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Roads to Reuse pilot project

Part A: Waste Authority report
Part B: Main Roads Western Australia report

WasteSorted
A Waste Authority Program

November 2020

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This publication is available at our website www.wasteauthority.wa.gov.au or for those with special needs it can be made available in alternative formats such as audio, large print, or Braille.

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Summary

The Waste Authority, Department of Water and Environmental Regulation (the department), and Main Roads Western Australia (MRWA) delivered the Roads to Reuse (RtR) pilot project with support from the Waste Recycling Industry Association WA (WRIWA) and the Department of Health (DoH). Two producers of recycled construction and demolition products (producers) supplied material to the pilot.

The Waste Authority, with support from the department, developed the RtR product specification to ensure protection of human health and the environment, as well as providing funding to support producers with testing costs associated with supplying recycled products in accordance with the product specification. The Waste Authority also engaged independent auditors to verify producers' processes and products.

MRWA worked closely with key stakeholders, including suppliers and contractors, through all stages of the project to procure and use materials; determine the suitability of products (including assessing sampling, testing and audit reports); and test the application of products in construction projects.

Part A of this report describes the Waste Authority's RtR program, including its role in supporting the Waste Avoidance and Resource Recovery Strategy 2030, as well as key findings from the pilot phase to the end of June 2020.

Part B of this report presents the experience from MRWA. It describes MRWA's use of materials in a construction setting, including engineering conditions, contract conditions, and practical use considerations.

Part A: Waste Authority report

Waste Avoidance and Resource Recovery Strategy 2030

Western Australia's (WA) Waste Avoidance and Resource Recovery Strategy 2030 (waste strategy) contains objectives to avoid waste, recover more value and resources from waste, and protect the environment, supported by targets including a material recovery target of 75 per cent by 2030.

The waste strategy identifies construction and demolition (C&D) waste as a focus material because it is generated in high volumes and provides significant opportunities for increased recovery. Also, C&D recycling can support a more circular economy. C&D is normally recycled close to the point of waste generation thereby supporting local jobs and investment. The material recovery target for the C&D sector is 77 per cent by 2025 and 80 per cent by 2030.

The waste strategy and its action plan provides the strategic framework to support procurement of recycled materials and develop markets for recycled C&D materials.[1] The waste strategy commits to implement sustainable government procurement practices that encourage greater use of recycled products and support local market development. The action plan includes commitments to delivering the RtR program.

The amount of C&D waste being recycled has remained relatively constant since 2011–12, while opportunities for using recycled materials have not been met. In order to support markets for recycled C&D products, it is important to provide the market with confidence about the suitability of recycled materials and to normalise their use.

The Waste Authority's RtR program is designed to provide confidence to purchasers and users of recycled C&D products.

1 Terminology: For the purposes of this report, the terms 'recycled C&D products' and 'crushed recycled concrete' refer to products used by MRWA in the RtR pilot project.

About Roads to Reuse

RtR encourages state government organisations, local governments, regional councils and the private sector to use recycled C&D products in civil applications, such as road construction. It does this by supporting the supply of recycled C&D products to the market which meets a product specification to protect public health and environment.

The key elements of the RtR program are:

A. RtR product specification.

B. Product testing scheme.

C. An independent auditing regime.

RtR product specification

The RtR product specification: recycled road base and recycled drainage rock is designed to protect human health and the environment. The product specification applies to recycled road base (sealed with asphalt) and recycled drainage rock.

The product specification is central to the RtR program. It covers:

- authorised product uses and restrictions
- operational control procedures, including pre-acceptance and acceptance criteria for material, and waste processing controls
- product sampling and testing, including preference for moving from stockpiled product testing to interval testing via conveyor belt
- sampling frequency
- analysis and results interpretation
- management, audit and record keeping
- limits for analytes in acceptable material.

The product specification sets out requirements for C&D recyclers, including a requirement to prepare a Material Acceptance and Sampling Plan (MASP), and sampling and testing requirements.

MASP – The product specification includes a requirement to prepare a site-specific plan which describes the recycler's processes and procedures. Under the RtR program, a recycler's MASP must be approved by the Waste Authority having regard to advice provided by the department and DoH. Furthermore, a preliminary audit (including site inspection) must occur before a recycler is permitted to commence production under the RtR framework.

Sampling and testing requirements – The product specification includes sampling and testing requirements which must be applied in order to determine whether recycled C&D product meets standards. The document establishes routine frequency sampling requirements for recyclers. The Waste Authority can approve reduced

frequency routine sampling where a recycler has demonstrated that the RtR product specification has been consistently met for at least six months.

Recycled C&D product that meets the RtR product specification provides confidence to purchasers about the suitability of the material.

RtR product testing scheme

The RtR product testing scheme (Appendix 1) is a Waste Authority funding program to support C&D recyclers with the cost of producing material in accordance with the RtR product specification. The product testing scheme:

- supports C&D producers with the cost of routine frequency sampling required by the RtR product specification
- supports C&D producers to transition from routine frequency sampling to reduced frequency routine sampling, subject to Waste Authority approval
- encourages the supply of suitable recycled C&D product for use as part of the RtR.

The product testing scheme reimburses eligible C&D recyclers for the cost of sampling in accordance with RtR product specification as follows:

- up to 26 weeks (or six months) of routine frequency sampling, which is the minimum period of sampling required for the Waste Authority to assess an application to undertake reduced frequency routine sampling
- up to eight weeks of additional routine frequency sampling to allow for the Waste Authority to consider an application to undertake reduced frequency routine sampling
- up to 50 per cent of the costs incurred to engage a qualified person to prepare an approved MASP.

Independent auditing

The RtR program includes an independent audit of C&D recyclers' processes and products managed by the Waste Authority. There are two types of audits: initial audits and random audits.

- Initial audit: An initial audit is undertaken following the Waste Authority's approval of a recycler's MASP. The initial audit consists of a desktop audit of the MASP as well as a site inspection to confirm that the site is set up in accordance with the MASP. A producer may commence production under the RtR framework following a successful preliminary audit.
- Random audits: Random audits are conducted at various times during the production phase. The random audits determine whether procedures are being followed in accordance with the MASP, and include independent sampling and testing of material, to determine whether product meets the RtR product specification.

The audit provides an additional level of assurance to purchasers of recycled C&D products.

Roads to Reuse pilot project: Overview

MRWA is responsible for managing WA's network of main roads. MRWA's use of recycled C&D products is important in terms of using significant quantities of materials, but also, for providing leadership and confidence to the sector about the suitability of recycled C&D products. MRWA's use of materials supplied under the RtR program is critical to the ongoing success of the RtR program.

The Waste Authority and the department, in partnership with MRWA, the Waste Recycling Industry Association WA (WRIWA) and with support from the DoH, piloted the RtR project.

The pilot aimed to determine the suitability of the RtR product specification and the accompanying testing and auditing regime and determine MRWA's preparedness to use RtR products. A successful pilot aimed to instil confidence in the sector about the use of recycled C&D products.

MRWA committed to use 25,000 tonnes of recycled C&D products in the Murdoch Drive Connection and Kwinana Freeway Widening project during the pilot. RtR material was used as subbase under full depth asphalt.

Project partners

- Waste Authority: Responsible for the design and implementation of the RtR pilot.
- The department: Provided advice to the Waste Authority throughout the program, including:
    - technical advice in relation to the RtR product specification and its application
    - advice on a recycler's MASP
    - advice on the sampling and testing regime (including analysis of results) and the independent audit process
    - administrative support to the Waste Authority.
- MRWA: Worked closely with key stakeholders, including suppliers and contractors, through all stages of the project to procure materials; determine the suitability of product (including assessing sampling, testing and audit reports); and test the application of products in construction projects.
- WRIWA: Worked closely with the Waste Authority, the department and MRWA throughout the project. WRIWA provided training to its members on the RtR product specification, encouraged members to participate in the pilot, and acted as the conduit between participating WRIWA members (that is, participating C&D recyclers) and the project team.

Project support

- DoH: Assessed the suitability of a MASP in relation to applicable asbestos management guidelines and asbestos management, as outlined in the RtR product specification.
- Senversa: The department, on behalf of the Waste Authority, engaged Senversa to undertake independent audits of producers' processes and products (as described in *About Roads to Reuse*. The department and the Waste Authority appointed Senversa to conduct the independent audits during the pilot project.

Project delivery

The project required input and support across government agencies and industry. The department (on behalf of the Waste Authority), MRWA and the WRIWA met regularly during the pilot to identify and address issues, and to track progress.

The pilot provided an opportunity for partners with various interests, responsibilities and expertise, to collaboratively identify and work through issues.

Key findings

Collaboration and good working relationships across government agencies and industry is critical to the project's success.

Roads to reuse: Implementation

Phase 1: MASP preparation and preliminary audit

The Waste Authority and department worked with the WRIWA to engage industry and encourage participation in the pilot.

Two C&D recyclers, Urban Resources and Waste Stream Management, applied to participate in the pilot. Both recyclers operated sites located in Perth's south:

- Urban Resources: Ashley Rd, Hope Valley, WA.
- Waste Stream Management: Ratcliffe Rd, Medina, WA.

Urban Resources and Waste Stream Management engaged a consultant to prepare the MASP for their sites. The MASPs were submitted to the Waste Authority in early 2019.

The MASPs were assessed by the department and DoH. Both MASPs were initially assessed as being broadly suitable but requiring minor amendments. In April 2019, the Waste Authority advised Urban Resources and Waste Stream Management that the MASPs were approved, and that production could commence subject to a preliminary site audit.

Preliminary site audits conducted by Senversa (Urban Resources 23 April 2019; Waste Stream Management 2 May 2019) confirmed that both sites were set up in accordance with the MASP. Waste Stream Management and Urban Resources commenced production under the RtR framework in May 2019.

Urban Resources submitted a MASP for a second site (Hester Ave, Neerabup), which was approved in February 2020. A preliminary audit was conducted on 24 April 2020; however, this site did not supply material to the pilot phase of the project.

A fourth recycler submitted a MASP during the pilot phase; however, as at 30 June 2020, the MASP was not approved. The fourth recycler did not supply material to the pilot phase of the project.

The WRIWA worked with its members closely through this phase to explain the requirements of the program and support members and their consultants with the development of MASPs.

During the pilot, Urban Resources and Waste Stream Management were able to claim reimbursements through the PTS for MASP preparation and testing of material.

Key findings

- The engagement of a suitably qualified consultant is important to ensure the MASP is prepared in accordance with the RtR product specification.
- The preliminary audit provides assurance that producers' sites are set up in accordance with the approved MASP.
- WRIWA plays an import role communicating with and supporting its members.

- C&D recyclers have been able to access funding for the costs of engagement of consultants to prepare MASPs, and for testing of material

Phase 2: Production and audit

Urban Resources and Waste Stream Management commenced production from May 2019 following the approval of the MASP and a successful preliminary site audit.

Senversa developed an audit process (including an audit protocol and checklist to assess the requirements set out in the approved MASP) and undertook audits through the production phase. The audits comprised of a site inspection and interviews with site personnel. Compliance with each of the requirements of the MASP was assessed via inspection of site procedures, site observations, review of available documentation and information provided by site personnel. Audits also included examination of testing results to ensure specification criteria were met.

Senversa collected samples of material being sampled by the producer at a frequency of 10 per cent of the samples collected by the producer in accordance with the MASP to provide an independent check of the producer's analytical data.

Urban Resources

Urban Resources supplied around 31, 000 tonnes of recycled C&D material to MRWA from May 2019 to June 2020 with 26,331 tonnes supplied prior to February 2020. Approximately 90 per cent was produced from feedstock sourced from the demolition of the Subiaco oval, and approximately 10 per cent was produced from feedstock sourced from other sources.

Urban Resources commissioned testing in accordance with the frequency outlined in the MASP and the RtR product specification. Sampling was conducted by onsite staff, and testing was done by EnviroLab.

Senversa undertook random audits on three occasions during the pilot (21 May 2019, 1 October 2019 and 25 October 2019). Senversa provided 'same day notification' to Urban Resources; Urban Resources granted site access to Senversa on the day of notification.

The audits were completed by Ashton Betti (Senior Associate Environmental Scientist) with 12 years' experience in contaminated sites assessment and auditing. Ashton was accompanied by Mark Jones (Risk & Compliance Manager, Urban Resources) and Luke Bennett (Site Supervisor, Urban Resources).

Samples were collected randomly across stockpiles to provide for uniform spatial coverage that was representative of the volume of material being sampled recognising potential heterogeneity.

The laboratory results indicate the following:

- Concentrations of all analytes were below the relevant criteria (maximum average and absolute maximum values) presented in the RtR product specification.

- Asbestos (AF/FA) was not detected in any sample.
- The results from the sampling and testing audit were consistent with those reported by Urban Resources as part of their routine sampling of the material as part of the MASP.

Senversa concluded that:

"The site appeared to be well organised and onsite management procedures for material acceptance and processing were in general compliance with the MASP, noting two minor non-conformances related to pre-acceptance procedures (absence of contracts and insufficient information on incoming materials dockets). The other operational control procedures that are in place are considered adequate such that, in isolation, these minor non-conformances are unlikely to materially compromise the suitability of C&D product being accepted at the site.

Overall, the operational control procedures adopted to reduce the potential for contamination to enter the production stream appeared effective and there was no evidence that source materials for recycled road base were grossly contaminated. This was confirmed by sampling and testing of material which identified that material was compliant with the Roads to Reuse Product Specification and suitable for use as part of the Roads to Reuse Pilot Project."

Reports on the initial and random audits conducted at Urban Resources at Appendix 2.

Waste Stream Management

Waste Stream Management did not supply material to MRWA during the pilot phase.

Waste Stream Management commissioned testing in accordance with the frequency outlined in the MASP and the RtR product specification. Sampling was conducted by onsite staff, and testing done by EnviroLab.

A preliminary compliance audit was undertaken at the site on 2 May 2019 to assess compliance with the MASP prior to commencement of production of material.

Senversa concluded that:

"The recycling/crushing area appeared to be well organised and onsite management procedures for material acceptance and processing were in general compliance with the MASP, noting one minor non-conformance related to pre-acceptance procedures (insufficient information on incoming materials dockets). It was noted that measures were in place to rectify this non-conformance at the time of the inspection, being computer system upgrades. The other operational control procedures that are in place are considered adequate such that, in isolation, this minor non-conformance is unlikely to materially compromise the suitability of C&D product being accepted at the site.

Overall, the operational control procedures adopted to reduce the potential for contamination to enter the production stream appeared effective and there was no evidence that source materials for recycled road base were grossly contaminated.

The recycling/crushing area is considered suitably compliant with the processes outlined in the MASP to commence full production in accordance with the Roads to Reuse Product Specification."

Senversa recommended:

- Incoming materials dockets should be revised to include the additional information requirements per Section 3.1 of the MASP. It is noted that works were occurring to include this information on the docket system during the inspection.
- Sampling and testing audits should be scheduled once routine frequency sampling has commenced to verify whether or not the material produced meets the Roads to Reuse Product Specification.

Due to the volume of material processed at Waste Stream Management, the random audit schedule was still underway as of June 2020.

A report on the initial audit conducted at Waste Stream Management are at Appendix 3. The scheduling of audits presented various challenges. Audits needed to:

- to coincide with the supply requirements of MRWA and its contractors
- be conducted when material was available to be audited
- be conducted at random times.

Senversa worked with the project partners to coordinate the timing of audits.

Key findings

- To date, producers have consistently produced recycled C&D products in accordance with the RtR product specification.
- The independent audit determined that the recyclers' process was consistent with the process described in the MASP and confirmed that products met the RtR product specification.
- The auditor should work with project partners to schedule the random audits.
- The auditor reported full cooperation from producers in relation to accessing sites and conducting audits.

Phase 3: Supply and use of material

MRWA and its contractors commenced receiving RtR material in May 2019. MRWA negotiated the use of RtR material directly with the Metropolitan Roads Improvement Alliance and Kwinana Freeway Northbound Widening project teams. Participation in the pilot trial by those projects was a contract variation and extra costs were passed on to MRWA by varying the contract.

MRWA also worked with contractors to advise suitable suppliers of recycled product, and that adequate processes were implemented onsite to manage risks (both technical and quality) associate with the product. Verification was sought from the

independent audit testing to confirm that the material met the RtR product specification and was suitable for construction.

The following issues were identified during this phase relating to the RtR product specification and the use of materials:

Use of material near watercourses

The RtR Specification identifies that concrete-containing products with pH>9 should not be used within 100m of any wetland/watercourse[2] or on land subject to flooding. MRWA reported that a contractor sought clarification about using recycled material near drainage trenches excavated for the project, as they were subject to intermittent collection of water.

It was determined that the intent of the specification was not to treat temporarily inundated holes and trenches excavated for a road construction project in the same manner as watercourses protected by the *Rights in Water and Irrigation Act 1914*.

Landfill Waste Classification and Waste Definitions 1996 (as amended 2019), uncontaminated fill

In December 2019, the department released Landfill Waste Classification and Waste Definitions 1996 (as amended 2019) including details of uncontaminated fill (Part 5). Industry has raised issues with the RtR specification criteria being more conservative than the guidelines.

Consistency between uses and protection measures in guidelines and specifications released by the department has been raised as an issue for review – it is anticipated that consistency between the RtR Specification and the Uncontaminated Fill guidelines will be examined during a review of RtR following the pilot project.

Allowable percentages of other C&D wastes

Industry identified that the allowable percentage of 'other C&D wastes' was not consistent with percentages in engineering specifications released by MRWA and the

2 Watercourse is defined as being as appears in the *Rights in Water and Irrigation Act 1914* which states:

> *(1) In this Act, unless the contrary intention appears —*
>
> *watercourse means —*
> *(a) any river, creek, stream or brook in which water flows;*
> *(b) any collection of water (including a reservoir) into, through or out of which anything coming within paragraph (a) flows;*
> *(c) any place where water flows that is prescribed by local by-laws to be a watercourse and includes the bed and banks of anything referred to in paragraph (a), (b) or (c).*
> *(2) For the purposes of the definition in subsection (1) —*
> *(a) a flow or collection of water comes within that definition even though it is only intermittent or occasional; and*
> *(b) a river, creek, stream or brook includes a conduit that wholly or partially diverts it from its natural course and forms part of the river, creek, stream or brook; and*
> *(c) it is immaterial that a river, creek, stream or brook or a natural collection of water may have been artificially improved or altered.*

Institute of Public Works Engineering Australia. This issue was rectified in the June 2020 amendment of the specification, following consultation with technical experts at the department and MRWA.

Outcomes

Up to June 2020, MRWA had used over 31,000 tonnes of RtR material in the Kwinana Freeway Northbound Widening project. Between May 2019 and February 2020, over 26,000 tonnes of material were used in the following contracts:

- Kwinana Freeway Northbound Widening Russell to Roe project (17,300 tonnes).
- Kwinana Freeway / Roe Highway interchange project (7,287 tonnes).
- Karel Avenue / Roe Highway interchange project (1,744 tonnes).

The material was used as subbase under full depth asphalt.

MRWA reported the following benefits using the material:

- lower transport costs (due to suppliers of recycled product being located closer to construction sites compared to suppliers of virgin materials)
- lower emissions from reduced transport
- reduced disturbance of the natural environment associated with quarrying activities
- increased use of recycled material, resulting in less material going to landfill.

Other benefits have been observed as a results of the pilot project activities, including:

- Recycled C&D material strength: self-cementing properties can provide benefits for certain applications in road construction. Used as a sub-base, it provides a stiff underlying layer that will help extend the life of various road pavements.
- Additional cost reductions over time: base course under local roads (ideally with geotextile seals) presents initial costs, but these costs are offset by longer life of recycled material
- Time and labour savings: less mixing required because material is more consistent than traditional limestone.
- Water savings: recycled material uses less compaction moisture than virgin material.
- Durability: recycled material functions similarly to conventional granular materials. It is durable and can withstand moderate traffic from construction vehicles without further material breakdown. Conventional materials are more likely to breakdown under the same traffic volume.

Please refer to Part B of this report for more information on MRWA's use of materials and key findings.

Key findings

- MRWA and its contractors were able to source material when required.
- MRWA was satisfied that the independent audit regime provided sufficient rigour to confirm that materials met the RtR product specification.
- MRWA supports the use of RtR compliant material as subbase under full depth asphalt.
- Minor issues were identified in the RtR product specification which have been addressed or are subject to review.
- MRWA used over 26,000 tonnes of recycled C&D products in the Kwinana Freeway Northbound Widening project during the pilot phase.

Findings

The RtR pilot project has been successful. Usage targets have been met, though there were delays when compared to original project timelines. Initial anticipated benefits were largely realised, with some issues around costs (that is, MRWA contractors and others in the supply line adding costs). Additional engineering and work/labour benefits were discovered during the pilot. The following outcomes were achieved during the pilot project:

Table 1: Outcomes of the RtR pilot project

Aspect	Finding
Collaboration and engagement	
Collaboration and good working relationships across government agencies and industry is critical to the project's success.	
WRIWA plays an import role communicating with and supporting its members.	
Implementation	
MASP and preliminary audit	The engagement of a suitably qualified consultant is important to ensure the MASP is prepared in accordance with the RtR product specification.
	The preliminary audit provides assurance that producers' sites are set up in accordance with the approved MASP.
	C&D recyclers have been able to access funding for the costs of engagement of consultants to prepare MASPs, and for testing of material.
Production and audit	To date, producers have consistently produced recycled C&D products in accordance with the RtR product specification.
	The independent audit determined that the recyclers' processes were consistent with the process described in the MASP and confirmed that products met the RtR product specification.
	The auditor should work with project partners to schedule the random audits.
	The auditor reported full cooperation from producers in relation to accessing sites and conducting audits.
Use of materials	MRWA and its contractors were able to source material when required.
	MRWA was satisfied that the independent audit regime provided sufficient rigour to confirm that materials met the RtR product specification.
	MRWA supports the use of RtR compliant material as subbase under full depth asphalt.
	Minor issues were identified in the RtR product specification which have been addressed or are subject to review.
	MRWA used over 31,000 tonnes of recycled C&D products up until June 2020, with over 26,000 tonnes being used between May 2019 and February 2020.

Part B: Main Roads Western Australia report

Scope

This report presents Main Roads Western Australia's (MRWA) assessment of the implementation of the Roads to Reuse (RtR) pilot project and the effectiveness of the Roads to Reuse product specification: recycled road base and recycled drainage rock (RtR product specification) (September 2018) in managing the usage of 25,000 tonnes of crushed recycled concrete (CRC). The CRC was used as sub-base under full depth asphalt pavements on three construction contracts related to the Kwinana Freeway northbound widening near Roe Highway in 2019, completed in February 2020.

The pilot project was delivered by MRWA, the Waste Authority and the Department of Water and Environmental Regulation (the department), with support from the Waste and Recycling Industry Association of Western Australia (WRIWA) and the Department of Health.

The pilot project focussed on implementing and assessing the robust measures to manage product health and safety and product environmental impacts under the RtR product specification. Engineering properties, manufacturing and constructability of CRC have been proven in previous MRWA and local government authority projects.

This pilot project is an important milestone towards embedding the use of CRC as a safe and viable standard road construction material.

Overview

Background

In Western Australia (WA), CRC has been used as roadbase material to various extents by MRWA and LGAs since the early 2000s, most notably by City of Kwinana, City of Canning and City of Swan. Over time, its use has led to the uncovering of various issues that required addressing including the need for management specifications, the potential for contamination which may pose a health risk and various engineering constraints to be overcome. Joint monitoring by City of Kwinana and MRWA of the Gilmore Avenue bus lane trial constructed in 2004, led to MRWA publishing its Specification 501.92 for CRC as a sub-base material on the MRWA network, with the same criteria as per the Institute of Public Works Engineering Australasia (IPWEA) specification for CRC as sub-base. MRWA restricted its usage to sub-base only, due to concerns over the re-cementation of the material leading to fatigue cracking under high traffic loads. MRWA recommended a geofabric reinforced seal be applied where CRC is used as basecourse.

The first usage of CRC on the MRWA network was as a basecourse trial under thin asphalt surfacing on the Kwinana Freeway in 2008. This section continues to be monitored twice annually and cracking in the open graded asphalt became evident in 2019 – visually assessed as being reflective cracking from shrinkage of the CRC basecourse. MRWA notes and maintains an interest in the wide application of various blends of CRC as basecourse by the City of Canning.

In 2011, the use of CRC as sub-base under full depth asphalt (on the MRWA Great Eastern Highway upgrade project in Belmont) was halted when asbestos was identified in the product on a separate project. No asbestos was detected on the MRWA project.

The department (then Department of Environment and Conservation [DEC]) worked with MRWA and the Department of Health to develop new guidelines to manage asbestos in the C&D waste stream. The *Guideline: Managing Asbestos at Construction and Demolition Waste Recycling Premises* (published in December 2012) includes extensive testing regimes to manage asbestos levels below maximum permissible limits. Almost all of the 37 C&D waste recycling premises applied for and received renewed licences in compliance with the 2012 guidelines. MRWA recommenced use of CRC as sub-base under full depth asphalt on alliance projects only – as alliances allow commercial implications to be more readily managed in the event that intervention is required if asbestos is detected. DEC guidelines on maximum permissible limits of other hazardous contaminants were published in January 2015.

In 2013 and 2014, 67,000 tonnes of CRC were used on the MRWA alliance project upgrading Tonkin Highway in Kewdale. Daily demand on product supply was very high. Following a major plant breakdown, alternative sub-base materials were sourced. A review of the usage of CRC showed that more than 5,000 tests undertaken by independent testing (arranged by the supplier) demonstrated no

asbestos detected above the maximum permissible limits. However, two out of eight (25 per cent) independent audit samples and tests identified that two stockpiles exceeded the maximum permissible limit. Although the two stockpiles were not supplied to the MRWA project, MRWA was concerned about the robustness of the implementation of the DEC 2012 guidelines.

In September 2018, the Waste Authority published the RtR product specification as part of the RtR program. The RtR product specification contains robust environmental and safety, health and welfare criteria and requirements. MRWA committed to undertake a 25,000-tonne pilot project with the Waste Authority and the department, which included independent end product audit testing managed by the Waste Authority to verify compliance with the RtR product specification.

Pilot project purpose

The objective of the pilot project was to assess the effectiveness of the measures to manage product health and safety and product environmental impacts under the RtR product specification. There are five key elements to the assessment:

- specification requirements
- approval of a supplier's MASP
- industry capability
- compliance verification and enforcement
- feasibility and reliability.

Interagency and industry collaboration

A waste forum was established in 2018 to facilitate interagency and industry collaboration, initially with a focus on CRC, but also on the reuse and recycling of other materials recovered from the waste stream with potential use in road infrastructure. The forum comprises representatives from MRWA, the department, the Waste Authority and WRIWA.

A number of meetings and workshops were held with industry in 2018 and 2019 to facilitate understanding and application of the RtR product specification and the development by industry of MASPs specific to their operations.

The waste forum continues to meet to facilitate adoption of the use of CRC into business as usual and help resolve issues as they arise.

Crushed recycled concrete properties

Engineering considerations

CRC is a high strength pavement material exceeding the minimum requirement of 80 per cent Californian Bearing Capacity (CBR) for basecourse. It has good workability and is placed and compacted similar to crushed rockbase.

