



AUSTRALIAN  
MARINE DEBRIS INITIATIVE



# West Australian Beach Clean-up Report 2015

## Tangaroa Blue Foundation

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## Summary

A mild winter this year meant a little less debris encountered on the beach compared to 2014. There were exceptions with hotspots being encountered in some places and debris levels remaining high in others. The Cocos Islands, Broome Town Beach and Mindarie Marina seawall were among the exceptions.

Throughout the year a number of individuals and organisations have continued being involved in cleaning beaches and collecting data. Data collected throughout the year together with the snapshot of data provided during the October West Australian Beach Clean-up builds up a knowledge base about marine debris in WA. The value of ongoing clean-up activities is that it provides data and information to do something about the problem, and there is in effect a watch on WA beaches which improves the chances of early spotting and reporting of hazardous items, items presenting quarantine issues and other incidents such as the search for debris from missing flight MH370.

In this report we discuss how to give some focus on where we direct our activities and what those activities can be. One way of doing this is to encourage groups to form at a local or regional level to identify achievable marine debris objectives and develop responses. We are encouraging participation from community members and organisations, business, local government and NRM bodies. Some organisations are currently at this stage and our objective is to continue to support them while also assisting new groups wanting to develop a focus to their activities.

In the next section we provide a wrap up of this year's October West Australian Beach Clean-up followed by a discussion of developing a regional focus on marine debris. Data from each NRM region is then analysed to provide a broad picture of debris types, quantities, sources and possible areas for activity. The report then provides some information on source reduction plans and concludes with an update on the watch for items from missing flight MH370.

## West Australian Beach Clean-up 2015

The annual West Australian Beach Clean-up (WABCU) was held over the weekend of October 10<sup>th</sup> and 11<sup>th</sup>, 2015. Volunteers reported generally less debris this year partly as a result of the mild winter. Exceptions were for clean-ups at locations such as marinas and remote coastal beaches. Table 1 shows the details for this year's event and for the year as a whole.

## Event details

Table 1: Event details

	WABCU 2015	All WA Activity 2015	WABCU 2014	All WA Activity 2014
<b>Clean-ups</b>	<b>112</b>	<b>315</b>	137	368
<b>Volunteers</b>	<b>1,238</b>	<b>2,473</b>	1,243	2,702
<b>Hours</b>	<b>3,220</b>	<b>5,272</b>	3,012	6,009
<b>Items</b>	<b>63,902</b>	<b>165,126</b>	87,159	179,226
<b>Weight Kg</b>	<b>5,528</b>	<b>19,320</b>	5,614	16,174
<b>Distance Km</b>	<b>268</b>	<b>571</b>	292	556

## Photos and comments

The following photos and quotes provide a brief glimpse of the activities around the state.



*Left: Keen helpers take time out to relax on a 2-seater sofa found on the beach at Binningup.*

A comment from Broome:

*“The beach clean-up was a great success here in Broome with 18 volunteers. The plan was to clean up the stretch of coastline from Streeter’s Jetty to Town Beach, approx. 2 kms. There was soooooo much rubbish in the mangroves and everywhere around the old jetty that we filled all our bags in no time. Seriously, it was unbelievable. Between CVA and Environs Kimberley we had around 40 and we filled them all up just from the rubbish collected within the first 400 metres. By that stage it was getting pretty hot so we decided to call it a day.” - Julia Rau, Environs Kimberley.*



*Left: This shopping trolley found near the old jetty at Broome was put to use in removing the mass of rubbish found.*

Volunteers tackling a seawall at Mindarie Marina saw the need for a Source Reduction Plan:

*"We'd love to be involved with any events you have in the future and we are going to keep going to our clean-up site, it is so littered that we only managed 100m of it over 6 hours!!!! Do you know the best way and who to speak with to get bins placed and maintained there? Half the issue with littering at that site is that there are no bins at all in the vicinity."*



*Left: Iluka Resources staff absorbed in the nitty gritty of counting items collected at Minninup Beach, Bunbury.*



*Left: 'Trolleyed with Trash' was the title Responsible Runners from Bunbury came up with for this photo after finding 3 shopping trolleys during their clean-up.*

At Kalbarri, the Kalbarri Offshore and Angling Club mainly encountered fishing gear:

*"Time didn't allow us to get as far up the coast as we would have liked. However, we were pleasantly surprised at the lack of household rubbish found. The majority of rubbish collected was that of old rope, broken plastic cray pots & bait baskets, the ever present rubber thongs and 1 mop head and handle! Hahaha. Bottles, cans, plastic bags, toilet paper/wipes etc. were all very minimal."*



*Left: At Ellensbrook near Margaret River, several bags full of old rope were collected.*

## Common items and materials

The kinds of items found remain consistent with previous years. The following tables show the most frequently occurring items and the material proportions for the event.

