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National Waste Data System
Systems review – Integration and Learnings

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Report

Report preparation

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National Waste Data System

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Table of Contents

Executive Summary

Three systems for the collection and reporting of environmental data were reviewed to identify any alignment with the objectives of the National Waste Data System and to capture learnings from the development and management of these systems. The systems reviewed were:

- The National Greenhouse and Energy Reporting Scheme (NGERS); comprising the Online System for Comprehensive Activity Reporting (OSCAR) and the NGER Disclosure Tool (NDT), but with replacement systems under development for release in 2013.
- The National Pollutant Inventory (NPI).
- The Australian Bureau of Statistics' (ABS) approaches to, and systems for, waste and recycling data.

The major finding of this review is that the establishment and management of a national system is a complex task that has required multi-million dollar investments and significant lead times.

Opportunities for integration

The potential benefits of integrating the systems reviewed and the NWDS include reduction in duplication of effort and the burden placed on data providers, and reduction in costs to the Australian Government by eliminating duplication in terms of system development, hosting and maintenance costs.

While acknowledging these benefits, those system operators consulted view systems integration as a significant challenge.

While there is overlap in the users for all three systems, the degree of overlap in terms of the waste and recycling data collected by these systems and that anticipated to be collected by the NWDS is not considered significant. A small amount of solid waste data is captured by OSCAR and the NPI, while the ABS industry surveys capture waste and recycling quantity, industry earnings and investment and employment.

The obstacles to integration cited by system operators include:

- The legislation that underpins the NPI and NGERS and the ABS are all complex instruments with well-defined, rigid and extensive data requirements that are complex to meet in their own right, notwithstanding the consideration of integration.
- The investment that has gone into the development of the systems in place, and contracts in place for the hosting and maintenance of these systems.
- Varying needs of the different stakeholder groups for each system.

Re-purposing an existing system to integrate the requirements of various programs carries the risk of compromising its performance or stability, while developing a new system that meets the needs of all the schemes reviewed is likely to be an ambitious task requiring significant investment and a long lead time.

Learnings

- Systems development can take a number of years, and attempts to introduce systems or changes in tight timeframes can create underlying architectural or performance issues.
- The systems reviewed have evolved over time to increase capacity and meet changing needs. While it is common practice to evolve a system over time, constant re-development can compromise the performance and stability of the system. Therefore planned and staged re-development that is fully scoped and implemented with adequate expertise and time is preferred to ad hoc changes implemented in tight timeframes.
- Consultation was an essential component of the development of the systems reviewed. Input from system users, data users and other interests such as community and academia is believed to be essential to the quality and acceptance of the systems, however consultation does lengthen the time required for the development of the system.
- System development and ongoing maintenance can require millions of dollars of investment, with substantial amounts of money invested in the establishment phase.
- Clear legislation is a critical factor determining the success of a system, by enabling the system operator to create clear business rules that underpin the system.
- The ability to direct people or companies to provide data ensures a high level of compliance.
- Specialist input from statistics and systems experts is considered appropriate for a multi-million dollar investment.

Introduction

Background

A new *National Waste Policy: Less Waste, More Resources* (the Policy) was agreed by Australia's environment ministers in November 2009. The Policy includes 16 strategies that will be implemented over ten years. Strategy 16 covers the design and development of an online, accessible and up-to-date National Waste Data System (NWDS) for Australia, to support a periodic (three-yearly) National Waste Report.

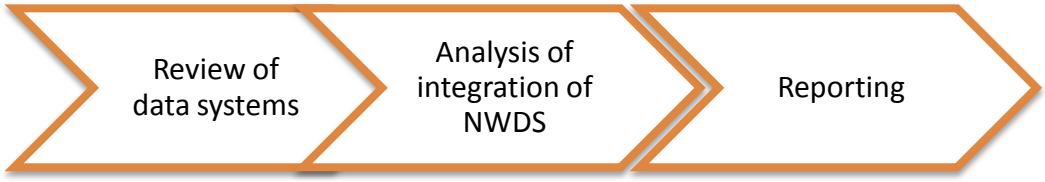
Purpose

The purpose of this report and the accompanying NWDS system summaries reports is to assist in informing the design, development and implementation of a NWDS for Australia.

