ 170,000
9.4	Second Loader	Item	1	$ 70,000	$ 70,000
9.5	Second tractor & feed wagon	Item	1	$ 100,000	$ 100,000
9.6	Utes	Item	1	$ 60,000	$ 60,000
9.7	Quad bikes	Item	1	$ 10,000	$ 10,000
9.8	Front end loader	Item	1	$ 30,000	$ 30,000
			SUB TOTAL		**$ 670,000**

SECTION 10 - FACILITY LICENCING		Unit	Quantity	Rate	Fixed Price
10.1	Preparation of Development Application	Item	1	$ 15,000	$ 15,000
10.2	Development Application advertising cost	Item	1	$ 500	$ 500
10.3	Preparation of the Vegetation Clearing Application	Item	1	$ 5,000	$ 5,000
10.4	Native Vegetation Clearing Permit	Item	1	$ 200	$ 200
10.5	Environmental Protection Licence	Item	1	$ 1,000	$ 1,000
10.6	Department of Agriculture Licence Fee	Item	1	$ -	$ -
			SUB TOTAL		**$ 21,700**

SECTION 11 - DETAILED DESIGN		Unit	Quantity	Rate	Fixed Price
11.1	Detailed engineering design	Item	1	$ 0	$ 24,534
11.2	Bill of Quantities	Item	1	$ 6,000	$ 6,000
			SUB TOTAL		**$ 30,533.71**

SECTION 12 - CONTINGENCY		Unit	Quantity	Rate	Fixed Price
12.1	Detailed engineering design (10%)	Item	1	$ 248,390	$ 248,390
			SUB TOTAL		**$ 248,390**

SUMMARY OF COSTS	COST (GST INC.)
SECTION 1 - SITE PREPARATION	$ 47,035
SECTION 2 - BULK EARTHWORK	$ 36,550
SECTION 3 - ROAD INFRASTRUCTURE	$ 128,705
SECTION 4 - YARD COMPONENT - WORKING CENTRE	$ 674,261
SECTION 5 - YARD COMPONENT - FEED YARDS	$ 593,926
SECTION 6 - WATER SUPPLY	$ 112,720
SECTION 7 - EFFLUENT MANAGEMENT	$ -
SECTION 8 - ASSOCIATED INFRASTRUCUTRE	$ 168,475
SECTION 9 - ONSITE EQUIPMENT	$ 670,000
SECTION 10 - FACILITY LICENCING	$ 21,700
SECTION 11 - DETAILED DESIGN	$ 30,534
SECTION 12 - CONTINGENCY	$ 248,390

TOTAL	**$**	**2,732,295**

Appendix B Aboriginal Heritage Inquiry System Search Reports

Search Criteria

Other Heritage Place ID 30274

Disclaimer

The *Aboriginal Heritage Act 1972* preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Aboriginal Affairs by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at heritageenquiries@daa.wa.gov.au and we will make every effort to rectify it as soon as possible.

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Accuracy is shown as a code in brackets following the coordinates. Map coordinates (Latitude/Longitude and Easting/Northing) are based on the GDA 94 Datum. The Easting/Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '500000mE:Z50' means Easting=500000, Zone=50.

Terminology (NB that some terminology has varied over the life of the legislation)

Place ID/Site ID: This a unique ID assigned by the Department of Aboriginal Affairs to the place

Status:

- **Registered Site**: The place has been assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972*
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Origin Place ID: Used in conjuction with Status Reason to indicate which Registered Site this Place originates from.

Access and Restrictions:

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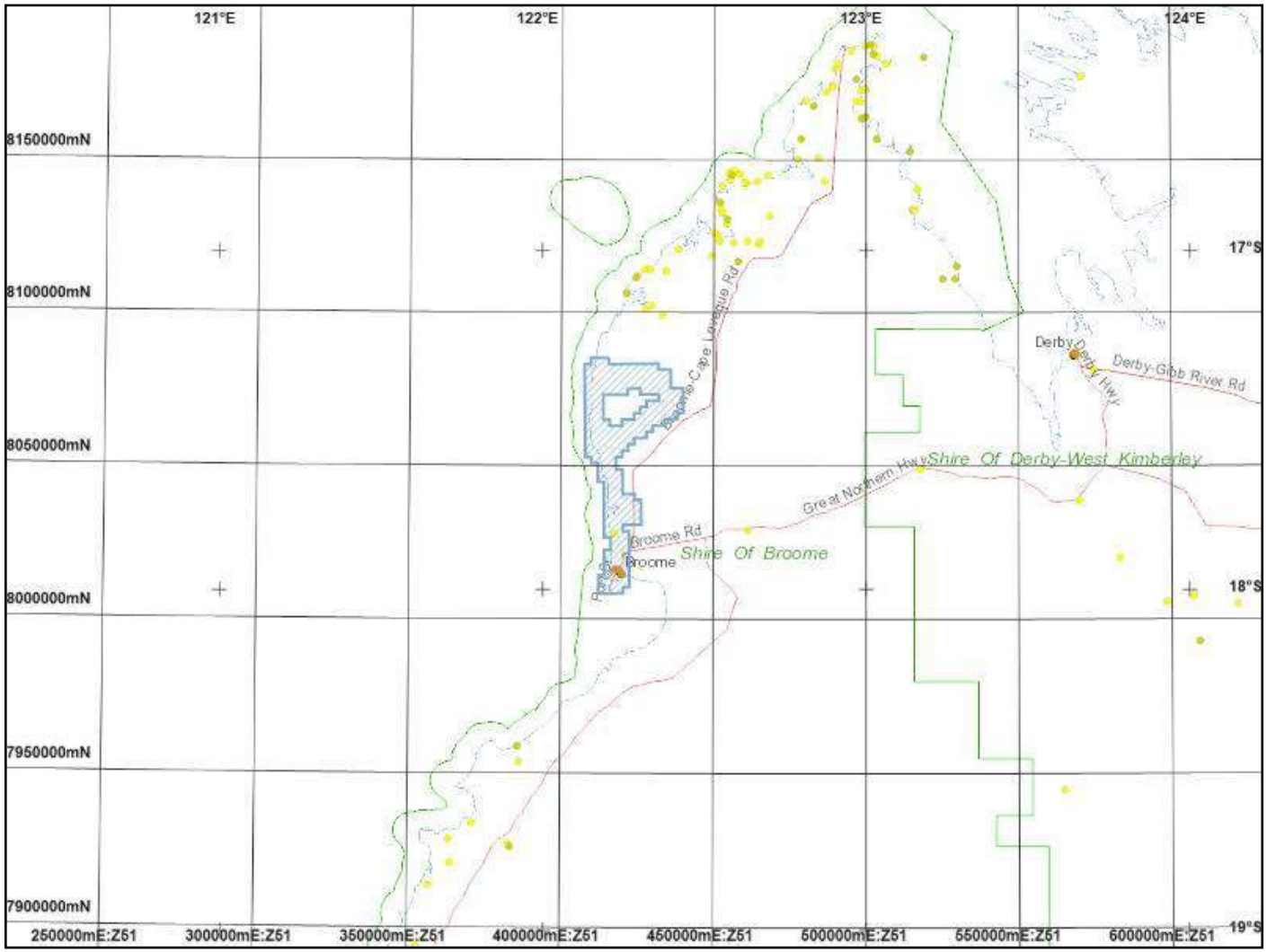
Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place. This has been replaced by the Place ID / Site ID.

List of Other Heritage Places with Map

ID	Place Name	File Restricted	Boundary Restricted	Restrictions	Status	Status Reason	Origin Place ID	Type	Knowledge Holders	Coordinates	Legacy ID
30274	LSC11	Yes	Yes	No Gender Restrictions	Contact DAA			Artefacts / Scatter, Ceremonial, Fish Trap, Midden / Scatter, Mythological, Quarry, Repository / Cache, Skeletal Material / Burial, Arch Deposit, Camp, Meeting Place, Named Place, Natural Feature, Ochre, Plant Resource, Shell, Water Source	*Registered Knowledge Holder names available from DAA	Not available when location is restricted	

Aboriginal Heritage Inquiry System

Aboriginal Sites Database



Legend

Selected Heritage Places

- Other Heritage Places
- Aboriginal Community Occupied
- Aboriginal Community Unoccupied
- Town
- Search Area

Search Criteria

Registered Aboriginal Site ID 13872

Disclaimer

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List of Registered Aboriginal Sites with Map

Site ID	Site Name	File Restricted	Boundary Restricted	Restrictions	Status	Status Reason	Origin Place ID	Site Type	Knowledge Holders	Coordinates	Legacy ID
13872	HALLS CREEK	No	No	No Gender Restrictions	Registered Site			Artefacts / Scatter		362734mE 7981866mN Zone 52 [Reliable]	K01250

Aboriginal Heritage Inquiry System

Aboriginal Sites Database

Legend

Selected Heritage Sites

- Registered Sites
- Aboriginal Community Occupied
- Aboriginal Community Unoccupied
- Town
- Search Area