Figure 1: Types of items found

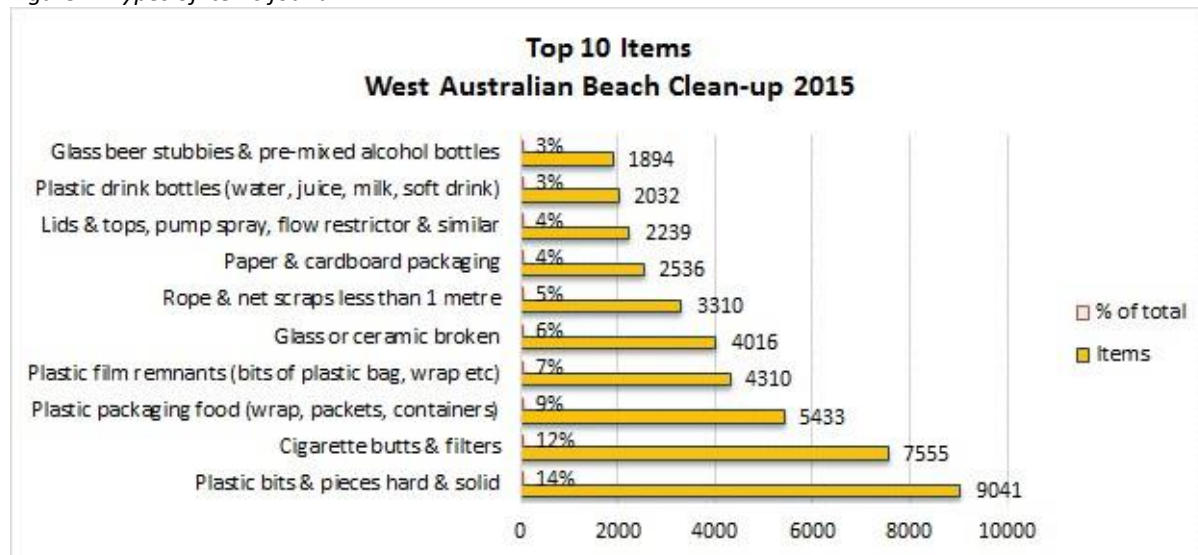
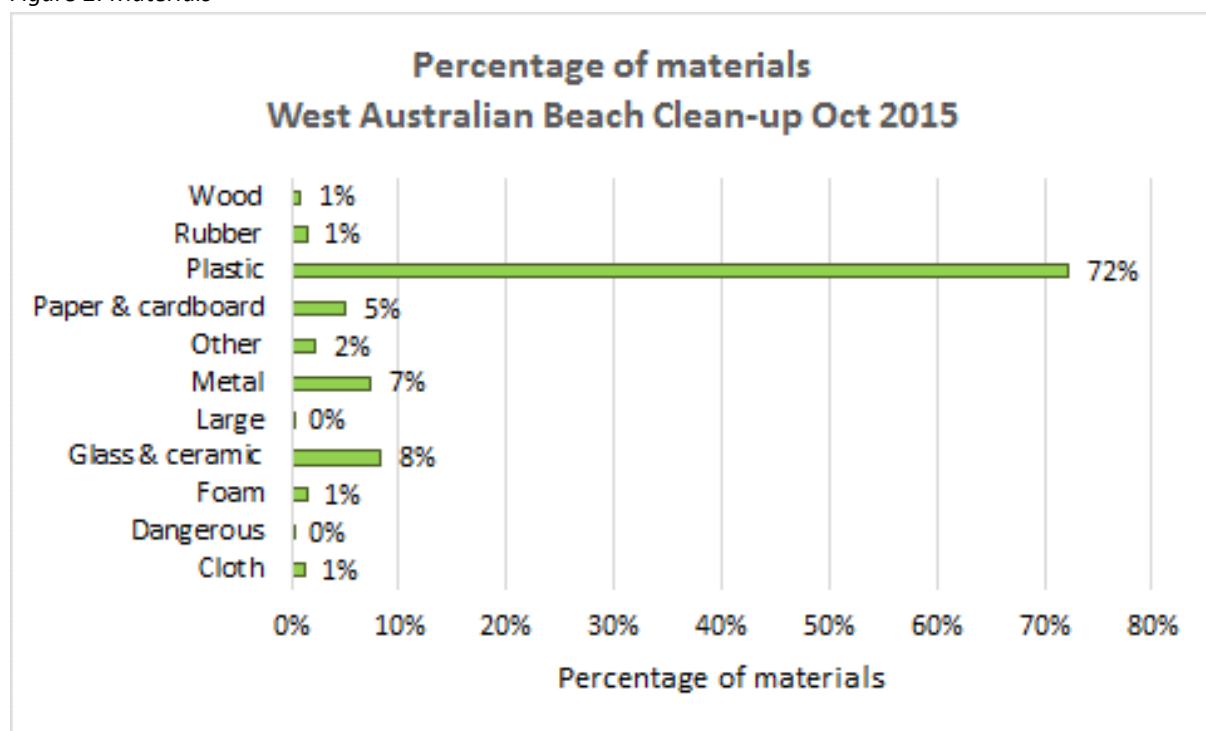


Figure 2: Materials



## Developing a regional focus for marine debris activity

The ongoing success of the annual West Australian Beach Clean-up demonstrates the willingness and ability of the community to be involved in actions aimed at addressing the marine debris issue. Beach clean-up and data collection has been the primary activity to date and baseline data is now available for all coastal NRM regions in the state. This baseline data tells us which items are most often found, what percentage are plastic, gives us an indication of where debris comes from and provides a guide to the quantities of debris we can expect to find at particular types of clean-up sites. It also shows where there are gaps in the data. From this baseline it is now possible to be more strategic in directing efforts both in terms of where we conduct activities and what kinds of activities we pursue. In addition to clean-up and data collection activity, further positive actions which can be undertaken include developing [source reduction plans](#), carrying out identification and remediation of hotspots, developing monitoring plans, developing and implementing regional and industry plans and finding ways to place a value on items of marine debris so that they are seen as a resource rather than a liability.

The stakeholder groups involved directly or supportively in marine debris activities include NRM organisations, local government bodies, state and federal government agencies, industry organisations, not-for-profit organisations, community organisations and community members. Developing a strategic direction for marine debris requires identifying some basic marine debris objectives within each region or shire and this in turn requires the formation of, for example, marine debris working groups which are representative of the stakeholder groups within each region. The process can be simple and informal to start with and begin with one or two manageable objectives within a region.

The following pages, one for each NRM region, provide statistics with brief notes about possible actions, sources, abundance and monitoring options. These are presented as a general overview of marine debris in each region and the statistics can also be provided for local government and locality levels on request for groups interested in developing a group to focus on marine debris.

## About the statistics presented in the following pages

### Types of items being found

Under this heading two tables show first, the most frequently occurring items and second, the percentage of material types found in clean-ups for the entire period during which data has been recorded.

### Estimate of debris sources (long term data)

Under this heading a pie graph is provided to show the estimated percentage of each broad source of debris. The segments in the pie chart are positioned away from the centre of the pie if the source can be addressed at the local or regional level. It is suggested that these sources may be the easiest to tackle locally first. This graph applies to coastal and island sites but not to inland waterways where all debris is assumed to be litter, dumping and industrial waste of local origin.

### Abundance of debris at various types of clean-up locations

#### 2015 and long term comparison

This bar graph gives a comparison of the long term and current year quantity of debris indicated in the data. The quantity is expressed as the average number of items expected to be found in one kilometre of clean-up site. The figures are given for five different types of clean-up sites which include islands, coastal beaches away from populated areas, coastal beaches in or near populated areas, inland waterways (e.g. estuaries, rivers, creeks and drains), and structures and facilities on, near or affecting the flow of litter into the water (e.g. jetties, groynes). If no data is available for a particular type of site this can be interpreted as a possible gap in monitoring in the region.

### Comments in the text boxes

Options for action:	These are broad examples. The decision on what to do belongs to the local and regional stakeholders. The choice should focus on achievable aims.
Major sources:	This is our best estimate of the big picture to date about where the debris comes from and how it arrives in the region.
Abundance:	The information in this comment compares the abundance of debris in the NRM to the state averages shown in Table 2.
Monitoring suggestions:	These are broad examples of monitoring that could be considered. The decision on what to monitor belongs to the local and regional stakeholders.

## Regional comparisons

Table 2 provides a comparative guide to the abundance of debris in each NRM region based on historic data. The highlighted cells represent above average figures for count of items and weight per one kilometre of beach. Zeroes represent an absence of data. Table 3 shows the number of clean-ups by year for each NRM region.