There are a number of Australian government models in place that capture environmental data, including waste data. It is prudent to review these systems to identify any alignment with the objectives of the NWDS and to capture learnings from the development and management of these systems.

Methodology

This project was undertaken through a combination of desktop research and stakeholder interviews. The project consisted of the following phases:



Phase 1 – Review of data systems

The following Australian Governments systems were reviewed to determine the capture, measurement and reporting of waste information:

- The National Greenhouse and Energy Reporting Scheme (NGERS); comprising the Online System for Comprehensive Activity Reporting (OSCAR) and the NGER Disclosure Tool (NDT), but with replacement systems under development for release in 2013
- The National Pollutant Inventory (NPI)
- The Australian Bureau of Statistics' approaches to, and systems for, waste and recycling data.

This review considered the following issues:

- History of development and use
- Key objectives and design attributes
- Data system structure, architecture and business requirements
- Supportive legislation
- Roles and responsibilities of system operators
- Costs associated with system operation and maintenance.

The review consisted of 3 elements:

- desktop research of source documents associated with the data system and its design
- interviews with key department (system) personnel, including representatives from the:
    - Department of Climate Change and Energy Efficiency (OSCAR) (for the version of this report finalised in 2011) and the Clean Energy Regulator (CER) (for this current version of the report)
    - Department of Sustainability, Environment, Water, Population & Communities (NPI)
    - Australian Bureau of Statistics

- System walk–throughs to document many of the technical aspects of each system such as data flows, controls and outputs.

Phase 2 – Integration of NWDS

The review of the data systems provided information to analyse:

- Potential alignment between the existing data systems and the future NWDS
- Potential opportunities for integration, synergies and duplication
- Waste and recycling data gaps within current systems.

Phase 3 – Reporting

Four reports have been produced as outputs of this project:

- Three systems summaries, each profiling one of the systems listed above
- An integration opportunities report outlining opportunities for integration and learnings.

Summary of NWDS system summaries report

A brief summary of the three systems reviewed is provided here. The three system summaries reports provide a detailed description of the systems reviewed. The individual reports are available via www.environment.gov.au/wastepolicy.

Australian Bureau of Statistics waste and recycling data

The Australian Bureau of Statistics (ABS) provides statistics to assist and encourage informed decision making, research and discussion within governments and the community[1]. The ABS provides a wide range of environmental data, including data on waste generation and waste services. The ABS has not conducted "waste-themed" surveys on an ongoing basis and currently, does not develop a fully integrated set of waste statistics. When surveys are undertaken, statistics and information are collected; physical measurements, such as waste audits, are not undertaken by the ABS.

The waste and recycling data collected by the Australian Bureau of Statistics (ABS) is different in nature to the two other systems reviewed. Whereas NGERS/OSCAR and the NPI are actual standalone systems that collect data, the ABS is a government body responsible for collecting, maintaining and distributing statistics.

The main features of ABS statistics collection are as follows:

- The Information Warehouse is the single repository and management tool for all statistics collected by the ABS. The Warehouse is accessible by ABS staff only. It is a fully searchable system that can compile data and generate reports based on parameters defined by the user. Users can, therefore, develop products for publication which draw upon numerous surveys. These products, in Excel or PDF format, are then published on the ABS website at www.abs.gov.au.
- Wherever possible, the ABS utilises existing standards and categorisations in general use in Australia. For example, the ABS adheres to the Fundamental Principles of Official Statistics to ensure international consistency and endorsement, and adopts the Australian and New Zealand Standard Industrial Classification (ANZSIC) codes when identifying and contacting organisations in certain industries.

[1] http://www.abs.gov.au/websitedbs/d3310114.nsf/51c9a3d36edfd0dfca256acb00118404/325a67193dc1ae1bca256b21001c4078!OpenDocument

- The *Census and Statistics Act 1905* and the *Australian Bureau of Statistics Act 1975*[2] (ABS Act) provide the legislative framework for the operation and functions of the ABS. These Acts define the organisations structure, functions and authorities.
- The research objectives of the ABS are outlined in its Forward Work Program. The research objectives are determined by the ABS, led by the Australian Statistician, and guided by the Australian Statistics Advisory Council (ASAC), which consists of members chosen to represent a cross-section of perspectives, covering government, business, academic and community interests[3].
- There is no particular unit within the ABS which is responsible for collecting waste and recycling data. Such data may be collected by different statistical programs, such as Environment Statistics or Economic Analysis and Reporting.
- Because the ABS waste and recycling data does not constitute a standalone system, and waste data is often collected via larger surveys covering many issues, it is not possible to easily determine the costs associated with collecting and publishing waste and recycling data.
- A key objective of the ABS is to collect and publish high quality statistics, and to ensure this, sufficient resources are allocated. A high quality approach requires significant investment across all stages of the survey process, from design through to publication.
- Resources dedicated to the collection of environmental statistics are small but growing, in line with the increasing role of the ABS in environmental statistics.