The crushing of the concrete reactivates unhydrated cement, leading to re-cementation over time. Standard seven day and 28-day unconfined compressive strength test results are lower than maximum limits for unbound cement modified materials; however, it should be noted that these characterisation test requirements are based on the addition of fresh unhydrated cement. Observations over time of CRC basecourse trials indicate that the material behaves more like a lightly cemented granular material, rather than a cement modified granular material.

There have been a number of cases where CRC basecourse layers under thin asphalt surfacings have exhibited shrinkage cracking between three years and 10 years after placement. Under heavy traffic loadings, CRC presents a fatigue cracking risk if used as a basecourse layer with thin asphalt surfacings. A trial section of CRC as a basecourse layer under thin asphalt surfacing (30 mm open-graded asphalt on 30 mm dense-graded asphalt) constructed on Kwinana Freeway in 2008 is performing well, with a number of broadly spaced transverse cracks in the asphalt first appearing in 2018, but no other defects apparent. The trial continues to be monitored.

There have been cases of “popping” reported to MRWA where CRC has been used as a basecourse under thin asphalt surfacing applications in car parks. Popping occurs when pieces of aluminium (such as rivets) or other expansive materials swell up over time with sufficient force to lift the overlying surfacing, typically up to 20 mm in height and up to 100 mm in diameter. No popping has occurred on MRWA projects.

MRWA is satisfied that if used as a sub-base under full depth asphalt pavements, CRC presents a low risk of pavement cracking or popping. This is a conservative approach consistent with the Austroads Guide to Pavement Technology advice to place a minimum of 175 mm asphalt over the bound sub-base layers in composite and deep strength pavement designs commonly used in eastern Australia. MRWA will permit a higher sub-base modulus for CRC to be assigned in the mechanistic design procedure than in the unbound granular sub-base limit.

For low traffic loadings, if CRC is used as a basecourse under thin asphalt surfacings, MRWA recommends the use of a geotextile reinforced seal to mitigate against reflective cracking in the asphalt.

Health and safety considerations

The foremost health and safety consideration with CRC is the risk of asbestos contamination. This is particularly important in WA due to the prevalence of asbestos in construction materials and in sacrificial formwork, making it difficult to ensure that asbestos does not enter the C&D waste recycling streams. The RtR product specification includes strict inspection and testing regime requirements in the supplier's quality system and MASPs to ensure that asbestos levels do not exceed Department of Health maximum acceptance limits. These requirements extend similarly to other potential contaminants hazardous to health and safety.

In addition to the supplier's management and testing, MRWA requires procedural audits and random end product audit testing to ensure and independently verify that all health and safety requirements are being fully complied with.

Environmental considerations

CRC has a high alkalinity (pH) which can leach into surrounding soil and drainage if it gets wet and become hazardous to the environment. Leaching of potential contaminants such as heavy metals is also hazardous to the environment and is exacerbated by alkalinity. The RtR product specification includes strict inspection and testing regime requirements in the supplier's quality system and MASPs to ensure that potentially hazardous contaminant levels do not exceed specified maximum acceptance limits. These current maximum acceptance limits are based on a conservative assessment of a broad spectrum of research. It is likely that the potential for hazardous leachate reduces as re-cementation of the material occurs over time.

Sustainability considerations

MRWA adopts the international sustainability hierarchy of reduce, reuse, recycle. This includes actions to reduce the amount of concrete waste produced during construction, research projects on the reuse of waste concrete into new concrete products, and encouragement of recycled materials to be upcycled into the highest value products practicable. CRC is a high-end manufactured pavement construction material. There are hundreds of thousands of tonnes of C&D waste generated each year that can be processed into CRC for road pavement construction, reducing the use of virgin crushed rock aggregates and reducing the amount of C&D waste going to landfill. A proactive approach to utilising CRC and establishing a permanent market for its ongoing use is an essential step to developing a circular economy in WA.

Given the proximity of recycling facilities, there are flow on sustainability outcomes from utilising CRC resulting from the reductions in haulage requirements for materials, potentially from both diversion from landfill and transport to site. These include less energy and fuel use, reduced air quality impacts, greenhouse gas emission reductions, and less nuisance to the community from heavy vehicle movements.

Risk mitigation strategies

The risk mitigation strategies adopted by MRWA in relation to the engineering, health, safety and environmental considerations outlined above for the use of CRC are as follows:

Risk	Cause	Mitigation
Cracking	Reactivation of cement shrinkage fatigue (high traffic)	Use as sub-base under full depth asphalt. Do not use as basecourse under heavy traffic. Consider geofabric seal if used as basecourse.
Popping	Expansive contaminants (for example, aluminium and gypsum)	Promote awareness and inspect end product. Use as sub-base under full depth asphalt.
Hazardous contaminants	Asbestos and other hazardous materials not removed in demolition	RtR product specification and departmental guidelines: • robust industry management systems • strict supplier end product testing • Independent audit testing (managed by the Waste Authority).
Alkalinity (pH)	Reactivation of cement	Do not use near wetlands/groundwater.

In relation to the risk management for asbestos, the following measures are adopted:

Responsibility	Asbestos risk mitigation measures
Demolition site	Asbestos check: • If asbestos is present or suspected, material is not to be recycled. • Audit and enforcement of legislation (illegal to recycle asbestos).
CRC supplier	Robust, approved quality system: • Approved MASP. • Incoming materials asbestos check at gate and traceability. • High asbestos awareness and inspection during processing. • Strict dust control measures, and quarantine if asbestos detected. • Strict supplier end product testing regime.
The department	• RtR product specification and departmental guidelines. • Waste Authority's assessment of a supplier's MASP (assessment undertaken with advice from the department and Department of Health). • Independent random end-product audit testing.
MRWA project	• Only RtR approved suppliers permitted. • Contractor required to assess and understand risks and mitigations. • Strict dust control measures required onsite. • Product must be clearly identified as CRC, including for testing. • CRC supply to cease if asbestos exceeds limits until investigated and resolved.

Findings

In April 2019, both Urban Resources and Waste Stream Management received approval of their respective MASPs. Between May 2019 and February 2020, approximately 26,331 tonnes of CRC were produced and supplied by Urban Resources to three Main Roads contracts under the Kwinana Freeway Northbound Widening Project:

- Kwinana Freeway Northbound Widening Russell to Roe project (17,300 tonnes)
- Kwinana Freeway/Roe Highway interchange project (7,287 tonnes)
- Karel Avenue/Roe Highway interchange project (1,744 tonnes)

This section of the report presents the observations and findings of the pilot project.

Specification requirements

RtR product specification

The RtR product specification sets out clear and robust requirements to manage asbestos and other potential hazardous contaminants. A number of workshops and information sessions were held to ensure that the requirements were clearly understood.

The RtR product specification criteria for maximum permissible levels are clear and robust and involve a high level of end product sampling and testing to demonstrate safety. Industry feedback is that the level of testing is onerous and costly. MRWA feedback is that the level of testing provides confidence in the safety of using the product. The criteria for environmental protection appear to be overly conservative.

There were no non-compliances with any of the RtR product specification criteria for asbestos and other potential hazardous contaminants.

The RtR product specification does not permit the use of CRC within 100 m of a wetland or watercourse, on or above land subject to flooding, or within a P1 Public Drinking Water Source areas. These restrictions appear to be overly conservative. MRWA pavement design requirements do not permit granular pavement layers within the capillary rise zone of the underlying water table. Leaching appears to be unlikely if the material is above the capillary rise zone over the water table.

There was one case of non-compliance by one contractor placing CRC over a P1 Public Drinking Water Source, which was identified and corrected promptly by removal of the material to a suitable alternative location. The particular location was tens of metres above the water table and unlikely to have presented a risk of contamination.

MRWA specification 501.92

The MRWA pilot project specification 501.92 requires increased attention to dust control and includes a hold point to immediately cease supply in the event of

asbestos exceeding maximum permissible levels. There were no events of non-compliance.

The MRWA pilot project specification 501.92 explicitly repeats the RtR product specification limitations on the location of use. There was one case of non-compliance, as discussed above.

Supplier approval

The Waste Authority MASP approval processes are clear and robust. Industry feedback is that the preparation and approval process is onerous and costly. MRWA feedback is that the robustness of the approval process provides confidence in the safety of using the product and is effectively like a prequalification system.

Industry capability

The supply timeframes and targets were met on all contracts. The quality of the CRC was consistent on all contracts and met all quality, safety and environmental criteria.

It should be noted that the pilot project involved widening works with relatively small quantities of material required at a time. These quantities are comparable to typical LGA road projects, but not with large scale freeway construction projects, which would involve a significantly higher supply demand. Consideration would need to be given to the capacity to stockpile large quantities of material at the supplier's premises while awaiting compliance test results in order to ensure a smooth and continuous supply of materials to site.

The industry has demonstrated its capability of working together to meet MRWA expectations and supply a reliable and consistent product. This approach needs to be maintained as MRWA gears up to increased usage of CRC on bigger projects.

Compliance verification and enforcement

MRWA experience from road construction materials quality management is that independent end-product audit sampling and testing is essential to verify the reliability of supplier end-product sampling and testing. The department, on behalf of the Waste Authority, engaged Senversa as an independent auditor to undertake initial procedural audits and ongoing random end-product audits. These services were provided to a high standard.

There were no non-compliances in Senversa's end-product audit sampling and testing, which provided confidence in the reliability of the supplier's processes and end-product sampling and testing.

MRWA notes that the RtR product specification allows the continued use of a stockpile even if a test result is non-compliant and exceeds the specified maximum permissible limits. This is based on a Department of Health holistic approach and probabilistic risk. MRWA is concerned that this approach is inconsistent with the approach taken on engineering criteria, and therefore requires additional

requirements in its specification 501.92 in the event of test results exceeding the maximum permissible limits in the RtR product specification.

Product feasibility and reliability

Material availability and acceptance

CRC was readily available to the pilot project contracts with relatively short lead for transport.

All three contracts reported good consistency and workability of the material and ease of placement with no rework required. The finished CRC product provided an excellent, tightly-bound stone-mosaic surface suitable for heavy sweeping and application of the bituminous prime. The material was noted to have good resistance to construction traffic wear and tear.

Cost

The cost of CRC was initially higher than limestone, and a $4/tonne subsidy was provided by the Waste Authority for the pilot project to incentivise usage. Additional extra-over costs were provided by MRWA. Feedback from the alliance project was that the actual costs reduced over time and were comparable to limestone.

Industry feedback since the pilot project is that CRC has been successfully included in other competitively tendered supply contracts.

Conclusions and recommendations

The RtR pilot project has successfully achieved its objectives to provide a safe and reliable CRC product.

RtR product specification

The RtR product specification and supplier approvals provide robust processes and criteria to manage asbestos and other potential hazardous contaminants.

It is recommended that:

- The strict supplier process and end-product testing regime requirements be maintained to ensure ongoing confidence in the product.
- The robust MASP assessment and approval processes be maintained to ensure only approved producers can supply the product.
- Further research is undertaken into leaching potential and environmental criteria, including in relation to restrictions on location of usage where the material is used well above capillary rise zones. Undergoing this research may enable greater opportunities to use CRC in practice.

MRWA specification 501.92

It is recommended that:

- the MRWA pilot project specification 501.92 be published into MRWA specification 501 for broader use
- a hold point be added to MRWA specification 501.92 to confirm that health, safety and environment requirements and limitations on usage have been met.

RtR product specification independent audit testing

Independent end-product audit sampling and testing is essential to verify the reliability of supplier end-product sampling and testing.

It is recommended that:

- The department, on behalf of the Waste Authority, continue to arrange independent end-product audit sampling and testing compliance with the RtR product specification.

Government and industry engagement

It is recommended that:

- the waste forum continue to facilitate the increased usage of CRC
- further knowledge transfer workshops are held with industry and LGAs
- a communications plan be developed to support communications and engagement with the sector.

Ongoing MRWA usage

It is recommended that:

- MRWA continue to expand usage to other MRWA projects.
- Closely monitor compliance with the RtR product specification on a high demand project.

Acknowledgement

MRWA would like to acknowledge the collaboration and efforts by all parties involved in making the RtR pilot project a success, in particular the Waste Authority, the Department of Water and Environmental Regulation, the Waste and Recycling Industry Association of Western Australia and participating suppliers and contractors.

Shortened forms

MRWA	Main Roads Western Australia
The department	Department of Water and Environmental Regulation
WRIWA	Waste and Recycling Industry Association of Western Australia
LGA	Local government authority
C&D waste	Construction and demolition waste
CRC	Crushed recycled concrete
RtR	Roads to Reuse
MASP	Material Acceptance and Sampling Plan

Appendices

Product testing scheme - construction products

Guide for construction and demolition recyclers

The *Product testing scheme – construction products* is a Waste Authority initiative which supports producers of recycled construction and demolition products with the costs of routine frequency sampling and testing requirements as set out in the *Roads to Reuse: Product Specification – recycled road base and drainage rock.*

BACKGROUND

The Roads to Reuse (RtR) program encourages local governments, state government entities, regional councils and the private sector to use recycled construction and demolition (C&D) products (recycled road base and recycled drainage rock) in civil applications such as road construction.

The RtR provides funding for the use of material that meets the *Roads to Reuse: Product Specification - recycled road base and recycled drainage rock* (RtR Product Specification).

The RtR Product Specification establishes *routine frequency sampling* requirements. The Waste Authority can approve *reduced frequency routine sampling* where a producer has demonstrated that the RtR Product Specification has been consistently met for at least six months.

This guideline describes the Product Testing Scheme (PTS), how producers can participate in it and the conditions upon which funding will be allocated.

Program description

The PTS subsidises the cost of the sampling and testing undertaken by C&D producers in accordance with the RtR Product Specification.

Objectives

The objectives of the PTS are to:

- Support C&D producers with the cost of *routine frequency sampling* required by the RtR Product Specification.
- Support C&D producers to transition from *routine frequency sampling* to *reduced frequency routine sampling*, subject to Waste Authority approval.
- Encourage the supply of suitable C&D product for use as part of the RtR.

Cost of sampling and testing

To transition from *routine frequency sampling* to *reduced frequency routine sampling*, producers must demonstrate that the RtR Product Specification has been consistently met over a continuous six month period and request Waste Authority approval to undertake *reduced frequency routine sampling*.

The PTS will reimburse eligible producers for the cost of sampling in accordance with RtR Product Specification as follows:

- Up to 26 weeks (or six months) of *routine frequency sampling*. This is the minimum period of sampling required for the Waste Authority to assess an application to undertake *reduced frequency routine sampling*.
- Up to eight weeks of additional *routine frequency sampling* to allow for the Waste Authority to consider an application to undertake *reduced frequency routine sampling*.

Cost of developing a Material Acceptance and Sampling Plan

To ensure that they have the evidence required to support a request for *reduced frequency routine sampling*, producers should engage a suitably qualified person[1] to develop a Material Acceptance and Sampling Plan (MASP) and submit that plan for review by the Waste Authority before commencing routine frequency sampling.

The PTS will pay up to 50 per cent of the costs incurred to engage a qualified person to prepare an approved MASP.

[1] Refer to funding conditions for the definition of suitably qualified person.

OPERATION OF THE SCHEME

The PTS has three stages:

1. **Application:** the producer registers its interest in the program with the Waste Authority and submits a MASP.

2. **Routine frequency sampling period:** following Waste Authority approval of the MASP, PTS funding is available to support up to 26 weeks of *routine frequency sampling*.

3. **Additional routine frequency sampling period:** PTS funding is available to support up to eight[2] additional weeks of *routine frequency sampling* while the Waste Authority reviews an application for *reduced frequency routine sampling*.

Independent auditing of the producer's sampling and testing will be arranged by the Department of Water and Environmental Regulation.

1. APPLICATION

Summary

Register interest in the program with the Waste Authority.

Engage a consultant and prepare a Material Acceptance and Sampling Plan (MASP).

Waste Authority assesses application.

Waste Authority approves sampling and testing plan.

A. Registration

To confirm eligibility for the PTS, producers must register their interest in the scheme with the Waste Authority using the registration form (Attachment 1).

When an application is lodged, the Waste Authority will discuss and clarify the PTS program details with the producer.

B. Preparation of Material Acceptance and Sampling Plan (MASP)

Producers must prepare a MASP. To ensure the plan is suitable for demonstrating compliance with the RtR Product Specification, a qualified person should be engaged to develop it.

The RtR Product Specification includes requirements to audit compliance with the RtR Product Specification.

C. Assessment of application

The Waste Authority will assess PTS applications (including registration form and MASP) and advise the producer in writing whether the application has been approved.

[2] The Waste Authority may at its sole discretion extend this period in exceptional circumstances.

2.2 ROUTINE FREQUENCY SAMPLING PERIOD

Summary

A preliminary audit (including site inspection) must occur before *routine frequency sampling* begins.

Commence *routine frequency sampling* in accordance with the MASP.

Submit product testing scheme claims.

A. Undertake preliminary audit (including site inspection)

Once an application is approved, the Department of Water and Environmental Regulation will arrange for an independent auditor to conduct a preliminary audit (including site inspection) prior to commencing *routine frequency sampling* in accordance with the approved MASP. The independent auditor will be an accredited contaminated sites auditor in Western Australia.

B. Commence routine frequency sampling

Following the preliminary audit, the producer may commence *routine frequency sampling* in accordance with the approved MASP. *Routine frequency sampling* must occur for a minimum of 26 weeks to provide the Waste Authority with the evidence required to support an application for approval to undertake *reduced frequency routine sampling*.

C. Submit claims

To make a claim for PTS funds, the producer must submit:

- the results of the *routine frequency sampling* undertaken in accordance with the approved MASP;
- invoices and any other supporting evidence requested to substantiate expenditure.

The claim form is included at Attachment 2.

The PTS will cover the costs of *routine frequency sampling* for a maximum of 34 weeks whether or not the material meets the RtR Product Specification.

2.3. ADDITIONAL ROUTINE FREQUENCY SAMPLING PERIOD (up to eight weeks)

Summary

Demonstrate that sampling and testing has been undertaken for a continuous 26 week period and that all relevant criteria in the RtR Product Specification have been consistently met.

Submit an application to undertake *reduced frequency routine sampling* to the Waste Authority.

Continue *routine frequency sampling* while the application is assessed (up to eight weeks of additional *routine frequency sampling* will be funded while the application for *reduced frequency routine sampling* is assessed).

A. Demonstrate RtR Product Specification has been met

The producer must be able to demonstrate that it has met the RtR Product Specification for a continuous six month period before submitting an application for approval to *undertake reduced frequency routine sampling* to the Waste Authority.

B. Apply for approval to undertake reduced frequency routine sampling

As soon as practicable after 26 weeks of continuous *routine frequency sampling*, the producer should submit an application to the Waste Authority for approval to undertake *reduced frequency routine sampling*.

Producers are encouraged to engage a suitably qualified consultant to assist with the preparation of the application to undertake *reduced frequency routine sampling*.

See the RtR Product Specification (section 4.2) for further details on the *reduced frequency routine sampling* application process and criteria.

C. Continue routine frequency sampling

For a producer's products to remain eligible under the RtR, the producer must continue *routine frequency sampling* until the Waste Authority provides a written response to its application for *reduced frequency routine sampling*.

PTS funding for *routine frequency sampling* is available for up to eight[3] weeks following the submission of an application for *reduced frequency routine sampling*, or the date upon which the Waste Authority responds to the producer's application, whichever occurs first.

[3] The Waste Authority may at its sole discretion extend this period in exceptional circumstances.

1. FUNDING CONDITIONS

3.1. Eligibility

To be eligible for PTS funding, a producer must:

- hold a licence to accept and process C&D waste to produce recycled materials under Part V of the *Environmental Protection Act 1986* and be compliant with licence conditions;
- have no outstanding levy payments pursuant to the *Waste Avoidance and Resource Recovery Levy Regulations 2008*; and
- have completed and submitted data for inclusion in the most recent annual survey of recyclers and re-processors which is used to produce the *Recycling Activity in Western Australia* report.

For the purposes of this scheme, producer means a person who processes, mixes, blends or otherwise incorporates C&D waste into recycled construction products.

Producers may operate anywhere in Western Australia.

3.2. Commitment to achieving approval for reduced frequency routine sampling

A producer must demonstrate a commitment to transition from *routine frequency sampling* to *reduced frequency routine sampling* to the Waste Authority.

The Waste Authority's approval of *reduced frequency routine sampling* is limited to the purpose of suppling suitable C&D product for use as part of the RtR.

3.3. Preparation of MASP

Producers must engage a qualified person to prepare a MASP in accordance with the RtR Product Specification.

The qualified person must be engaged through a competitive process or offer services at competitive rates. To demonstrate this, producers are required to obtain or refer to at least two quotes. The Waste Authority will pay up to 50 per cent of the lowest price quoted to develop an approved MASP[4].

3.4. Routine frequency sampling

Sampling and testing must be undertaken in accordance with the MASP approved by the Waste Authority.

Producers may claim PTS funding to cover 100 per cent of *routine frequency sampling* and testing costs undertaken in accordance with their MASP.

3.5. Maximum funding

PTS funding is available to each producer for no more than 34 weeks of continuous *routine frequency sampling*. The 34 week period allows for:

- twenty six weeks (or six months) of *routine frequency sampling*, being the minimum period required in order for the Waste Authority to assess a producer's request for *reduced frequency routine sampling*; and
- up to eight[5] weeks of additional *routine frequency sampling* to allow for the Waste Authority to consider approval of a producer's request for *reduced frequency routine sampling*.

[4] If a producer is of the opinion that the higher quote should be accepted, the producer should contact the program manager.

[5] The producer may continue to claim PTS payments during the assessment period for up to eight weeks following the 26 weeks of testing or to the date upon which the Waste Authority advises the producer of its decision relating to the

3.6. Claims

Producers must submit claims using the claim form at Attachment 2.

Claims must be accompanied by documentation including: test results; quotes from National Association of Testing Authorities (NATA) accredited laboratories; and evidence of expenditure.

3.7. Scope

The PTS only funds the cost of *routine frequency sampling* and testing associated with the RtR Product Specification.

It does not fund other testing or other purposes that may be required by a C&D producer.

3.8. Disputes

The Waste Authority reserves the right, at its absolute discretion, to withhold funds claimed under the PTS to entities that it reasonably determines do not meet these eligibility requirements.

3.9. Qualified person

Qualified person means a person possessing relevant tertiary qualifications to a minimum bachelor level, such as in environmental science or environmental engineering, with a minimum of five years' experience in analysing laboratory results related to contaminated sites, or extractive industry testing, and:

- a certified practitioner (a person holding a 'Site Contamination' specialist certification under the Certified Environmental Practitioners Scheme), and/or
- an accredited contaminated sites auditor.

3.10 RtR Product Specification

The RtR Product Specification is for the purposes of applying RtR funds and is not a Department of Water and Environmental Regulation guideline. Material must meet the specifications in Appendix 1 of the RtR Product Specification to be eligible for RtR funding. Producers, transporters and users of material that meets the RtR Appendix 1 specifications are still required to meet all other legal requirements that apply to the handling, transport, storage and use of the material. The specifications in RtR Appendix 1 are for the purposes of applying RtR funding only.

3.11 Audit

To be eligible for PTS funding, a producer must allow independent auditors to audit products and procedures in accordance with the MASP and RtR Product Specification, regardless of whether or not RtR incentive payments are made in relation to the product.

CONTACT DETAILS

Waste Authority
Prime House
8 Davidson Terrace
Joondalup WA 6027
Telephone: (08) 6364 6965
Email: RtR@dwer.wa.gov.au

2. PRODUCT TESTING SCHEME REGISTRATION FORM

Organisation details

Name _____

ABN _____

Postal address _____

Contact person _____

Position _____

Phone _____ Mobile _____

Fax _____ Email _____

Facility details

DWER licence number _____

DWER licence categories _____

Estimated tonnes processed per week _____

Products produced

☐ Recycled road base ☐ Recycled drainage rock

Applicant declaration

☐ I have read and understood the Product Testing Scheme guidelines.

☐ I confirm my commitment to implementing routine frequency sampling in accordance with the approved MASP.

☐ I confirm my intention to submit a request to the Waste Authority for approval to undertake reduced frequency routine sampling.

☐ I commit to engaging an independent qualified person to produce a MASP.

☐ I understand the funding conditions in relation to the preparation of a MASP

Authorised person

Signature _____

Name _____

Position _____

Date _____

Application form and MASP should be submitted to:

Waste Authority
Prime House
8 Davidson Terrace
Joondalup WA 6027
Tel: (08) 6364 6965
Email: RtR@dwer.wa.gov.au

3. PRODUCT TESTING SCHEME - CLAIM FORM

Please attach Certificate of Analysis and evidence of expenditure (invoices and receipts)

Construction and demolition producer details

Premises name _____ Occupier name _____

Facility address _____ Licence number _____

Contact name _____ Date submitted _____

Sampling overview

Sampling laboratory (if applicable) _____

Sample description (for example, soil) _____

Total weight or volume from which samples were taken (tonnes or m^3) _____

Number of samples _____

Start date _____ End date _____

Testing (analysis) overview (attach test results)

Laboratory _____

Start date _____ End date _____

Claim overview (attach invoices and evidence of expenditure)

Total cost of sampling	$
Total cost of testing by NATA accredited laboratory	$
Total cost incurred for engaging a consultant to develop the MASP (one claim only)	$

Applicant declaration

☐ I declare that the details given here are true and correct.

Authorised person

Signature _____

Name _____

Position _____

Date _____

Material Acceptance and Sampling Plan – Sampling and Testing Audit

Urban Resources, Ashley Road, Hope Valley, WA

Prepared for:
Department of Water and Environmental Regulation
Prime House, 8 Davidson Terrace
Joondalup WA 6027

13 November 2019

Distribution

Material Acceptance and Sampling Plan Compliance Audit
Urban Resources, Ashley Road, Hope Valley, WA

13 November 2019

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Contents

Executive Summary

Senversa Pty Ltd was commissioned by the Department of Water and Environmental Regulation (DWER) (Waste Authority) to undertake sampling and testing audits of material produced as part of the Roads to Reuse (RtR) Pilot Project for Urban Resources, located at 64 Ashley Road, Hope Valley, Western Australia ('the site').

The objectives of the sampling and testing audits were to verify whether or not the producers were compliant with their Material Acceptance and Sampling Plan (MASP) and to verify compliance of the product with the RtR Product Specification (Waste Authority 2018).

The scope of work for the sampling and testing audit comprised review of MASP, preparation of an audit protocol, site inspection and interviews with site personnel, sampling of representative material, laboratory analysis and reporting.

The audit was completed by Ashton Betti (Senior Associate Environmental Scientist) with 12 years' experience in contaminated sites assessment and auditing. Ashton was accompanied by Mark Jones (Risk & Compliance Manager, Urban Resources) and Luke Bennett (Site Supervisor, Urban Resources).

The site appeared to be well organised and onsite management procedures for material acceptance and processing were in general compliance with the MASP, noting two minor non-conformances related to pre-acceptance procedures (absence of contracts and insufficient information on incoming materials dockets). The other operational control procedures that are in place are considered adequate such that, in isolation, these minor non-conformances are unlikely to materially compromise the suitability of construction and demolition product being accepted at the site.