*Table 2: Regional abundance of debris at various types of clean-up locations*

	Parks, Drains & Structures		Inland Waterway		Coastal beach in built area		Coastal beach away from built area		Island	
	Items	Weight Kg	Items	Weight Kg	Items	Weight Kg	Items	Weight Kg	Items	Weight Kg
South Coast NRM	0	0	0	0	309	18	262	13	0	0
South West Catchments Council	29	1	246	8	296	15	290	17	25	1
Peel Harvey Catchment Council	0	0	113	34	411	33	173	40	0	0
Swan NRM	2,006	69	4,438	1,718	774	99	0	0	287	15
Northern Agricultural Catchments Council	167	7	0	0	460	25	484	37	333	30
Rangelands NRM	0	0	0	0	484	62	21	4	155	43
Territory of Cocos (Keeling) Islands	0	0	0	0	0	0	0	0	13,473	399

*Table 3: Regional annual clean-up activity*

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
South Coast NRM						3	13	18	19	21	28	18
South West Catchments Council	11	67	134	151	302	244	162	303	231	285	221	200
Peel Harvey Catchment Council					5	3	6	3	2	9	6	6
Swan NRM					4	6	31	46	43	90	51	50
Northern Agricultural Catchments Council						7	36	19	58	8	46	20
Rangelands NRM			3			6	3	13	19	38	18	20
Territory of Cocos (Keeling) Islands						4		4	2	4	1	2

## Debris type, quantity and source for each NRM region

### South Coast NRM

Shires of Manjimup, Denmark, Albany, Jerramungup, Esperance and Ravensthorpe

#### Types of items being found (South Coast NRM Sep 2009 to Dec 2015)

Table 4: Top 10 items

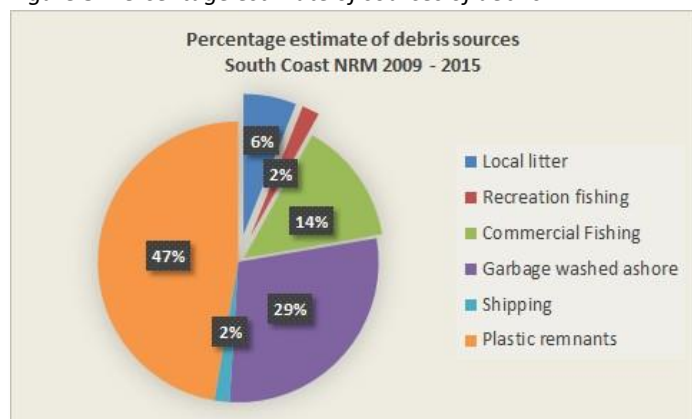
	Items	% of total
Plastic bits & pieces hard & solid	26,596	45%
Rope & net scraps less than 1 metre	4,506	8%
Lids & tops, pump spray, flow restrictor & similar	4,236	7%
Rope (estimated length in metres)	2,230	4%
Plastic packaging food (wrap, packets, containers)	1,863	3%
Cigarette butts & filters	1,805	3%
Plastic drink bottles (water, juice, milk, soft drink)	1,803	3%
Glass beer stubbies & pre-mixed alcohol bottles	1,589	3%
Foam insulation & packaging (whole and remnants)	1,532	3%
Plastic film remnants (bits of plastic bag, wrap etc)	1,510	3%
	<b>47,670</b>	<b>80%</b>

Table 5: Materials

Percentage of materials	
Cloth	1%
Foam	3%
Glass & ceramic	5%
Metal	4%
Other	1%
Paper & cardboard	1%
<b>Plastic</b>	<b>84%</b>
Rubber	1%
Wood	1%

#### Estimate of debris sources (South Coast NRM Sep 2009 to Dec 2015)

Figure 3: Percentage estimate of sources of debris

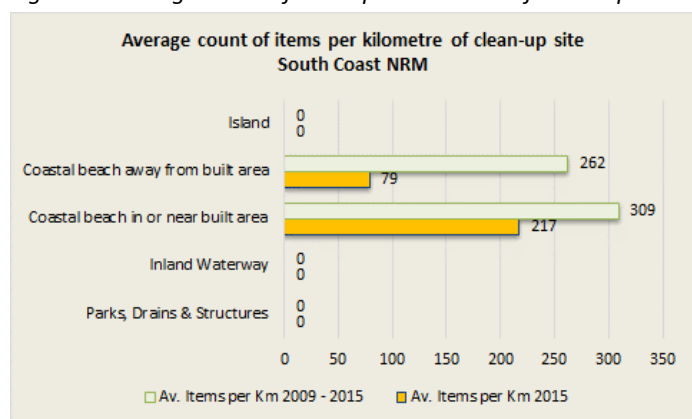


**Options for action:** Litter prevention around the towns, collaboration with other regions on commercial fishing debris, coastal hotspot remedial action.

**Major sources:** Leeuwin Current conveying debris and fishing gear mainly from the mid-west coast; debris from the Southern Ocean; shipping garbage; plastic remnants accumulating in the coastal system.

#### Abundance of debris by type of clean-up location (South Coast NRM 2015 and 2009 -2015)

Figure 4: Average count of items per kilometre of clean-up site



**Abundance:** Coastal beaches away from towns above the WA average.

**Monitoring suggestions:** Drain outlets onto beaches in populated areas. Monitoring program for coastal sites to establish a coastal watch on what is coming ashore.

## South West Catchments Council

Shires of Manjimup, Nannup, Augusta-Margaret River, Harvey and Capel, Cities of Busselton and Bunbury

### Types of items being found (South West Catchments Council Apr 2004 to Dec 2015)

Table 6: Top 10 items

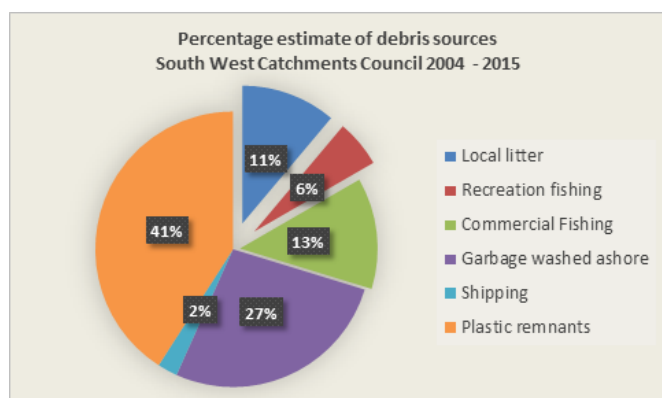
	Items	% of total
Plastic bits & pieces hard & solid	289,824	37%
Lids & tops, pump spray, flow restrictor & similar	48,895	6%
Rope & net scraps less than 1 metre	36,259	5%
Plastic film remnants (bits of plastic bag, wrap etc)	32,161	4%
Glass or ceramic broken	30,763	4%
Cigarette butts & filters	30,468	4%
Fishing line in metres (Recreation)	30,353	4%
Plastic packaging food (wrap, packets, containers)	27,845	4%
Rope (estimated length in metres)	25,067	3%
Foam insulation & packaging (whole and remnants)	21,227	3%
	<b>572,862</b>	<b>73%</b>

Table 7: Materials

Percentage of materials	
Cloth	1%
Foam	3%
Glass & ceramic	6%
Metal	3%
Other	2%
Paper & cardboard	2%
<b>Plastic</b>	<b>81%</b>
Rubber	1%
Wood	1%

### Estimate of debris sources (South West Catchments Council Apr 2004 to Dec 2015)

Figure 5: Percentage estimate of sources of debris

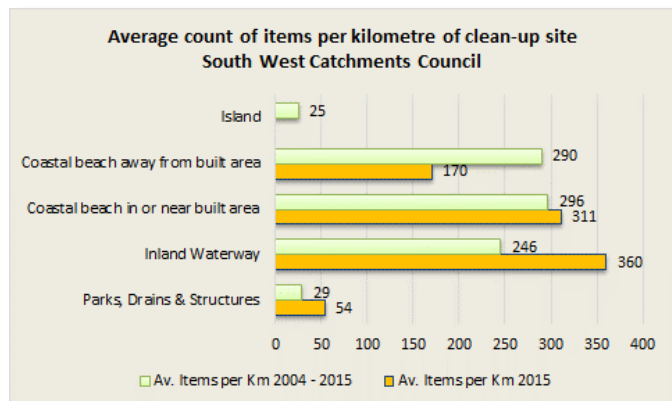


**Options for action:** Local litter and recreational fishing gear; collaboration with other regions on commercial fishing debris; remediation of coastal marine debris hotspots.