National Pollutant Inventory

The National Pollutant Inventory (NPI) tracks pollution across Australia, to ensure that the community, industry and government have access to free information about the emission and transfer of toxic substances which may affect them.

The NPI provides data on emissions estimates for 93 substances, and the source and location of these emissions that have been identified as important due to their possible effects on human health and the environment. The data comes from facilities like mines, power stations and factories, and from other sources, such as households and transport. More than 4000 facilities from a wide range of industry sectors report annually to the NPI[4]. Examples of the substances include mercury, lead and carbon monoxide. These substances can be emitted to air, land or water.

[2] Australian Bureau of Statistics, Forward work program 2010-11 to 2013-14, p5, http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/9AF537ED0374B9C5CA2577490019BC6B/$File/1006.0_2010-11%20to%202013-14.pdf

[3] http://www.asac.gov.au/

[4] http://www.npi.gov.au/substances/index.html

The main features of the NPI are as follows:

- The NPI consists of an online reporting system which is accessible only to registered users and system operators and the public website (www.npi.gov.au) through which emissions data is retrieved by interested parties.
- The online reporting system enables registered users to view, edit and submit their NPI report via the internet. The online reporting system pre-populates data in the report template based on the report entered by the user for the previous year. Standardised, nationally consistent validation alerts the user to any potential problems in their report[5].
- Data is transferred from the online reporting system to the public website in March each year. The data entered into the online reporting system is filtered to remove any data that is commercial in confidence or related to national security.
- It is possible for registered users to directly integrate their in-house data systems with the NPI online reporting system. This functionality is particularly useful for registered users who submit large numbers of reports per year or users who already have in-house systems in place[6].
- Paper reporting forms are available for users who cannot or do not wish to use the online reporting system[7], however the majority of registered users submit their data using the online reporting system.
- The *National Environment Protection (National Pollutant Inventory) Measure* (NPI NEPM) underpins the NPI. Each state and territory environment protection agency across Australia is responsible for implementation of the NPI NEPM in their jurisdiction. State and territory environment protection agencies have their own legislative frameworks to ensure there is compliance with the NEPM.
- The NPI is funded to approximately $2.2 million annually, shared by the Australian, state and territory governments. Costs to industry are estimated at $3,000 per facility, which amounts to a total cost of $12 million annually across approximately 4,000 facilities.

The National Greenhouse and Energy Reporting Scheme (NGERS)

The *National Greenhouse and Energy Reporting Act 2007* (the NGER Act) places registration and reporting obligations on corporations that meet energy and emissions thresholds for their corporations as a whole or for individual facilities. As of 1 December 2011, 812 corporations had

[5] http://www.npi.gov.au/reporting/index.html#lodging

[6] http://www.npi.gov.au/publications/pubs/web-service.pdf

[7] http://www.npi.gov.au/reporting/forms.html

registered. These corporations include manufacturers, universities, mining and energy companies and local governments[8].

The online system for Comprehensive Activity Reporting (OSCAR) is a web-based data collection tool that enables corporations to fulfil the reporting obligations prescribed by the NGER Act. Collected data is then made available to Australian, state and territory government agencies via an associated web-based system – the NGER Disclosure Tool (NDT).

Prior to 2 April 2012, the NGER Act and its supporting systems were administered by the Department of Climate Change and Energy Efficiency (DCCEE). Since that time, they have been administered by the Clean Energy Regulator (CER).

The main features of OSCAR and NDT are:

- OSCAR includes-
    - an online registration tool for corporations to apply to be registered – basic data entry screens and report functionality to print a registration application
    - discreet data entry screens that guide reporters to enter activity data, higher order method emissions factors, corporate structure details and other matters to be identified as required by the legislation
    - report modules to enable summary reports, and annual report templates where data is populated from data entry screens and underlying calculations
    - business process management screens for registration and report management administration.
- NDT includes-
    - a number of reporting databases which present content and reports using Microsoft Reporting Services.