Overall the operational control procedures adopted to reduce the potential for contamination to enter the production stream appeared effective and there was no evidence that source materials for recycled road base were grossly contaminated. This was confirmed by sampling and testing of material which identified that material was compliant with the RtR Product Specification and suitable for use as part of the RtR Pilot Project.

Based on the sampling and testing audit it is recommended that, subject to ongoing adoption of MASP procedures, the Urban Resources located at 64 Ashley Road, Hope Valley is suitable for use as part of the RtR Pilot Project.

List of Acronyms

Acronym	Definition
ACM	Asbestos Containing Material
AF	Asbestos Fines
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure
C&D	Construction and Demolition
DoH	Department of Health
DWER	Department of Water and Environmental Regulation
FA	Fibrous Asbestos
MASP	Material Acceptance and Sampling Plan
MRWA	Main Roads WA
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
RtR	Roads to Reuse

1.0 Introduction

Senversa Pty Ltd was commissioned by the Department of Water and Environmental Regulation (DWER) (Waste Authority) to undertake a sampling and testing audit of material produced as part of the Roads to Reuse (RtR) Pilot Project for Urban Resources, located at 64 Ashley Road, Hope Valley, Western Australia ('the site').

1.1 Project Appreciation

The RtR Pilot Project is a State Government initiative being delivered through the Waste Authority which encourages the use of recycled construction and demolition (C&D) products in road construction.

Material funded by the program must meet the RtR Product Specification (*Roads to Reuse; Product Specification - recycled road base and recycled drainage rock*; September 2018) to ensure the environment and human health are protected.

The product specification requires producers of recycled C&D products to prepare a Material Acceptance and Sampling Plan (MASP), which outlines operational controls and acceptance procedures for products and to undertake sampling and testing to determine whether or not recycled C&D product meets the product specification.

The Waste Authority is delivering a pilot project (the RtR Pilot Project) with Main Roads WA (MRWA). As part of the RtR Pilot Project, the Waste Authority engaged Senversa to independently confirm the effectiveness of the C&D producers' management and testing processes and ability to meet the RtR Product Specification.

1.2 Objectives

The objectives of the sampling and testing audits were to verify whether or not the producers were compliant with their MASP and to verify compliance of the product with the RtR Product Specification (Waste Authority 2018).

1.3 Scope of Work

The scope of work for the sampling and testing audit comprised:

- review of MASP and audit protocol prior to inspection;
- site inspection and interviews with site personnel (three occasions);
- sampling of representative material produced as part of the project;
- laboratory analysis of samples; and
- reporting.

2.0 Site Identification

Site identification details are summarised in **Table 1**. The site location is shown on **Figure 1**.

Table 1: Site Identification Details

Site Identification Details	
Site Name	Urban Resources
Street Address	64 Ashley Road, Hope Valley
Legal Description	Part of Lot 126 on Diagram 93192
Certificate of Title	Volume: 2124 Folio: 670
Licence	L9050/2017/1
Permitted Waste Types	Clean Fill, Inert Waste Type 1

3.0 RtR Product Specification Guidelines

3.1 Assessment Guidelines

The approach to sampling of the material was consistent with relevant guidelines including:

1) *Roads to Reuse; Product Specification - recycled road base and recycled drainage rock;* September 2018 (http://www.wasteauthority.wa.gov.au/media/files/documents/RtR_Product_Specification.pdf)

2) Department of Water and Environmental Regulation (DWER) *Contaminated Sites Guidelines*

3) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (Department of Health [DoH] 2009)

4) *National Environment Protection (Assessment of Site Contamination) Measure (as amended and in force 16 May 2013)* (ASC NEPM) (National Environment Protection Council [NEPC] 1999)

3.2 Assessment Criteria

The primary assessment criteria adopted are the RtR Product Specification (Waste Authority 2018). These are reproduced in **Table 2**.

Table 2: Concrete-containing recycled road base product specifications (pH above 9[1])

Chemical and other attributes	Maximum average concentration (mg/kg dry weight)	Absolute maximum concentration[2] (mg/kg dry weight)
Metals/metalloids		
Antinomy, Sb	10	20
Arsenic, As	20	40
Cadmium, Cd	0.5	1.5
Total Chromium, Cr	60	120
Copper, Cu	60	150
Lead, Pb	75	150
Mercury, Hg	0.5	1
Molybdenum, Mo	40	80
Nickel, Ni	40	80
Selenium, Se	2	4
Vanadium, V	25	50
Zinc, Zn	200	350
Other		
pH	9 and above	9 and above
Asbestos		Note 3

Notes:

[1] concrete-containing products with pH>9 should not be used within 100m of any wetland/watercourse or on land subject to flooding.

[2] the maximum concentration in any individual sample

[3] inspection, sampling and testing for asbestos is to be carried out in accordance with Section 4.3 of Guidelines for managing asbestos at construction and demolition waste recycling facilities (DEC 2012 and as updated from time to time) using the specified weight of evidence approach to assess whether the product specification is met. https://www.der.wa.gov.au/images/documents/our-services/approvals-and-licences/final-guidelines-asbestos-in-cd-recycling--version-1.pdf

4.0 Methodology

4.1 Review MASP

Senversa was provided with a copy of the following document:

- Talis Consultants Pty Ltd (2019) *Material Acceptance and Sampling Plan. 64 Ashley Road, Hope Valley WA.* Version 4c, 2 April 2019. (Reference: TE19001)

The MASP was prepared in a manner designed to be compliant with the requirements of the RtR Specification.

The MASP provided an overview of site operations and described the authorised product specification. Most relevant to this aspect of the audit, the MASP outlined operational control procedure requirements to ensure compliance with the RtR Specification, these were broadly described in the following categories:

- Source product definitions (Section 2.1)
- Pre-acceptance procedures (Section 3.1)
- Acceptance procedures (Section 3.2)
- Asbestos acceptance procedures (Section 3.3)
- Waste processing controls (Section 3.4)
- Record keeping / documentation requirements (Section 8)

The MASP also defined the sampling and testing requirements for asbestos, geochemical parameters and product specifications).

4.2 Audit Protocol

Senversa prepared an audit protocol which identified each of the compliance requirements of the MASP, based on the categories identified above and developed a simple checklist style format designed to allow for verification that each requirement was reflected by site activities. A copy of the audit protocol is included in **Appendix B**.

A preliminary compliance audit was undertaken at the site on 23 April 2019 to assess compliance with the MASP prior to commencement of production of material. The results from the preliminary compliance audit were presented in:

- Senversa Pty Ltd (2019) *Material Acceptance and Sampling Plan Compliance Audit. Urban Resources, Ashley Road, Hope Valley, WA*. 29 April 2019 (Reference: P17000_003_RPT_Rev0_ComplianceAudit).

Three subsequent site inspections were randomly scheduled during production of material on 21 May 2019, 1 October 2019 and 25 October 2019 to assess compliance with the MASP.

The audits comprised a site inspection and interviews with site personnel. Compliance with each of the requirements of the MASP was assessed via inspection of site procedures, site observations, review of available documentation and information provided by site personnel.

The audits were completed by Ashton Betti (Senior Associate Environmental Scientist) with 12 years' experience in contaminated sites assessment and auditing. Ashton was accompanied by Mark Jones (Risk & Compliance Manager, Urban Resources) and Luke Bennett (Site Supervisor, Urban Resources).

4.3 Sampling and Testing Audit

4.3.1 Stockpile Sampling

As requested by DWER (email dated 15 November 2018) Senversa collected samples of material being sampled by the producer at a frequency of 10% of the samples collected by the producer in accordance with the MASP to provide an independent check of the producer's analytical data.

Samples were collected randomly across stockpiles to provide for uniform spatial coverage that was representative of the volume of material being sampled recognising potential heterogeneity. Samples were collected at the following frequencies across the three sampling events:

- 21 May 2019
  - Stockpile 4 (2500 tonnes): three samples for geochemical and asbestos analysis
- 1 October 2019:
  - Stockpile 7 (3600 tonnes): three samples for geochemical analysis, four samples for asbestos analysis
  - Stockpile 8 (3600 tonnes): three samples for geochemical analysis, four samples for asbestos analysis
- 25 October 2019
  - Stockpile 10 (3600 tonnes): three samples for geochemical and asbestos analysis
  - Stockpile 11 (1800 tonnes): two samples for geochemical analysis, one sample for asbestos analysis

Samples for geochemical analysis were collected directly from freshly exposed stockpile material into laboratory supplied sample jars by the field investigator wearing disposable nitrile gloves, which were replaced for each sample[1]. Samples were then sealed, labelled and placed in an insulated cooler for transport to the laboratory under industry standard chain of custody protocols.

Samples for asbestos analysis were collected from freshly exposed stockpile material into a 10 L bucket and sieved through a 7 mm sieve onto a flat surface. Material not passing through the 7 mm sieve were inspected for potential asbestos containing material (ACM). Any suspect material was weighed and placed in a snap lock plastic bag for confirmatory laboratory analysis. A 500 ml sample of the material that passed through the sieve was collected in a snap lock bag for laboratory analysis for asbestos fines (AF) and fibrous asbestos (FA).

All persons involved in the field program were appropriately qualified and experienced in environmental sampling protocols (including for asbestos). Sampling was completed by Ashton Betti (Senior Associate Environmental Scientist) with 12 years' contaminated sites experience.

4.3.2 Laboratory Analysis

Samples were appropriately stored and transported directly to the primary laboratory (ALS) under chain of custody protocols. ALS is National Association of Testing Authorities (NATA) accredited for the required analysis and completed necessary preparation and analysis within the recommended sample holding times and to the required detection limits.

It is recognised that recommended sample holding times for pH are so short that they were practically unachievable. Given the nature of the assessment (where the nature of material is not expected to change following sampling) this limitation was considered acceptable.

A summary of analytical methods adopted are provided below in **Table 3**.

[1] The samples comprised a blended mixture of coarse and fine aggregate (less than 19 mm in size) primarily comprising concrete and sand from the crushing and screening of C&D products. No screening of the product, other than for asbestos analysis, was undertaken prior to sampling

Table 3: Laboratory Analytical Methods

Analyte	Method	Limit of Reporting
Metals/metalloids (antimony, arsenic, cadmium, total chromium, copper, lead, mercury, molybdenum, nickel, selenium, vanadium and zinc)[1]	US EPA 6010, 6020	0.1 mg/kg - 1 mg/kg
Asbestos identification in soils (quantification if detected)[2]	AS 4964-2004 / WA/NEPM Guidelines	0.0004 g/kg - 0.1 g/kg 0.001 % (w/w) - 0.01 % (w/w)
pH	APHA 4500 pH / NEPM Schedule B3	0.1 pH unit

Notes:

[1] Samples for pH and metals analysis were milled to <2 mm and a 2 g sub sample taken for analysis.

[2] The NATA approved methodology for quantification of asbestos currently has a limit of reporting of 0.1 g/kg (0.01% w/w). As such, using the NATA approved methodology, if any asbestos (AF/FA) is detected in a sample the concentration is considered to exceed the adopted guideline of 0.001% w/w due to the elevated LOR (0.01% w/w). Laboratories have adopted a non-NATA approved methodology (gravimetric procedures) to enable quantification to levels of below 0.001% w/w where asbestos is detected and this data has been reported as provided by the laboratory. It is not clear how the Waste Authority may want to interpret these results, so at this stage Senversa will consider any detection to be an exceedance.

5.0 Audit Observations

5.1 Site Observations

The sampling and testing audits were undertaken at the site on 21 May 2019, 1 October 2019 and 25 October 2019 to assess compliance with the MASP. The site location and layout are shown on **Figure 1** and **Figure 2**, respectively. Photographs taken during the audits are presented in **Appendix A**. The audit checklists are presented in **Appendix B**.

Section 3.1 of the MASP identified that Urban Resources accepts commercial loads by contract only, however Mark Jones (Risk & Compliance Manager, Urban Resources) advised that loads are received on a job-by-job basis and accepted or rejected in accordance with the other pre-acceptance procedures outlined in the MASP. Whilst not strictly in accordance with the procedures outlined in the MASP, this process, combined with the other pre-acceptance procedures that are in place, are considered to be adequate to provide confidence that the C&D product entering the site is appropriately compliant with the RtR Product Specification. This is consistent with the observations and conclusions made during the preliminary compliance audit.

The C&D products enter the site via truck from a signed entry on Ashley Road, to the north-west of the site. Each truck is inspected via an elevated observation platform. Once the initial visual inspection has been completed, each truck driver is required to complete and sign an incoming material docket, which states the contractor name, vehicle registration, source site, product type, volume and declaration that the load is free from asbestos. An example incoming material docket is shown on **Photo 1, Appendix A**. It is noted that some of the pre-acceptance information requirements as identified in Section 3.1 of the MASP had not been completed within the observed incoming material docket (e.g. age of buildings/structures, current/previous uses of source site). It is understood that several loads of material come from each site, and this information is provided, at minimum, for every site.

To date, one load of material has been rejected from the site due to the identification of a fragment of asbestos sheeting during the initial visual assessment (**Photo 2, Appendix A**). This material was taken immediately off-site for disposal at a licenced asbestos facility. Follow up by site personnel identified that there were six additional loads of material from the same source site (Boundary Road, Mandurah), all of which were carefully inspected and confirmed to be free of asbestos.

Once the initial visual assessment has been passed, the C&D product is tipped in an area in the southern portion of the site for a secondary inspection. This material is spread out by loader operator and sprayed with water, then inspected (**Photo 3, Appendix A**). If approved for acceptance this material will be initially processed by picking out any large pieces of rebar (for off-site disposal) and then added to a larger stockpile to be used as source material for crushing/screening operations. During the inspection the source material stockpile predominantly comprised concrete, with minor plastic and steel components (**Photo 4, Appendix A**).

Material that is suspected to be potentially contaminated during the secondary inspection or subsequent processing is taken to an isolation area for confirmatory sampling (**Photo 5, Appendix A**). At the time of the inspections no material was present in the isolation area.

Accepted source material is run through a crushing and screening process, whereby metal and plastic are removed and different sized fragments are separated (road base and drainage rock) and placed in discrete stockpiles. The road base stockpile is sampled at a rate of one sample for asbestos analysis per 70 m^3 stockpile and 20 samples for geochemical analysis per 4000 tonnes of material. Each sample has an individual identification number, which includes the unique identification of the larger stockpile. Stockpile signage also includes colour coding to identify the status of the stockpile (red for awaiting classification and green for material suitable for sale). At the time of the inspections, the following stockpiles were present at the site:

- 21 May 2019
  - Stockpile 4 - 2500 tonnes
- 1 October 2019:
  - Stockpile 7 - 3600 tonnes
  - Stockpile 8 - 3600 tonnes
- 25 October 2019
  - Stockpile 10 - 3600 tonnes
  - Stockpile 11 - 1800 tonnes

During the inspections, the site appeared to be well organised and site personnel were familiar with the requirements of the MASP. Documentation including training registers, sampling notes and sample registers was well maintained and available on request. There was no evidence of ACM at any location on the site.

5.2 Sampling Results

5.2.1 Site Observations

Three sampling and testing audits were randomly scheduled during production of material on 21 May 2019, 1 October 2019 and 25 October 2019 to provide an independent check of the producer's analytical data.

During sampling there was no evidence of contamination such as staining or odour. At each sampling location, a 10 L sample was sieved using a 7 mm sieve to assess for presence of ACM. ACM (>7 mm) was not identified at any of the sampling locations.

5.2.2 Laboratory Results

Soil laboratory results are tabulated in **Table C1**, **Appendix C** and laboratory analytical reports are presented in **Appendix D**.

The laboratory results indicate the following:

- Concentrations of all analytes were below the relevant criteria (maximum average and absolute maximum values) presented in the RtR Product Specification.
- Asbestos (AF/FA) was not detected in any sample.
- The results from the sampling and testing audit were consistent with those reported by Urban Resources as part of their routine sampling of the material as part of the MASP.

Based on these results, the material was considered compliant with the RtR Product Specification and suitable for use as part of the RtR Pilot Project.

5.3 Summary of MASP Compliance

A summary of MASP compliance, based on the audit protocol is summarised in the table below.

Table 4: MASP Compliance

Compliance Category	Compliance	Comment
Source product	Yes	Clean concrete only, no formwork.
Pre-acceptance procedures	Partial	Material currently accepted on a load by load basis, MASP identifies contract acceptance only. Some information incomplete on individual incoming material dockets, but available on a site basis.
Acceptance procedures	Yes	Compliant with MASP.
Asbestos acceptance procedures	Yes	Compliant with MASP.
Waste processing controls	Yes	Compliant with MASP.
Record keeping	Yes	Compliant with MASP.

6.0 Conclusions and Recommendations

6.1 Conclusions

Senversa was engaged to undertake a sampling and testing audit of material to verify whether or not Urban Resources were compliant with their MASP and to verify compliance of the product with the RtR Product Specification.

The site appeared to be well organised and onsite management procedures for material acceptance and processing were in general compliance with the MASP, noting two minor non-conformances related to pre-acceptance procedures (absence of contracts and insufficient information on incoming materials dockets). The other operational control procedures that are in place are considered adequate such that, in isolation, these minor non-conformances are unlikely to materially compromise the suitability of C&D product being accepted at the site.

Overall the operational control procedures adopted to reduce the potential for contamination to enter the production stream appeared effective and there was no evidence that source materials for recycled road base were grossly contaminated. This was confirmed by sampling and testing of material which identified that material was compliant with the RtR Product Specification and suitable for use as part of the RtR Pilot Project.

6.2 Recommendations

Based on the sampling and testing audit it is recommended that, subject to ongoing adoption of MASP procedures, the Urban Resources located at 64 Ashley Road, Hope Valley is suitable for use as part of the RtR Pilot Project.

7.0 Principles and Limitations of Investigation

The following principles are an integral part of site contamination assessment practices and are intended to be referred to when resolving any ambiguity or exercising such discretion as is accorded the user or site assessor.

Area	Principle and Limitation
Elimination of Uncertainty	Some uncertainty is inherent in all site investigations. Furthermore, any sample, either surface or subsurface, taken for chemical testing may or may not be representative of a larger population or area. Professional judgment and interpretation are inherent in the process, and even when exercised in accordance with objective scientific principles, uncertainty is inevitable. Additional assessment beyond that which was reasonably undertaken may reduce the uncertainty.
Failure to Detect	Even when site investigation work is executed competently and in accordance with the appropriate Australian guidance, such as the National Environment Protection (Assessment of Site Contamination) Amendment Measure ('the NEPM'), it must be recognised that certain conditions present especially difficult target analyte detection problems. Such conditions may include, but are not limited to, complex geological settings, unusual or generally poorly understood behaviour and fate characteristics of certain substances, complex, discontinuous, random, or heterogeneous distributions of existing target analytes, physical impediments to investigation imposed by the location of services, structures and other man-made objects, and the inherent limitations of assessment technologies.
Limitations of Information	The effectiveness of any site investigation may be compromised by limitations or defects in the information used to define the objectives and scope of the investigation, including inability to obtain information concerning historic site uses or prior site assessment activities despite the efforts of the user and assessor to obtain such information.
Chemical Analysis Error	Chemical testing methods have inherent uncertainties and limitations. Senversa routinely seeks to require the laboratory to report any potential or actual problems experienced, or non-routine events which may have occurred during the testing, so that such problems can be considered in evaluating the data.
Level of Assessment	The investigation herein should not be considered to be an exhaustive assessment of environmental conditions on a property. There is a point at which the effort required to obtain information is outweighed by the time required to obtain that information, and, in the context of private transactions and contractual responsibilities, may become a material detriment to the orderly conduct of business. If the presence of target analytes is confirmed on a property, the extent of further assessment is a function of the degree of confidence required and the degree of uncertainty acceptable in relation to the objectives of the assessment.
Comparison with Subsequent Inquiry	The justification and adequacy of the findings of this investigation in light of the findings of a subsequent inquiry should be evaluated based on the reasonableness of judgments made at the time and under the circumstances in which they were made.
Data Useability	Investigation data generally only represent the site conditions at the time the data were generated. Therefore, the usability of data collected as part of this investigation may have a finite lifetime depending on the application and use being made of the data. In all respects, a future reader of this report should evaluate whether previously generated data are appropriate for any subsequent use beyond the original purpose for which they were collected, or are otherwise subject to lifetime limits imposed by other laws, regulations or regulatory policies.
Nature of Advice	The investigation works herein are intended to develop and present sound, scientifically valid data concerning actual site conditions. Senversa does not seek or purport to provide legal or business advice.

8.0 References

Department of Health (2009) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*.

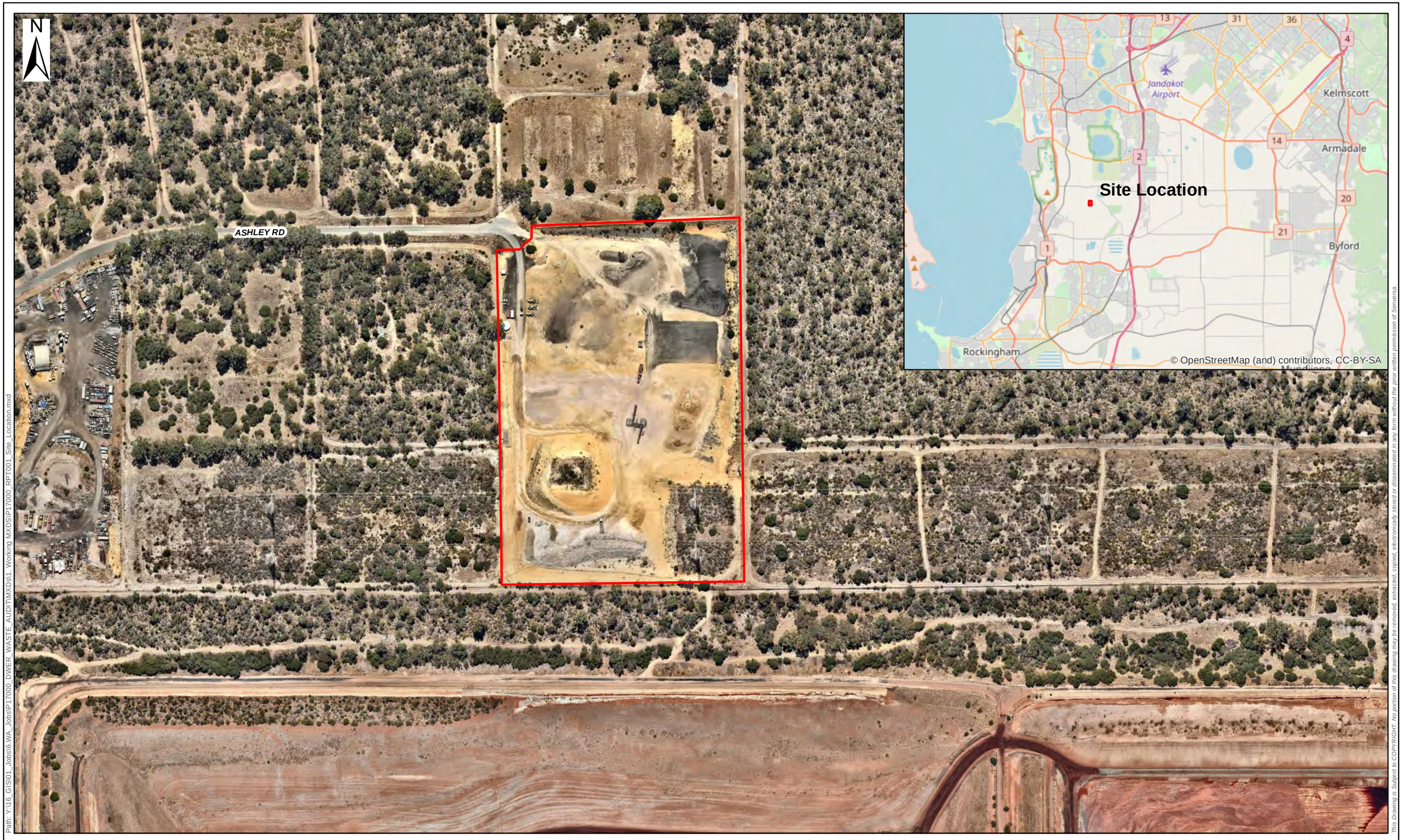
National Environment Protection Council (1999) *National Environment Protection (Assessment of Site Contamination) Measure (as amended and in force 16 May 2013)*.

Senversa Pty Ltd (2019) *Material Acceptance and Sampling Plan Compliance Audit. Urban Resources, Ashley Road, Hope Valley, WA*. 29 April 2019 (Reference: P17000_003_RPT_Rev0_ComplianceAudit).

Talis Consultants Pty Ltd (2019) *Material Acceptance and Sampling Plan. 64 Ashley Road, Hope Valley WA.* Version 4c, 2 April 2019. (Reference: TE19001)

Waste Authority (2018) *Roads to Reuse. Product Specification – Recycled road base and recycled drainage rock*. September 2018.