**Major sources:** The Leeuwin Current which carries debris and fishing gear from further up the west coast; shipping garbage; plastic remnants accumulating in the coastal system.

### Abundance of debris by type of clean-up location (South West Catchments Council 2015 and 2004 - 2015)

Figure 6: Average count of items per kilometre of clean-up site



**Abundance:** Coastal beaches away from populated areas is above the WA average.

**Monitoring suggestions:** Increased monitoring for estuaries and waterways in populated areas.

## Peel Harvey Catchment Council

Shire of Waroona and Cities of Mandurah and Rockingham

### Types of items being found (Peel Harvey Catchment Council Oct 2008 to Dec 2015)

Table 8: Top 10 items

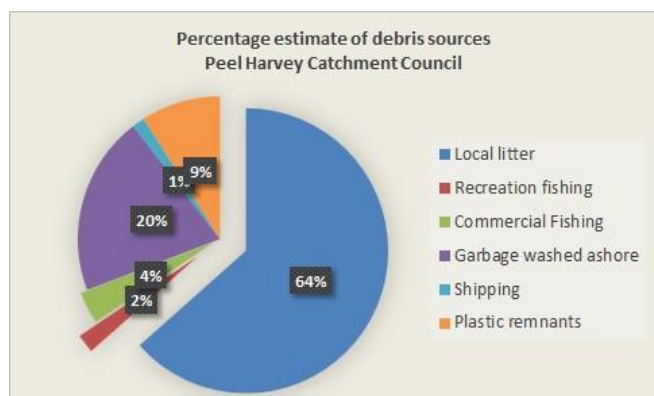
	Items	% of total
Cigarette butts & filters	9,102	46%
Plastic bits & pieces hard & solid	990	5%
Plastic packaging food (wrap, packets, containers)	894	5%
Plastic film remnants (bits of plastic bag, wrap etc)	712	4%
Newspaper, magazines & brochures	627	3%
Lids & tops, pump spray, flow restrictor & similar	605	3%
Straws, confection sticks, cups, plates & cutlery	572	3%
Aluminium cans	544	3%
Plastic bags supermarket, garbage, dog poo, ice	538	3%
Glass beer stubbies & pre-mixed alcohol bottles	522	3%
	<b>15,106</b>	<b>76%</b>

Table 9: Materials

Percentage of materials	
Cloth	1%
Foam	1%
Glass & ceramic	6%
Metal	6%
Other	2%
Paper & cardboard	5%
<b>Plastic</b>	<b>78%</b>
Rubber	1%
Wood	1%

### Estimate of debris sources (Peel Harvey Catchment Council Oct 2008 to Dec 2015)

Figure 7: Percentage estimate of sources of debris

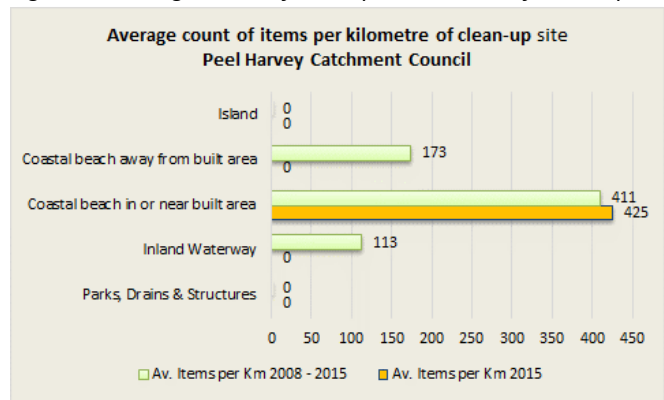


**Options for action:** Litter on coastal beaches, litter within Peel Harvey Estuary.

**Major sources:** Locally sourced litter; garbage from offshore conveyed down the coast in the Leeuwin Current.

### Abundance of debris by type of clean-up location (Peel Harvey Catchment Council 2015 and 2008 - 2015)

Figure 8: Average count of items per kilometre of clean-up site



**Abundance:** Coastal beaches in and near populated areas is above the WA average. Abundance of debris for inland waterways including estuaries is not yet adequately measured.

**Monitoring suggestions:** Monitoring program for Peel Harvey Estuary, particularly groynes and breakwaters and high conservation value shore-lines.

## Swan NRM

Cities of Bayswater, Canning, Fremantle, Joondalup, Kwinana, Nedlands, Rockingham, Stirling, Wanneroo, Towns of Cambridge, Cottesloe, East Fremantle, Mosman Park and Rottnest Island Authority

Types of items being found (Swan NRM Aug 2008 to Dec 2015)

Table 10: Top 10 items

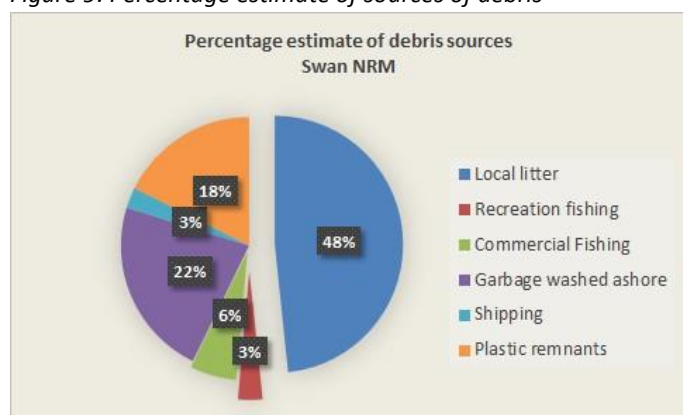
	Items	% of total
Cigarette butts & filters	53,935	22%
Plastic bits & pieces hard & solid	29,176	12%
Plastic film remnants (bits of plastic bag, wrap etc)	13,235	5%
Plastic packaging food (wrap, packets, containers)	10,419	4%
Plastic bags supermarket, garbage, dog poo, ice	8,909	4%
Rope & net scraps less than 1 metre	8,222	3%
Straws, confection sticks, cups, plates & cutlery	7,899	3%
Aluminium cans	7,799	3%
Glass beer stubbies & pre-mixed alcohol bottles	7,753	3%
Glass or ceramic broken	7,696	3%
	<b>155,043</b>	<b>64%</b>

Table 11: Materials

Percentage of materials	
Cloth	2%
Foam	3%
Glass & ceramic	7%
Metal	8%
Other	2%
Paper & cardboard	5%
<b>Plastic</b>	<b>70%</b>
Rubber	1%
Wood	1%