Search Criteria

Registered Aboriginal Site IDs 16011, 16012, 16013, 16014, 16015

Disclaimer

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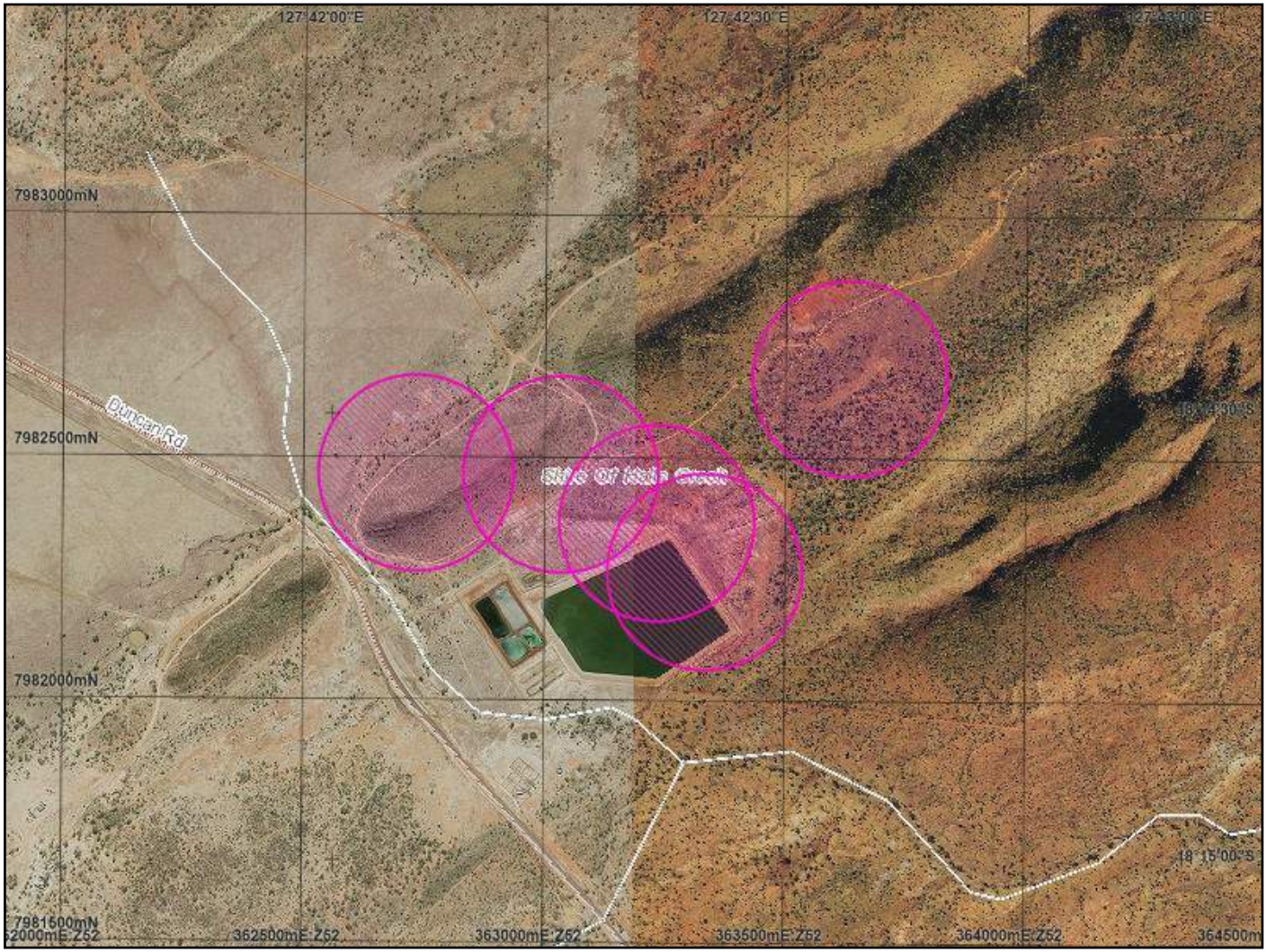
List of Registered Aboriginal Sites with Map

Site ID	Site Name	File Restricted	Boundary Restricted	Restrictions	Status	Status Reason	Origin Place ID	Site Type	Knowledge Holders	Coordinates	Legacy ID
16011	HALLS CREEK EAST 1	No	No	No Gender Restrictions	Registered Site			Artefacts / Scatter		362734mE 7982466mN Zone 52 [Reliable]	
16012	HALLS CREEK EAST 2	No	No	No Gender Restrictions	Registered Site			Artefacts / Scatter		363034mE 7982466mN Zone 52 [Reliable]	
16013	HALLS CREEK EAST 3	No	No	No Gender Restrictions	Registered Site			Artefacts / Scatter		363234mE 7982366mN Zone 52 [Reliable]	
16014	HALLS CREEK EAST 4	No	No	No Gender Restrictions	Registered Site			Artefacts / Scatter		363634mE 7982666mN Zone 52 [Reliable]	
16015	HALLS CREEK EAST 5	No	No	No Gender Restrictions	Registered Site			Artefacts / Scatter		363334mE 7982266mN Zone 52 [Reliable]	

Aboriginal Heritage Inquiry System

Aboriginal Sites Database



Legend

Selected Heritage Sites

- Registered Sites
- Aboriginal Community Occupied
- Aboriginal Community Unoccupied
- Town
- Search Area

Search Criteria

Registered Aboriginal Site ID 12617

Disclaimer

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List of Registered Aboriginal Sites with Map

Site ID	Site Name	File Restricted	Boundary Restricted	Restrictions	Status	Status Reason	Origin Place ID	Site Type	Knowledge Holders	Coordinates	Legacy ID
12617	RUBBISH TIP	No	No	No Gender Restrictions	Registered Site			Skeletal Material / Burial		357434mE 7983366mN Zone 52 [Reliable]	K02611

Aboriginal Heritage Inquiry System

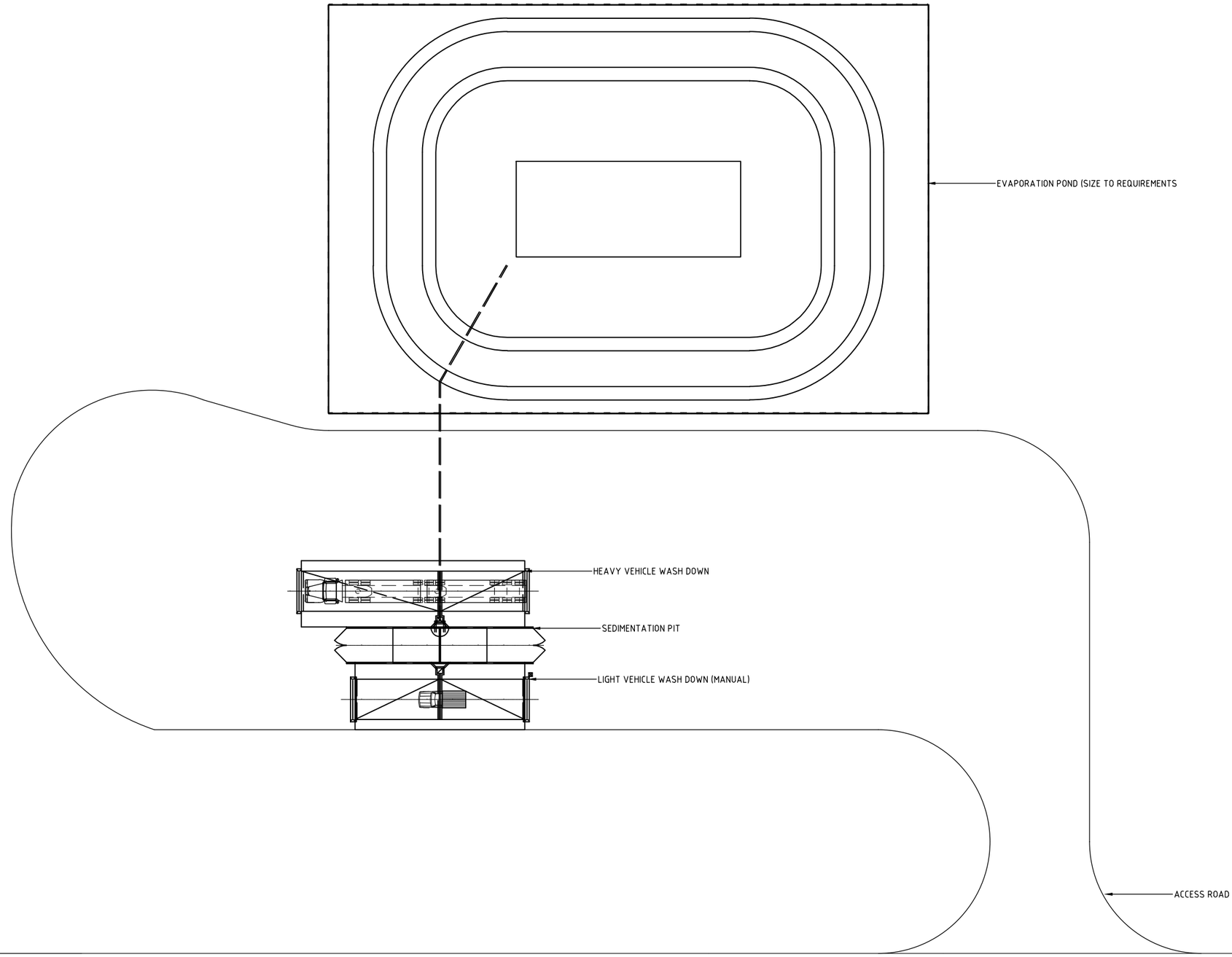
Aboriginal Sites Database

Legend

Selected Heritage Sites

- Registered Sites
- Aboriginal Community Occupied
- Aboriginal Community Unoccupied
- Town
- Search Area

