

# TANGAROA BLUE OCEAN CARE SOCIETY



## 2008 Cape to Cape Beach Clean Up (South West Australia) Technical Data Report

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Thanks to the following government agencies and organisations for funding and support, enabling us to continue the South West Marine Debris Project.



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# 1. Summary

## Amount of Debris

A total of 26,363 items were collected in the 2008 Cape to Cape Beach Clean Up; this was 7,300 items more than the 2007 total. This is partly accounted for by the increase in size of the clean up area. However, five out of seven areas on the Cape to Cape coast showed increases and this together with there now being clean ups conducted many times throughout the year on the Capes coast, indicates that overall debris has increased.

## Areas/Sites with the Greatest Concentration of Items

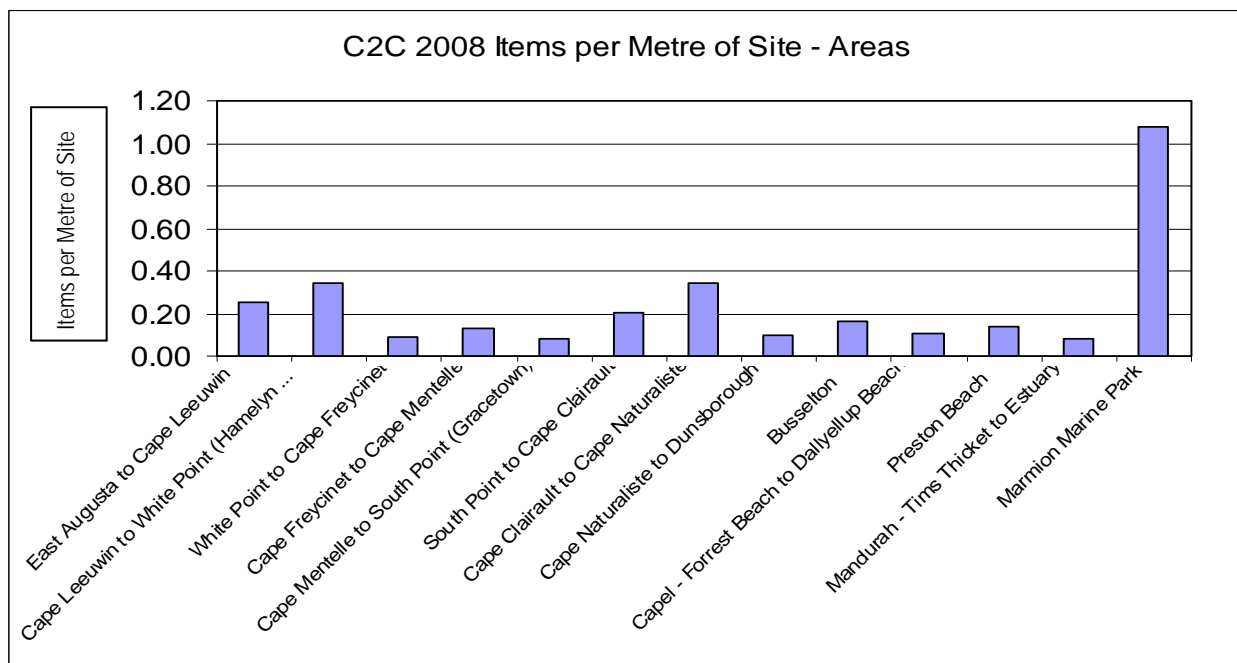


Figure 1.1: Areas/Sites with the Greatest Concentration of Items

Based on the number of items per metre of beach, the highest concentration of marine debris in the clean up data were found at Marmion Marine Park (Perth), followed by Cape Leeuwin to White Point; Cape Clairault to Cape Naturaliste; and East Augusta to Cape Leeuwin, all being above the clean up average of 0.24 items per metre of beach. Each of these areas reflects different aspects of the pollution problem.

- Marmion Marine Park, in the Perth metropolitan area, experiences a combination of high beach usage and associated littering together with some offshore and near shore generated debris. (Hillarys had the highest count with 365 items);
- Cape Clairault to Cape Naturaliste, which includes some high usage tourist and recreation sites, shows a combination of accrued offshore and longshore sourced debris [1] together with sites affected by littering. (Windmills to Lighthouse Beach had the highest count with 2276 items);
- Cape Leeuwin to White Point (Hamelin Bay) reflects accrued debris from offshore, especially Deepdene Beach, where nearly all the debris comes from offshore or longshore sources. (Deepdene South had the highest count with 1917 items);
- East Augusta to Cape Leeuwin, covering part of Flinders Bay, incurred a combination of littering around Augusta and littering and offshore sourced debris on the beaches. (Colour Patch Cafe (Estuary) to Flinders Bay had the highest count with 398 items).