Figures



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senversa
Address: Level 17, 140 St Georges Terrace, Perth WA 6000
Phone: (08) 6557 8881
Website: www.senversa.com.au

Legend

Site Boundary

Notes:
Aerial imagery sourced from Nearmap Pty Ltd

Designed:	A. Betti	Date:	29/04/2019
Drawn:	F. Gurnett	Revision:	0
Checked:	.	Scale:	1:3,000 (A3)
File:	P17000_RPT001_Site_Location		

0 30 60 120 180 240 Metres

Datum GDA 1994, Projection MGA Zone 50

Figure No: 1

Title: Site Location

Project: Preliminary Compliance Audit

Location: 64 Ashley Road, Hope Valley

Client: Department of Water and Environmental Regulation

Path: Y:\16_GIS\01_Jobs\6.WA_Jobs\P17000_DWER_WASTE_AUDIT\MXDs\1. Working MXDs\P17000_RPT001_Site_Layout.mxd

senversa

Address: Level 17, 140 St Georges Terrace, Perth WA 6000
Phone: (08) 6557 8881
Website: www.senversa.com.au

Legend

- Site Features
- Site Boundary

Notes:
Aerial imagery sourced from Nearmap Pty Ltd

Designed:	A. Betti	Date:	29/04/2019
Drawn:	F. Gurnett	Revision:	0
Checked:	.	Scale:	1:1,700 (A3)
File:	P17000_RPT001_Site_Layout		

0 15 30 60 90 120 Metres

Datum GDA 1994, Projection MGA Zone 50

Figure No: 2

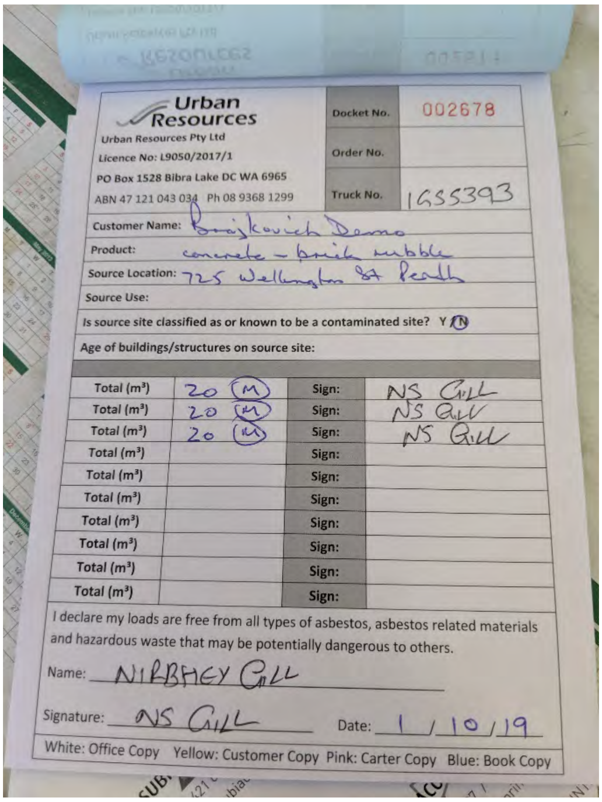
Title: Site Layout

Project: Preliminary Compliance Audit

Location: 64 Ashley Road, Hope Valley

Client: Department of Water and Environmental Regulation

Appendix A: Site Photographs


Urban Resources
Urban Resources Pty Ltd
Licence No: L9050/2017/1
PO Box 1528 Bibra Lake DC WA 6965
ABN 47 121 043 034 Ph 08 9368 1299

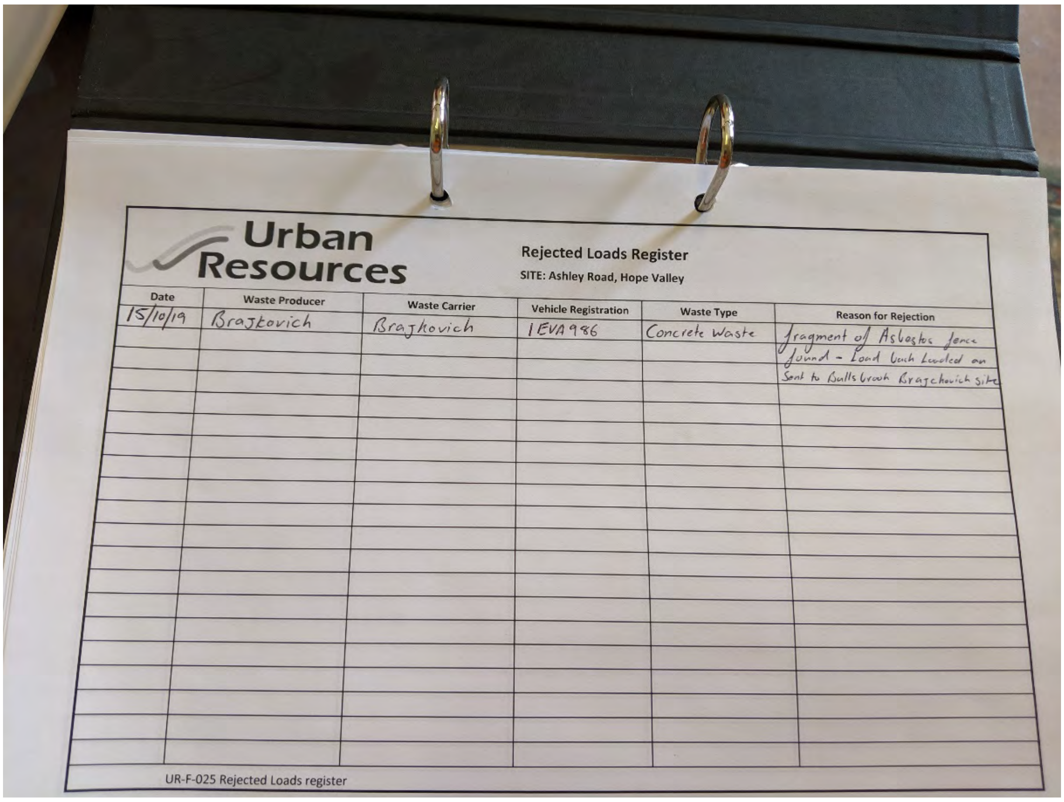
Docket No.	002678
Order No.	
Truck No.	1GSS393

Customer Name: Brajkovich Demo
Product: concrete – brick rubble
Source Location: 725 Wellington St Perth
Source Use:
Is source site classified as or known to be a contaminated site? Y / N
Age of buildings/structures on source site:

Total (m³)	20 (M)	Sign:	NS Gill
Total (m³)	20 (M)	Sign:	NS Gill
Total (m³)	20 (M)	Sign:	NS Gill
Total (m³)		Sign:	
Total (m³)		Sign:	
Total (m³)		Sign:	
Total (m³)		Sign:	
Total (m³)		Sign:	
Total (m³)		Sign:	
Total (m³)		Sign:	

I declare my loads are free from all types of asbestos, asbestos related materials and hazardous waste that may be potentially dangerous to others.
Name: NIRBHEY GILL
Signature: NS GILL Date: 1 / 10 / 19
White: Office Copy Yellow: Customer Copy Pink: Carter Copy Blue: Book Copy

Photo 1. Example incoming material docket.


Urban Resources
Rejected Loads Register
SITE: Ashley Road, Hope Valley

Date	Waste Producer	Waste Carrier	Vehicle Registration	Waste Type	Reason for Rejection
15/10/19	Brajkovich	Brajkovich	1EVA986	Concrete Waste	fragment of Asbestos fence found – Load back loaded on sent to Bulls brook Brajchovich site

UR-F-025 Rejected Loads register

Photo 2. Rejected loads register.

Photo 3. Secondary inspection after tipping (25 May 2019).

Photo 4. Source material for recycled road base (25 October 2019).

Photo 5. Isolation area (25 October 2019).

Photo 6. Recycled road base stockpiles with signage

Appendix B: Compliance Checklist

Senversa Pty Ltd
Level 17, 140 St Georges Terrace, Perth WA 6000
ABN 89 132 231 380 www.senversa.com.au

MASP Compliance Audit

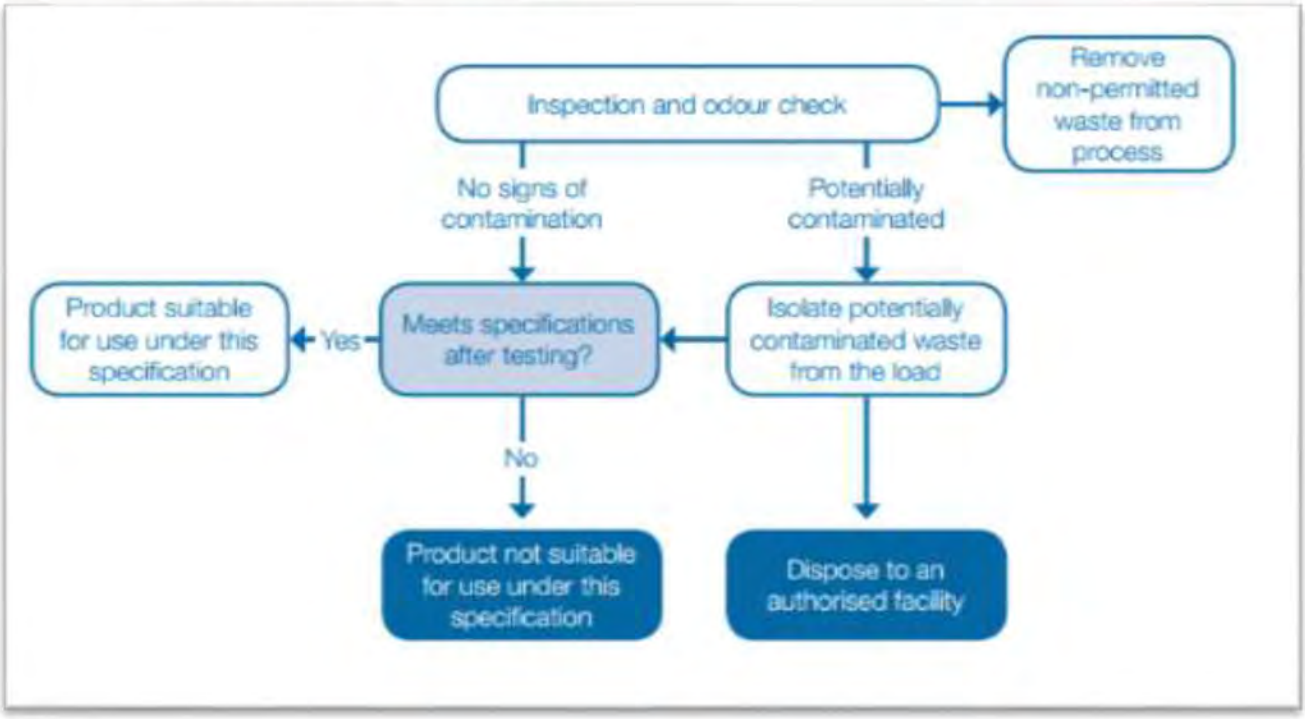
Site Name:	Urban Resources	**Date / Time:**	21 May 2019
Site Address:	64 Ashley Road, Hope Valley	**Client:**	DWER – Waste Authority
Licence Number:	L9050/2017/1	**Permitted Waste Types:**	Clean Fill, Inert Waste Type 1
Audit Representative:	Ashton Betti	**Site Representative:**	Mark Jones (Risk & Compliance Manager) Luke Bennett (Site Supervisor)

Ref.	Description	✓ / ✗	Notes
1	General Observations		Site accepts clean concrete only. No mixed demolition waste accepted. Main suppliers – Brajkovich, Boral, Merit and Macmahon. Site appeared well organised. Currently only producing recycled road base. Number of loads received per day highly variable (2-20 trucks per day).
2	Source Product Describe observed input products. • Recycled road base may consist concrete, bricks, tiles, ceramics, asphalt, natural rock, sand and recovered glass. <19mm • Recycled drainage rock may consist rock, brick and other similar rubble. Should not contain concrete. 20-27mm		Clean concrete, some minor plastic and metal (rebar). Rebar and plastic removed as far as practical as part of initial processing – placed into scrap bins for disposal off-site.
3	Pre-Acceptance Procedures		
	Evidence of contracts for material acceptance ('no asbestos' clause should be part of contract).	☒	Material accepted on a load by load basis.
	Evidence of 'No Asbestos' sign at site entry.	☑	Sign at entry present.
	Evidence of information related to material loads (type, source, location of source site and site history, contaminated site status).	☑	Incoming dockets contain information related to source location, source us, contaminated sites status, age of building and product type.
	Detail any loads that contain asbestos.	NA	No loads containing asbestos.
	Are gatehouse staff aware of these procedures?	☑	Gatehouse staff aware of procedures.

Ref.	Description	✓ / ✗	Notes
4	Acceptance Procedures		
	Evidence of signed declaration - load is free of asbestos.	☑	Signed declaration observed.
	Evidence of visual / olfactory assessment per flow chart.	☑	Visual inspection of material at gatehouse.
	Records of any rejected loads (producer, carrier, vehicle registration, date).	NA	No loads rejected to date. Rejected load book observed in gatehouse.
	Demarcated isolation area, with signage.	☑	Isolation area observed. No material present.
	Records of any stockpiles disposed of due to rejection.	☑	No stockpiles rejected to date. Any rejected stockpiles to be sent to Waste Stream.
5	Waste Processing Controls		
	Evidence of second inspection after stockpiling.	☑	Second inspection observed. Material is
	Output stockpiles – 70 m^3 then moved to a larger stockpile with maximum weight of 4000 tonnes.	☑	spread out by loader operator and sprayed with water, then inspected. Material
	Evidence of unique stockpile identifier on each stockpile.	☑	processing also occurs (removal of metal, plastic, etc.) prior to being stockpiled as feed
	Evidence of ongoing inspections during processing and movements.	☑	material.
	Evidence of dust mitigation. Any visible dust observed?	☑	Magnet to removal metal and blower to remove plastic as part of screening operations.
			Evidence of stockpiling per the MASP observed.
			Stockpile identification signs observed. Colour coded depending on status (red/green).
			Evidence of ongoing inspections observed.
			No visible dust observed. Water truck onsite.
6	Product Sampling and Testing		
	Evidence of training register onsite (loader operations, crushing operations, screen and stacker operations, sampling of material).	☑	Evidence of training registers onsite.
	Evidence of training register onsite (working with asbestos and asbestos awareness training).	☑	Evidence of training registers onsite.
7	Product Sampling and Testing Method (if occurring)		
	Sample collected at end of conveyor system.	☑	Sample collection at end of conveyor observed.
	Confirm sampling frequency (20 samples per 4000 tonnes).	☑	Sampling frequency: Stockpile 4 – 2500 tonnes (20 samples).
	Surface material (200 mm) removed prior to sampling.	☑	
	Sample collected using stainless steel shovel (200 g).	☑	Samples collected in zip lock bags.
	Samples stored in chilled esky for transport to laboratory.	☑	Samples for chemical analysis stored in fridge and transported in eskies to laboratory.
	Any evidence of contamination during sampling? Evidence of sample collected to characterise this material.	NA	No evidence of contamination during sampling.

Ref.	Description	✓ / ✗	Notes
8	Product Sampling Analysis		
	Samples submitted to a NATA laboratory for analysis.	☑	Samples to be sent to MPL for analysis.
	Limit of reporting below product specification.	☑	LORs below product specification.
	Sample crushed/milled by laboratory.	☑	Lab quote indicates crushing of samples will occur.
	Any additional analysis required?	NA	No additional analysis requested based on observations.
9	Statistical Analysis		
	Statistical analysis to occur on a minimum of three and maximum of 20 samples.	☑	Stockpile 4 – 20 samples
	Does any material fail product specification?	NA	No material failed product specification.
10	Asbestos Testing (if occurring)		
	Sample collected at end of conveyor system.	☑	Sample collection at end of conveyor observed.
	Confirm sampling frequency (1 sample per 70 m^3).	☑	Sampling frequency – one sample per 70 m^3.
	Visual inspection of material.	☑	
	Collection of 10 L sample, passed through 7 mm sieve.	☑	Collected via 10 x 1 L samples across stockpile.
	Collection of 500 mL sample that has passed through sieve.	☑	
	Visual assessment of >7 mm material that did not pass through sieve.	☑	
	Description of ACM conditions.	NA	No ACM identified.
	Any stockpiles rejected due to identification of ACM/FA?	NA	No ACM identified.
11	Product Sampling Analysis (Asbestos)		
	Samples submitted to a NATA laboratory for analysis.	☑	Samples to be sent to Emissions Assessment for analysis.
	Limit of reporting 0.001% w/w.	☑	LOR below product specification.
	Does any material fail product specification due to asbestos?	NA	No asbestos detected in any samples.
	Corrective actions for any failed material – assess source, assess acceptance procedures, contact supplier.	NA	No asbestos detected in any samples.
12	Record Keeping		
	Evidence of all waste used to produce product – type, quantity and all acceptance information.	☑	Incoming material dockets observed onsite.
	Evidence of documentation associated within inspection, sampling and testing.	☑	Inspection and sampling records observed onsite.
	Evidence of laboratory reports onsite.	☑	Laboratory reports stored digitally, accessible by site supervisor.
	Evidence of written determination for material.	☑	Tabulated data provided by Urban Resources – all material complies with specification.
	Evidence of audit reports.	☑	Preliminary compliance audit available digitally.

Diagram 1: Acceptance Procedures (WA, 2018)



Senversa Pty Ltd
Level 17, 140 St Georges Terrace, Perth WA 6000
ABN 89 132 231 380 www.senversa.com.au

MASP Compliance Audit

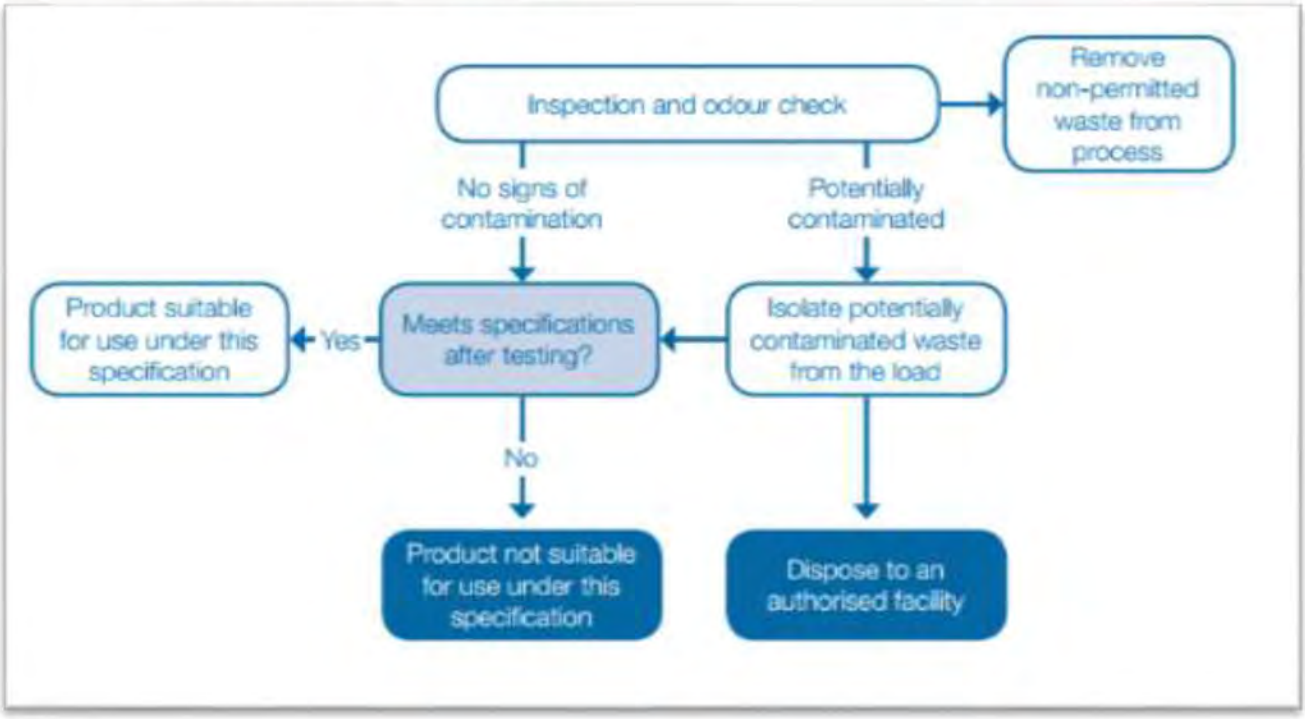
Site Name:	Urban Resources	**Date / Time:**	1 October 2019
Site Address:	64 Ashley Road, Hope Valley	**Client:**	DWER – Waste Authority
Licence Number:	L9050/2017/1	**Permitted Waste Types:**	Clean Fill, Inert Waste Type 1
Audit Representative:	Ashton Betti	**Site Representative:**	Mark Jones (Risk & Compliance Manager) Luke Bennett (Site Supervisor)

Ref.	Description	✓ / ✗	Notes
1	General Observations		Site accepts clean demolition products only. No mixed demolition waste accepted. Main supply is Subiaco Oval demolition. Site appeared well organised. Currently only producing recycled road base. Number of loads received per day highly variable (2-20 trucks per day).
2	Source Product Describe observed input products. • Recycled road base may consist concrete, bricks, tiles, ceramics, asphalt, natural rock, sand and recovered glass. <19mm • Recycled drainage rock may consist rock, brick and other similar rubble. Should not contain concrete. 20-27mm		Clean concrete, brick, some minor plastic and metal (rebar). Rebar and plastic removed as far as practical as part of initial processing – placed into scrap bins for disposal off-site.
3	Pre-Acceptance Procedures		
	Evidence of contracts for material acceptance ('no asbestos' clause should be part of contract).	☒	Material accepted on a load by load basis.
	Evidence of 'No Asbestos' sign at site entry.	☑	Sign at entry present.
	Evidence of information related to material loads (type, source, location of source site and site history, contaminated site status).	☑	Incoming dockets contain information related to source location, source us, contaminated sites status, age of building and product type.
	Detail any loads that contain asbestos.	NA	No loads containing asbestos.
	Are gatehouse staff aware of these procedures?	☑	Gatehouse staff aware of procedures.

Ref.	Description	✓ / ✗	Notes
4	Acceptance Procedures		
	Evidence of signed declaration - load is free of asbestos.	☑	Signed declaration observed.
	Evidence of visual / olfactory assessment per flow chart.	☑	Visual inspection of material at gatehouse.
	Records of any rejected loads (producer, carrier, vehicle registration, date).	NA	No loads rejected to date. Rejected load book observed in gatehouse.
	Demarcated isolation area, with signage.	☑	Isolation area observed. No material present.
	Records of any stockpiles disposed of due to rejection.	☑	No stockpiles rejected to date. Any rejected stockpiles to be sent to Waste Stream.
5	Waste Processing Controls		
	Evidence of second inspection after stockpiling.	☑	Second inspection observed. Material is spread out by loader operator and sprayed with water, then inspected. Material processing also occurs (removal of metal, plastic, etc.) prior to being stockpiled as feed material. Magnet to removal metal and blower to remove plastic as part of screening operations.
	Output stockpiles – 70 m^3 then moved to a larger stockpile with maximum weight of 4000 tonnes.	☑	Evidence of stockpiling per the MASP observed.
	Evidence of unique stockpile identifier on each stockpile.	☑	Stockpile identification signs observed. Colour coded depending on status (red/green).
	Evidence of ongoing inspections during processing and movements.	☑	Evidence of ongoing inspections observed.
	Evidence of dust mitigation. Any visible dust observed?	☑	No visible dust observed. Water truck onsite.
6	Product Sampling and Testing		
	Evidence of training register onsite (loader operations, crushing operations, screen and stacker operations, sampling of material).	☑	Evidence of training registers onsite.
	Evidence of training register onsite (working with asbestos and asbestos awareness training).	☑	Evidence of training registers onsite.
7	Product Sampling and Testing Method (if occurring)		
	Sample collected at end of conveyor system.	☑	Sample collection at end of conveyor observed.
	Confirm sampling frequency (20 samples per 4000 tonnes).	☑	Sampling frequency: Stockpile 7 – 3600 tonnes (18 samples) Stockpile 8 – 3600 tonnes (18 samples)
	Surface material (200 mm) removed prior to sampling.	☑	
	Sample collected using stainless steel shovel (200 g).	☑	Samples collected in zip lock bags.
	Samples stored in chilled esky for transport to laboratory.	☑	Samples for chemical analysis stored in fridge and transported in eskies to laboratory.
	Any evidence of contamination during sampling? Evidence of sample collected to characterise this material.	NA	No evidence of contamination during sampling.

Ref.	Description	✓ / ✗	Notes
8	Product Sampling Analysis		
	Samples submitted to a NATA laboratory for analysis.	☑	Samples to be sent to MPL for analysis.
	Limit of reporting below product specification.	☑	LORs below product specification.
	Sample crushed/milled by laboratory.	☑	Lab quote indicates crushing of samples will occur.
	Any additional analysis required?	NA	No additional analysis requested based on observations.
9	Statistical Analysis		
	Statistical analysis to occur on a minimum of three and maximum of 20 samples.	☑	Stockpile 7 – 18 samples Stockpile 8 – 18 samples
	Does any material fail product specification?	NA	No material fails product specification.
10	Asbestos Testing (if occurring)		
	Sample collected at end of conveyor system.	☑	Sample collection at end of conveyor observed.
	Confirm sampling frequency (1 sample per 70 m^3).	☑	Sampling frequency – one sample per 70 m^3.
	Visual inspection of material.	☑	
	Collection of 10 L sample, passed through 7 mm sieve.	☑	Collected via 10 x 1 L samples across stockpile.
	Collection of 500 mL sample that has passed through sieve.	☑	
	Visual assessment of >7 mm material that did not pass through sieve.	☑	
	Description of ACM conditions.	NA	No ACM identified.
	Any stockpiles rejected due to identification of ACM/FA?	NA	No ACM identified.
11	Product Sampling Analysis (Asbestos)		
	Samples submitted to a NATA laboratory for analysis.	☑	Samples to be sent to Emissions Assessment for analysis.
	Limit of reporting 0.001% w/w.	☑	LOR appropriate.
	Does any material fail product specification due to asbestos?	NA	No asbestos detected in any samples.
	Corrective actions for any failed material – assess source, assess acceptance procedures, contact supplier.	NA	No asbestos detected in any samples.
12	Record Keeping		
	Evidence of all waste used to produce product – type, quantity and all acceptance information.	☑	Incoming material dockets observed onsite.
	Evidence of documentation associated within inspection, sampling and testing.	☑	Inspection and sampling records observed onsite.
	Evidence of laboratory reports onsite.	☑	Laboratory reports stored digitally, accessible by site supervisor.
	Evidence of written determination for material.	☑	Tabulated data provided by Urban Resources – all material complies with specification.
	Evidence of audit reports.	☑	Preliminary compliance audit available digitally.

Diagram 1: Acceptance Procedures (WA, 2018)



Senversa Pty Ltd
Level 17, 140 St Georges Terrace, Perth WA 6000
ABN 89 132 231 380 www.senversa.com.au

MASP Compliance Audit

Site Name:	Urban Resources	**Date / Time:**	25 October 2019
Site Address:	64 Ashley Road, Hope Valley	**Client:**	DWER – Waste Authority
Licence Number:	L9050/2017/1	**Permitted Waste Types:**	Clean Fill, Inert Waste Type 1
Audit Representative:	Ashton Betti	**Site Representative:**	Mark Jones (Risk & Compliance Manager) Luke Bennett (Site Supervisor)

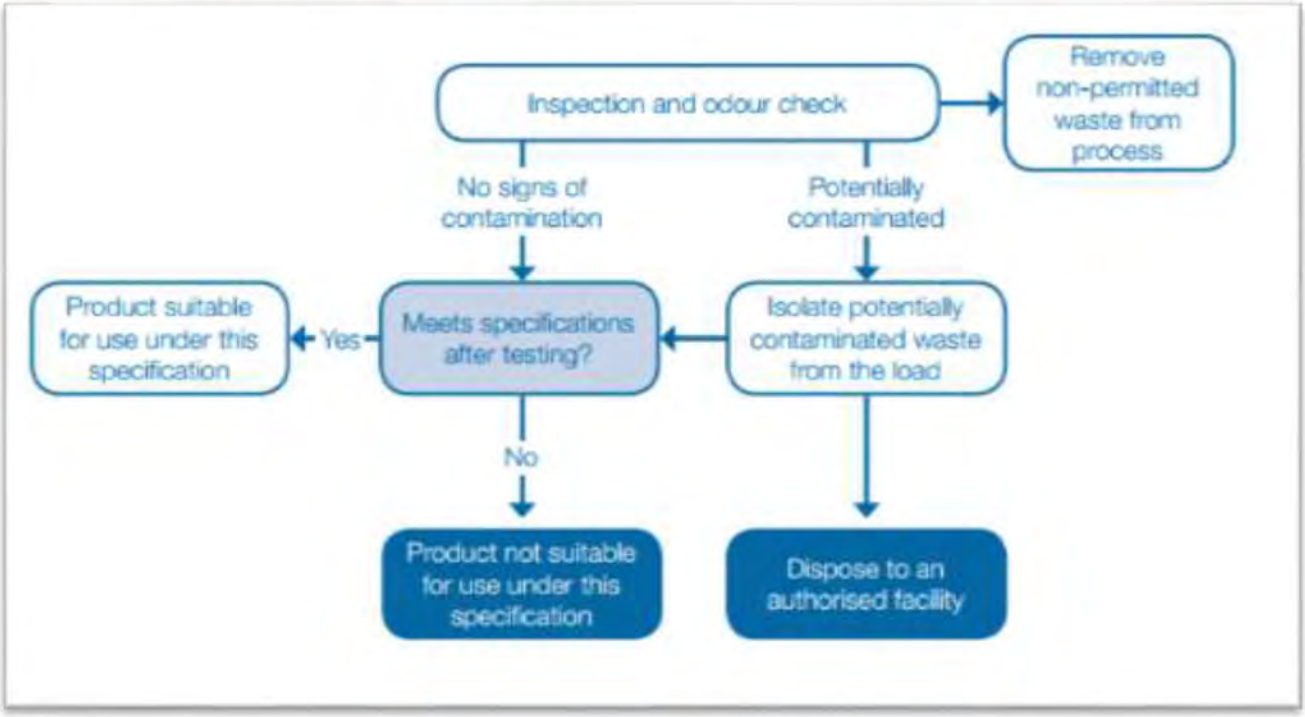
Ref.	Description	✓ / ✗	Notes
1	General Observations		Site accepts clean demolition products only. No mixed demolition waste accepted. Main supply is Subiaco Oval demolition. Site appeared well organised. Currently only producing recycled road base. Number of loads received per day highly variable (2-20 trucks per day).
2	Source Product Describe observed input products. • Recycled road base may consist concrete, bricks, tiles, ceramics, asphalt, natural rock, sand and recovered glass. <19mm • Recycled drainage rock may consist rock, brick and other similar rubble. Should not contain concrete. 20-27mm		Clean concrete, brick, some minor plastic and metal (rebar). Rebar and plastic removed as far as practical as part of initial processing – placed into scrap bins for disposal off-site.
3	Pre-Acceptance Procedures		
	Evidence of contracts for material acceptance ('no asbestos' clause should be part of contract).	☒	Material accepted on a load by load basis.
	Evidence of 'No Asbestos' sign at site entry.	☑	Sign at entry present.
	Evidence of information related to material loads (type, source, location of source site and site history, contaminated site status).	☑	Incoming dockets contain information related to source location, source us, contaminated sites status, age of building and product type. Some information incomplete on dockets.
	Detail any loads that contain asbestos.	NA	No loads reported as containing asbestos.
	Are gatehouse staff aware of these procedures?	☑	Gatehouse staff aware of procedures.