Appendix C Overview and cross-sectional plans of heavy and light vehicle truck wash-down facilities



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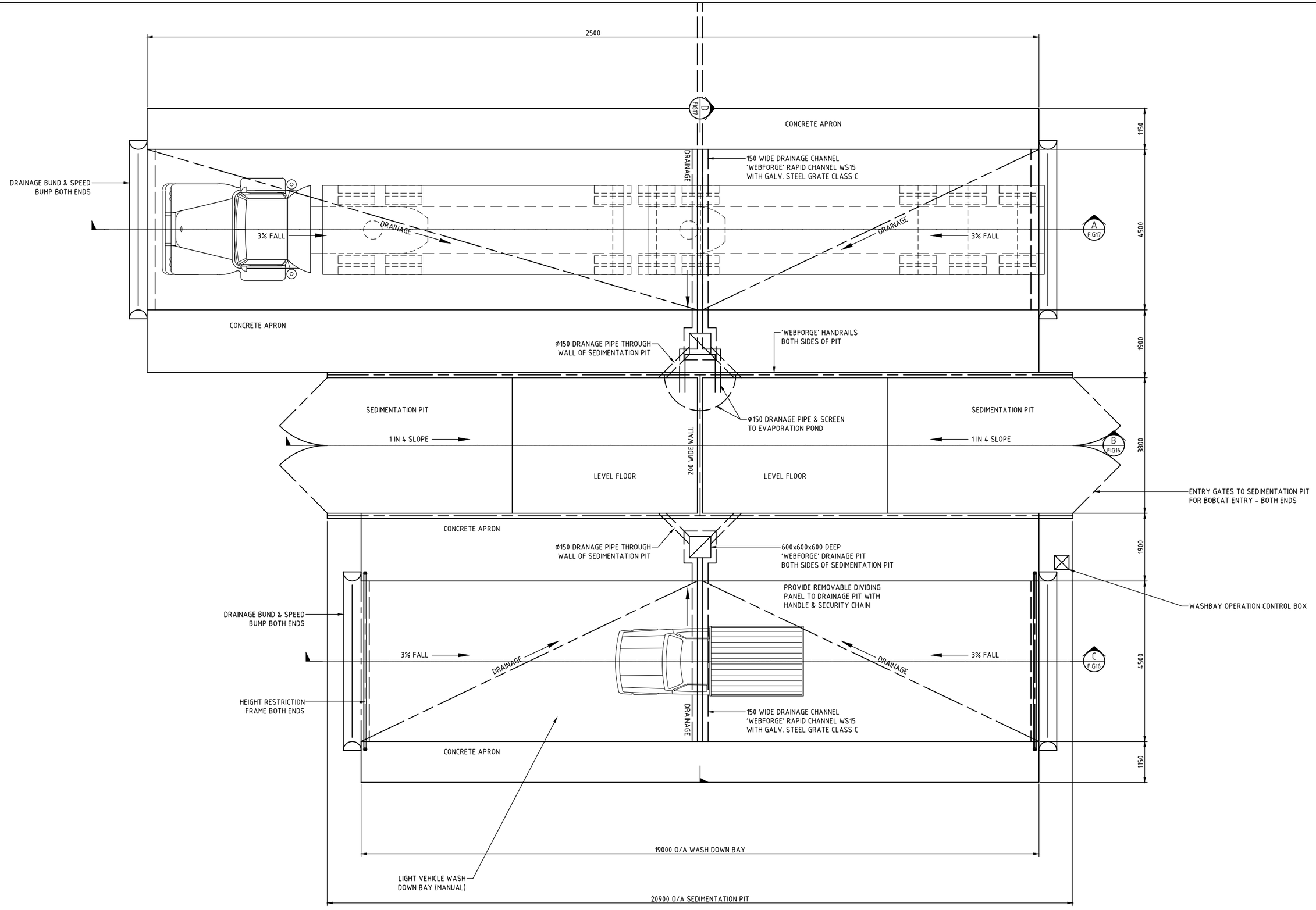
CLIENT
KIMBERLEY PILBARA CATTLEMAN'S ASSOCIATION

PROJECT TRUCK WASH DOWN FEASIBILITY
LOCATION BROOME & HALLS CREEK, WA
SHEET TITLE HEAVY & LIGHT OVERVIEW

JOB CODE: 17TOO1117
SHEET NUMBER: FIG14
REV: A

FORM E027
10 AUG 2006



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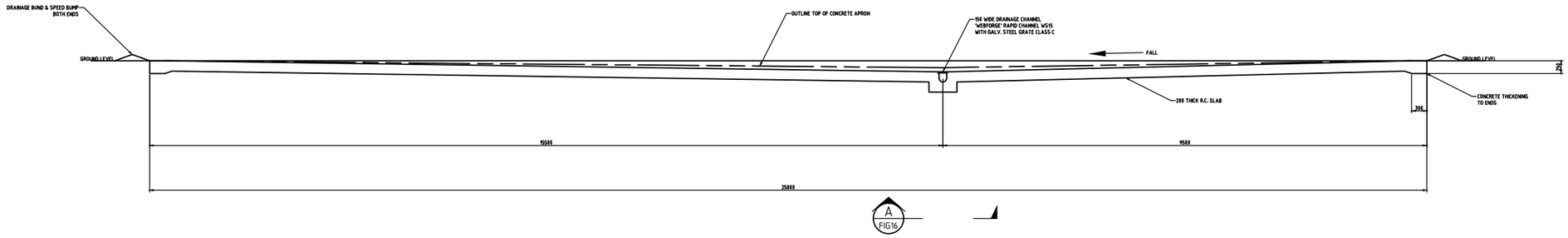
CLIENT
KIMBERLEY PILBARA CATTLEMAN'S ASSOCIATION