## Debris Categories

During 2008, a new method for categorising and analysing the marine debris data collected was developed. The new categories enable a site signature to be produced which shows which categories of debris are prevalent and require further analysis. The new categories are: 1) End User Items (consumables); 2) Packaging (all packaging and wrapping); 3) Industrial and Commercial Items (usually commercial fishing items in this area); 4) Linear Items (e.g. rope measured in metres, each metre is counted as one item); 5) Sundry Items (items not fitting into the other categories including items possibly dumped); 6) Oil and Tar; and 7) Remnants (remains and fragments of marine debris).

The remnants category includes pieces of plastic, rope and net fragments, lids and tops and polystyrene foam, and this category accounts for 59% of all debris collected with 12,893 items. The items in this category need to be viewed as items continually breaking down – eventually into microscopic fragments. The preponderance of visible remnant items gives us concern as to the levels of micro plastics in our coastal environments – especially along the Capes coast where our plastic resin pellet and micro plastic surveys have indicated a significant level of this type of pollution.

The next highest count of items was in the packaging category with 5,101 items. Based on the distribution of packaging items across the various clean up areas, the curve shows a distinct rise in high usage areas, we estimate 60% of all packaging items are the result of littering while 40% come from offshore sources. The highest ranking items were plastic drink bottles, food wrap, plastic wrap (non food), glass drink bottles, plastic containers and aluminium cans.

End user items numbering 2,888 also follow this pattern with cigarette butts, straws and stirrers, clothing and shoes, tissues and fishing floats frequently found.

In the linear category (3,846), items showing up strongly are rope, plastic strapping band and fishing line. Rope was found to come ashore in lengths of tens and hundreds of metres as well as in many small fragments and remnants. Its distribution was episodic with more rope found on the coasts away from Geographe Bay.

This year's underwater clean up participants at Busselton Jetty extracted 1.2km of snagged fishing line. This quantity viewed against the background of a scattering of small quantities of line at other sites highlights the fact that much discarded or lost fishing line remains in the ocean.

Industrial and commercial items came mainly from commercial fishing and shipping sources in the clean up area and numbered 782 items. Commercial fishing items were most frequently found, with rock lobster fishing activity items such as bait containers and lids, and buoys and floats predominant (518 items). Net and line fishing items (190 items) included cylume sticks and fishnet floats.[2] Commercial shipping sourced items such as light bulbs and fluorescent tubes and bleach and cleaner bottles were present in low numbers (74 items).

Of the two remaining categories wood and rubber showed up strongly amongst the 793 items in the sundry items category. Oil globules and tar balls totalling 60 were found at a small number of sites.

Two sites recorded the presence of plastic resin pellets with high numbers at Ellensbrook (found amongst the rocks beneath the lookout) and medium numbers at Deepdene South (medium numbers in one small location with a scattering along the whole southern section). [3]

Items whose count exceeded 500 fell into four groups

- Items mainly sourced from littering were cigarette butts (1024), food wrap (884), plastic drink bottles (874), glass drink bottles (602) and aluminium cans (569);
- Remnants – much of which result from past littering were pieces of plastic (6098) and broken glass (2256);
- Fishing line (1432m) while usually not intentionally discarded its loss into the marine environment is a serious problem; and
- Rope (1960m) related to commercial, especially fishing activities.

The additional data collected from Capel, Mandurah and Perth has allowed for the beginnings of a characterisation of the marine debris pattern in the whole South West. The broad features of this are:

1. An ever present and high volume of remnant debris on the entire coast, but not strongly expressed in Geographe Bay;
2. A growing beach/coast littering problem especially at high visitation sites and in built up areas;
3. The migration of buoyant members of these debris items along the coast and thus polluting downstream sites;
4. Significant fragmentation of this migrating debris along the Capes coast producing a cascade of small synthetic pieces and fragments which penetrate into all parts of the Capes coastline; and
5. An annual beaching of large amounts of debris from offshore activities and from remote regions during winter.

The clean up data consists mostly of macro debris – debris larger than 5mm. There is however a generally unrecognised level of micro marine debris – less than 5mm - which is comprised of both intact items (e.g. plastic resin pellets) and fragmenting plastics of all kinds polluting the coastal zone. The high numbers of plastic fragments in the remnants category together with results from studies of plastic resin pellets and plastic fragments carried out previously [4] indicate that a significant level of micro plastic pollution is being introduced into and produced within the clean up area - especially in the Capes region. Also unexplored is the distribution of marine debris on the surface, in the water column and in the benthic regions of the nearby sea. The amount of debris both micro and macro coming ashore during winter suggests this to be also significant.

## 2. Preface

### *Organisation of Data into Clean Up "Areas"*

Clean up sites are grouped into areas for ease of presentation. These groups are in tabulated in Attachment 1.