Estimate of debris sources (Swan NRM Aug 2008 to Dec 2015)

Figure 9: Percentage estimate of sources of debris

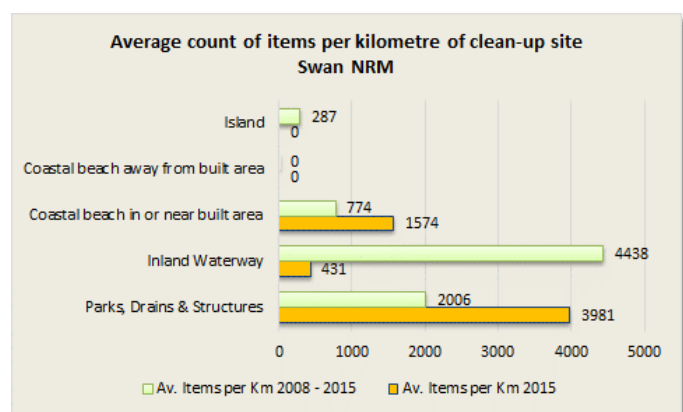


**Options for action:** Coastal infrastructure, particularly involving public visitation and Swan River Estuary foreshore areas; plastic resin pellet Source Reduction Plan.

**Major sources:** Locally sourced litter; garbage from offshore.

Abundance of debris by type of clean-up location (Swan NRM 2015 and 2008 - 2015)

Figure 10: Average count of items per kilometre of clean-up site



**Abundance:** Structures, inland waterways and coastal beaches all carry high levels of debris.

**Monitoring suggestions:** Development of a monitoring plan for the Swan River Estuary.

## Northern Agricultural Catchments Council

City of Greater Geraldton and Shires of Coorow, Dandaragan, Gingin, Irwin, and Northampton

Types of items being found (Northern Agricultural Catchments Council Apr 2009 to Dec 2015)

Table 12: Top 10 items

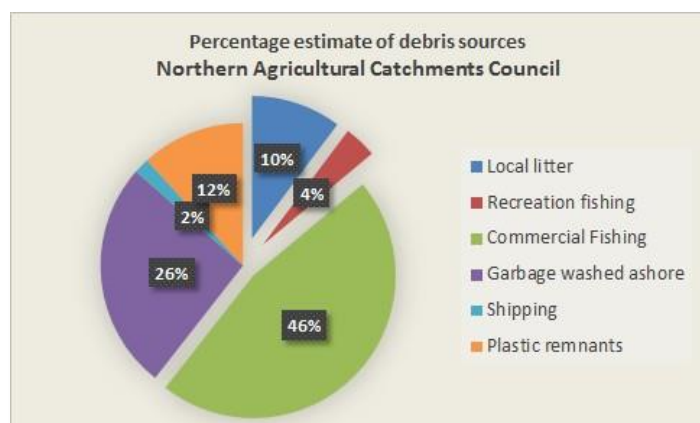
	Items	% of total
Commercial fishing remnants (float, pot, crate bits)	33,429	29%
Plastic bits & pieces hard & solid	11,077	10%
Rope (estimated length in metres)	8,887	8%
Rope & net scraps less than 1 metre	6,379	6%
Plastic bags supermarket, garbage, dog poo, ice	5,514	5%
Lids & tops, pump spray, flow restrictor & similar	4,644	4%
Foam insulation & packaging (whole and remnants)	3,137	3%
Cigarette butts & filters	2,966	3%
Plastic drink bottles (water, juice, milk, soft drink)	2,708	2%
Plastic film remnants (bits of plastic bag, wrap etc)	2,333	2%
	<b>81,074</b>	<b>70%</b>

Table 13: Materials

Percentage of materials	
Cloth	2%
Foam	4%
Glass & ceramic	3%
Metal	3%
Other	1%
Paper & cardboard	2%
<b>Plastic</b>	<b>84%</b>
Rubber	1%
Wood	1%

Estimate of debris sources (Northern Agricultural Catchments Council Apr 2009 to Dec 2015)

Figure 11: Percentage estimate of sources of debris

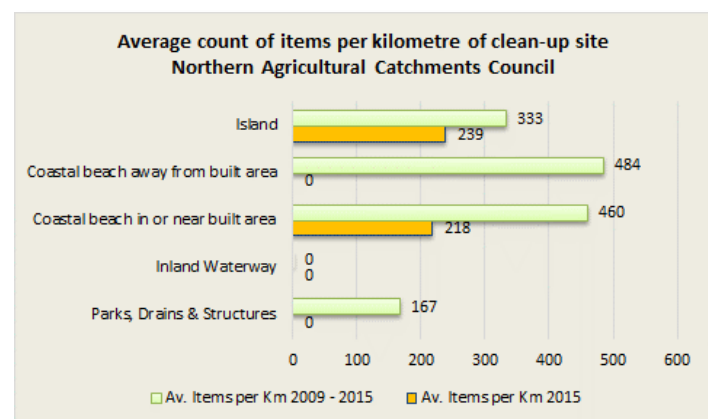


**Options for action:** Strategies for reducing commercial fishing gear loss; identification and remediation program for coastal hotspots especially where fishing gear accumulates.

**Major sources:** Commercial fishing gear losses; garbage from offshore.

Abundance of debris by type of clean-up location (Northern Agricultural Catchments Council 2015 and 2009 - 2015)

Figure 12: Average count of items per kilometre of clean-up site



**Abundance:** Coastal beaches away from populated areas are above the WA average.

**Monitoring suggestions:** Monitoring plan to assess impacts in the estuarine systems in the region.

## Rangelands NRM

Shires of Dundas, Carnarvon, Shark Bay, Ashburton, Port Hedland, Roebourne, Broome, and Wyndham East Kimberley

### Types of items being found (Rangelands NRM Jul 2006 to Dec 2015)

Table 14: Top 10 items

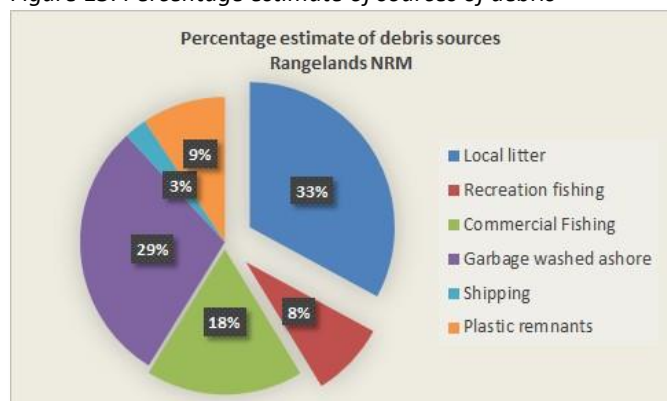
	Items	% of total
Rope (estimated length in metres)	3,381	11%
Cigarette butts & filters	2,798	9%
Aluminium cans	2,430	8%
Plastic bits & pieces hard & solid	2,346	7%
Plastic drink bottles (water, juice, milk, soft drink)	1,956	6%
Fishing line in metres (Recreation)	1,808	6%
Metal bottle caps, lids & pull tabs	1,760	6%
Glass or ceramic broken	1,707	5%
Glass beer stubbies & pre-mixed alcohol bottles	1,154	4%
Rope & net scraps less than 1 metre	1,054	3%
	20,394	65%
	<b>20,394</b>	<b>65%</b>