PROJECT: TRUCK WASH DOWN FEASIBILITY
LOCATION: BROOME & HALLS CREEK, WA
SHEET TITLE: HEAVY & LIGHT LAYOUT PLAN

JOB CODE: 17TOO1117
SHEET NUMBER: FIG15
REV: A

FORM E027 10 AUG 2006



A
FIG16

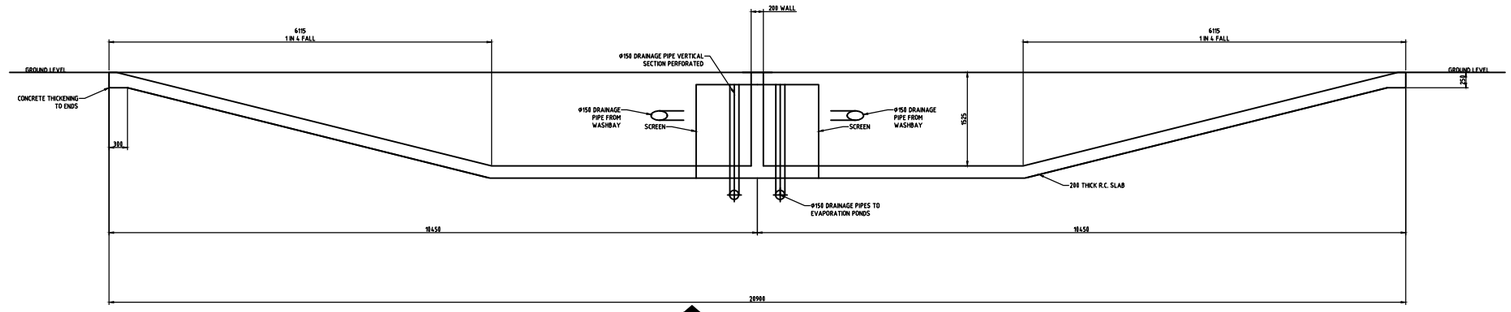


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FIG16

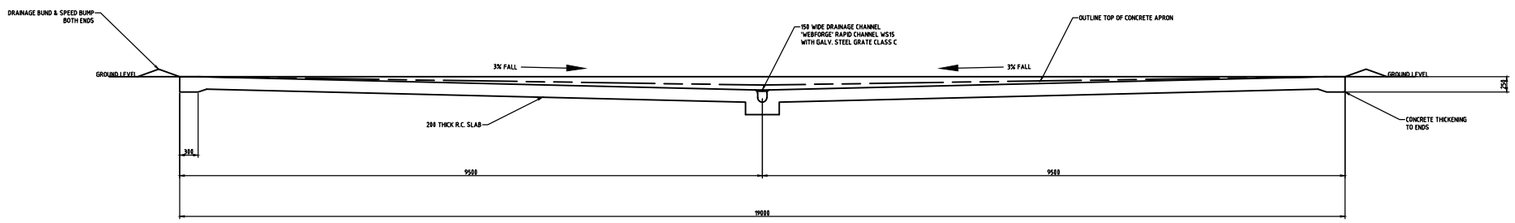

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FIG16

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KIMBERLEY PILBARA CATTLEMAN'S ASSOCIATION

PROJECT TRUCK WASH DOWN FEASIBILITY
LOCATION BROOME & HALLS CREEK, WA
SHEET TITLE HEAVY & LIGHT X SECTION A-B-C

JOB CODE: 17TOO1117
SHEET NUMBER: FIG16
REV: A

FORM E027
10 AUG 2006

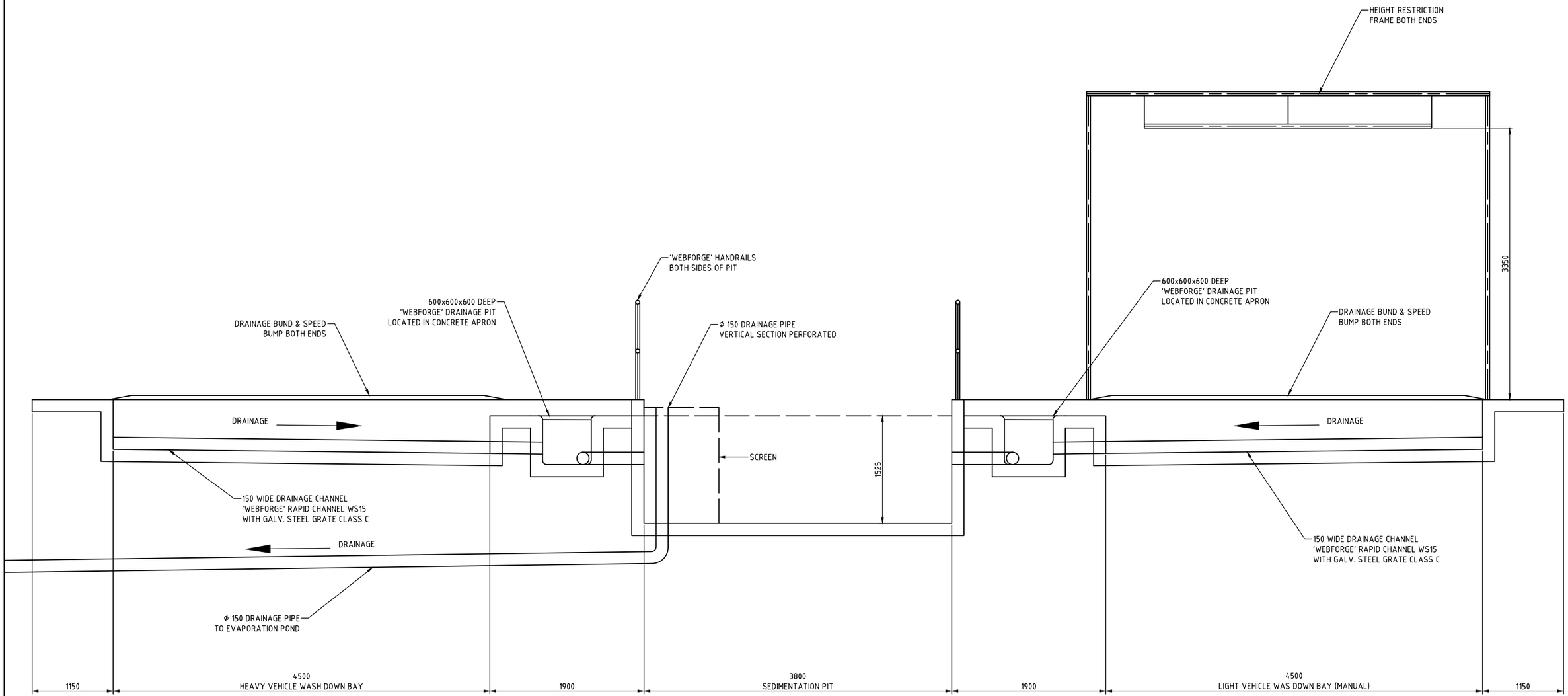

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FIG17

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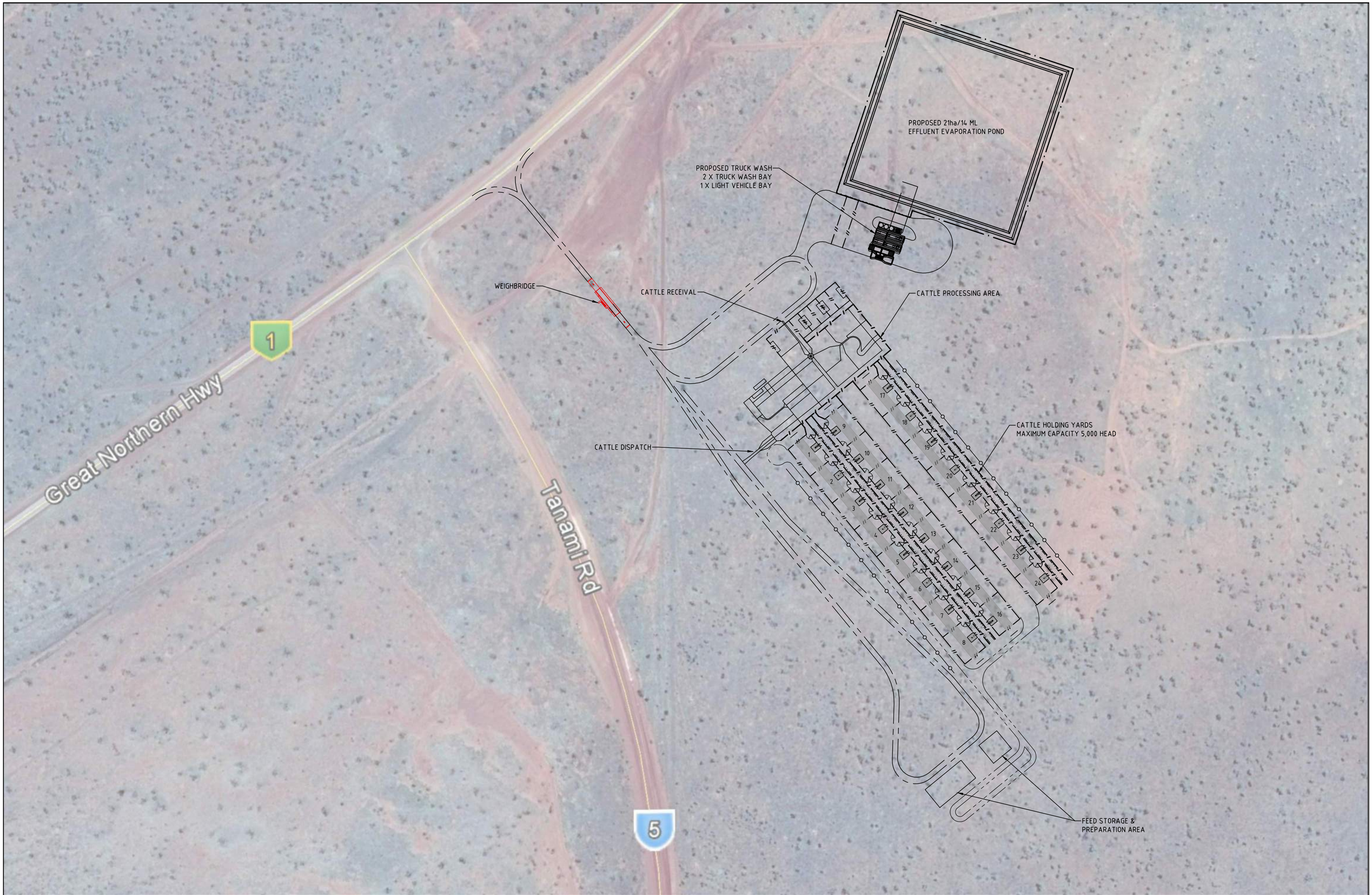
KIMBERLEY PILBARA
CATTLEMAN'S ASSOCIATION

PROJECT TRUCK WASH DOWN FEASIBILITY
LOCATION BROOME & HALLS CREEK, WA
SHEET TITLE HEAVY & LIGHT X SECTION PLAN

JOB CODE: 17TOO1117
SHEET NUMBER: FIG17
REV: A

FORM E027
10 AUG 2006

Appendix D Overview and layout plans for the Halls Creek sites showing the holding yards