OSCAR supports ten Government reporting programs. The required data set varies between programs, however, they can be broadly categorised into three types:

- NGERS – the NGER Act creates an obligation for the Australian Government to publish greenhouse emissions and energy consumption data for those corporations that exceed the corporate and facility emissions thresholds stated in the Act.
- Energy Efficiency Opportunities (EEO) - administered by the Australian Government Department of Resources, Energy and Tourism, covers mandatory identification and reporting of industry energy efficiency opportunities that can be implemented by industry.

[8] http://www.climatechange.gov.au/government/initiatives/national-greenhouse-energy-reporting/~/media/publications/greenhouse-report/national-greenhouse-energy-register-pdf.pdf

- Government Programs - these programs gather data about Australian, state and territory government operations including energy, greenhouse emissions, greenhouse reduction actions, performance against KPIs, and some waste data. A separate reporting program exists for each jurisdiction, each with its own department (not the CER) assigned to provide administration. Government departments within each program submit this data via OSCAR. The Australian Government reporting program is called the Government Greenhouse Energy Reporting program (GGER), and is administered by DCCEE. It publishes data annually on energy efficiency in Australian government operations.

- Of the ten programs supported by OSCAR, NDT is only used by the NGERS program.
- There are strict provisions in the NGER Act about which government agencies can access NGER data, and what data they can access. The NDT is structured to meet these provisions.
- OSCAR and NDT have been under constant development for most of their service lives, being continually modified to meet emerging requirements. Constant system changes within tight timeframes have created some underlying architectural issues, making modification and maintenance costly.

Findings

Systems integration

A key objective of this project is to explore opportunities to integrate or align the NWDS with the three existing systems reviewed. Alignment of systems may create the following benefits:

- Reduce duplication of effort and the burden placed on data providers
- Reduce costs by eliminating duplication in terms of system development, hosting and maintenance costs for the Australian Government and compliance costs for industry.

While acknowledging these benefits, those system operators consulted view systems integration as a significant challenge. The following opportunities and challenges are associated with integration.

Overlap in users

It is likely that many of the companies that contribute data to the three systems reviewed will also be sources of data for the NWDS. Waste management and recycling companies, large manufacturers and local councils are just some examples of the organisations that are contributing data to OSCAR, the NPI and the ABS and are also key data owners in terms of waste and recycling. While data owners were not consulted as part of this project, there is little doubt that there would be strong support from data owners for systems integration. Compliance with government requirements for data provisions does impose a cost on industry. Work undertaken by Envirolink in 2005 estimated that compliance with the NPI imposed a cost to industry of $3,000 per facility, amounting to $12 million annually across 4,000 facilities. Minimising costs to data owners is a key driver for exploring integration.

Overlap in data

There is also some overlap in terms of the data that is likely to be required by the NWDS and the NPI, NGERS and the ABS.

Company and facility information such as name, address, contact details and facility activities is a requirement of the three systems reviewed and is likely to be a requirement of the NWDS.

It is anticipated that there would be some overlap between the data requirements of the NWDS and the NPI in terms of a small number of the substances captured by the NPI that also classify as solid waste or hazardous waste. These substances include mercury, lead and hydrochloric acid. Data on source and quantity generated and disposal/transfer of the substances may be required by both systems. Of the 93 substances contained within the NPI, only a very small number may also be captured by the NWDS.

It is anticipated that there would be only a very small overlap in data required for the NWDS and that captured by OSCAR. Quantity of waste disposed to landfill is the only waste data captured by OSCAR.

There is some data that is collected by the ABS that a NWDS is likely to require, and other data that is collected by the ABS that a NWDS is unlikely to collect. The household surveys on waste-related attitudes and behaviours conducted by the ABS are unlikely to be within the scope of the NWDS. Some of the data collected by the business surveys conducted by the ABS is likely to be captured by the NWDS, such as quantities of waste received at waste management facilities and expenditure and revenue in relation to waste, by state and local government. Some detailed data collected by the business surveys including items of expenditure for waste management and recycling companies, employee numbers, wages and salaries, capital expenditure by the waste industry, profitability and earnings may not be within the scope of the NWDS.