Table 15: Materials

Percentage of materials	
Cloth	1%
Foam	2%
Glass & ceramic	11%
Metal	17%
Other	1%
Paper & cardboard	3%
<b>Plastic</b>	<b>62%</b>
Rubber	3%
Wood	1%

### Estimate of debris sources (Rangelands NRM Jul 2006 to Dec 2015)

Figure 13: Percentage estimate of sources of debris

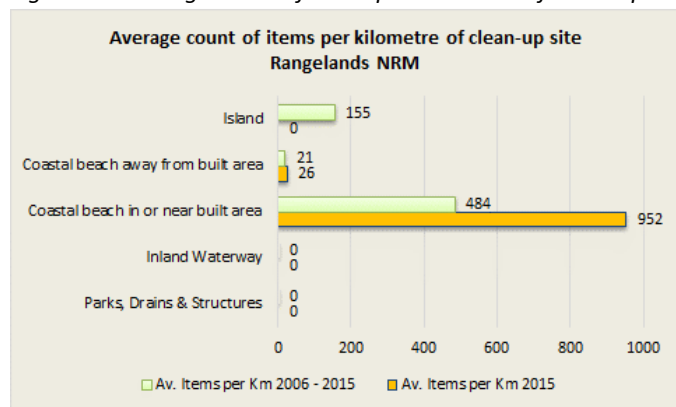


**Options for action:** Local litter and recreation fishing gear.

**Major sources:** Local litter, garbage from offshore, commercial fishing gear.

### Abundance of debris by type of clean-up location (Rangelands NRM 2015 and 2006 - 2015)

Figure 14: Average count of items per kilometre of clean-up site



**Abundance:** Coastal beaches in populated areas have second highest levels of debris.

**Monitoring suggestions:** Monitoring of estuaries and mangrove habitat in populated areas.

## Island Territory – Cocos (K) Islands

### Shire of Cocos (Keeling) Islands

#### Types of items being found (Island Territory – Cocos (K) Islands Feb 2009 to Dec 2015)

Table 16: Top 10 items

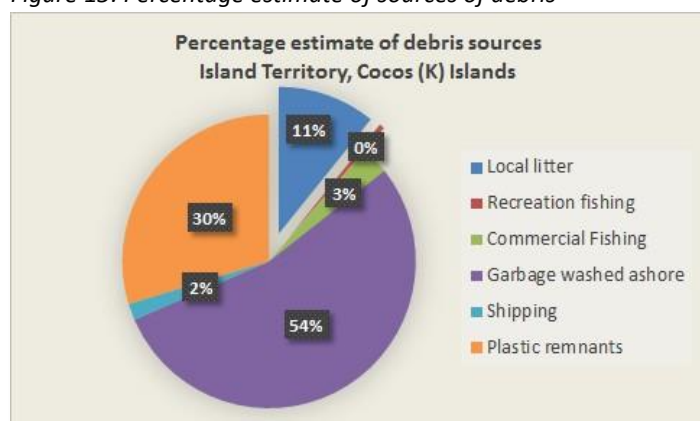
	Items	% of total
Plastic bits & pieces hard & solid	7,406	27%
Plastic drink bottles (water, juice, milk, soft drink)	4,408	16%
Lids & tops, pump spray, flow restrictor & similar	3,611	13%
Rubber footwear & thongs	2,083	8%
Straws, confection sticks, cups, plates & cutlery	2,062	7%
Plastic packaging food (wrap, packets, containers)	1,560	6%
Foam insulation & packaging (whole and remnants)	1,115	4%
Plastic film remnants (bits of plastic bag, wrap etc)	831	3%
Shoes leather & fabric	653	2%
Personal care & pharmaceutical packaging	480	2%
	<b>24,209</b>	<b>87%</b>

Table 17: Materials

Percentage of materials	
Cloth	0%
Foam	5%
Glass & ceramic	2%
Metal	2%
Other	3%
Paper & cardboard	0%
<b>Plastic</b>	<b>81%</b>
Rubber	9%
Wood	0%

#### Estimate of debris sources (Island Territory – Cocos (K) Islands Feb 2009 to Dec 2015)

Figure 15: Percentage estimate of sources of debris

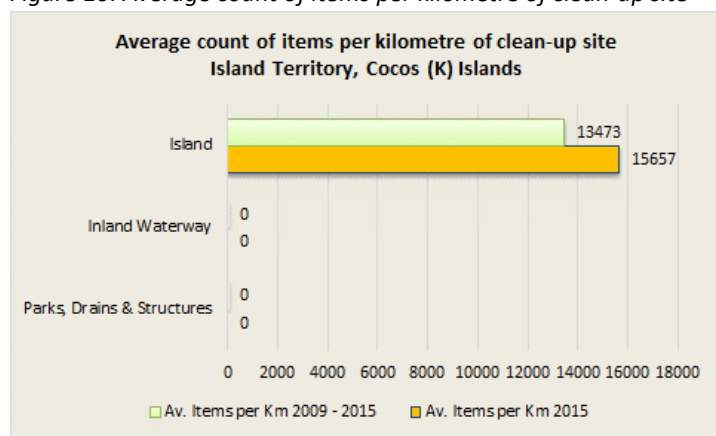


**Options for action:** Island territories are remote regions in need of ongoing support to address very high levels of marine debris.

**Major sources:** Garbage and plastic remnants washed ashore. This comes from the South Equatorial Current with debris coming from South East Asia and from Southern Indian Ocean latitudes conveyed by the West Australian Current depending on the time of year.

#### Abundance of debris by type of clean-up location (Island Territory – Cocos (K) Islands 2015 and 2009 - 2015)

Figure 16: Average count of items per kilometre of clean-up site



**Abundance:** Cocos Island may experience the highest levels of debris for any Australian island.

**Monitoring suggestions:** Monitoring at Cocos could assist with Indian Ocean Gyre research while providing opportunities for the local community.

## Source reduction activities

There are different types and levels of activity for source reduction:

1. The simplest is developing a [Source Reduction Plan](#) which uses local knowledge, observations and data to identify one or several items or bulk litter whose source and reason for escape into the environment can be identified and rectified in a straight forward manner.
2. Finding ways to place a value on items of marine debris so that they are seen as a resource rather than a liability is important for the source reduction process and the resource conservation needs of society.
3. Redesign of items to minimise impact through change of design and type of material used.
4. Identification and remediation of litter and debris hotspots can prevent further migration of debris from the hotspot and provide further understanding of why debris accumulates at the hotspot.
5. Monitoring plans can bring together the various monitoring activities within a region and form a core part of regional level marine debris focus groups by providing monitoring objectives and data collection purpose.
6. Regional plans address management objectives for a geographical area not necessarily confined to NRM regions.
7. Industry plans address industry level source reduction plans such as the plastic resin pellet plan described below.

Some of the common items found in WA with possible solutions are listed in Table 18.