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DATE	13/04/2017	SCALE 1:1500 (A1)	

CLIENT
KIMBERLEY PILBARA
CATTLEMAN'S ASSOCIATION

PROJECT TRUCK WASH DOWN FEASIBILITY
LOCATION BROOME & HALLS CREEK, WA
SHEET TITLE HALLS CREEK SITE 1 - TANAMI ROAD

JOB CODE: 17TOO1117
SHEET NUMBER: FIG03
REV: A

FORM E027
10 AUG 2006

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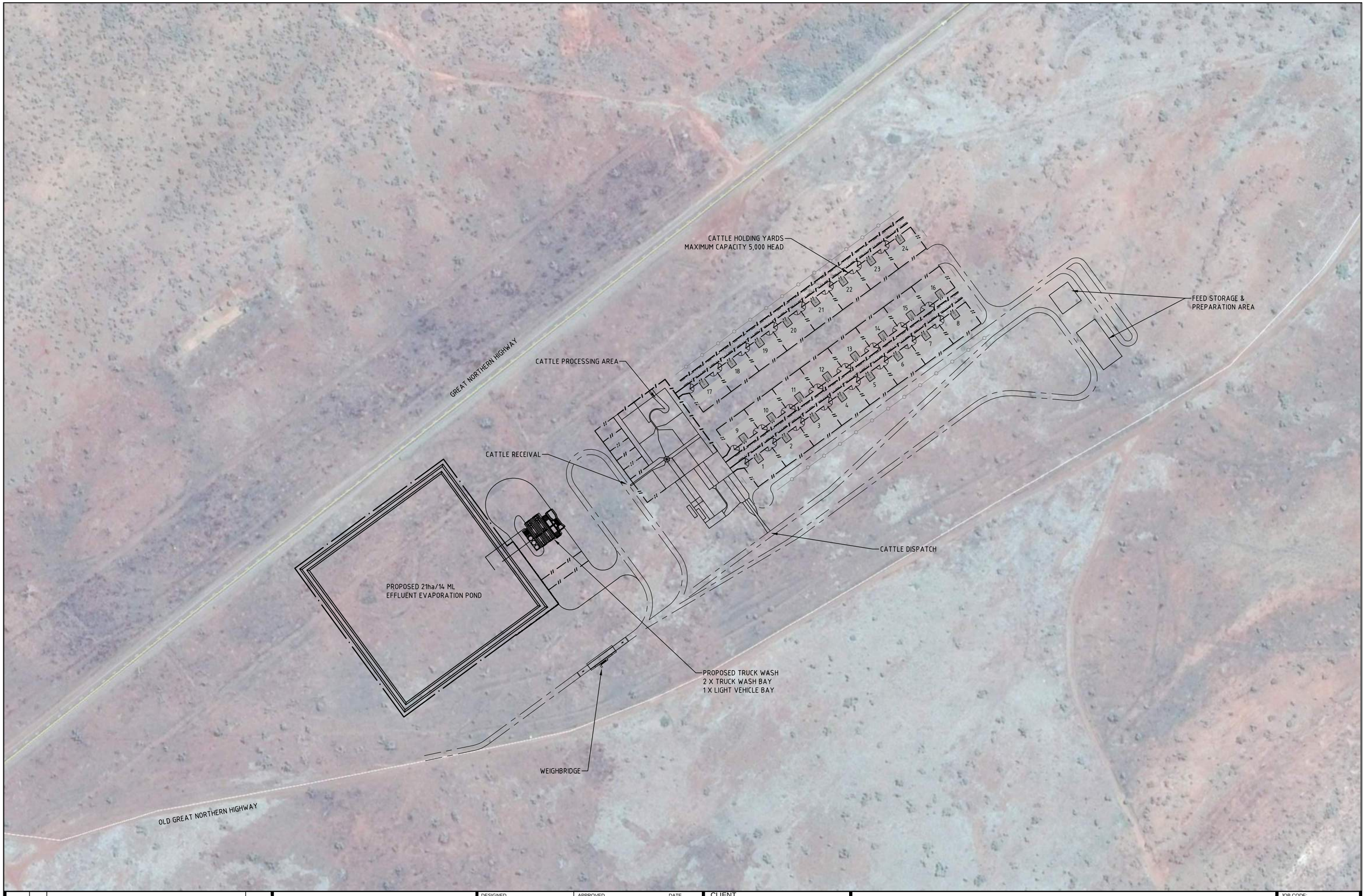
CLIENT
KIMBERLEY PILBARA
CATTLEMAN'S ASSOCIATION

PROJECT TRUCK WASH DOWN FEASIBILITY
LOCATION BROOME & HALLS CREEK, WA
SHEET TITLE HALLS CREEK SITE 2 - OLD DIP

JOB CODE: 17TOO1117
SHEET NUMBER: FIG04
REV: A

FORM E027
10 AUG 2006



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DATE
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SCALE 1:1500 (A1)

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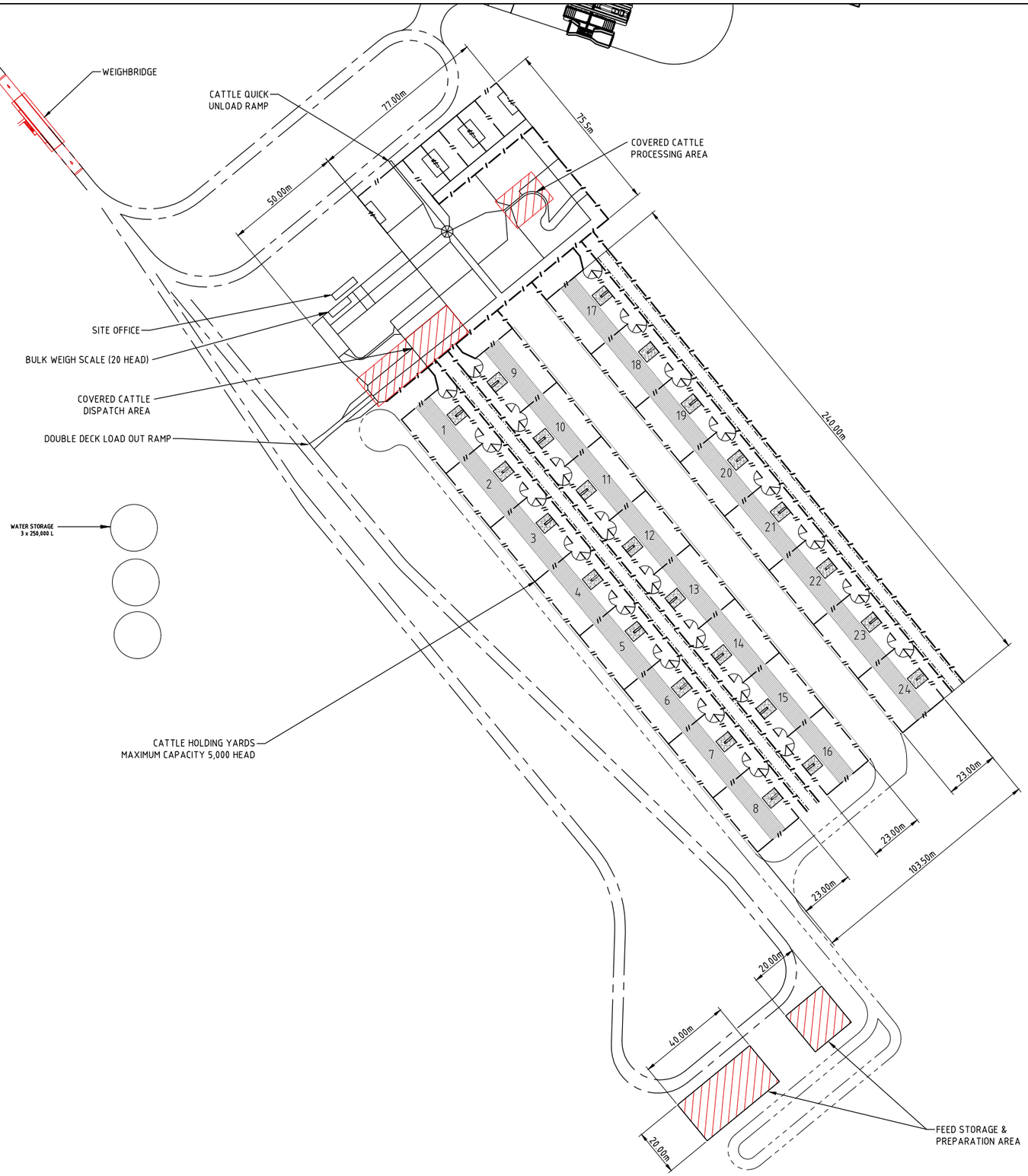
KIMBERLEY PILBARA
CATTLEMAN'S ASSOCIATION