In order to centralise waste and recycling data, it is considered likely that the NWDS will become the primary system for waste and recycling data. This may eliminate the need for the ABS to conduct some of their surveys, either in whole or in part. Further, these ABS business surveys are generally not conducted annually, and it is anticipated that the NWDS will require data submission and reporting on an annual basis.

Utilising the ABS' expertise in statistics

In addition to statistics collection, the ABS Act defines one of the functions of the ABS as coordinating the operations of official bodies in the collection, compilation and dissemination of statistics, and to provide advice and assistance to official bodies in relation to statistics. The ABS has extensive in-house expertise in the management of statistics. The framing and design of data collection and systems will determine its success and the ABS is well placed to assist the Australian Government to develop the NWDS, whether as a stand-alone system or as an integrated model.

Obstacles to integration

Operators of the NPI, OSCAR and NDT systems were understandably cautious about the potential to integrate systems. The obstacles cited by these system operators include:

- The legislation that underpins the NPI and NGERS and the ABS are all complex instruments with well-defined, rigid and extensive data requirements that are complex to meet in their own right, notwithstanding the consideration of integration.
- The investment that has gone into the development of the systems in place, and contracts in place for the hosting and maintenance of these systems.
- Varying needs of the different stakeholder groups for each system, with some overlap as acknowledged previously. Each stakeholder group has its own needs and opinions about systems, which may conflict and compromise the quality of an integrated system.

The system operators of OSCAR and NDT have faced significant challenges with its development, posed by continual modifications to meet emerging requirements. The learning is that modifying an existing system to integrate the requirements of various programs carries the risk of compromising its performance or stability, while developing a new system that meets the needs of all the schemes reviewed is likely to be an ambitious task requiring significant investment and a long lead time.

Learnings

The experiences of the ABS and the Australian Government in the development of the ABS waste and recycling data and the NPI and OSCAR and NDT systems can provide valuable learnings for the development of the NWDS. The learnings shared by the system operators are outlined below.

Systems development takes time

The strong message from the system operators consulted is that the development and introduction of systems takes a significant amount of lead time. Work on the NPI started substantially in 1995, three years prior to its introduction. In the case of OSCAR and NDT, system changes implemented within tight timeframes have created some underlying architectural issues, making modification and maintenance costly.

Systems evolve over time

The NPI and OSCAR and NDT systems have evolved over time in order to enhance capability and improve operation. In the case of the National Pollutant Inventory, a basic system was instituted and in place for almost ten years before the integrated, web-based Online Reporting System was introduced. The OSCAR and NDT systems have also been re-developed over time to meet emerging requirements. Beyond the three systems reviewed, it is common practice for systems to be evolved and enhanced over time. Consider upgrades to internet banking as an everyday example. It is therefore likely that the NWDS will also evolve over time to improve capability and ease of use.

There are however, risks associated with re-development, as demonstrated by the experience of the OSCAR and NDT team. Constant re-development can compromise the performance and stability of a system. Therefore planned and staged re-development that is fully scoped and implemented with adequate expertise and time is preferred to ad hoc changes implemented in tight timeframes. The NPI operators have a system in place where feedback from users and system enhancements are assessed in terms of the business case and any risks and issues associated with the change, prior to any modification being implemented.

The importance of consultation

Consultation was an essential component of the development of the systems reviewed:

- The development of the national NPI system was guided by a number of working groups including the National Environment Protection Council (NEPC); a non-government organisation advisory group to represent industry, environment and community concerns; and an independent Technical Advisory Panel. Public meetings and workshops were also held across Australia. Trials of the NPI process for compiling and submitting NPI data were carried out in two locations. The re-designed system prototypes were presented to user testing groups, consisting of representatives from state and territory jurisdictions and industry.
- The Australian Statistics Advisory Council, with membership covering government, business, academic and community interests[9], provides input to the directions and priorities of the ABS work program. The ABS consults with prospective data users and providers to inform the survey design, identify methodology issues and test forms prior to the conduct of a survey.