Ref.	Description	✓ / ✗	Notes
4	Acceptance Procedures		
	Evidence of signed declaration - load is free of asbestos.	☑	Signed declaration observed.
	Evidence of visual / olfactory assessment per flow chart.	☑	Visual inspection of material at gatehouse.
	Records of any rejected loads (producer, carrier, vehicle registration, date).	☑	One load rejected (15/10/2019, 1EVA.986), fragment of ACM fence identified during initial visual assessment. Taken offsite for disposal. Isolation area observed. No material present.
	Demarcated isolation area, with signage.	☑	
	Records of any stockpiles disposed of due to rejection.	NA	No stockpiles rejected to date. Any rejected stockpiles to be sent to Waste Stream.
5	Waste Processing Controls		
	Evidence of second inspection after stockpiling.	☑	Second inspection observed. Material is
	Output stockpiles – 70 m^3 then moved to a larger stockpile with maximum weight of 4000 tonnes.	☑	spread out by loader operator and sprayed with water, then inspected. Material
	Evidence of unique stockpile identifier on each stockpile.	☑	processing also occurs (removal of metal, plastic, etc.) prior to being stockpiled as feed
	Evidence of ongoing inspections during processing and movements.	☑	material. Magnet to remove metal and blower to
	Evidence of dust mitigation. Any visible dust observed?	☑	remove plastic as part of screening operations. Evidence of stockpiling per the MASP observed. Stockpile identification signs observed. Colour coded depending on status (red/green). Evidence of ongoing inspections observed. No visible dust observed. Water truck onsite.
6	Product Sampling and Testing		
	Evidence of training register onsite (loader operations, crushing operations, screen and stacker operations, sampling of material).	☑	Evidence of training registers onsite.
	Evidence of training register onsite (working with asbestos and asbestos awareness training).	☑	Evidence of training registers onsite.

Ref.	Description	✓ / ✗	Notes
7	Product Sampling and Testing Method (if occurring)		
	Sample collected at end of conveyor system.	☑	Sample collection at end of conveyor observed.
	Confirm sampling frequency (20 samples per 4000 tonnes).	☑	Sampling frequency: Stockpile 9 – 3600 tonnes (18 samples) Stockpile 10 – 3600 tonnes (18 samples) Stockpile 11 – 1800 tonnes (9 samples)
	Surface material (200 mm) removed prior to sampling.	☑	
	Sample collected using stainless steel shovel (200 g).	☑	Samples collected in zip lock bags.
	Samples stored in chilled esky for transport to laboratory.	☑	Samples for chemical analysis stored in fridge and transported in eskies to laboratory.
	Any evidence of contamination during sampling? Evidence of sample collected to characterise this material.	NA	No evidence of contamination during sampling.
8	Product Sampling Analysis		
	Samples submitted to a NATA laboratory for analysis.	☑	Samples to be sent to MPL for analysis.
	Limit of reporting below product specification.	☑	LORs below product specification.
	Sample crushed/milled by laboratory.	☑	Lab quote indicates crushing of samples will occur.
	Any additional analysis required?	NA	No additional analysis requested based on observations.
9	Statistical Analysis		
	Statistical analysis to occur on a minimum of three and maximum of 20 samples.	☑	Stockpile 9 – 18 samples Stockpile 10 – 18 samples Stockpile 11 – 9 samples
	Does any material fail product specification?	NA	No material fails product specification.
10	Asbestos Testing (if occurring)		
	Sample collected at end of conveyor system.	☑	Sample collection at end of conveyor observed.
	Confirm sampling frequency (1 sample per 70 m^3).	☑	Sampling frequency – one sample per 70 m^3.
	Visual inspection of material.	☑	
	Collection of 10 L sample, passed through 7 mm sieve.	☑	Collected via 10 x 1 L samples across stockpile.
	Collection of 500 mL sample that has passed through sieve.	☑	
	Visual assessment of >7 mm material that did not pass through sieve.	☑	
	Description of ACM conditions.	NA	No ACM identified.
	Any stockpiles rejected due to identification of ACM/FA?	NA	No stockpiles rejected due to ACM/FA.

Ref.	Description	✓ / ✗	Notes
11	Product Sampling Analysis (Asbestos)		
	Samples submitted to a NATA laboratory for analysis.	☑	Samples to be sent to Emissions Assessment for analysis.
	Limit of reporting 0.001% w/w.	☑	LOR appropriate.
	Does any material fail product specification due to asbestos?	NA	AF detected in sample no. L37307 (0.0398 g), concentration of AF <0.001%w/w, therefore stockpile not rejected on basis of result.
	Corrective actions for any failed material – assess source, assess acceptance procedures, contact supplier.	NA	No failure of material.
12	Record Keeping		
	Evidence of all waste used to produce product – type, quantity and all acceptance information.	☑	Incoming material dockets observed onsite.
	Evidence of documentation associated within inspection, sampling and testing.	☑	Inspection and sampling records observed onsite.
	Evidence of laboratory reports onsite.	☑	Laboratory reports stored digitally, accessible by site supervisor.
	Evidence of written determination for material.	☑	Tabulated data provided by Urban Resources – all material complies with specification.
	Evidence of audit reports.	☑	Preliminary compliance audit available digitally.

Diagram 1: Acceptance Procedures (WA, 2018)



Appendix C: Tabulated Laboratory Data

Table C1: Stockpile Analytical Results

Sample ID	Units	LOR	Maximum Average Concentration	Absolute Maximum Concentration	URSP04-01	URSP04-02	URSP04-03	Average	SP08_01A	SP08_02A	SP08_03A	SP08_04A	Average	SP07_01A	SP07_02A	SP07_03A	SP07_04A	Average
Laboratory ID					EP1904841001	EP1904841002	EP1904841003		EP1909972009	EP1909972010	EP1909972011	EP1909972012		EP1909972013	EP1909972014	EP1909972015	EP1909972016	
Sample Date					21/5/19	21/5/19	21/5/19		01/10/2019	01/10/2019	01/10/2019	01/10/2019		01/10/2019	01/10/2019	01/10/2019	01/10/2019	
Physical Parameters																		
pH (1:5 Aqueous extract)	pH units	0.1			**11.5**	**11.7**	**11.6**	***11.6***	**12.1**	**11.9**	**11.3**	-	***11.8***	**11.8**	**11.7**	**11.6**	-	***11.7***
Inorganic Species																		
Asbestos	% w/w	0.001			ND	ND	ND	-	ND	ND	ND	ND	-	ND	ND	ND	ND	-
Heavy Metals / Metalloids																		
Antimony	mg/kg	5	**10**	**20**	<5	<5	<5	*<5*	**0.2**	**0.1**	**0.1**	-	***0.1***	**0.1**	**0.2**	**0.2**	-	***0.2***
Arsenic	mg/kg	5	**20**	**40**	<5	<5	<5	*<5*	**2.4**	**2.3**	**2.2**	-	***2.3***	**2.9**	**2.8**	**3**	-	***3***
Cadmium	mg/kg	0.1	**0.5**	**1.5**	<0.1	<0.1	<0.1	*<0.1*	<0.1	<0.1	<0.1	-	*<0.1*	<0.1	**0.1**	**0.1**	-	***0.1***
Chromium	mg/kg	2	**60**	**120**	**19**	**23**	**23**	***22***	**21.4**	**21.2**	**18.7**	-	***20.4***	**22.2**	**19.6**	**19.8**	-	***21***
Copper	mg/kg	5	**60**	**150**	**14**	**17**	**17**	***16***	**6.5**	**7.9**	**11.1**	-	***8.5***	**12.3**	**10.7**	**12.2**	-	***12***
Lead	mg/kg	5	**75**	**150**	**17**	**14**	**11**	***14***	**9**	**8.3**	**7.5**	-	***8.3***	**11.3**	**10.3**	**17.5**	-	***13***
Mercury	mg/kg	0.1	**0.5**	**1**	<0.1	<0.1	<0.1	*<0.1*	<0.1	<0.1	<0.1	-	*<0.1*	<0.1	<0.1	<0.1	-	*<0.1*
Molybdenum	mg/kg	2	**40**	**80**	<2	<2	<2	*<2*	**1**	**1.4**	**1**	-	***1.1***	**1.3**	**1.2**	**1.4**	-	***1.3***
Nickel	mg/kg	2	**40**	**80**	**6**	**8**	**7**	***7***	**3.4**	**3.3**	**3.8**	-	***3.5***	**6.9**	**6.6**	**6.3**	-	***6.6***
Selenium	mg/kg	1	**2**	**4**	<1	<1	<1	*<1*	<1	<1	<1	-	*<1*	<1	<1	<1	-	*<1*
Vanadium	mg/kg	5	**25**	**50**	**15**	**13**	**15**	***14***	**13**	**13**	**13**	-	***13***	**13**	**13**	**14**	-	***13***
Zinc	mg/kg	5	**200**	**350**	**92**	**129**	**83**	***101***	**31.3**	**45.4**	**33.9**	-	***37***	**241**	**127**	**101**	-	***156***

Sample ID	Units	LOR	Maximum Average Concentration	Absolute Maximum Concentration	URSP10_01	URSP10_02	URSP10_03	Average	URSP11_01	URSP11_02	Average
Laboratory ID					EP1911046001	EP1911046002	EP1911046003		EP1911046004	EP1911046005	
Sample Date					25/10/2019	25/10/2019	25/10/2019		25/10/2019	25/10/2019	
Physical Parameters											
pH (1:5 Aqueous extract)	pH units	0.1			**11.7**	**12.1**	**12.2**	***12.0***	**12.2**	**12.2**	***12.2***
Inorganic Species											
Asbestos	% w/w	0.001						-			-
Heavy Metals / Metalloids											
Antimony	mg/kg	5	**10**	**20**	<0.1	**0.2**	**0.2**	***0.2***	**0.2**	**0.1**	***0.2***
Arsenic	mg/kg	5	**20**	**40**	**4.2**	**2.2**	**2.2**	***3***	**2.1**	**2**	***2.1***
Cadmium	mg/kg	0.1	**0.5**	**1.5**	<0.1	<0.1	<0.1	*<0.1*	<0.1	<0.1	*<0.1*
Chromium	mg/kg	2	**60**	**120**	**23.3**	**22.8**	**27.7**	***24.6***	**27.6**	**30.9**	***29.3***
Copper	mg/kg	5	**60**	**150**	**18.8**	**11.4**	**9.8**	***13.3***	**10.8**	**14.3**	***12.6***
Lead	mg/kg	5	**75**	**150**	**2.8**	**9.9**	**11**	***7.9***	**13.7**	**11.4**	***12.6***
Mercury	mg/kg	0.1	**0.5**	**1**	<0.1	<0.1	<0.1	*<0.1*	<0.1	<0.1	*<0.1*
Molybdenum	mg/kg	2	**40**	**80**	**0.5**	**1**	**1.4**	***1.0***	**2**	**1**	***1.5***
Nickel	mg/kg	2	**40**	**80**	**9.8**	**5.1**	**5**	***6.6***	**4.2**	**6.1**	***5.2***
Selenium	mg/kg	1	**2**	**4**	<1	<1	<1	*<1*	<1	<1	*<1*
Vanadium	mg/kg	5	**25**	**50**	**9**	**15**	**17**	***14***	**14**	**16**	***15.0***
Zinc	mg/kg	5	**200**	**350**	**14**	**55.7**	**53.4**	***41***	**52.1**	**43.1**	***47.6***

Appendix D: Laboratory Certificates of Analysis

senversa

Chain of Custody Documentation

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Laboratory: ALS
Address: 26 Rigali Way, Wangara WA 6065
Contact: Lauren Biagioni
Phone: 08 9406 1301

Job Number:	P17000	**Purchase Order:**	PO004389
Project Name:	RtR Pilot	**Quote No:**	EP/422/19 V2
Sampled By:	Ashton Betti	**Turn Around Time:**	standard
Project Manager:	Ashton Betti	**Page:**	of
Email Report To:	ashton.betti@senversa.com.au	**Phone/Mobile:**	0421 473 219

Sample Information					Container Information		Analysis Required											
Lab ID	Sample ID	Matrix *	Date	Time	Type / Code	Total Bottles	HOLD	Dry & Crush to <2mm	pH (1:5 extract)	Metals (As, Total Cr, Cu, Pb, Hg, Mo, Ni, Sb, V, Zn)	Trace Metals (Cd, Se)	Asbestos Presence/Absence Quantification (if detected)						
1	URSP04_01	S	21/5/19		Jar	1		X	X	X	X							
2	URSP04_02	S	21/5/19		Jar	1		X	X	X	X							
3	URSP04_03	S	21/5/19		Jar	1		X	X	X	X							
4	URSP04_01A	S	21/5/19		Bag	1						X						
5	URSP04_02A	S	21/5/19		Bag	1						X						
6	URSP04_03A	S	21/5/19		Bag	1						X						

Comments: Soil samples for pH and metals analysis should be milled to <2mm and a 2 g sub sample taken for analysis. Remaining sample to remain on hold.

Environmental Division
Perth
Work Order Reference
EP1904841

Telephone : + 61-8-9406 1301

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:	**Sampler Name:** Ashton Betti	**Signature:** ABetti	**Date:** 21/5/2019

Relinquished By:		**Method of Shipment (if applicable):** COURIER	**Received by:**	
Name/Signature: A. Betti	Date: 21/5/19	Carrier / Reference #:	Name/Signature:	Date:
Of: Senversa	Time:	Date/Time:	Of:	Time:
Name/Signature: Lauren Biagioni	Date: 21/5	Carrier / Reference #:	Name/Signature:	Date:
Of: ALS	Time: 1330	Date/Time:	Of:	Time:
Name/Signature:	Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:	Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic; V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

Completed by: AB
Checked by: AB

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EP1904841**		
Amendment	: **1**		
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Contact	: Lauren Biagioni
Address	: LEVEL 25, 108 ST GEORGES TERRACE PERTH 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: Ashton.Betti@senversa.com.au	E-mail	: Lauren.biagioni@alsglobal.com
Telephone	: +61 08 6557 8881	Telephone	: 08 9406 1307
Facsimile	: +61 03 9606 0074	Facsimile	: +61-8-9406 1399
Project	: P17000 RtR Pilot	Page	: 1 of 2
Order number	: PO004389	Quote number	: EP2019SENVER0006 (EP/422/19 V3)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: ASHTON BETTI		

Dates

Date Samples Received	: 21-May-2019 13:30	Issue Date	: 31-May-2019
Client Requested Due Date	: 31-May-2019	Scheduled Reporting Date	: **31-May-2019**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 15.1 - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 6 / 6

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Asbestos analysis will be conducted by ALS Environmental, Melbourne, NATA accreditation No. 825, Site No. 13778.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA002 pH (1:5)	SOIL - EA055-103 Moisture Content	SOIL - EA200N-TBA Asbestos in Soils - Quantitation by WA/NEPM	SOIL - EG005T (solids) Total Metals by ICP-AES	SOIL - EG020T (solids) Total Metals by ICP-MS	SOIL - EN84 Dry and Crush	SOIL - S-02 8 Metals (incl. Digestion)
EP1904841-001	21-May-2019 00:00	URSP04-01	✓	✓		✓	✓	✓	✓
EP1904841-002	21-May-2019 00:00	URSP04-02	✓	✓		✓	✓	✓	✓
EP1904841-003	21-May-2019 00:00	URSP04-03	✓	✓		✓	✓	✓	✓
EP1904841-004	21-May-2019 00:00	URSP04-01A			✓				
EP1904841-005	21-May-2019 00:00	URSP04-02A			✓				
EP1904841-006	21-May-2019 00:00	URSP04-03A			✓				

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ASHTON BETTI

- *AU Certificate of Analysis - NATA (COA)	Email	Ashton.Betti@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	Ashton.Betti@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	Ashton.Betti@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	Ashton.Betti@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	Ashton.Betti@senversa.com.au
- EDI Format - ENMRG (ENMRG)	Email	Ashton.Betti@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	Ashton.Betti@senversa.com.au
- EDI Format - XTab (XTAB)	Email	Ashton.Betti@senversa.com.au

SUPPLIER ACCOUNTS

- A4 - AU Tax Invoice (INV)	Email	supplieraccounts@senversa.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP1904841**	Page	: 1 of 4
Amendment	: **1**		
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Contact	: Lauren Biagioni
Address	: LEVEL 25, 108 ST GEORGES TERRACE PERTH 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 08 6557 8881	Telephone	: 08 9406 1307
Project	: P17000 RtR Pilot	Date Samples Received	: 21-May-2019 13:30
Order number	: PO004389	Date Analysis Commenced	: 22-May-2019
C-O-C number	: ----	Issue Date	: 04-Jun-2019 08:58
Sampler	: ASHTON BETTI		
Site	: ----		
Quote number	: EP/422/19 V3		
No. of samples received	: 6		
No. of samples analysed	: 6		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Indra Astuty	Instrument Chemist	Perth Inorganics, Wangara, WA
Vanessa Phung	Approved Asbestos Identifier	Melbourne Asbestos, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Asbestos analysis conducted by ALS Melbourne, NATA accreditation no. 825, site no 13778
- Amendment (31/05/2019): This report has been amended and re-released to change reporting of Cadmium and Selenium to report under EG020T for samples 1-3. All other anlysis results are as per the previous report.
- EA200N: Asbestos weights and percentages are not covered under the Scope of NATA Accreditation.
  Weights of Asbestos are based on extracted bulk asbestos, fibre bundles, and/or ACM and do not include respirable fibres (if present)
  The Asbestos (Fines and Fibrous) weight is calculated from the extracted Fibrous Asbestos and Asbestos Fines as an equivalent weight of 100% Asbestos
  Percentages for Asbestos content in ACM are based on the 2013 NEPM default values.
  All calculations of percentage Asbestos under this method are approximate and should be used as a guide only.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.
- EA200N: ALS laboratory procedures and methods used for the identification and quantitation of asbestos are consistent with AS4964-2004 and the requirements of the 2013 NEPM for Assessment of Site Contamination
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	URSP04-01	URSP04-02	URSP04-03	URSP04-01A	URSP04-02A
			Client sampling date / time	21-May-2019 00:00	21-May-2019 00:00	21-May-2019 00:00	21-May-2019 00:00	21-May-2019 00:00
Compound	CAS Number	LOR	Unit	EP1904841-001	EP1904841-002	EP1904841-003	EP1904841-004	EP1904841-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**11.5**	**11.7**	**11.6**	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	<1.0	<1.0	<1.0	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	----	----	**No**	**No**
Asbestos (Trace)	1332-21-4	5	Fibres	----	----	----	**No**	**No**
Asbestos Type	1332-21-4	-	--	----	----	----	-	-
Sample weight (dry)	----	0.01	g	----	----	----	**767**	**720**
APPROVED IDENTIFIER:	----	-	--	----	----	----	**E.DAOS**	**E.DAOS**
EA200N: ACM Asbestos in Soil (non-NATA)								
ø Asbestos Containing Material	1332-21-4	0.1	g	----	----	----	<0.1	<0.1
ø Asbestos Containing Material (as 15% Asbestos in ACM >7mm)	1332-21-4	0.01	% (w/w)	----	----	----	<0.01	<0.01
EA200N: Asbestos Quantification (non-NATA)								
ø Asbestos (Fines and Fibrous <7mm)	1332-21-4	0.0004	g	----	----	----	<0.0004	<0.0004
ø Asbestos (Fines and Fibrous FA+AF)	----	0.001	% (w/w)	----	----	----	<0.001	<0.001
ø Fibrous Asbestos >7mm	----	0.0004	g	----	----	----	<0.0004	<0.0004
ø Weight Used for % Calculation	----	0.0001	kg	----	----	----	**0.767**	**0.720**
EG005(ED093)T: Total Metals by ICP-AES								
Antimony	7440-36-0	5	mg/kg	<5	<5	<5	----	----
Molybdenum	7439-98-7	2	mg/kg	<2	<2	<2	----	----
Vanadium	7440-62-2	5	mg/kg	**15**	**13**	**15**	----	----
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	----	----
Chromium	7440-47-3	2	mg/kg	**19**	**23**	**23**	----	----
Copper	7440-50-8	5	mg/kg	**14**	**17**	**17**	----	----
Lead	7439-92-1	5	mg/kg	**17**	**14**	**11**	----	----
Nickel	7440-02-0	2	mg/kg	**6**	**8**	**7**	----	----
Zinc	7440-66-6	5	mg/kg	**92**	**129**	**83**	----	----
EG020T: Total Metals by ICP-MS								
Selenium	7782-49-2	1	mg/kg	<1	<1	<1	----	----
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	URSP04-03A	----	----	----	----
			Client sampling date / time	21-May-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP1904841-006	--------	--------	--------	--------
				Result	----	----	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	----	----	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	----	----	----	----
Asbestos Type	1332-21-4	-	--	**-**	----	----	----	----
Sample weight (dry)	----	0.01	g	**747**	----	----	----	----
APPROVED IDENTIFIER:	----	-	--	**E.DAOS**	----	----	----	----
EA200N: ACM Asbestos in Soil (non-NATA)								
ø **Asbestos Containing Material**	1332-21-4	0.1	g	<0.1	----	----	----	----
ø **Asbestos Containing Material (as 15% Asbestos in ACM >7mm)**	1332-21-4	0.01	% (w/w)	<0.01	----	----	----	----
EA200N: Asbestos Quantification (non-NATA)								
ø **Asbestos (Fines and Fibrous <7mm)**	1332-21-4	0.0004	g	<0.0004	----	----	----	----
ø **Asbestos (Fines and Fibrous FA+AF)**	----	0.001	% (w/w)	<0.001	----	----	----	----
ø **Fibrous Asbestos >7mm**	----	0.0004	g	<0.0004	----	----	----	----
ø **Weight Used for % Calculation**	----	0.0001	kg	**0.747**	----	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	URSP04-01A - 21-May-2019 00:00	Grey beige rocky soil.
EA200: Description	URSP04-02A - 21-May-2019 00:00	Grey beige rocky soil.
EA200: Description	URSP04-03A - 21-May-2019 00:00	Grey beige rocky soil.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP1904841**	Page	: 1 of 4
Amendment	: **1**		
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Contact	: Lauren Biagioni
Address	: LEVEL 25, 108 ST GEORGES TERRACE PERTH 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 08 6557 8881	Telephone	: 08 9406 1307
Project	: P17000 RtR Pilot	Date Samples Received	: 21-May-2019
Order number	: PO004389	Date Analysis Commenced	: 22-May-2019
C-O-C number	: ----	Issue Date	: 04-Jun-2019
Sampler	: ASHTON BETTI		
Site	: ----		
Quote number	: EP/422/19 V3		
No. of samples received	: 6		
No. of samples analysed	: 6		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Indra Astuty	Instrument Chemist	Perth Inorganics, Wangara, WA
Vanessa Phung	Approved Asbestos Identifier	Melbourne Asbestos, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 2374932)									
EP1904841-001	URSP04-01	EG005T: Chromium	7440-47-3	2	mg/kg	19	20	0.00	No Limit
		EG005T: Molybdenum	7439-98-7	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	6	8	19.9	No Limit
		EG005T: Antimony	7440-36-0	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	14	16	13.5	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	17	26	43.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	15	14	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	92	61	40.5	0% - 50%
EA002: pH 1:5 (Soils) (QC Lot: 2374934)									
EP1904841-001	URSP04-01	EA002: pH Value	----	0.1	pH Unit	11.5	11.6	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2374935)									
EP1904841-001	URSP04-01	EA055: Moisture Content	----	0.1	%	<1.0	<1.0	0.00	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 2380638)									
EP1904841-001	URSP04-01	EG020Y-T: Cadmium	7440-43-9	0.1	mg/kg	<0.1	0.1	0.00	No Limit
		EG020Y-T: Selenium	7782-49-2	1	mg/kg	<1	<1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2374933)									
EP1904841-001	URSP04-01	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 2374932)								
EG005T: Antimony	7440-36-0	5	mg/kg	<5	----	----	----	----
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	22 mg/kg	96.4	70	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	34 mg/kg	108	70	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	34 mg/kg	87.2	70	130
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	90.9	70	130
EG005T: Molybdenum	7439-98-7	2	mg/kg	<2	----	----	----	----
EG005T: Nickel	7440-02-0	2	mg/kg	<2	51 mg/kg	102	70	130
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	----	----	----	----
EG005T: Zinc	7440-66-6	5	mg/kg	<5	62 mg/kg	94.0	70	130
EA002: pH 1:5 (Soils) (QCLot: 2374934)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	99.2	70	130
				----	7 pH Unit	99.7	70	130
EG020T: Total Metals by ICP-MS (QCLot: 2380638)								
EG020Y-T: Selenium	7782-49-2	1	mg/kg	<1	----	----	----	----
EG020Y-T: Cadmium	7440-43-9	0.1	mg/kg	<0.1	4.68383 mg/kg	103	88	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2374933)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.154 mg/kg	96.1	81	115