*Table 18: Common items collected for sources that require local or regional action, with suggestions for potential solutions*

Source	Common items collected	Potential solutions (examples)
Recreational fishing items	<ul style="list-style-type: none"><li>- Fishing line</li><li>- Bait, tackle bags &amp; packaging</li></ul>	<ul style="list-style-type: none"><li>- These items can be addressed by targeted education / awareness of recreational fishers to reduce loss of gear.</li><li>- Where loss is deemed accidental, assess whether product design is resulting in increased debris (can changes be made in materials or design to reduce potential for loss or the impact of loss).</li></ul>
Commercial fishing	<ul style="list-style-type: none"><li>- Rope (includes scraps and lengths of rope)</li><li>- Strapping band scraps</li><li>- Commercial fishing remnants (float, pot, crate bits)</li></ul>	<ul style="list-style-type: none"><li>- Monitoring of compliance with regard to strapping band legislation.</li><li>- Liaison with industry to identify opportunities to reduce loss of gear (including rope, pots, crates etc.).</li><li>- Trialling new systems of management.</li></ul>
Beach and local litter	<ul style="list-style-type: none"><li>- Cigarette butts &amp; filters</li><li>- Broken glass</li><li>- Aluminium cans</li><li>- Food packaging</li><li>- Glass beer bottles</li></ul>	<ul style="list-style-type: none"><li>- Community awareness programs.</li><li>- Improved facilities where appropriate (e.g. cigarette butt bins in problem areas).</li><li>- Improved management of events at beaches to reduce litter and use of plastic while also raising awareness of the impact of marine debris.</li></ul>

## Plastic resin pellets - Operation Clean Sweep®



The Tangaroa Blue Foundation is currently working on a [Source Reduction Plan to mitigate plastic resin pellet pollution](#). These pellets are the raw form of plastic that is produced, then transported to manufacturing facilities, and melted into moulds to produce all plastic items. They can be clear to translucent, a variety of colours and they range between 3-5mm in diameter. The pellets are often spilt and lost to the environment due to poor housekeeping. They are buoyant and find their way into the stormwater drains which transport them to our natural waterways and eventually our beaches

and oceans. To wildlife pellets resemble food items such as fish eggs and are therefore mistakenly ingested.

In Melbourne Tangaroa Blue Foundation has a Source Reduction Plan underway to implement Operation Clean Sweep®. This program was created in the USA by the Society of the Plastics Industry (SPI) and has been successful in other countries such as the UK, Canada and New Zealand. It provides simple, cost effective solutions for the plastics industry which reduce the amount of pellet spills, for example using catch trays and tarps whilst unloading trucks containing pellets so that they are contained.

Operation Clean Sweep® is beneficial for the plastics industry as well as the environment. It allows companies to reduce the number of pellet spills which also reduces the likelihood of obtaining a regulatory fine, they are able to demonstrate that they are maintaining a safe workplace for employees, their reputation as environmental stewards is enhanced and their efficiency is increased as more of their product is retained rather than lost as waste. If the pellet Source Reduction Plan is successful in the Port Phillip Bay catchment it will be introduced as a national program.

The details of Operation Clean Sweep® can be viewed at [www.opcleansweep.org.au](http://www.opcleansweep.org.au)

## Update on the watch for debris from flight MH370 coming ashore on the WA coastline

Tangaroa Blue Foundation is continuing to watch for debris coming ashore from missing flight MH370 along the West Australian coastline. Four items have been reported to the Australian Maritime Safety Authority (AMSA) for referral to the search authorities with all being assessed as not related to the missing plane. A number of reports from the public have also been made which have also been ruled out.

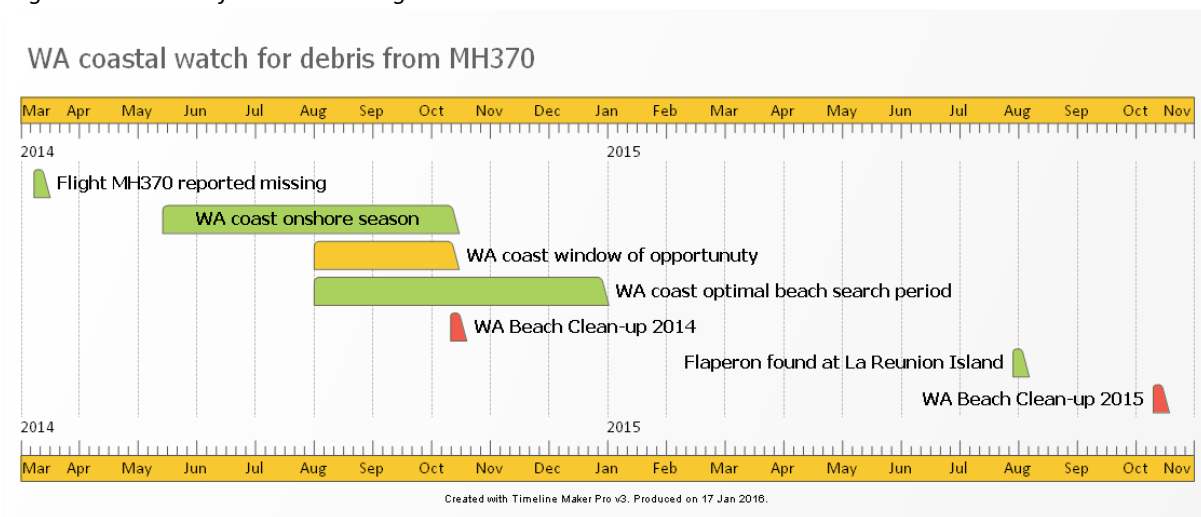
In October 2015 a researcher from the University of Hawaii at Manoa <sup>1</sup> contacted Tangaroa Blue Foundation regarding the MH370 search. Computer models had mostly indicated that if the crash had occurred close to the “7<sup>th</sup> arc” <sup>2</sup> then a significant part of the debris would wash ashore on the southwest coastline of WA. The absence of any positively identified debris on the WA coastline

needed to be understood and Tangaroa Blue Foundation was asked for an opinion as to whether we thought any debris had come ashore. The following notes summarise the opinion given and includes an additional explanation regarding the window of opportunity for finding debris on the WA coast which was not developed when providing the original opinion.

Newly arriving debris on the WA coast could have provided data that was of use in the search effort. However, there was a limited time period when this could happen. Researchers set this as between August 2014, the earliest debris was expected to arrive, and December 2014 beyond which debris arrival would be unlikely. This timeframe was dependent on the approximate correctness of the identified crash area. In the timeline presented in Figure 17, this period is titled the “WA coast optimal beach search period”.

The west facing coast of WA’s southwest coast has a well-defined season when winter weather systems generate conditions which drive debris into the coast and onto the beaches and is titled “WA coast onshore season” in the timeline. The offshore season is dominated by winds from the east which prevent debris moving inshore and beaches dry out, accrete and debris is buried. The onshore season opens the gate to ocean sourced debris while the offshore season largely closes it. The “WA coast window of opportunity” is therefore the 10-week period between August and mid-October.