PROJECT TRUCK WASH DOWN FEASIBILITY
LOCATION BROOME & HALLS CREEK, WA
SHEET TITLE HALLS CREEK - SITE 3 OLD DUMP

JOB CODE: 17TOO1117
SHEET NUMBER: FIG05
REV: A

FORM E027
10 AUG 2006



NOTES:

PENS

1.	CATTLE WEIGHT	= 400kg/HEAD
2.	STOCKING DENSITY	= 3.2m^2/HEAD
3.	BUNK SPACE	= 140mm/HEAD
4.	PENS 30m (WIDE)x 23m (DEPTH)	= 690m^2/PEN
5.	INDIVIDUAL PEN CAPACITY	= 215 HEAD
6.	TOTAL PENS	= 24
7.	TOTAL CAPACITY	= 5,0000 HEAD

FACILITY

1.	CATTLE LANE WIDTH	= 4.5m
2.	BUNK WIDTH	= 1.0m
3.	FEED ROAD WIDTH	= 4.5m
4.	DRAIN WIDTH	= 4.5m
5.	JUMP UP ALLOWANCE	= 2.0m

SHADE POSTS

1. NETPRO SHADE POSES ARE TO CONSTRUCTED INLINE WITH THE PEN & CATTLE LANE FENCES WHERE REQUIRED. THE SHADE POSTS ARE TO REPLACE STANDARD FENCE POSTS.
2. FENCE RAIL AND CABLE IS TO BUTT UP TO THE POST AND CABLES ARE TO PASS THROUGH THE SHADE POSTS.

LEGEND

- PEN FENCE - 1.6m HIGH (2 RAIL - 4 CABLE) 70 NB POSTS @ 3.0m CTRS
- LANE FENCE - 1.6m HIGH (2 RAIL - 4 CABLE) 70 NB POSTS @ 3.0m CTRS
- INDICATIVE SHADE POLE STAYS
- PROPOSED ROAD
- PROPOSED DRAIN
- INDICATIVE SHADE CLOTH (7.5m WIDE)
- EFFLUENT DRAINAGE DIRECTION

N

DATE	REV	DESCRIPTION	APPROVED
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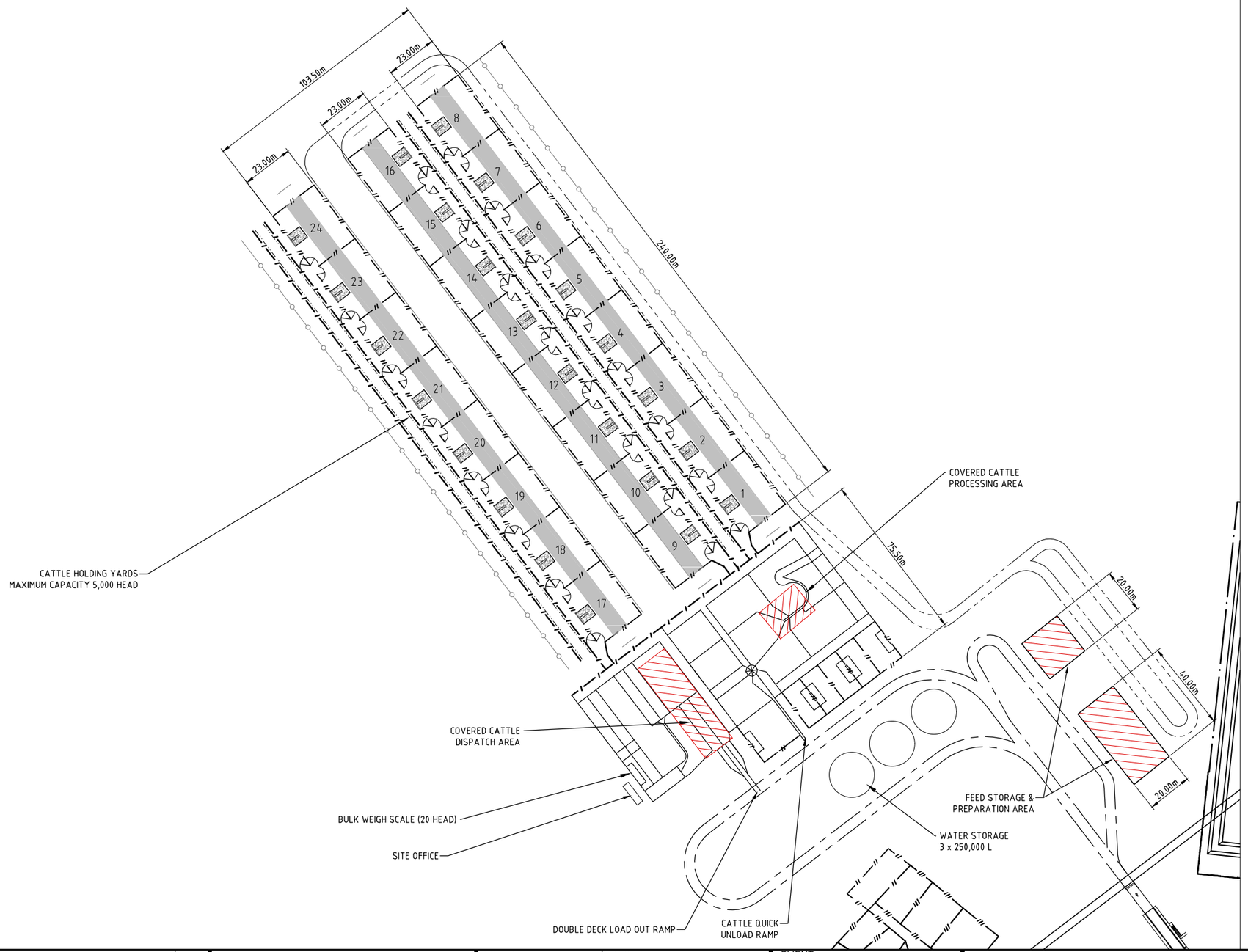
CLIENT
KIMBERLEY PILBARA CATTLEMAN'S ASSOCIATION

PROJECT: TRUCK WASH DOWN FEASIBILITY
LOCATION: BROOME & HALLS CREEK, WA
SHEET TITLE: TANAMI ROAD - CATTLE YARD LAYOUT

JOB CODE: 17TOO1117
SHEET NUMBER: FIG.33
REV: A

FORM E027 10 AUG 2006



NOTES:

PENS

1.	CATTLE WEIGHT	= 400kg/HEAD
2.	STOCKING DENSITY	= 3.2m^2/HEAD
3.	BUNK SPACE	= 140mm/HEAD
4.	PENS 30m (WIDE)x 23m (DEPTH)	= 690m^2/PEN
5.	INDIVIDUAL PEN CAPACITY	= 215 HEAD
6.	TOTAL PENS	= 24
7.	TOTAL CAPACITY	= 5,0000 HEAD

FACILITY

1.	CATTLE LANE WIDTH	= 4.5m
2.	BUNK WIDTH	= 1.0m
3.	FEED ROAD WIDTH	= 4.5m
4.	DRAIN WIDTH	= 4.5m
5.	JUMP UP ALLOWANCE	= 2.0m

SHADE POSTS

1. NETPRO SHADE POSES ARE TO CONSTRUCTED INLINE WITH THE PEN & CATTLE LANE FENCES WHERE REQUIRED. THE SHADE POSTS ARE TO REPLACE STANDARD FENCE POSTS.
2. FENCE RAIL AND CABLE IS TO BUTT UP TO THE POST AND CABLES ARE TO PASS THROUGH THE SHADE POSTS.

LEGEND

- PEN FENCE - 1.6m HIGH (2 RAIL - 4 CABLE) 70 NB POSTS @ 3.0m CTRS
- LANE FENCE - 1.6m HIGH (2 RAIL - 4 CABLE) 70 NB POSTS @ 3.0m CTRS
- INDICATIVE SHADE POLE STAYS
- PROPOSED ROAD
- PROPOSED DRAIN
- INDICATIVE SHADE CLOTH (7.5m WIDE)
- EFFLUENT DRAINAGE DIRECTION

DATE	REV	DESCRIPTION	APPROVED
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REVISIONS