Fitness for purpose

The advice of the ABS is that the data that the system collects needs to be 'fit for purpose' – that is, there should be a match between the quality of the data and the purpose for which it is being used. For example, the ABS needs to detect subtle changes in employment levels in order to provide an accurate picture to the government, therefore the employment survey has a sophisticated method that requires significant resources to conduct. However, this level of accuracy and associated investment may not always be required.

Systems development and maintenance requires significant investment

The development and maintenance of a good quality data management system requires significant investment.

The costs to governments from 1997–98 to 2001–02, which is nominally the establishment phase for the development of the NPI[10], totalled $14 million. Research undertaken in 2005 indicates that there was a strong perception across jurisdictions, industry and community groups that the program was under funded. An independent assessment conducted for the system operator indicated that annual expenditure was half what was considered necessary and that the shortage of resources had contributed to current system issues[11].

[9] http://www.asac.gov.au/

[10] Environment Link in conjunction with CH Environmental and JD Court and Associates, April 2005, Review of the National Pollutant Inventory, http://www.npi.gov.au/publications/pubs/npi-review290405.pdf, p51

[11] Environment Link in conjunction with CH Environmental and JD Court and Associates, April 2005, Review of the National Pollutant Inventory, http://www.npi.gov.au/publications/pubs/npi-review290405.pdf, pviii.

Although specific figures were not available, both the ABS and the operators of the OSCAR and NDT systems state that costs associated with systems development, maintenance and data collection are substantial. These costs are also ongoing, creating an ongoing financial commitment for governments, particularly the Australian Government.

Clear parameters

The operators of the NPI felt that clear legislation is a critical factor determining the success of a system established to support it. Legislation that is clear and not open to interpretation allows the system operators to create clear business rules that underpin the system.

Compliance

The NPI and NGERS are both legislated and companies that trigger the thresholds must comply by submitting data, with strong penalties in place for non-compliance. The ABS also has the authority to direct a person to provide statistical information, established under the CS Act. These provisions ensure a high level of compliance.

The value of expertise

The ABS recommends that specialists in statistics and systems development be engaged to assist the Australian Government to develop the NWDS. Investment in the design of a system yields dividends in terms of system performance and reduced re-development costs.

Design features and functionalities

The following features and functionalities were considered valuable for consideration by the developers of the NWDS:

- The adoption of existing standards and categorisations in general use in Australia. For example, the ABS adheres to the Fundamental Principles of Official Statistics to ensure international consistency and endorsement, and adopts the Australian and New Zealand Standard Industrial Classification (ANZSIC) codes when identifying and contacting organisations in certain industries.
- Filtering to maintain the confidentiality of data that is commercial in confidence, may identify a particular individual or company or that is central to national security.

Conclusions and recommendations

The reviews of the Australian Government systems already in place demonstrate that the establishment and management of a national system is a complex task that requires multi-million dollar investment and a significant lead time. Detailed scoping of the system, expert input into the system development and consultation with users and other interested parties are critical factors determining the success of the system.

It is likely that the system will evolve over time to improve performance and meet changing needs, however constant re-development can compromise the performance and stability of the system. Therefore planned and staged re-development that is fully scoped and implemented with adequate expertise and time is preferred to ad hoc changes implemented in tight timeframes.

A critical focus for the Australian Government is ensuring that the legislation or policy surrounding the NWDS is clear, enabling the establishment of clear business rules to underpin the system.

There are clear benefits of integrating the systems reviewed and the NWDS including reduced costs to the Australian Government for system development and maintenance and reduced burden placed on data providers. However, systems integration is considered to be an enormously challenging and risky task. Developing an integrated system that meets the needs of all the schemes reviewed is likely to require significant investment and a long lead time, and carries a high risk of compromised performance. The potential long term benefits do seem to justify the further consideration of an integrated system as the scope and requirements of a NWDS are developed. Possibly hybrid models of integration, such as data sharing, may be more realistic alternatives.

Limitations

Net Balance Management Group Pty Ltd (Net Balance) has prepared this report in accordance with the usual care and thoroughness of the consulting profession. This report has been prepared for use by the Department of Sustainability, Environment, Water, Population and Communities, and only those third parties who have been authorised in writing by Net Balance.

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This report was initially prepared in March and April 2011, and updated in November and December 2012 to reflect subsequent changes. It is based on the conditions encountered and information reviewed at the time of preparation. Net Balance disclaims responsibility for any changes that may have occurred after this time.

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