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 2374932)							
EP1904841-001	URSP04-01	EG005T: Antimony	7440-36-0	10 mg/kg	94.5	70	130
		EG005T: Arsenic	7440-38-2	50 mg/kg	100	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	94.4	70	130
		EG005T: Copper	7440-50-8	50 mg/kg	99.2	70	130
		EG005T: Lead	7439-92-1	50 mg/kg	95.1	70	130
		EG005T: Molybdenum	7439-98-7	10 mg/kg	87.5	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	90.1	70	130
		EG005T: Vanadium	7440-62-2	50 mg/kg	96.1	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 2374932) - continued							
EP1904841-001	URSP04-01	EG005T: Zinc	7440-66-6	50 mg/kg	112	70	130
EG020T: Total Metals by ICP-MS (QCLot: 2380638)							
EP1904841-001	URSP04-01	EG020Y-T: Selenium	7782-49-2	10 mg/kg	117	70	130
		EG020Y-T: Cadmium	7440-43-9	50 mg/kg	96.1	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2374933)							
EP1904841-001	URSP04-01	EG035T: Mercury	7439-97-6	10 mg/kg	89.3	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP1904841**	Page	: 1 of 5
Amendment	: **1**		
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Telephone	: 08 9406 1307
Project	: P17000 RtR Pilot	Date Samples Received	: 21-May-2019
Site	: ----	Issue Date	: 04-Jun-2019
Sampler	: ASHTON BETTI	No. of samples received	: 6
Order number	: PO004389	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)						
Soil Glass Jar - Unpreserved						
URSP04-01, URSP04-02, URSP04-03	30-May-2019	28-May-2019	**2**	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002)							
URSP04-01, URSP04-02, URSP04-03	**21-May-2019**	**30-May-2019**	28-May-2019	×	**30-May-2019**	30-May-2019	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
URSP04-01, URSP04-02, URSP04-03	**21-May-2019**	**----**	----	----	**29-May-2019**	04-Jun-2019	✓
EA200: AS 4964 - 2004 Identification of Asbestos in Soils							
Snap Lock Bag - Friable Asbestos/PSD Bag (EA200)							
URSP04-01A, URSP04-02A, URSP04-03A	**21-May-2019**	**----**	----	----	**22-May-2019**	17-Nov-2019	✓
EA200N: ACM Asbestos in Soil (non-NATA)							
Snap Lock Bag - Friable Asbestos/PSD Bag (EA200N)							
URSP04-01A, URSP04-02A, URSP04-03A	**21-May-2019**	**----**	----	----	**22-May-2019**	17-Nov-2019	✓
EA200N: Asbestos Quantification (non-NATA)							
Snap Lock Bag - Friable Asbestos/PSD Bag (EA200N)							
URSP04-01A, URSP04-02A, URSP04-03A	**21-May-2019**	**----**	----	----	**22-May-2019**	17-Nov-2019	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
URSP04-01, URSP04-02, URSP04-03	**21-May-2019**	**29-May-2019**	17-Nov-2019	✓	**29-May-2019**	17-Nov-2019	✓
EG020T: Total Metals by ICP-MS							
Soil Glass Jar - Unpreserved (EG020Y-T)							
URSP04-01, URSP04-02, URSP04-03	**21-May-2019**	**31-May-2019**	17-Nov-2019	✓	**31-May-2019**	17-Nov-2019	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
URSP04-01, URSP04-02, URSP04-03	**21-May-2019**	**29-May-2019**	18-Jun-2019	✓	**30-May-2019**	18-Jun-2019	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite Y	EG020Y-T	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
pH (1:5)	EA002	2	3	**66.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite Y	EG020Y-T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Total Mercury by FIMS	EG035T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite Y	EG020Y-T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Total Mercury by FIMS	EG035T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite Y	EG020Y-T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Asbestos Classification and Quantitation per NEPM 2013	* EA200N	SOIL	Asbestos Classification and Quantitation per NEPM 2013 with Confirmation of Identification by AS 4964 - 2004 Gravimetric determination of Asbestos Containing Material, Fibrous Asbestos, Asbestos Fines and sample weight and calculation of percentage concentrations per NEPM protocols. Asbestos (Fines and Fibrous FA+AF) is reported as the equivalent weight in the sample received after accounting for sub-sampling (where applicable for the <7mm and/or <2mm fractions).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Metals by ICP-MS - Suite Y	EG020Y-T	SOIL	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Dry and Crush	EN84	SOIL	In house

senversa

Chain of Custody Documentation

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Laboratory: ALS
Address: 26 Rigali Way, Wangara WA 6065
Contact: Lauren Biagioni
Phone: 08 9406 1301

Job Number:	P17000	Purchase Order:	PO004389
Project Name:	RtR Pilot	Quote No:	EP/422/19 V2
Sampled By:	Ashton Betti	Turn Around Time:	standard
Project Manager:	Ashton Betti	Page:	1 of 1
Email Report To:	ashton.betti@senversa.com.au	Phone/Mobile:	0421 473 219

Sample Information					Container Information		Analysis Required												Comments
Lab ID	Sample ID	Matrix *	Date	Time	Type / Code	Total Bottles	HOLD	Dry & Crush to <2mm	pH (1:5 extract)	Metals (As, Total Cr, Cu, Pb, Hg, Mo, Ni, Sb, V, Zn)	Trace Metals (Cd, Se)	Asbestos Presence/Absence Quantification (if detected)							
1	SP08_01	S	1/10/19		JAR	1		X	X	X	X								Soil samples for pH and metals analysis should be milled to <2mm and a 2 g sub sample taken for analysis. Remaining sample to remain on hold.
2	SP08_02	S	1/10/19					X	X	X	X								
3	SP08_03	S	1/10/19					X	X	X	X								
4	SP08_04	S	1/10/19					X	X	X	X								
5	SP07_01	S	"					X	X	X	X								
6	SP07_02	S						X	X	X	X								
7	SP07_03	S						X	X	X	X								
8	SP07_04	S						X	X	X	X								
9	SP08_01A	S	1/10/19		BAG	1						X							
10	SP08_02A	S										X							
11	SP08_03A	S										X							
12	SP08_04A											X							
13	SP07_01A											X							
14	SP07_02A											X							
15	SP07_03A											X							
16	SP07_04A											X							

Environmental Division
Perth
Work Order Reference
EP1909972

Telephone : +61-8-9406 1301

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:	Sampler Name: Ashton Betti	Signature: Betti	Date: 11/10/2019.

Relinquished By:		Method of Shipment (if applicable):	Received by:	
Name/Signature: A. Betti	Date: 1/10/19	Carrier / Reference #:	Name/Signature: [illegible]	Date: 1/10
Of: Senversa	Time: 3:45pm	Date/Time:	Of: ALS	Time: 1730
Name/Signature:	Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:	Date/Time:	Of:	Time:
Name/Signature:	Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:	Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic; V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

Completed by: _____
Checked by: _____

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP1909972**

Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Contact	: Lauren Biagioni
Address	: LEVEL 25, 108 ST GEORGES TERRACE PERTH 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: Ashton.Betti@senversa.com.au	E-mail	: Lauren.biagioni@alsglobal.com
Telephone	: +61 08 6557 8881	Telephone	: 08 9406 1307
Facsimile	: +61 03 9606 0074	Facsimile	: +61-8-9406 1399
Project	: P17000 RtR Pilot	Page	: 1 of 2
Order number	: PO004389	Quote number	: EP2019SENVER0006 (EP/422/19 V3)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: ASHTON BETTI		

Dates

Date Samples Received	: 01-Oct-2019 17:30	Issue Date	: 02-Oct-2019
Client Requested Due Date	: 18-Oct-2019	Scheduled Reporting Date	: **18-Oct-2019**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 16.2 - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 16 / 14

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Asbestos conducted by ALS Melbourne, NATA accreditation no. 825, site no 13778
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Asbestos analysis will be conducted by ALS Environmental, Melbourne, NATA accreditation No. 825, Site No. 13778.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA002 pH (1:5)	SOIL - EA200N-TBA Asbestos in Soils - Quantitation by WA/NEPM	SOIL - EG020T (solids) Total Metals by ICP-MS	SOIL - EN84 Dry and Crush	SOIL - S-02 (ICPMS) Standard 8 Metals by ICPMS
EP1909972-001	01-Oct-2019 00:00	SP08_01		✓		✓	✓	✓
EP1909972-002	01-Oct-2019 00:00	SP08_02		✓		✓	✓	✓
EP1909972-003	01-Oct-2019 00:00	SP08_03		✓		✓	✓	✓
EP1909972-004	01-Oct-2019 00:00	SP08_04	✓					
EP1909972-005	01-Oct-2019 00:00	SP07_01		✓		✓	✓	✓
EP1909972-006	01-Oct-2019 00:00	SP07_02		✓		✓	✓	✓
EP1909972-007	01-Oct-2019 00:00	SP07_03		✓		✓	✓	✓
EP1909972-008	01-Oct-2019 00:00	SP07_04	✓					
EP1909972-009	01-Oct-2019 00:00	SP08_01A			✓			
EP1909972-010	01-Oct-2019 00:00	SP08_02A			✓			
EP1909972-011	01-Oct-2019 00:00	SP08_03A			✓			
EP1909972-012	01-Oct-2019 00:00	SP08_04A			✓			
EP1909972-013	01-Oct-2019 00:00	SP07_01A			✓			
EP1909972-014	01-Oct-2019 00:00	SP07_02A			✓			
EP1909972-015	01-Oct-2019 00:00	SP07_03A			✓			
EP1909972-016	01-Oct-2019 00:00	SP07_04A			✓			

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ASHTON BETTI

- *AU Certificate of Analysis - NATA (COA)	Email	Ashton.Betti@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	Ashton.Betti@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	Ashton.Betti@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	Ashton.Betti@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	Ashton.Betti@senversa.com.au
- EDI Format - ENMRG (ENMRG)	Email	Ashton.Betti@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	Ashton.Betti@senversa.com.au
- EDI Format - XTab (XTAB)	Email	Ashton.Betti@senversa.com.au

SUPPLIER ACCOUNTS

- A4 - AU Tax Invoice (INV)	Email	supplieraccounts@senversa.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP1909972**	Page	: 1 of 5
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Contact	: Lauren Biagioni
Address	: LEVEL 25, 108 ST GEORGES TERRACE PERTH 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 08 6557 8881	Telephone	: 08 9406 1307
Project	: P17000 RtR Pilot	Date Samples Received	: 01-Oct-2019 17:30
Order number	: PO004389	Date Analysis Commenced	: 03-Oct-2019
C-O-C number	: ----	Issue Date	: 17-Oct-2019 23:09
Sampler	: ASHTON BETTI		
Site	: ----		
Quote number	: EP/422/19 V3		
No. of samples received	: 16		
No. of samples analysed	: 14		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Emily Daos	Team Leader - Asbestos	Melbourne Asbestos, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Asbestos conducted by ALS Melbourne, NATA accreditation no. 825, site no 13778
- EG020T: Poor precision was obtained for copper on sample EP1909972-001 due to possible sample heterogeneity and matrix interference. Results have been confirmed by re-extraction and re-analysis.
- Moisture correction for all samples has been disabled due to sample matrix interference.
- EA200N: Asbestos weights and percentages are not covered under the Scope of NATA Accreditation.
  Weights of Asbestos are based on extracted bulk asbestos, fibre bundles, and/or ACM and do not include respirable fibres (if present)
  The Asbestos (Fines and Fibrous) weight is calculated from the extracted Fibrous Asbestos and Asbestos Fines as an equivalent weight of 100% Asbestos
  Percentages for Asbestos content in ACM are based on the 2013 NEPM default values.
  All calculations of percentage Asbestos under this method are approximate and should be used as a guide only.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200N: ALS laboratory procedures and methods used for the identification and quantitation of asbestos are consistent with AS4964-2004 and the requirements of the 2013 NEPM for Assessment of Site Contamination
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SP08_01	SP08_02	SP08_03	SP07_01	SP07_02
			Client sampling date / time	01-Oct-2019 00:00	01-Oct-2019 00:00	01-Oct-2019 00:00	01-Oct-2019 00:00	01-Oct-2019 00:00
Compound	CAS Number	LOR	Unit	EP1909972-001	EP1909972-002	EP1909972-003	EP1909972-005	EP1909972-006
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**12.1**	**11.9**	**11.3**	**11.8**	**11.7**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.1	mg/kg	**2.4**	**2.3**	**2.2**	**2.9**	**2.8**
Selenium	7782-49-2	1	mg/kg	<1	<1	<1	<1	<1
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	**0.1**
Chromium	7440-47-3	0.1	mg/kg	**21.4**	**21.2**	**18.7**	**22.2**	**19.6**
Copper	7440-50-8	0.1	mg/kg	**6.5**	**7.9**	**11.1**	**12.3**	**10.7**
Molybdenum	7439-98-7	0.1	mg/kg	**1.0**	**1.4**	**1.0**	**1.3**	**1.2**
Nickel	7440-02-0	0.1	mg/kg	**3.4**	**3.3**	**3.8**	**6.9**	**6.6**
Lead	7439-92-1	0.1	mg/kg	**9.0**	**8.3**	**7.5**	**11.3**	**10.3**
Antimony	7440-36-0	0.1	mg/kg	**0.2**	**0.1**	**0.1**	**0.1**	**0.2**
Zinc	7440-66-6	0.5	mg/kg	**31.3**	**45.4**	**33.9**	**241**	**127**
Vanadium	7440-62-2	1	mg/kg	**13**	**13**	**13**	**13**	**13**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SP07_03	SP08_01A	SP08_02A	SP08_03A	SP08_04A
			Client sampling date / time	01-Oct-2019 00:00	01-Oct-2019 00:00	01-Oct-2019 00:00	01-Oct-2019 00:00	01-Oct-2019 00:00
Compound	CAS Number	LOR	Unit	EP1909972-007	EP1909972-009	EP1909972-010	EP1909972-011	EP1909972-012
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	11.6	----	----	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	No	No	No	No
Asbestos (Trace)	1332-21-4	5	Fibres	----	No	No	No	No
Asbestos Type	1332-21-4	-	--	----	-	-	-	-
Sample weight (dry)	----	0.01	g	----	756	820	814	830
Synthetic Mineral Fibre	----	0.1	g/kg	----	No	No	No	No
Organic Fibre	----	0.1	g/kg	----	No	Yes	Yes	Yes
APPROVED IDENTIFIER:	----	-	--	----	E.DAOS	E.DAOS	E.DAOS	E.DAOS
EA200N: ACM Asbestos in Soil (non-NATA)								
ø Asbestos Containing Material	1332-21-4	0.1	g	----	<0.1	<0.1	<0.1	<0.1
ø Asbestos Containing Material (as 15% Asbestos in ACM >7mm)	1332-21-4	0.01	% (w/w)	----	<0.01	<0.01	<0.01	<0.01
EA200N: Asbestos Quantification (non-NATA)								
ø Asbestos (Fines and Fibrous <7mm)	1332-21-4	0.0004	g	----	<0.0004	<0.0004	<0.0004	<0.0004
ø Asbestos (Fines and Fibrous FA+AF)	----	0.001	% (w/w)	----	<0.001	<0.001	<0.001	<0.001
ø Fibrous Asbestos >7mm	----	0.0004	g	----	<0.0004	<0.0004	<0.0004	<0.0004
ø Weight Used for % Calculation	----	0.0001	kg	----	0.756	0.820	0.814	0.830
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.1	mg/kg	3.0	----	----	----	----
Selenium	7782-49-2	1	mg/kg	<1	----	----	----	----
Cadmium	7440-43-9	0.1	mg/kg	0.1	----	----	----	----
Chromium	7440-47-3	0.1	mg/kg	19.8	----	----	----	----
Copper	7440-50-8	0.1	mg/kg	12.2	----	----	----	----
Molybdenum	7439-98-7	0.1	mg/kg	1.4	----	----	----	----
Nickel	7440-02-0	0.1	mg/kg	6.3	----	----	----	----
Lead	7439-92-1	0.1	mg/kg	17.5	----	----	----	----
Antimony	7440-36-0	0.1	mg/kg	0.2	----	----	----	----
Zinc	7440-66-6	0.5	mg/kg	101	----	----	----	----
Vanadium	7440-62-2	1	mg/kg	14	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SP07_01A	SP07_02A	SP07_03A	SP07_04A	----
			Client sampling date / time	01-Oct-2019 00:00	01-Oct-2019 00:00	01-Oct-2019 00:00	01-Oct-2019 00:00	----
Compound	CAS Number	LOR	Unit	EP1909972-013	EP1909972-014	EP1909972-015	EP1909972-016	--------
				Result	Result	Result	Result	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	**No**	**No**	**No**	**----**
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	**No**	**No**	**No**	**----**
Asbestos Type	1332-21-4	-	--	**-**	**-**	**-**	**-**	**----**
Sample weight (dry)	----	0.01	g	**692**	**654**	**719**	**616**	**----**
Synthetic Mineral Fibre	----	0.1	g/kg	**No**	**No**	**No**	**No**	**----**
Organic Fibre	----	0.1	g/kg	**Yes**	**No**	**Yes**	**No**	**----**
APPROVED IDENTIFIER:	----	-	--	**E.DAOS**	**E.DAOS**	**E.DAOS**	**E.DAOS**	**----**
EA200N: ACM Asbestos in Soil (non-NATA)								
ø **Asbestos Containing Material**	1332-21-4	0.1	g	<0.1	<0.1	<0.1	<0.1	**----**
ø **Asbestos Containing Material (as 15% Asbestos in ACM >7mm)**	1332-21-4	0.01	% (w/w)	<0.01	<0.01	<0.01	<0.01	**----**
EA200N: Asbestos Quantification (non-NATA)								
ø **Asbestos (Fines and Fibrous <7mm)**	1332-21-4	0.0004	g	<0.0004	<0.0004	<0.0004	<0.0004	**----**
ø **Asbestos (Fines and Fibrous FA+AF)**	----	0.001	% (w/w)	<0.001	<0.001	<0.001	<0.001	**----**
ø **Fibrous Asbestos >7mm**	----	0.0004	g	<0.0004	<0.0004	<0.0004	<0.0004	**----**
ø **Weight Used for % Calculation**	----	0.0001	kg	**0.692**	**0.654**	**0.719**	**0.616**	**----**

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	SP08_01A - 01-Oct-2019 00:00	Beige white sandy soil with rock matter.
EA200: Description	SP08_02A - 01-Oct-2019 00:00	Beige white sandy soil with rock and organic matter.
EA200: Description	SP08_03A - 01-Oct-2019 00:00	Beige white sandy soil with rock and organic matter.
EA200: Description	SP08_04A - 01-Oct-2019 00:00	Beige white sandy soil with rock and organic matter.
EA200: Description	SP07_01A - 01-Oct-2019 00:00	Beige white sandy soil with rock and organic matter.
EA200: Description	SP07_02A - 01-Oct-2019 00:00	Beige white sandy soil with rock matter.
EA200: Description	SP07_03A - 01-Oct-2019 00:00	Beige white sandy soil with rock and organic matter.
EA200: Description	SP07_04A - 01-Oct-2019 00:00	Beige white sandy soil with rock matter.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP1909972**	Page	: 1 of 4
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Contact	: Lauren Biagioni
Address	: LEVEL 25, 108 ST GEORGES TERRACE PERTH 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 08 6557 8881	Telephone	: 08 9406 1307
Project	: P17000 RtR Pilot	Date Samples Received	: 01-Oct-2019
Order number	: PO004389	Date Analysis Commenced	: 03-Oct-2019
C-O-C number	: ----	Issue Date	: 17-Oct-2019
Sampler	: ASHTON BETTI		
Site	: ----		
Quote number	: EP/422/19 V3		
No. of samples received	: 16		
No. of samples analysed	: 14		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Emily Daos	Team Leader - Asbestos	Melbourne Asbestos, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002: pH 1:5 (Soils) (QC Lot: 2624835)									
EP1909972-001	SP08_01	EA002: pH Value	----	0.1	pH Unit	12.1	12.2	0.00	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 2624852)									
EP1909972-001	SP08_01	EG020X-T: Arsenic	7440-38-2	0.1	mg/kg	2.4	2.2	10.8	0% - 20%
		EG020X-T: Chromium	7440-47-3	0.1	mg/kg	21.4	20.1	6.37	0% - 20%
		EG020X-T: Copper	7440-50-8	0.1	mg/kg	6.5	# 8.2	23.9	0% - 20%
		EG020X-T: Molybdenum	7439-98-7	0.1	mg/kg	1.0	0.9	13.7	0% - 50%
		EG020X-T: Nickel	7440-02-0	0.1	mg/kg	3.4	3.7	9.54	0% - 20%
		EG020X-T: Lead	7439-92-1	0.1	mg/kg	9.0	8.8	1.86	0% - 20%
		EG020X-T: Antimony	7440-36-0	0.1	mg/kg	0.2	0.1	0.00	No Limit
		EG020X-T: Zinc	7440-66-6	0.5	mg/kg	31.3	31.6	0.773	0% - 20%
		EG020X-T: Vanadium	7440-62-2	1	mg/kg	13	12	0.00	0% - 50%
EG020T: Total Metals by ICP-MS (QC Lot: 2624854)									
EP1909972-001	SP08_01	EG020Y-T: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
		EG020Y-T: Selenium	7782-49-2	1	mg/kg	<1	<1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2624853)									
EP1909972-001	SP08_01	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 2624835)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	70.0	130
				----	7 pH Unit	100	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 2624852)								
EG020X-T: Arsenic	7440-38-2	0.1	mg/kg	<0.1	21.62091 mg/kg	111	80.0	120
EG020X-T: Chromium	7440-47-3	0.1	mg/kg	<0.1	33.90415 mg/kg	107	70.0	120
EG020X-T: Copper	7440-50-8	0.1	mg/kg	<0.1	33.78205 mg/kg	104	70.0	120
EG020X-T: Molybdenum	7439-98-7	0.1	mg/kg	<0.1	----	----	----	----
EG020X-T: Nickel	7440-02-0	0.1	mg/kg	<0.1	51.10088 mg/kg	114	74.0	120
EG020X-T: Lead	7439-92-1	0.1	mg/kg	<0.1	40.33169 mg/kg	106	70.0	120
EG020X-T: Antimony	7440-36-0	0.1	mg/kg	<0.1	----	----	----	----
EG020X-T: Zinc	7440-66-6	0.5	mg/kg	<0.5	61.70999 mg/kg	113	81.0	120
EG020X-T: Vanadium	7440-62-2	1	mg/kg	<1	----	----	----	----
EG020T: Total Metals by ICP-MS (QCLot: 2624854)								
EG020Y-T: Selenium	7782-49-2	1	mg/kg	<1	----	----	----	----
EG020Y-T: Cadmium	7440-43-9	0.1	mg/kg	<0.1	4.68383 mg/kg	106	88.0	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2624853)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.154 mg/kg	103	81.0	115

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 2624852)							
EP1909972-001	SP08_01	EG020X-T: Arsenic	7440-38-2	50 mg/kg	98.1	70.0	130
		EG020X-T: Chromium	7440-47-3	50 mg/kg	92.8	70.0	130
		EG020X-T: Copper	7440-50-8	50 mg/kg	95.4	70.0	130
		EG020X-T: Nickel	7440-02-0	50 mg/kg	89.9	70.0	130
		EG020X-T: Lead	7439-92-1	50 mg/kg	103	70.0	130
		EG020X-T: Zinc	7440-66-6	50 mg/kg	107	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 2624854)							
EP1909972-001	SP08_01	EG020Y-T: Selenium	7782-49-2	10 mg/kg	105	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG020T: Total Metals by ICP-MS (QCLot: 2624854) - continued							
EP1909972-001	SP08_01	EG020Y-T: Cadmium	7440-43-9	50 mg/kg	98.9	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2624853)							
EP1909972-001	SP08_01	EG035T: Mercury	7439-97-6	10 mg/kg	94.9	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP1909972**	Page	: 1 of 5
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Telephone	: 08 9406 1307
Project	: P17000 RtR Pilot	Date Samples Received	: 01-Oct-2019
Site	: ----	Issue Date	: 17-Oct-2019
Sampler	: ASHTON BETTI	No. of samples received	: 16
Order number	: PO004389	No. of samples analysed	: 14

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG020T: Total Metals by ICP-MS	EP1909972--001	SP08_01	**Copper**	7440-50-8	23.9 %	0% - 20%	**RPD exceeds LOR based limits**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)		Extraction / Preparation: Date extracted	Due for extraction	Days overdue	Analysis: Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved							
SP08_01,	SP08_02,	10-Oct-2019	08-Oct-2019	**2**	----	----	----
SP08_03,	SP07_01,						
SP07_02,	SP07_03						

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
SP08_01,	SP08_02,	**01-Oct-2019**	**10-Oct-2019**	08-Oct-2019	×	**10-Oct-2019**	10-Oct-2019	✓
SP08_03,	SP07_01,							
SP07_02,	SP07_03							
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Snap Lock Bag - Friable Asbestos/PSD Bag (EA200)								
SP08_01A,	SP08_02A,	**01-Oct-2019**	**----**	----	----	**03-Oct-2019**	29-Mar-2020	✓
SP08_03A,	SP08_04A,							
SP07_01A,	SP07_02A,							
SP07_03A,	SP07_04A							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA200N: ACM Asbestos in Soil (non-NATA)								
Snap Lock Bag - Friable Asbestos/PSD Bag (EA200N)								
SP08_01A,	SP08_02A,	**01-Oct-2019**	**----**	----	----	**03-Oct-2019**	29-Mar-2020	✓
SP08_03A,	SP08_04A,							
SP07_01A,	SP07_02A,							
SP07_03A,	SP07_04A							
EA200N: Asbestos Quantification (non-NATA)								
Snap Lock Bag - Friable Asbestos/PSD Bag (EA200N)								
SP08_01A,	SP08_02A,	**01-Oct-2019**	**----**	----	----	**03-Oct-2019**	29-Mar-2020	✓
SP08_03A,	SP08_04A,							
SP07_01A,	SP07_02A,							
SP07_03A,	SP07_04A							
EG020T: Total Metals by ICP-MS								
Soil Glass Jar - Unpreserved (EG020Y-T)								
SP08_01,	SP08_02,	**01-Oct-2019**	**09-Oct-2019**	29-Mar-2020	✓	**09-Oct-2019**	29-Mar-2020	✓
SP08_03,	SP07_01,							
SP07_02,	SP07_03							
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
SP08_01,	SP08_02,	**01-Oct-2019**	**09-Oct-2019**	29-Oct-2019	✓	**09-Oct-2019**	29-Oct-2019	✓
SP08_03,	SP07_01,							
SP07_02,	SP07_03							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
pH (1:5)	EA002	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite X	EG020X-T	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite Y	EG020Y-T	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
pH (1:5)	EA002	2	6	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite X	EG020X-T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite Y	EG020Y-T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Total Mercury by FIMS	EG035T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite X	EG020X-T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite Y	EG020Y-T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Total Mercury by FIMS	EG035T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite X	EG020X-T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite Y	EG020Y-T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Asbestos Classification and Quantitation per NEPM 2013	* EA200N	SOIL	Asbestos Classification and Quantitation per NEPM 2013 with Confirmation of Identification by AS 4964 - 2004 Gravimetric determination of Asbestos Containing Material, Fibrous Asbestos, Asbestos Fines and sample weight and calculation of percentage concentrations per NEPM protocols. Asbestos (Fines and Fibrous FA+AF) is reported as the equivalent weight in the sample received after accounting for sub-sampling (where applicable for the <7mm and/or <2mm fractions).
Total Metals by ICP-MS - Suite X	EG020X-T	SOIL	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite Y	EG020Y-T	SOIL	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Dry and Crush	EN84	SOIL	In house

senversa

Chain of Custody Documentation

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Laboratory: ALS
Address: 26 Rigali Way, Wangara WA 6065
Contact: Lauren Biagioni
Phone: 08 9406 1301