TOOWOOMBA OFFICE
FLOOR 2, UNIT 2,
128 MARGARET STREET
PO BOX 2175
TOOWOOMBA, QLD 4350
PH: (07) 4632 8230

FSA CONSULTING PART OF O2UDP

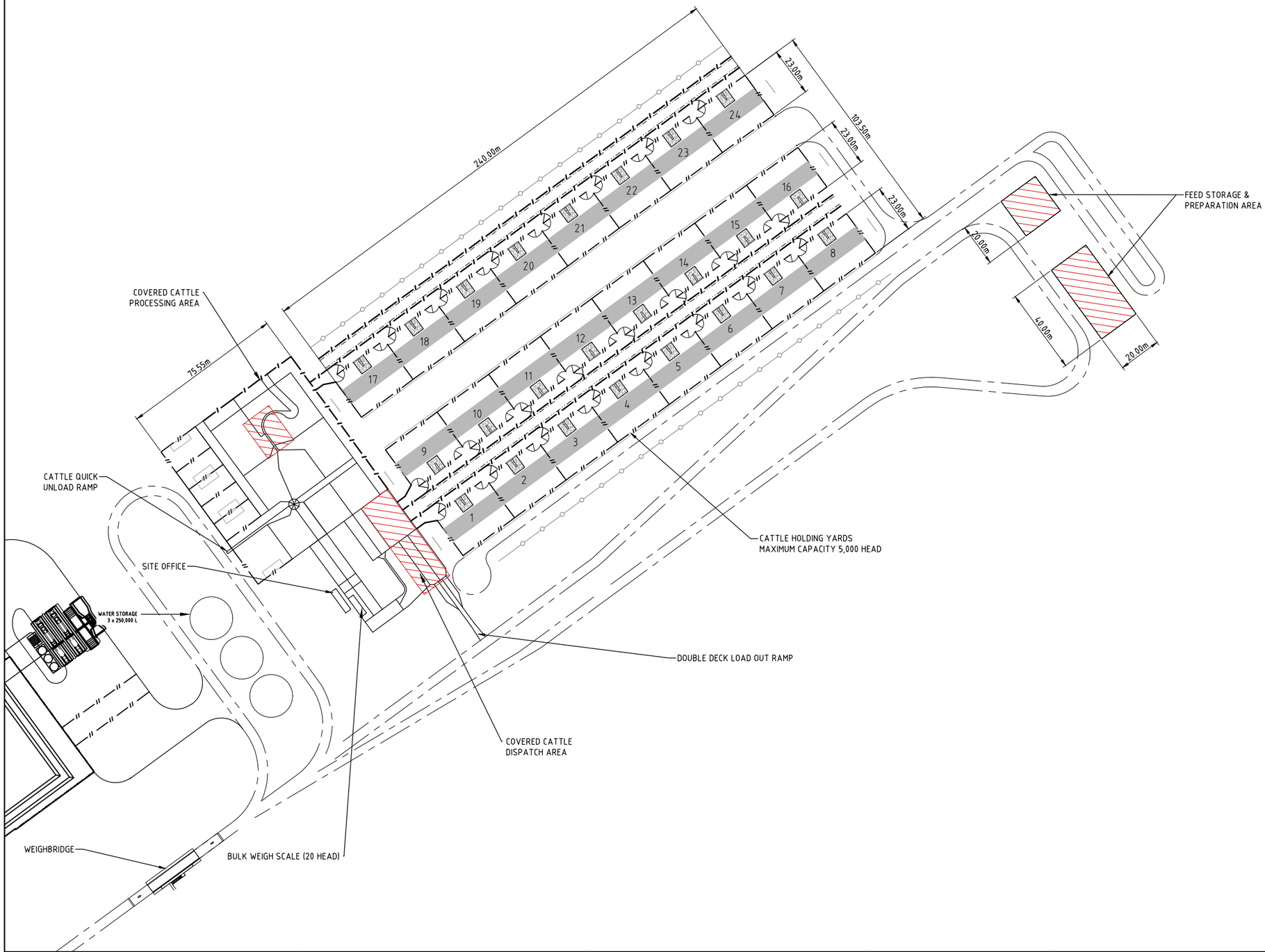
DESIGNED	TJS	APPROVED	DATE
DRAWN	TJS		
CHECKED	TJS	DATE	SCALE
DATE	01/05/2017		0 20 40 60m
			SCALE 1:1000 (A1)

CLIENT
KIMBERLEY PILBARA
CATTLEMAN'S ASSOCIATION

PROJECT: TRUCK WASH DOWN FEASIBILITY
LOCATION: BROOME & HALLS CREEK, WA
SHEET TITLE: OLD DIP YARDS - CATTLE YARD LAYOUT

JOB CODE: 17TOO1117
SHEET NUMBER: FIG.44
REV: A

FORM E027
10 AUG 2006



NOTES:

PENS

1.	CATTLE WEIGHT	= 400kg/HEAD
2.	STOCKING DENSITY	= 3.2m^2/HEAD
3.	BUNK SPACE	= 140mm/HEAD
4.	PENS 30m (WIDE)x 23m (DEPTH)	= 690m^2/PEN
5.	INDIVIDUAL PEN CAPACITY	= 215 HEAD
6.	TOTAL PENS	= 24
7.	TOTAL CAPACITY	= 5,0000 HEAD

FACILITY

1.	CATTLE LANE WIDTH	= 4.5m
2.	BUNK WIDTH	= 1.0m
3.	FEED ROAD WIDTH	= 4.5m
4.	DRAIN WIDTH	= 4.5m
5.	JUMP UP ALLOWANCE	= 2.0m

SHADE POSTS

1. NETPRO SHADE POSES ARE TO CONSTRUCTED INLINE WITH THE PEN & CATTLE LANE FENCES WHERE REQUIRED. THE SHADE POSTS ARE TO REPLACE STANDARD FENCE POSTS.
2. FENCE RAIL AND CABLE IS TO BUTT UP TO THE POST AND CABLES ARE TO PASS THROUGH THE SHADE POSTS.

LEGEND

- PEN FENCE - 1.6m HIGH (2 RAIL - 4 CABLE) 70 NB POSTS @ 3.0m CTRS
- LANE FENCE - 1.6m HIGH (2 RAIL - 4 CABLE) 70 NB POSTS @ 3.0m CTRS
- INDICATIVE SHADE POLE STAYS
- PROPOSED ROAD
- PROPOSED DRAIN
- INDICATIVE SHADE CLOTH (7.5m WIDE)
- EFFLUENT DRAINAGE DIRECTION

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DRAWN	TJS		
CHECKED	TJS	DATE	----
DATE	01/05/2017	SCALE	0 20 40 60m
			SCALE 1:1000 (A1)

CLIENT
KIMBERLEY PILBARA
CATTLEMAN'S ASSOCIATION

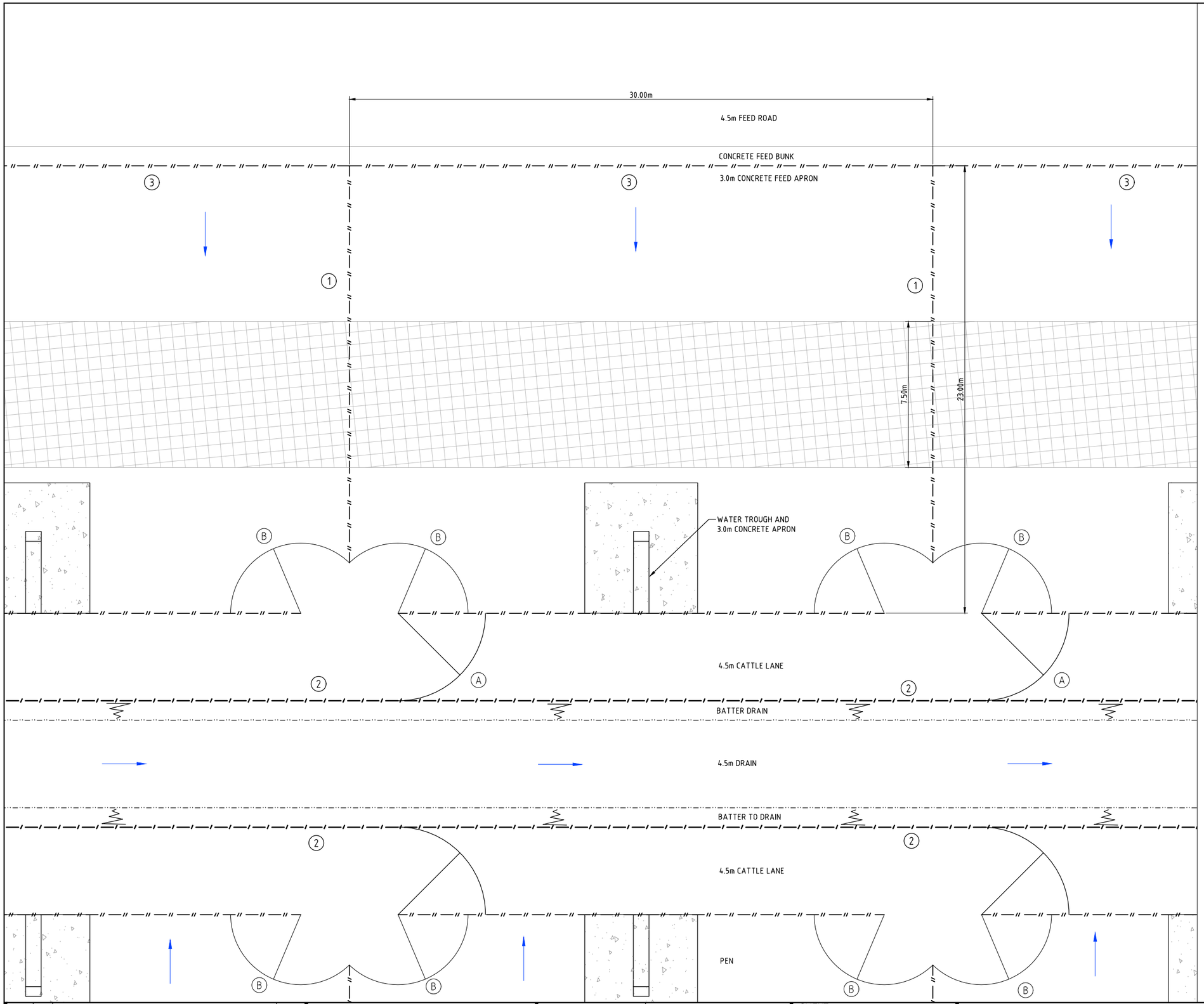
PROJECT: TRUCK WASH DOWN FEASIBILITY
LOCATION: BROOME & HALLS CREEK, WA
SHEET TITLE: OLD DUMP - CATTLE YARD LAYOUT