Figure 17: Timeline for debris coming ashore on the WA coast



During the period between March 8<sup>th</sup> and December 31<sup>st</sup> 2014, 289 clean-ups took place along the southwest coast as part of Tangaroa Blue Foundation’s ongoing Australian Marine Debris Initiative (AMDI). The area with the greatest activity and coverage was the Capes Coast region.

By August there was strong public awareness of debris possibly coming ashore due to media coverage and visitors to the coast were alert to the possibility of finding debris. Map 1 shows the locations of clean-ups and Table 19 shows the number of clean-ups for each month.

Map 1: AMDI clean-up locations March 8<sup>th</sup> to December 31<sup>st</sup> 2014



Table 19: Monthly clean-ups

2014	Number of Clean-ups
Mar	10
Apr	18
May	27
Jun	16
Jul	15
Aug	6
Sep	36
Oct	117
Nov	20
Dec	24
	<b>289</b>

The original opinion was, and remains, that we cannot confidently say that no items have come ashore from the plane. The 10-week window when debris from the plane was most likely to come ashore may have been too narrow or the estimated position of the crash may have been out to some degree. If debris had come ashore there was a sufficient level of organised activity and public awareness for someone to find something but one other factor also had a bearing - the amount of debris released in the crash and the proportion of that debris able to remain afloat and be moved by current and wind. There would have needed to be a reasonably high number of items presenting along the coast and coming ashore in WA if the probability of someone finding something from the plane was to become likely (the author's estimate is in the mid to high hundreds). Tangaroa Blue Foundation will continue to watch for items and report any finds to the relevant authorities.

## Acknowledgements

A big thank you is again extended to all our volunteers and supporters whether working alone or as part of an organisation. Organisations involved in this year's clean-up and/or throughout the year are listed below under their respective NRM regions. In the list a single asterisk \* indicates participation in the October West Australian Beach Clean-up, two asterisks \*\* indicates participation in the October West Australian Beach Clean-up and participation during the year, and no asterisk indicates participation during the year.

## List of partners by NRM region

### Event support:

Coastwest  
Department of Fisheries  
Department of Parks and Wildlife  
Government of Western Australia

Keep Australia Beautiful Council WA  
Local Government Areas  
ProAcqua  
Natural Resource Management Regions

### Northern Agricultural Catchments Council – regional participation:

Batavia Coast Maritime Institute\*  
Durack Institute of Technology\*  
Jurien Bay Coastcare Group  
Jurien Bay Progress Association  
Kalbarri Offshore and Angling Club Inc.\*

Ledge Point Coastcare\*  
Northern Agricultural Catchments Council (NACC)\*  
Seabird Caravan Park\*  
Tidy Towns Sustainable Committee, Dongara\*

### Peel Harvey Catchments Council – regional participation:

City of Mandurah  
Conservation Volunteers Australia WA (CVA)  
Coodanup College

Falcon Coastcare Group\*  
John Tonkin College\*  
Peel-Harvey Catchments Council\*

### Rangelands NRM – regional participation:

Birdlife Australia\*\*  
Broome Seagrass\*  
Care for Hedland Environmental Association\*  
Conservation Volunteers Australia WA (CVA)\*

Environs Kimberley\*  
Eyre Bird Observatory\*\*  
Nyul Nyul Rangers – Kimberly Land Council\*  
Rangelands NRM

### South Coast NRM – regional participation:

Albany Scouts\*  
Albany Secondary Education Support Centre\*  
Bush Ranger Cadets\*  
Apex Club of Albany\* Boatshed  
BBQ Group\* Denmark  
Environment Centre\*  
Denmark Primary School  
Esperance Dive Club Inc.\*

Esperance Inclusive Holiday Steering Group\*  
Hopetoun Progress Association\*  
South Coast NRM\*  
Walpole Nornalup National Parks Association  
Western Australian Museum, Albany  
William Bay National Parks Association\*  
Wongutha Caps\*

### South West Catchments Council – regional participation:

Aftercare and Life Without Barriers\*  
Augusta Land and Coast Care\*  
Binningup Coastcare & Environment Group (BCEG)\*  
Bluenanou  
Boranup Board Riders\*  
Bunbury Senior High School  
Busselton Dunsborough Environment Centre\*  
Busselton Senior High School

Cape to Cape Catchment Group Volunteers\*  
City of Busselton  
Conservation Volunteers Australia – Perth  
Department of Parks and Wildlife Blackwood District  
Department of Parks and Wildlife Donnelly District  
Dolphin Discovery Centre\*

Dunsborough Coast & Landcare (Inc.)  
(DCALC)\*  
First Margaret River Scouts\* Georgiana  
Molloy Anglican School  
Gracetown Progress Association (Inc.)\*  
Iluka Resources\*  
Leschenault Catchment Council\*  
MacKillop Catholic College  
Margaret River Primary School  
Margaret River Regional Environment Centre\*  
Meelup Regional Park Volunteers\*\*  
Myalup Community Association\*  
Pemberton Discovery Tours\*

Prevelly Penguins\*  
Responsible Runners WA\*\*  
Shire of Augusta Margaret River  
Shire of Capel  
Shire of Harvey  
South West Catchments Council (SWCC)\*  
St Mary's Anglican Girls School  
Stocker Preston, Busselton\* Stocker  
Preston, Margaret River\*  
Surfrider Foundation Australia WA\*  
Tangaroa Blue Foundation\*\*  
Trackcare WA\*  
West Busselton Primary School\*

#### **Swan NRM – regional participation:**

ANZ\*  
BP Refinery Kwinana Staff  
Centre for English Language Teaching Study  
Tours\*  
City of Wanneroo  
Conservation Volunteers Australia WA  
(CVA)\*\*  
Duncraig Education Support Centre  
Gilmore College  
Keep Australia Beautiful Council (KABC) - WA\*  
Kennedy Bay Coastcare\*  
Leeming Education Support Centre  
Leeming SHS Education Support Centre  
Methodist Ladies College, Perth  
Millennium Kids Inc.  
Mullaloo Beach Community Group

NARC Dive Club  
Ngee Ann Polytechnic\*  
Perth Region NRM - Coastcare in the KIA\*\*  
Perth Scuba\*  
ProAlliance  
Rockingham Youth Advisory Council  
Sea Shepherd Marine Debris Team WA\*\*  
Singleton Coast Care\*  
South Coogee Primary School  
South Fremantle Senior High School  
Stirling Natural Environment Coastcare\*  
Tangaroa Blue Foundation  
University of Western Australia\*  
WAVMA Murdoch Student Chapter\*  
Wesley College

#### **Island Territory, Cocos (Keeling) Islands – regional participation:**

Cocos Island Youth Council\*  
Shire of Cocos Islands\*

## **References**

1. International Pacific Research Center  
School of Ocean & Earth Science & Technology  
University of Hawaii at Manoa  
[http://iprc.soest.hawaii.edu/news/MH370\\_debris/IPRC\\_MH370\\_News.php](http://iprc.soest.hawaii.edu/news/MH370_debris/IPRC_MH370_News.php)
2. The 7<sup>th</sup> arc is explained in this webpage <https://www.atsb.gov.au/mh370-pages/the-search/maps.aspx>