Job Number:	P17000	**Purchase Order:**	~~PO004389~~ PO 005933
Project Name:	RtR Pilot	**Quote No:**	EP/422/19 V2
Sampled By:	Ashton Betti	**Turn Around Time:**	standard
Project Manager:	Ashton Betti	**Page:**	of
Email Report To:	ashton.betti@senversa.com.au	**Phone/Mobile:**	0421 473 219

Sample Information					Container Information		Analysis Required												
Lab ID	Sample ID	Matrix *	Date	Time	Type / Code	Total Bottles	HOLD	Dry & Crush to <2mm	pH (1:5 extract)	Metals (As, Total Cr, Cu, Pb, Hg, Mo, Ni, Sb, V, Zn)	Trace Metals (Cd, Se)	Asbestos Presence/Absence Quantification (if detected)							Comments: Soil samples for pH and metals analysis should be milled to <2mm and a 2 g sub sample taken for analysis. Remaining sample to remain on hold.
1	URSP10_01	S	25/10/19		S	1		X	X	X	X								
2	URSP10_02	↓	↓		↓	1		X	X	X	X								
3	URSP10_03					1		X	X	X	X								
4	URSP11_01					1		X	X	X	X								
5	URSP11_02				↓	1		X	X	X	X								
6	URSP10_01A				B	1						X							
7	URSP10_02A					1						X							
8	URSP10_03A					1						X							
9	URSP11_01A	↓	↓		↓	1						X							

Environmental Division
Perth
Work Order Reference
EP1911046

Telephone : +61-8-9406 1301

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:

Sampler Name: Ashton Betti | **Signature:** A Betti | **Date:** 25/10/2019

Relinquished By:		**Method of Shipment (if applicable):** COURIER.	**Received by:**	
Name/Signature: A. Betti	Date: 25/10/19	Carrier / Reference #:	Name/Signature:	Date: 25/10/19
Of: Senversa	Time:	Date/Time:	Of: PKS	Time: 1605
Name/Signature:	Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:	Date/Time:	Of:	Time:
Name/Signature:	Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:	Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic; V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

Completed by: _____
Checked by: _____

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP1911046**

Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Contact	: Lauren Biagioni
Address	: LEVEL 25, 108 ST GEORGES TERRACE PERTH 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: Ashton.Betti@senversa.com.au	E-mail	: Lauren.biagioni@alsglobal.com
Telephone	: +61 08 6557 8881	Telephone	: 08 9406 1307
Facsimile	: +61 03 9606 0074	Facsimile	: +61-8-9406 1399
Project	: P17000 RtR Pilot	Page	: 1 of 2
Order number	: PO 005933	Quote number	: EP2019SENVER0006 (EP/422/19 V3)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: ASHTON BETTI		

Dates

Date Samples Received	: 25-Oct-2019 16:05	Issue Date	: 28-Oct-2019
Client Requested Due Date	: 14-Nov-2019	Scheduled Reporting Date	: **14-Nov-2019**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 15.8 - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 9 / 9

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- EA200-TBA conducted by ALS Melbourne, NATA accreditation no. 825, site no 13778
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA002 pH (1:5)	SOIL - EA200N-TBA Asbestos in Soils - Quantitation by WA/NEPM	SOIL - EG020T (solids) Total Metals by ICP-MS	SOIL - S-02 (ICPMS) Standard 8 Metals by ICPMS
EP1911046-001	25-Oct-2019 00:00	URSP10_01	✓		✓	✓
EP1911046-002	25-Oct-2019 00:00	URSP10_02	✓		✓	✓
EP1911046-003	25-Oct-2019 00:00	URSP10_03	✓		✓	✓
EP1911046-004	25-Oct-2019 00:00	URSP11_01	✓		✓	✓
EP1911046-005	25-Oct-2019 00:00	URSP11_02	✓		✓	✓
EP1911046-006	25-Oct-2019 00:00	URSP10_01A		✓		
EP1911046-007	25-Oct-2019 00:00	URSP10_02A		✓		
EP1911046-008	25-Oct-2019 00:00	URSP10_03A		✓		
EP1911046-009	25-Oct-2019 00:00	URSP11_01A		✓		

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ASHTON BETTI

- *AU Certificate of Analysis - NATA (COA)	Email	Ashton.Betti@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	Ashton.Betti@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	Ashton.Betti@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	Ashton.Betti@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	Ashton.Betti@senversa.com.au
- EDI Format - ENMRG (ENMRG)	Email	Ashton.Betti@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	Ashton.Betti@senversa.com.au
- EDI Format - XTab (XTAB)	Email	Ashton.Betti@senversa.com.au

SUPPLIER ACCOUNTS

- A4 - AU Tax Invoice (INV)	Email	supplieraccounts@senversa.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP1911046**	Page	: 1 of 4
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Contact	: Lauren Biagioni
Address	: LEVEL 25, 108 ST GEORGES TERRACE PERTH 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 08 6557 8881	Telephone	: 08 9406 1307
Project	: P17000 RtR Pilot	Date Samples Received	: 25-Oct-2019 16:05
Order number	: PO 005933	Date Analysis Commenced	: 30-Oct-2019
C-O-C number	: ----	Issue Date	: 07-Nov-2019 22:40
Sampler	: ASHTON BETTI		
Site	: ----		
Quote number	: EP/422/19 V3		
No. of samples received	: 9		
No. of samples analysed	: 9		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Uyen Dalkin	Approved Asbestos Identifier	Melbourne Asbestos, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EA200-TBA conducted by ALS Melbourne, NATA accreditation no. 825, site no 13778
- EG020T: Poor precision was obtained for arsenic, nickel on sample EP1911046-001 due to possible sample heterogeneity. Results have been confirmed by re-extraction and re-analysis.
- EA200N: Asbestos weights and percentages are not covered under the Scope of NATA Accreditation.
  Weights of Asbestos are based on extracted bulk asbestos, fibre bundles, and/or ACM and do not include respirable fibres (if present)
  The Asbestos (Fines and Fibrous) weight is calculated from the extracted Fibrous Asbestos and Asbestos Fines as an equivalent weight of 100% Asbestos
  Percentages for Asbestos content in ACM are based on the 2013 NEPM default values.
  All calculations of percentage Asbestos under this method are approximate and should be used as a guide only.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200N: ALS laboratory procedures and methods used for the identification and quantitation of asbestos are consistent with AS4964-2004 and the requirements of the 2013 NEPM for Assessment of Site Contamination
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	URSP10_01	URSP10_02	URSP10_03	URSP11_01	URSP11_02
			Client sampling date / time	25-Oct-2019 00:00	25-Oct-2019 00:00	25-Oct-2019 00:00	25-Oct-2019 00:00	25-Oct-2019 00:00
Compound	CAS Number	LOR	Unit	EP1911046-001	EP1911046-002	EP1911046-003	EP1911046-004	EP1911046-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**11.7**	**12.1**	**12.2**	**12.2**	**12.2**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.1	mg/kg	**4.2**	**2.2**	**2.2**	**2.1**	**2.0**
Selenium	7782-49-2	1	mg/kg	<1	<1	<1	<1	<1
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	7440-47-3	0.1	mg/kg	**23.3**	**22.8**	**27.7**	**27.6**	**30.9**
Copper	7440-50-8	0.1	mg/kg	**18.8**	**11.4**	**9.8**	**10.8**	**14.3**
Molybdenum	7439-98-7	0.1	mg/kg	**0.5**	**1.0**	**1.4**	**2.0**	**1.0**
Nickel	7440-02-0	0.1	mg/kg	**9.8**	**5.1**	**5.0**	**4.2**	**6.1**
Lead	7439-92-1	0.1	mg/kg	**2.8**	**9.9**	**11.0**	**13.7**	**11.4**
Antimony	7440-36-0	0.1	mg/kg	<0.1	**0.2**	**0.2**	**0.2**	**0.1**
Zinc	7440-66-6	0.5	mg/kg	**14.0**	**55.7**	**53.4**	**52.1**	**43.1**
Vanadium	7440-62-2	1	mg/kg	**9**	**15**	**17**	**14**	**16**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	URSP10_01A	URSP10_02A	URSP10_03A	URSP11_01A	----
			Client sampling date / time	25-Oct-2019 00:00	25-Oct-2019 00:00	25-Oct-2019 00:00	25-Oct-2019 00:00	----
Compound	CAS Number	LOR	Unit	EP1911046-006	EP1911046-007	EP1911046-008	EP1911046-009	--------
				Result	Result	Result	Result	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	**No**	**No**	**No**	**----**
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	**No**	**No**	**No**	**----**
Asbestos Type	1332-21-4	-	--	**-**	**-**	**-**	**-**	**----**
Sample weight (dry)	----	0.01	g	**651**	**634**	**608**	**592**	**----**
Synthetic Mineral Fibre	----	0.1	g/kg	**No**	**No**	**No**	**No**	**----**
Organic Fibre	----	0.1	g/kg	**Yes**	**Yes**	**Yes**	**Yes**	**----**
APPROVED IDENTIFIER:	----	-	--	**E.DAOS**	**E.DAOS**	**E.DAOS**	**E.DAOS**	**----**
EA200N: ACM Asbestos in Soil (non-NATA)								
ø **Asbestos Containing Material**	1332-21-4	0.1	g	<0.1	<0.1	<0.1	<0.1	**----**
ø **Asbestos Containing Material (as 15% Asbestos in ACM >7mm)**	1332-21-4	0.01	% (w/w)	<0.01	<0.01	<0.01	<0.01	**----**
EA200N: Asbestos Quantification (non-NATA)								
ø **Asbestos (Fines and Fibrous <7mm)**	1332-21-4	0.0004	g	<0.0004	<0.0004	<0.0004	<0.0004	**----**
ø **Asbestos (Fines and Fibrous FA+AF)**	----	0.001	% (w/w)	<0.001	<0.001	<0.001	<0.001	**----**
ø **Fibrous Asbestos >7mm**	----	0.0004	g	<0.0004	<0.0004	<0.0004	<0.0004	**----**
ø **Weight Used for % Calculation**	----	0.0001	kg	**0.651**	**0.634**	**0.608**	**0.592**	**----**

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	URSP10_01A - 25-Oct-2019 00:00	Beige grey rocky soil with organic matter.
EA200: Description	URSP10_02A - 25-Oct-2019 00:00	Beige grey rocky soil with organic matter.
EA200: Description	URSP10_03A - 25-Oct-2019 00:00	Beige grey rocky soil with organic matter.
EA200: Description	URSP11_01A - 25-Oct-2019 00:00	Beige grey rocky soil with organic matter.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP1911046**	Page	: 1 of 4
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Contact	: Lauren Biagioni
Address	: LEVEL 25, 108 ST GEORGES TERRACE PERTH 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 08 6557 8881	Telephone	: 08 9406 1307
Project	: P17000 RtR Pilot	Date Samples Received	: 25-Oct-2019
Order number	: PO 005933	Date Analysis Commenced	: 30-Oct-2019
C-O-C number	: ----	Issue Date	: 07-Nov-2019
Sampler	: ASHTON BETTI		
Site	: ----		
Quote number	: EP/422/19 V3		
No. of samples received	: 9		
No. of samples analysed	: 9		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Uyen Dalkin	Approved Asbestos Identifier	Melbourne Asbestos, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002: pH 1:5 (Soils) (QC Lot: 2676960)									
EP1910961-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	9.5	9.5	0.00	0% - 20%
EP1911039-005	Anonymous	EA002: pH Value	----	0.1	pH Unit	9.2	9.2	0.00	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 2674226)									
EP1911046-001	URSP10_01	EG020X-T: Arsenic	7440-38-2	0.1	mg/kg	4.2	# 6.2	38.5	0% - 20%
		EG020X-T: Chromium	7440-47-3	0.1	mg/kg	23.3	22.0	5.61	0% - 20%
		EG020X-T: Copper	7440-50-8	0.1	mg/kg	18.8	19.3	2.58	0% - 20%
		EG020X-T: Molybdenum	7439-98-7	0.1	mg/kg	0.5	0.5	0.00	No Limit
		EG020X-T: Nickel	7440-02-0	0.1	mg/kg	9.8	# 7.9	21.3	0% - 20%
		EG020X-T: Lead	7439-92-1	0.1	mg/kg	2.8	3.0	7.30	0% - 20%
		EG020X-T: Antimony	7440-36-0	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
		EG020X-T: Zinc	7440-66-6	0.5	mg/kg	14.0	12.8	8.78	0% - 20%
		EG020X-T: Vanadium	7440-62-2	1	mg/kg	9	9	0.00	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 2674228)									
EP1911046-001	URSP10_01	EG020Y-T: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
		EG020Y-T: Selenium	7782-49-2	1	mg/kg	<1	<1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 2674227)									
EP1911046-001	URSP10_01	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 2676960)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	102	70.0	130
				----	7 pH Unit	100	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 2674226)								
EG020X-T: Arsenic	7440-38-2	0.1	mg/kg	<0.1	21.62091 mg/kg	106	80.0	120
EG020X-T: Chromium	7440-47-3	0.1	mg/kg	<0.1	33.90415 mg/kg	120	70.0	120
EG020X-T: Copper	7440-50-8	0.1	mg/kg	<0.1	33.78205 mg/kg	107	70.0	120
EG020X-T: Molybdenum	7439-98-7	0.1	mg/kg	<0.1	----	----	----	----
EG020X-T: Nickel	7440-02-0	0.1	mg/kg	<0.1	51.10088 mg/kg	113	74.0	120
EG020X-T: Lead	7439-92-1	0.1	mg/kg	<0.1	40.33169 mg/kg	109	70.0	120
EG020X-T: Antimony	7440-36-0	0.1	mg/kg	<0.1	----	----	----	----
EG020X-T: Zinc	7440-66-6	0.5	mg/kg	<0.5	61.70999 mg/kg	117	81.0	120
EG020X-T: Vanadium	7440-62-2	1	mg/kg	<1	----	----	----	----
EG020T: Total Metals by ICP-MS (QCLot: 2674228)								
EG020Y-T: Selenium	7782-49-2	1	mg/kg	<1	----	----	----	----
EG020Y-T: Cadmium	7440-43-9	0.1	mg/kg	<0.1	4.68383 mg/kg	101	88.0	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2674227)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.154 mg/kg	102	81.0	115

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 2674226)							
EP1911046-001	URSP10_01	EG020X-T: Arsenic	7440-38-2	50 mg/kg	105	70.0	130
		EG020X-T: Chromium	7440-47-3	50 mg/kg	116	70.0	130
		EG020X-T: Copper	7440-50-8	50 mg/kg	109	70.0	130
		EG020X-T: Nickel	7440-02-0	50 mg/kg	96.2	70.0	130
		EG020X-T: Lead	7439-92-1	50 mg/kg	122	70.0	130
		EG020X-T: Zinc	7440-66-6	50 mg/kg	103	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 2674228)							
EP1911046-001	URSP10_01	EG020Y-T: Selenium	7782-49-2	10 mg/kg	116	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG020T: Total Metals by ICP-MS (QCLot: 2674228) - continued							
EP1911046-001	URSP10_01	EG020Y-T: Cadmium	7440-43-9	50 mg/kg	100	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 2674227)							
EP1911046-001	URSP10_01	EG035T: Mercury	7439-97-6	10 mg/kg	108	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP1911046**	Page	: 1 of 5
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Telephone	: 08 9406 1307
Project	: P17000 RtR Pilot	Date Samples Received	: 25-Oct-2019
Site	: ----	Issue Date	: 07-Nov-2019
Sampler	: ASHTON BETTI	No. of samples received	: 9
Order number	: PO 005933	No. of samples analysed	: 9

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG020T: Total Metals by ICP-MS	EP1911046--001	URSP10_01	**Arsenic**	7440-38-2	38.5 %	0% - 20%	**RPD exceeds LOR based limits**
EG020T: Total Metals by ICP-MS	EP1911046--001	URSP10_01	**Nickel**	7440-02-0	21.3 %	0% - 20%	**RPD exceeds LOR based limits**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EA002: pH 1:5 (Soils)						
Soil Glass Jar - Unpreserved URSP10_01, URSP10_02, URSP10_03, URSP11_01, URSP11_02	04-Nov-2019	01-Nov-2019	**3**	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002) URSP10_01, URSP10_02, URSP10_03, URSP11_01, URSP11_02	**25-Oct-2019**	**04-Nov-2019**	01-Nov-2019	×	**04-Nov-2019**	04-Nov-2019	✓
EA200: AS 4964 - 2004 Identification of Asbestos in Soils							
Snap Lock Bag: Separate bag received (EA200) URSP10_01A, URSP10_02A, URSP10_03A, URSP11_01A	**25-Oct-2019**	**----**	----	----	**30-Oct-2019**	22-Apr-2020	✓
EA200N: ACM Asbestos in Soil (non-NATA)							
Snap Lock Bag: Separate bag received (EA200N) URSP10_01A, URSP10_02A, URSP10_03A, URSP11_01A	**25-Oct-2019**	**----**	----	----	**30-Oct-2019**	22-Apr-2020	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA200N: Asbestos Quantification (non-NATA)							
Snap Lock Bag: Separate bag received (EA200N)							
URSP10_01A, URSP10_02A, URSP10_03A, URSP11_01A	**25-Oct-2019**	**----**	----	----	**30-Oct-2019**	22-Apr-2020	✓
EG020T: Total Metals by ICP-MS							
Soil Glass Jar - Unpreserved (EG020Y-T)							
URSP10_01, URSP10_02, URSP10_03, URSP11_01, URSP11_02	**25-Oct-2019**	**04-Nov-2019**	22-Apr-2020	✓	**04-Nov-2019**	22-Apr-2020	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
URSP10_01, URSP10_02, URSP10_03, URSP11_01, URSP11_02	**25-Oct-2019**	**04-Nov-2019**	22-Nov-2019	✓	**04-Nov-2019**	22-Nov-2019	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite X	EG020X-T	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite Y	EG020Y-T	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite X	EG020X-T	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite Y	EG020Y-T	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Total Mercury by FIMS	EG035T	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite X	EG020X-T	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite Y	EG020Y-T	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Total Mercury by FIMS	EG035T	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite X	EG020X-T	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite Y	EG020Y-T	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Asbestos Classification and Quantitation per NEPM 2013	* EA200N	SOIL	Asbestos Classification and Quantitation per NEPM 2013 with Confirmation of Identification by AS 4964 - 2004 Gravimetric determination of Asbestos Containing Material, Fibrous Asbestos, Asbestos Fines and sample weight and calculation of percentage concentrations per NEPM protocols. Asbestos (Fines and Fibrous FA+AF) is reported as the equivalent weight in the sample received after accounting for sub-sampling (where applicable for the <7mm and/or <2mm fractions).
Total Metals by ICP-MS - Suite X	EG020X-T	SOIL	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite Y	EG020Y-T	SOIL	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Dry and Crush	EN84	SOIL	In house

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Material Acceptance and Sampling Plan Compliance Audit

Waste Stream Management, Ratcliffe Road, Medina, WA

Prepared for:
Department of Water and Environmental Regulation
Prime House, 8 Davidson Terrace
Joondalup WA 6027

3 May 2019

Distribution

Material Acceptance and Sampling Plan Compliance Audit
Waste Stream, Ratcliffe Road, Medina, WA

3 May 2019

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Contents

Executive Summary

Senversa Pty Ltd was commissioned by the Department of Water and Environmental Regulation (DWER) (Waste Authority) to undertake a preliminary compliance audit of the Material Acceptance and Sampling Plan (MASP) prepared in relation to the Roads to Reuse (RtR) Pilot Project for Waste Stream Management, located on Ratcliffe Road, Medina, Western Australia ('the site').

The primary objective for the preliminary compliance audit was to verify whether or not the producer was compliant with their MASP. A separate sampling and testing audit will be completed to verify compliance of the product with the RtR Product Specification (Waste Authority 2018).

The scope of work for the preliminary compliance audit comprised review of MASP, preparation of an audit protocol, site inspection and interviews with site personnel and reporting.

The audit was completed by Ashton Betti (Senior Associate Environmental Scientist) with 12 years' experience in contaminated sites assessment and auditing. Ashton was accompanied by Mark Jones (Risk & Compliance Manager, Urban Resources) and Luke Bennett (Site Supervisor, Urban Resources).

The recycling/crushing area appeared to be well organised and onsite management procedures for material acceptance and processing were in general compliance with the MASP, noting one minor non-conformance related to pre-acceptance procedures (insufficient information on incoming materials dockets). It was noted that measures were in place to rectify this non-conformance at the time of the inspection, being computer system upgrades. The other operational control procedures that are in place are considered adequate such that, in isolation, this minor non-conformance is unlikely to materially compromise the suitability of C&D product being accepted at the site.

Overall the operational control procedures adopted to reduce the potential for contamination to enter the production stream appeared effective and there was no evidence that source materials for recycled road base were grossly contaminated. The recycling/crushing area is considered suitably compliant with the processes outlined in the MASP to commence full production in accordance with the RtR Product Specification.

Based on the preliminary compliance audit, the following recommendations are made:

- Incoming materials dockets should be revised to include the additional information requirements per Section 3.1 of the MASP. It is noted that works were occurring to include this information on the docket system during the inspection.
- Sampling and testing audits should be scheduled once routine frequency sampling has commenced to verify whether or not the material produced meets the RtR Product Specification.

List of Acronyms

Acronym	Definition
ACM	Asbestos Containing Material
C&D	Construction and Demolition
DWER	Department of Water and Environmental Regulation
MASP	Material Acceptance and Sampling Plan
MRWA	Main Roads WA
RtR	Roads to Reuse

1.0 Introduction

Senversa Pty Ltd was commissioned by the Department of Water and Environmental Regulation (DWER) (Waste Authority) to undertake a preliminary compliance audit of the Material Acceptance and Sampling Plan (MASP) prepared in relation to the Roads to Reuse (RtR) Pilot Project for Waste Stream Management, located on Ratcliffe Road, Medina, Western Australia ('the site').

1.1 Project Appreciation

The RtR Pilot Project is a State Government initiative being delivered through the Waste Authority which encourages the use of recycled construction and demolition (C&D) products in road construction.

Material funded by the program must meet the RtR Product Specification (*Roads to Reuse; Product Specification - recycled road base and recycled drainage rock*; September 2018) to ensure the environment and human health are protected.

The product specification requires producers of recycled C&D products to prepare a MASP, which outlines operational controls and acceptance procedures for products and to undertake sampling and testing to determine whether or not recycled C&D product meets the product specification.

The Waste Authority is delivering a pilot project (the RtR Pilot Project) with Main Roads WA (MRWA). As part of the RtR Pilot Project, the Waste Authority engaged Senversa to independently confirm the effectiveness of the C&D producers' management and testing processes and ability to meet the RtR Product Specification.

1.2 Objectives

The primary objectives for the audit were to verify whether or not the producer was compliant with their MASP and to verify whether or not the material produced meets the RtR Product Specification.

This report presents the results from the preliminary compliance audit, which addresses the first objective (verify compliance with the MASP). Subsequent sampling and testing audits will be completed to address the second objective (verify compliance with the RtR Product Specification). A separate report will be prepared to present the results from the sampling and testing audits.

1.3 Scope of Work

The scope of work for the preliminary compliance audit comprised:

- review of MASP;
- preparation of audit protocol;
- site inspection and interviews with site personnel; and
- reporting.

2.0 Site Identification

Site identification details are summarised in **Table 1**. The site location is shown on **Figure 1**.

Table 1: Site Identification Details

Site Identification Details	
Site Name	Waste Stream Management
Street Address	Ratcliffe Road, Medina
Legal Description	Part of Lot 304 on Diagram 72808 and Part of Lot 434 on Plan 220492
Licence	L6772/1997/13
Permitted Waste Types	Inert Waste Type 1, Inert Waste Type 2, Clean Fill, Special Waste Type 1 (asbestos), Green Waste, Acid Sulphate Soils

3.0 Methodology

Senversa was provided with a copy of the following document:

- Talis Consultants Pty Ltd (2019) *Material Acceptance and Sampling Plan. Ratcliffe Road, Medina WA.* Version 4c, 2 April 2019. (Reference: TE19001)

The MASP was prepared in a manner designed to be compliant with the requirements of the RtR Specification.

The MASP provided an overview of site operations and described the authorised product specification. Most relevant to this aspect of the audit, the MASP outlined operational control procedure requirements to ensure compliance with the RtR Specification, these were broadly described in the following categories:

- Source product definitions (Section 2)
- Pre-acceptance procedures (Section 3.1)
- Acceptance procedures (Section 3.1.1, Section 3.1.2 and Section 4.1)
- Asbestos acceptance procedures (Section 3.2 and Section 4.2)
- Waste processing controls (Section 4.3)
- Record keeping / documentation requirements (Section 9)

The MASP also defined the sampling and testing requirements for asbestos, geochemical parameters and product specifications).

Senversa prepared an audit protocol which identified each of the compliance requirements of the MASP, based on the categories identified above and developed a simple checklist style format designed to allow for verification that each requirement was reflected by site activities. A copy of the audit protocol is included in **Appendix B**.

The preliminary compliance audit was undertaken at the site on 2 May 2019 to assess compliance with the MASP. The audit comprised a site inspection and interviews with site personnel. Compliance with each of the requirements of the MASP was assessed via inspection of site procedures, site observations, review of available documentation and information provided by site personnel.

The audit was completed by Ashton Betti (Senior Associate Environmental Scientist) with 12 years' experience in contaminated sites assessment and auditing. Ashton was accompanied by Mark Jones (Risk & Compliance Manager, Urban Resources) and Luke Bennett (Site Supervisor, Urban Resources).

4.0 Compliance Audit Observations

4.1 Site Observations

The preliminary compliance audit was undertaken at the site on 2 May 2019 to assess compliance with the MASP. The site location and layout are shown on **Figure 1** and **Figure 2**, respectively. Photographs taken during the compliance audit are presented in **Appendix A**. The compliance audit checklist is presented in **Appendix B**.

The C&D products enter the site via truck from a signed entry on Ratcliffe Road, to the east of the site. Each truck is weighed and inspected via a movable overhead camera. Once the initial visual inspection has been completed, each truck driver is required to sign an incoming material docket, which states the contractor name, vehicle registration, source site (street and suburb), product type, volume and declaration that the load is free from asbestos. An example incoming material docket is shown on **Photo 1, Appendix A**. It is noted that some of the pre-acceptance information requirements as identified in Section 3.1 of the MASP were not included within the incoming material docket (e.g. age of buildings/structures, current/previous uses of source site, information related to contamination). Gatehouse staff advised that the incoming material docket system is being updated in the coming days to include the required additional information per the MASP. This should be reviewed as part of the subsequent sampling and testing audits.