JOB CODE: 17TOO1117
SHEET NUMBER: FIG.55
REV: A

FORM E027
10 AUG 2006

Appendix E Detailed holding pen layout and holding pen cross section

Appendix F Terms and Conditions



NOTES:

PENS

1.	CATTLE WEIGHT	= 400kg/HEAD
2.	STOCKING DENSITY	= 3.2m²/HEAD
3.	BUNK SPACE	= 140mm/HEAD
4.	PENS 30m (WIDE)x 23m (DEPTH)	= 690m²/PEN
5.	INDIVIDUAL PEN CAPACITY	= 215 HEAD
6.	TOTAL PENS	= 24
7.	TOTAL CAPACITY	= 5,0000 HEAD

FACILITY

1.	CATTLE LANE WIDTH	= 4.5m
2.	BUNK WIDTH	= 1.0m
3.	FEED ROAD WIDTH	= 4.5m
4.	DRAIN WIDTH	= 4.5m
5.	JUMP UP ALLOWANCE	= 2.0m

SHADE POSTS

1. NETPRO SHADE POSES ARE TO CONSTRUCTED INLINE WITH THE PEN & CATTLE LANE FENCES WHERE REQUIRED. THE SHADE POSTS ARE TO REPLACE STANDARD FENCE POSTS.
2. FENCE RAIL AND CABLE IS TO BUTT UP TO THE POST AND CABLES ARE TO PASS THROUGH THE SHADE POSTS.

LEGEND

- (1) PEN FENCE - 1.5m HIGH (2 RAIL - 4 CABLE) 70 NB POSTS @ 3.0m CTRS
- (2) LANE FENCE - 1.5m HIGH (2 RAIL - 4 CABLE) 70 NB POSTS @ 3.0m CTRS
- (3) FEED BUNK FENCE
- (A) 4.5m x 1.5m RAIL GATE
- (B) 3.6m x 1.5m RAIL GATE
- PROPOSED ROAD
- PROPOSED DRAIN
- INDICATIVE SHADE CLOTH (7.5m WIDE)
- EFFLUENT DRAINAGE DIRECTION

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DATE	01/05/2017		0 2 4 6m
			SCALE 1:100 (A1)

CLIENT
KIMBERLEY PILBARA CATTLEMAN'S ASSOCIATION

PROJECT: TRUCK WASH DOWN FEASIBILITY
LOCATION: BROOME & HALLS CREEK, WA
SHEET TITLE: TYPICAL PEN LAYOUT

JOB CODE: 17TOO1117
SHEET NUMBER: FIG.34
REV: A

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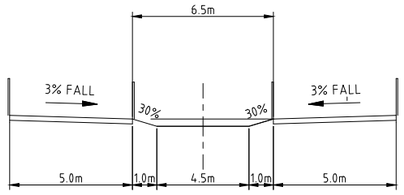


DETAIL A - CATCH DRAIN DESIGN ROW - A

SCALE: 1=125 (A1); 1=250 (A3)

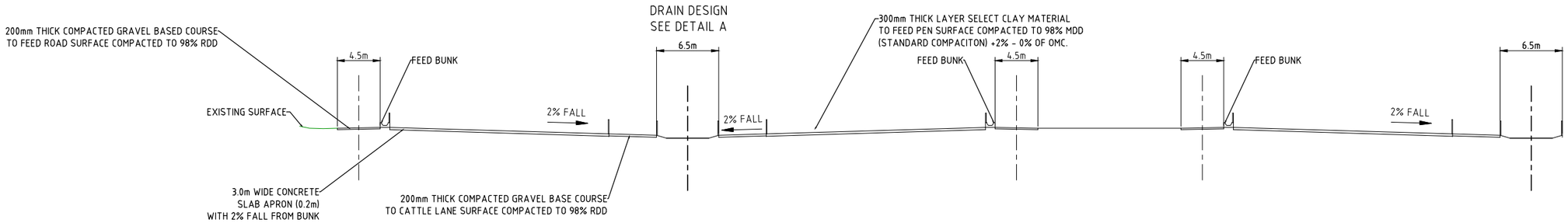
NOTES:

PEN FOUNDATIONS SHOULD BE CONSTRUCTED IN ACCORDANCE WITH THE NATIONAL GUIDELINES FOR BEEF CATTLE FEEDLOTS IN AUSTRALIA (2012). THESE STANDARDS STAGE THAT:

1) THE FINAL SURFACE OF THE PAD MUST HAVE A CBR (CALIFORNIA BEARING RATION) OF ≥ AT LEAST 20, AND BE OF SUFFICIENT DEPTH TO ENSURE THE INTEGRITY OF THE STRUCTURE IS MAINTAINED THROUGHOUT THE GENERAL WORKING OF THE FEEDLOT.

2) IRRESPECTIVE OF THE FINISHED PEN SURFACE, THE UNDERLYING SOILS MUST HAVE A MAXIMUM PERMEABILITY OF 1 x 10^{-9} m/s (0.1mm/day) FOR DISTILLED WATER WITH 1.0m OF PRESSURE HEAD.

3) IF A CLAY LINER IS USED, THE MATERIAL SHOULD BE PLAYED IN LAYERS OF 150mm (±50 mm). EACH LAYER SHOULD BE TINED, WETTED TO ±2% OF OPTIMUM MOISTURE CONTENT (AS 1289 5.1.1) AND COMPACTED TO REACH THE REQUIRED COMPACTION (RELATIVE TO THE MAXIMUM DRY DENSITY, AS 1289 5.4.2) THAT IS NEEDED TO ACHIEVE THE REQUIRED PERMEABILITY OF 0.1mm/day.



TYPICAL SECTION THROUGH FEED PENS

SCALE: 1=250 (A1); 1=500 (A3)

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CHECKED	TJS	DATE	SCALE
DATE	01/05/2017		0 5 10 15m SCALE 1:250 (A1)

CLIENT

KIMBERLEY PILBARA CATTLEMAN'S ASSOCIATION

PROJECT: TRUCK WASH DOWN FEASIBILITY

LOCATION: BROOME & HALLS CREEK, WA

SHEET TITLE: TYPICAL PEN CROSS SECTION

JOB CODE: 17TOO1117

SHEET NUMBER: FIG.35

REV: A

FORM E027 10 AUG 2006

Appendix G Stakeholder consultation list

Name	Organisation
Helen & Roy Wilson	Burks Park, Halls Creek
Simone Andrews	DAFWA
Noel Wilson	DAFWA
Kim Carter	DAFWA
Cassandra Wittwer	Department of Agriculture and Water Resources
Carman Standring	Licencing Officer, Licencing and Approval, Department of Environmental Regulation
Caron Goodburn	A/Manager, Licencing and Approval, Department of Environmental Regulation
Justin Morrisey	ILE Export Depot Broome
Tom Dury	ILE Export Depot Broome
Rodger Kerr-Newell	CEO – Halls Creek Shire Council
Phil Burgess	Infrastructure Assets Manager, Halls Creek Shire Council
Bronwyn Little	Strategic Planning Manager, Halls Creek Shire Council
Dick Pasfield	Kimberley Regional Biosecurity Group
Mark Gordon	Koongie Elvira Aboriginal Corporation
Lynette Gordon	Koongie Elvira Aboriginal Corporation
Terrance Gordon	Koongie Elvira Aboriginal Corporation
Wendy Brockhurst	Larrawa Station, Halls Creek & KPCA Director
Steve Craig	Mistake Creek Station, NT
Glenn Smith	Road Trains Australia, Broome
Paul Heil	Roebuck Export Depot, Broome
Lettie Cook	Suplejack Station, NT
Paul Brown	Operator, South Hedland Holding Yards
Scott Riggs	Territory Rural, Katherine
Bevan Besson	TunaBlue Consulting
Annabelle Coppin	Yarrie Station & KPCA Director
Tony Chaffer	CEO, Wyndham Port