On entering the site trucks are directed to three different areas depending on the type of material they are carrying. Clean concrete is taken direct to the recycling/crushing area, mixed demolition waste is taken to the demolition area and loads containing asbestos are taken to the Special Waste Type 1 (asbestos) tip. The material in the demolition area is processed and inspected. Any large pieces of concrete are segregated by Waste Stream Management on a weekly basis and stockpiled for transfer to the recycling/crushing area.

On placement at the recycling/crushing area, material is spread out by loader operator and sprayed with water, then inspected (**Photo 2, Appendix A**). Any loads that are suspected of containing deleterious material such as asbestos are taken directly to Waste Stream for disposal at the Special Waste Type 1 (asbestos) tip. A quarantine area is also present within the recycling/crushing area for instances where direct load out cannot occur. At the time of the inspection no loads of material had been rejected from the recycling/crushing area.

If approved for acceptance C&D products will be initially processed by picking out any large pieces of rebar (for off-site disposal) and then added to a larger stockpile to be used as source material for crushing/screening operations. During the inspection the source material stockpile predominantly comprised concrete, with minor plastic, steel and brick components (**Photo 2, Appendix A**).

Accepted source material is run through a crushing and screening process (**Photo 3, Appendix A**), whereby metal and plastic are removed and different sized fragments are separated (road base and drainage rock) and placed in discrete stockpiles. Drainage rock sized fragments (20-27 mm) are reprocessed through the system to create road base material (<19 mm)

The road base stockpile is sampled at the end of the conveyor (**Photo 4, Appendix A**), with one sample (for asbestos and chemical analysis) collected per 70 m^3 stockpile. Each sample has an individual identification number, which includes the identification of the larger stockpile that the material will be deposited. During the compliance audit, sampling for both asbestos and chemical analysis was being undertaken by Luke Bennett (Site Supervisor; Urban Resources) and was consistent with the procedures described in the MASP (**Photo 5 and Photo 6, Appendix A**).

After sampling, each smaller stockpile is moved to form part of a larger stockpile. Each larger stockpile has a unique stockpile identifier. Stockpile signage also includes colour coding to identify the status of the stockpile (red for awaiting classification and green for material suitable for sale) (**Photo 7, Appendix A**).

During the inspection, the site appeared to be well organised and site personnel were familiar with the requirements of the MASP. Documentation including training registers, sampling notes and sample

registers was well maintained and available on request. There was no evidence of asbestos containing material (ACM) at any location within the crushing operations area.

4.2 Summary of MASP Compliance

A summary of MASP compliance, based on the audit protocol is summarised in the table below.

Table 2: MASP Compliance

Compliance Category	Compliance	Comment
Source product	Yes	Clean concrete only, no formwork.
Pre-acceptance procedures	Partial	Additional information requirements for incoming material dockets.
Acceptance procedures	Yes	Compliant with MASP.
Asbestos acceptance procedures	Yes	Compliant with MASP.
Waste processing controls	Yes	Compliant with MASP.
Record keeping	Yes	Compliant with MASP.

5.0 Conclusions and Recommendations

5.1 Conclusions

Senversa was engaged to undertake a preliminary audit assess compliance with the procedures outlined in the MASP at Waste Stream Management.

The recycling/crushing area appeared to be well organised and onsite management procedures for material acceptance and processing were in general compliance with the MASP, noting one minor non-conformance related to pre-acceptance procedures (insufficient information on incoming materials dockets). It was noted that measures were in place to rectify this non-conformance at the time of the inspection, being computer system upgrades. The other operational control procedures that are in place are considered adequate such that, in isolation, this minor non-conformance is unlikely to materially compromise the suitability of C&D product being accepted at the site.

Overall the operational control procedures adopted to reduce the potential for contamination to enter the production stream appeared effective and there was no evidence that source materials for recycled road base were grossly contaminated. The recycling/crushing area is considered suitably compliant with the processes outlined in the MASP to commence full production in accordance with the RtR Product Specification.

5.2 Recommendations

Based on the preliminary compliance audit, the following recommendations are made:

- Incoming materials dockets should be revised to include the additional information requirements per Section 3.1 of the MASP. It is noted that works were occurring to include this information on the docket system during the inspection.
- Sampling and testing audits should be scheduled once routine frequency sampling has commenced to verify whether or not the material produced meets the RtR Product Specification.

6.0 Principles and Limitations of Investigation

The following principles are an integral part of site contamination assessment practices and are intended to be referred to when resolving any ambiguity or exercising such discretion as is accorded the user or site assessor.

Area	Principle and Limitation
Elimination of Uncertainty	Some uncertainty is inherent in all site investigations. Furthermore, any sample, either surface or subsurface, taken for chemical testing may or may not be representative of a larger population or area. Professional judgment and interpretation are inherent in the process, and even when exercised in accordance with objective scientific principles, uncertainty is inevitable. Additional assessment beyond that which was reasonably undertaken may reduce the uncertainty.
Limitations of Information	The effectiveness of any site investigation may be compromised by limitations or defects in the information used to define the objectives and scope of the investigation, including inability to obtain information concerning historic site uses or prior site assessment activities despite the efforts of the user and assessor to obtain such information.
Level of Assessment	The investigation herein should not be considered to be an exhaustive assessment of environmental conditions on a property. There is a point at which the effort required to obtain information is outweighed by the time required to obtain that information, and, in the context of private transactions and contractual responsibilities, may become a material detriment to the orderly conduct of business. If the presence of target analytes is confirmed on a property, the extent of further assessment is a function of the degree of confidence required and the degree of uncertainty acceptable in relation to the objectives of the assessment.
Comparison with Subsequent Inquiry	The justification and adequacy of the findings of this investigation in light of the findings of a subsequent inquiry should be evaluated based on the reasonableness of judgments made at the time and under the circumstances in which they were made.
Data Useability	Investigation data generally only represent the site conditions at the time the data were generated. Therefore, the usability of data collected as part of this investigation may have a finite lifetime depending on the application and use being made of the data. In all respects, a future reader of this report should evaluate whether previously generated data are appropriate for any subsequent use beyond the original purpose for which they were collected, or are otherwise subject to lifetime limits imposed by other laws, regulations or regulatory policies.
Nature of Advice	The investigation works herein are intended to develop and present sound, scientifically valid data concerning actual site conditions. Senversa does not seek or purport to provide legal or business advice.

7.0 References

Talis Consultants Pty Ltd (2019) *Material Acceptance and Sampling Plan. Ratcliffe Road, Medina WA.* Version 4c, 2 April 2019. (Reference: TE19001)

Waste Authority (2018) *Roads to Reuse. Product Specification – Recycled road base and recycled drainage rock*. September 2018.

Figures

Path: Y:\16_GIS\01_Jobs\6.WA_Jobs\P17000_DWER_WASTE_AUDIT\MXDs\1. Working MXDs\002 Medina\P17000_002_F001_Site Location.mxd

senversa

Address: Level 17, 140 St Georges Terrace, Perth WA 6000
Phone: (08) 6557 8881
Website: www.senversa.com.au

Legend

Site Boundary

Notes:
Aerial imagery sourced from Nearmap Pty Ltd

Designed:	A. Betti	Date:	3/05/2019
Drawn:	M. Byrne	Revision:	0
Checked:	.	Scale:	1:4,000 (A3)
File:	P17000_002_F001_Site Location		

0 37.5 75 150 225 300 Metres

Datum GDA 1994, Projection MGA Zone 50

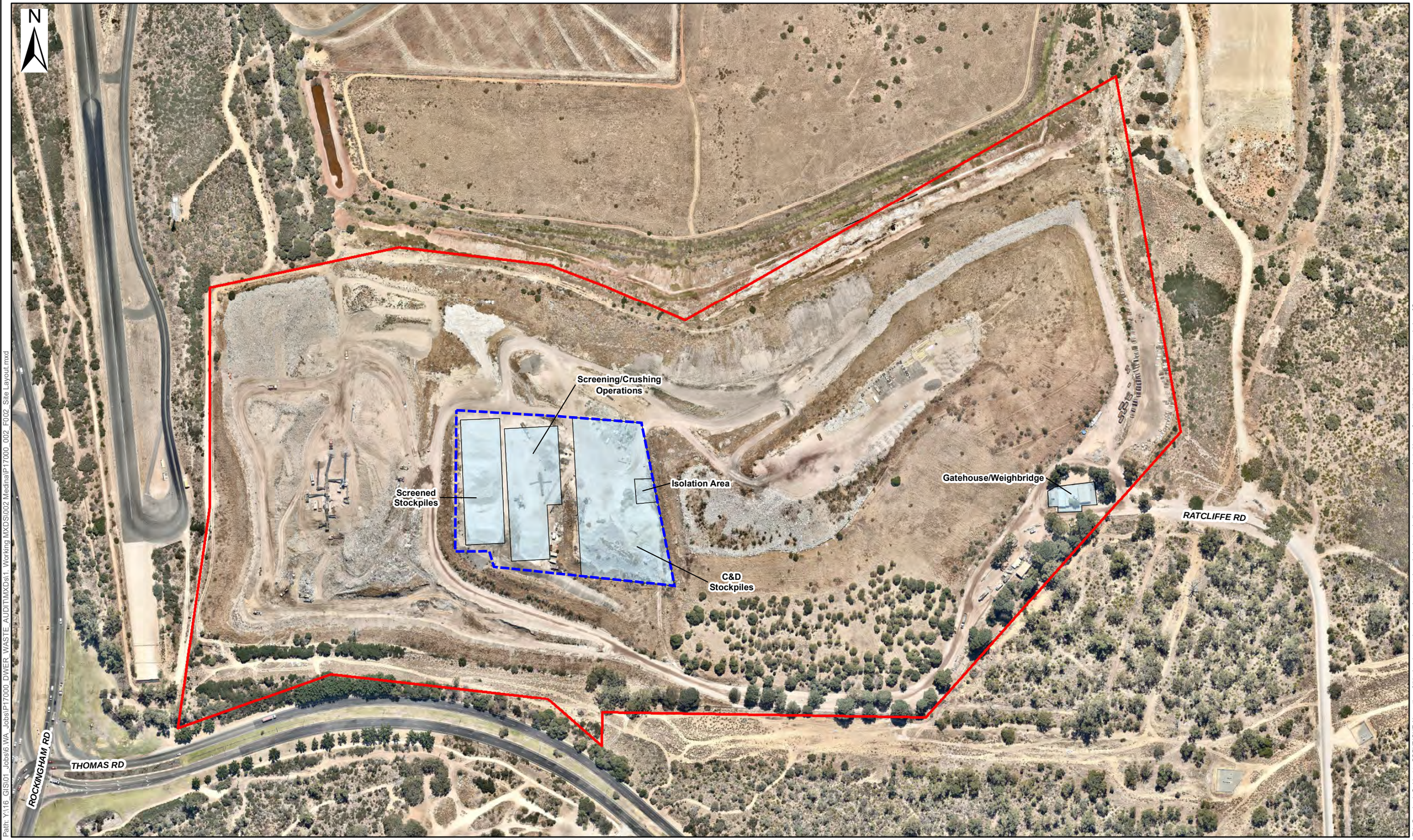
Figure No: 1

Title: Site Location

Project: Preliminary Compliance Audit

Location: Ratcliffe Road, Medina

Client: Department of Water and Environmental Regulation



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Legend

- Urban Resources Recycling Area
- Site Feature
- Site Boundary

Notes:
Aerial imagery sourced from Nearmap Pty Ltd

Designed:	A. Betti	Date:	3/05/2019
Drawn:	M. Byrne	Revision:	0
Checked:	.	Scale:	1:3,000 (A3)
File:	P17000_002_F002_Site Layout		

0 25 50 100 150 200 Metres

Datum GDA 1994, Projection MGA Zone 50

Figure No: 2

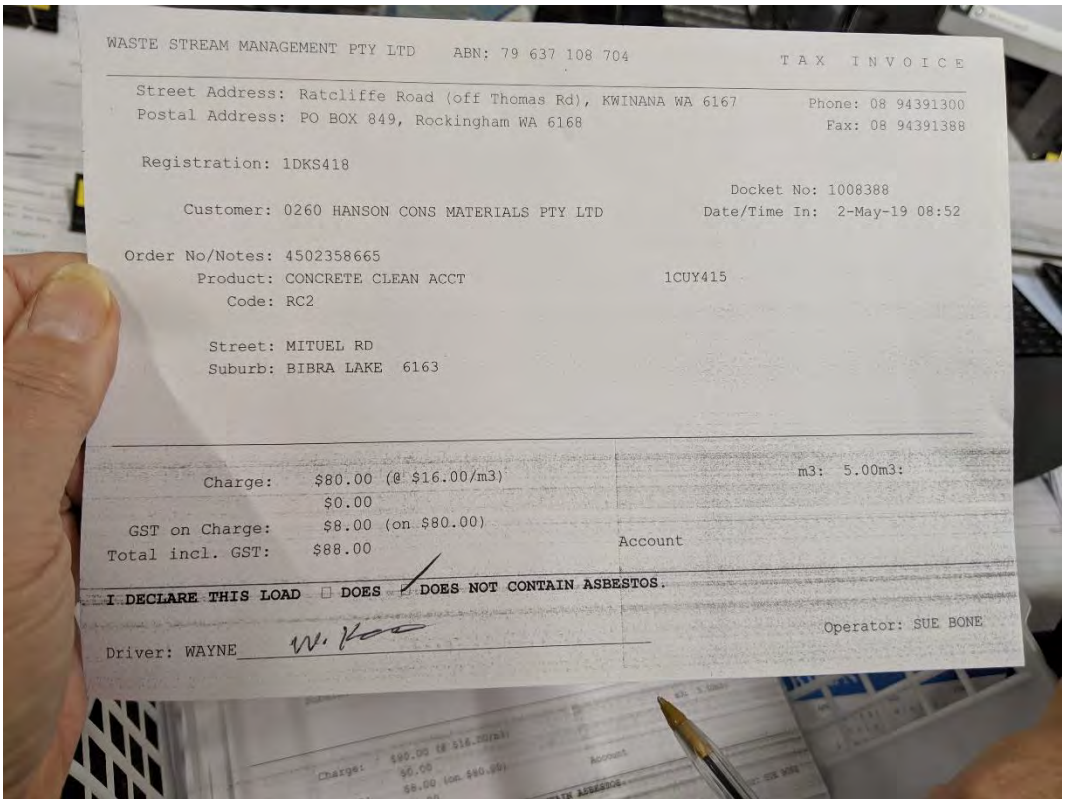
Title: Site Layout

Project: Preliminary Compliance Audit

Location: Ratcliffe Road, Medina

Client: Department of Water and Environmental Regulation

Appendix A: Site Photographs



WASTE STREAM MANAGEMENT PTY LTD ABN: 79 637 108 704 TAX INVOICE

Street Address: Ratcliffe Road (off Thomas Rd), KWINANA WA 6167 Phone: 08 94391300
Postal Address: PO BOX 849, Rockingham WA 6168 Fax: 08 94391388

Registration: 1DKS418

Docket No: 1008388
Customer: 0260 HANSON CONS MATERIALS PTY LTD Date/Time In: 2-May-19 08:52

Order No/Notes: 4502358665
Product: CONCRETE CLEAN ACCT 1CUY415
Code: RC2

Street: MITUEL RD
Suburb: BIBRA LAKE 6163

Charge: $80.00 (@ $16.00/m3) m3: 5.00m3:
$0.00
GST on Charge: $8.00 (on $80.00)
Total incl. GST: $88.00 Account

I DECLARE THIS LOAD ☐ DOES ☑ DOES NOT CONTAIN ASBESTOS.

Driver: WAYNE W. Kee Operator: SUE BONE

Photo 1. Example incoming material docket.

Photo 2. Secondary inspection after tipping, source material comprising predominantly concrete.

Photo 3. Crushing and screening plant.

Photo 4. Recycled road base material at end of conveyor.

Photo 5. Sampling of recycled road base for asbestos.

Photo 6. Samples stored in fridge awaiting transport to laboratory.

Photo 7. Recycled road base stockpiles with signage.

Appendix B: Compliance Checklist

ABN 89 132 231 380

Senversa Pty Ltd
Level 17, 140 St Georges Terrace, Perth WA 6000
www.senversa.com.au

MASP Compliance Audit

Site Name:	Waste Stream Management	**Date / Time:**	2 May 2019; 9am-11am
Site Address:	Ratcliffe Road, Medina	**Client:**	DWER – Waste Authority
Licence Number:	L6772/1997/13	**Permitted Waste Types:**	Inert Waste Type 1, Inert Waste Type 2, Clean Fill, Special Waste Type 1 (asbestos), Green Waste, Acid Sulphate Soils
Audit Representative:	Ashton Betti	**Site Representative:**	Mark Jones (Risk & Compliance Manager) Luke Bennett (Site Supervisor)

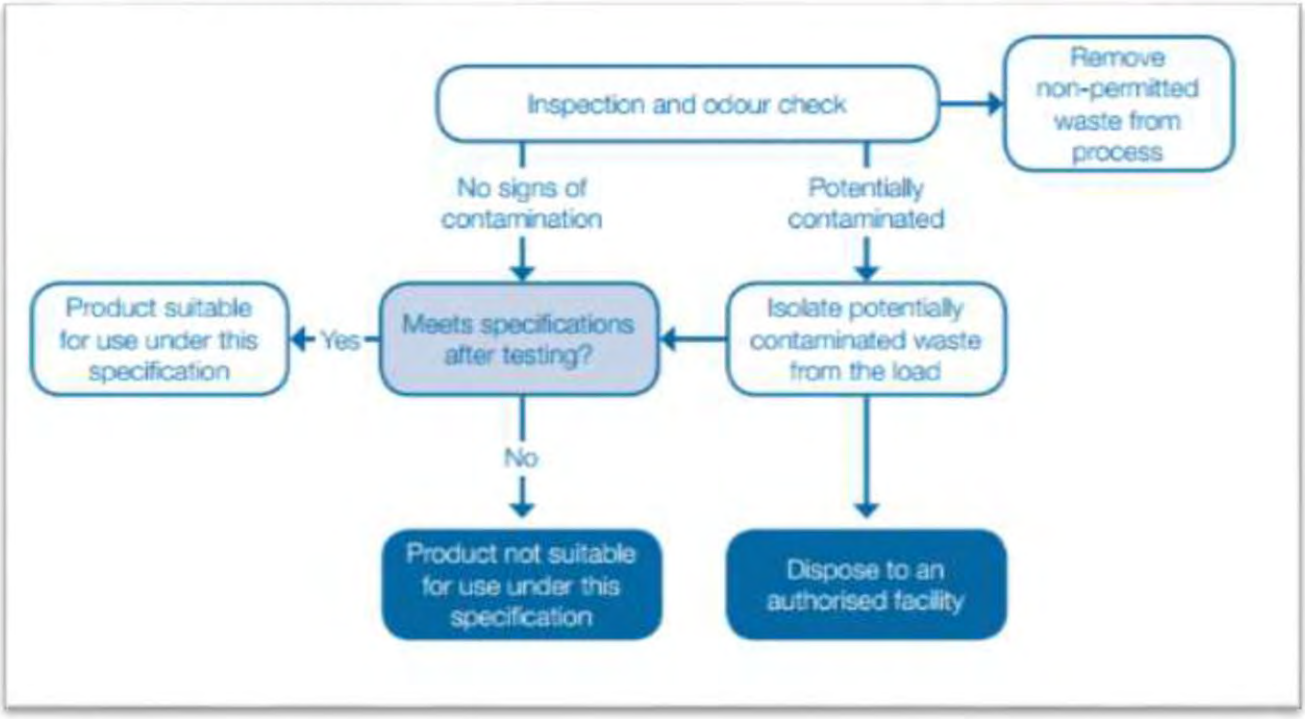
Ref.	Description	✓ / ✗	Notes
1	General Observations		Larger site operates as a landfill. Crushing operations occur in a specific portion. Waste Stream Management holds licence for site, Urban Resources manages crushing operations. Crushing operation accepts clean concrete (no formwork) only. No mixed demolition waste accepted. Site has been used as a crushing plant operated by Urban Resources since January 2019. Site appeared well organised. Currently only producing recycled road base. Number of loads received per day variable (7-15 trucks per day), plus approximately 3 loads per week from Waste Stream Management (demolition area).
2	Source Product Describe observed input products. - Recycled road base may consist concrete, bricks, tiles, ceramics, asphalt, natural rock, sand and recovered glass. <19mm - Recycled drainage rock may consist rock, brick and other similar rubble. Should not contain concrete. 20-27mm		Clean concrete (no formwork), some minor plastic and metal (rebar). Also minor component of brick. Rebar removed as far as practical as part of initial processing – placed into scrap metal bin for disposal off-site.

Ref.	Description	✓ / ✗	Notes
3	<u>Pre-Acceptance Procedures – Waste Stream</u> (to be completed at gatehouse)		
	Evidence of contracts for material acceptance ('no asbestos' clause should be part of contract).	NA	No specific contracts are in place for material acceptance. Accepted on a project and load basis.
	Evidence of 'No Asbestos' sign at site entry.	☑	Signage at entry.
	Evidence of information related to material loads (type, source, location of source site and site history, contaminated site status).	☒	Incoming dockets contain information related to source location and product type. ACTION: Evidence of additional information related to material load must be provided (site history etc.). Noted that this was being rectified at the time of the inspection.
	Evidence of visual inspections and cameras at weighbridge. Detail any loads that contain asbestos.	☑	Inspections and cameras observed.
		NA	Loads containing asbestos are sent directly to asbestos disposal area. Records for these loads observed.
	Are gatehouse staff aware of these procedures?	☑	Gatehouse staff aware of procedures (Sue).
4	<u>Acceptance Procedures</u> – Waste Stream		This occurs in the "Demolition Area".
	Evidence of sorting of clean concrete from other product.	☑	Large fragments of concrete are segregated for recycling.
	Evidence of visual / olfactory assessment of mixed waste material.	☑	Visual inspection of mixed demolition waste.
	Records of any rejected loads (producer, carrier, vehicle registration, date).	NA	No loads rejected to date.
	Records of any stockpiles disposed of due to rejection.	NA	No loads rejected to date.
5	<u>Acceptance Procedures</u> (Asbestos High Risk)		
	Evidence of quarantine area, including demarcation.	NA	Any high risk material is taken directly to asbestos cell for disposal as Special Waste Type 1 (asbestos).
	Evidence of spreading to 300 mm thickness and visual assessment.	NA	
	Evidence of understanding the procedure for asbestos assessment – hand picking, sampling, etc.	NA	
6	<u>Pre-Acceptance Procedures – Urban Resources</u>		
	Evidence of 'No Asbestos' sign at site entry.	☑	Signage observed.
	Evidence of signed declaration – load is asbestos free.	☑	Declaration per original acceptance at gate house.
	Evidence of visual / olfactory assessment per flow chart.	☑	Visual inspection of material.
	Records of any rejected loads.	NA	No rejected loads to date. Rejected loads register present. Any rejected loads would be taken directly to asbestos cell for disposal as Special Waste Type 1 (asbestos).

Ref.	Description	✓ / ✗	Notes
7	Waste Processing Controls		
	Evidence of second inspection after stockpiling.	☑	Second inspection observed. Material is spread out by loader operator and sprayed with water, then inspected. Material processing also occurs (removal of metal etc.) prior to being stockpiled as feed material.
	Output stockpiles – 70 m^3 then moved to a larger stockpile with maximum weight of 4000 tonnes. How is this determined?	☑	Evidence of stockpiling per the MASP observed.
	Evidence of unique stockpile identifier on each stockpile.	☑	Stockpile identification signs observed. Colour coded depending on status (red/green).
	Evidence of ongoing inspections during processing and movements.	☑	Evidence of ongoing inspections observed.
	Any visible dust during operations? Evidence of mitigation.	☑	No visible dust observed. Water truck onsite.
8	Training Procedures		
	Evidence of training register onsite (loader operations, crushing operations, screen and stacker operations, sampling of material).	☑	Evidence of training registers onsite.
	Evidence of training register onsite (working with asbestos and asbestos awareness training).	☑	
9	Product Sampling and Testing Method (if occurring)		
	Sample collected at end of conveyor system.	☑	Sample collection at end of conveyor observed.
	Confirm sampling frequency (20 samples per 4000 tonnes).	☑	Sampling frequency – one sample per 70 m^3.
	Surface material (200 mm) removed prior to sampling.	☑	
	Sample collected using stainless steel shovel (200 g).	☑	Samples collected in zip lock bags.
	Samples stored in chilled esky for transport to laboratory.	☑	Samples for chemical analysis stored in fridge and transported in eskies to laboratory.
	Any evidence of contamination during sampling? Evidence of sample collected to characterise this material.	NA	No evidence of contamination during sampling.
10	Product Sampling Analysis		
	Samples submitted to a NATA laboratory for analysis.	☑	Samples to be sent to MPL for analysis.
	Limit of reporting below product specification.	☑	LORs on lab quote appropriate.
	Sample crushed/milled by laboratory.	☑	Lab quote indicates crushing of samples will occur.
	Any additional analysis required?	NA	No additional analysis proposed based on observations.
11	Statistical Analysis		
	Statistical analysis to occur on a minimum of three and maximum of 20 samples.	NA	No statistical analysis to date (no lab analysis to date).
	Does any material fail product specification?	NA	

Ref.	Description	✓ / ✗	Notes
12	Asbestos Testing (if occurring)		
	Sample collected at end of conveyor system.	☑	Sample collection at end of conveyor observed.
	Confirm sampling frequency (1 sample per 70 m^3).	☑	Sampling frequency – one sample per 70 m^3.
	Visual inspection of material.	☑	
	Collection of 10 L sample, passed through 7 mm sieve.	☑	Collected via 10 x 1 L samples across stockpile.
	Collection of 500 mL sample that has passed through sieve.	☑	
	Visual assessment of >7 mm material that did not pass through sieve.	☑	
	Description of ACM conditions.	NA	No ACM identified.
	Any stockpiles rejected due to identification of ACM/FA?	NA	No ACM identified.
13	Product Sampling Analysis (Asbestos)		
	Samples submitted to a NATA laboratory for analysis.	☑	Samples sent to Emissions Assessment for analysis.
	Limit of reporting 0.001% w/w.	☑	Reporting presence/absence – quantification to 0.001% w/w where asbestos detected.
	Does any material fail product specification due to asbestos?	NA	No asbestos detected to date.
	Corrective actions for any failed material – assess source, assess acceptance procedures, contact supplier.	NA	
14	Record Keeping		
	Evidence of all waste used to produce product – type, quantity and all acceptance information.	☑	Incoming material dockets observed onsite.
	Evidence of documentation associated within inspection, sampling and testing.	☑	Inspection and sampling records observed onsite.
	Evidence of laboratory reports onsite.	☑	Asbestos lab reported observed onsite.
	Evidence of written determination for material.	NA	No determinations completed to date.
	Evidence of audit reports.	NA	No audit reports completed to date.

Diagram 1: Acceptance Procedures (WA, 2018)



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