### *Individual Site Data*

Detailed data for individual sites is not given but is available on request from TBOCS.

### *Data Reliability*

Data for a small number of sites was recorded in a different way than usual and for these sites adjustments were made to show the types of items collected but not their quantities. Overall the data and information gives a true general reflection of the marine debris situation in the clean up area.

### *Time of the Clean Up in the Seasonal Context*

A number of conditions are worth noting for clean up beaches at this time of the year on this coast:

1. Debris coming from offshore is tailing off as the prevailing wind direction tends easterly;
2. Beaches dry out, and accrete (grow wider) and sand becomes mobile tending to bury debris in the process;

3. Vehicle and foot traffic in high usage areas also buries debris;
4. Beach visitation is in the early phase of building to higher seasonal levels.

### *Categories Used in this Report*

The following tables show our method of sorting individual items or groups of items into categories and sub categories. These are then analysed in a spreadsheet and graphs are produced to show the distribution patterns across the clean up area. We are developing this method as a way to use the large volumes of community clean up data becoming available.

### *Main Categories*

Marine debris items are initially grouped into categories which help home in on the information required. Categories used in our analysis system are shown in table 1 and differ slightly to clean up data sheet categories.

Category	Description	Unit
End User	All items intended for personal use in any activity	Single item or item group
Packaging	All packaging but not accessory items such as straps, binding etc	Single item or item group
Industrial & Commercial	All items used in all production and service activities	Single item or item group
Linear	Rope, net, fishing line 1 metre or greater and intact cut and uncut strapping band	1 metre of item representing 1 item
Sundry	Any item which does not fit into the other categories (including dumping items)	Single item or item group
Oil	Oil and tar	Single item
Remnants	All fragmented synthetic remains	Single item

Table 1

### Sub Categories

The above main categories are next assigned subcategories as shown in Table 2.

Category/Sub-category	Items such as:
<b>End User Items</b>	
• Food & Drink	Plates, cutlery, straws, confection sticks etc.
• Clothing & Footwear	Cloth, clothing, shoes, socks, hats etc.
• Recreation	Balloons, surf wax, recreational fishing gear, toys etc.
• Medical Personal & Hygiene	Toothbrushes, combs, nappies, band aids, tissues etc.
• Smoking	Cigarette butts, lighters etc.
• Miscellaneous	Pens, pencils, candles, thread, string etc.
<b>Packaging Items</b>	
• End User Packaging	Bags, packets, wrappers, bottles, jars, cans etc.
• End User Brand Specific	e.g. Coke, McDonalds, KFC etc.
• Industrial & Commercial Packaging	Hessian bags, poly-weave bags, 20 litre drums, tarps etc.
• Foreign Source Packaging	Any packaging with foreign writing.
• Rural & Farming Activities	Farm chemical containers etc.
<b>Industrial, Commercial &amp; Rural Items</b>	
• Cray Fishing	Bait containers, traps, buoys, floats etc.
• Net & Long line Fishing	Net floats, net runners, cylume sticks, fish nets etc.
• Shipping	Pallets, plastic tags, timber, pallets, etc.
• Shore-based Industrial Activity	Items clearly related to shore based industry.
• Offshore Industrial /Activity	Oil rigs, drilling, dredging etc.
• Rural & Farming Activities	Ear tags, stock care items etc.
• Other	EG oceanography, meteorology items.
<b>Linear Items</b>	
• Set Group of Items	Rope, strapping band, fishing line, fishing net.
<b>Sundry Items</b>	
• Materials	Wood, metal, rubber.
• Electricals	Cables, batteries, connectors.
• E-Waste	Mobile phones, printer cartridges, pedometers, circuit boards.
• Boat and vehicle parts	Air filters, seals, door handles, panels.
• Household whitegoods, furniture and fittings	Fridges, wardrobes, chairs, carpet.
• Building materials	Bricks, particle board, plaster.
<b>Oil &amp; Tar</b>	
• Set Group of Items	Tar Balls & Oil Globules.
<b>Remnants</b>	
• End User Remnants	Pieces of plastic, polystyrene, lids & tops, broken glass.
• Industrial & Commercial Remnants	Rope scrap <0.5m, fishing net pieces, strapping band remnants, buoy & float remnants.

Table 2

### 3. Clean Up Data Summary

#### Details of Data Set

- Clean Up Code C2C2008.
- Data gathered by 571 volunteers.
- Clean up areas covered East Augusta through to Minninup, Preston Beach, Tim's Thicket to Mandurah Estuary and Marmion Marine Park (Perth).
- Clean up dates – centred around October 11 & 12, 2008.
- Number of clean ups – One event including 72 individual clean up sites.
- Total number of items collected – 26,363.

#### Total Items

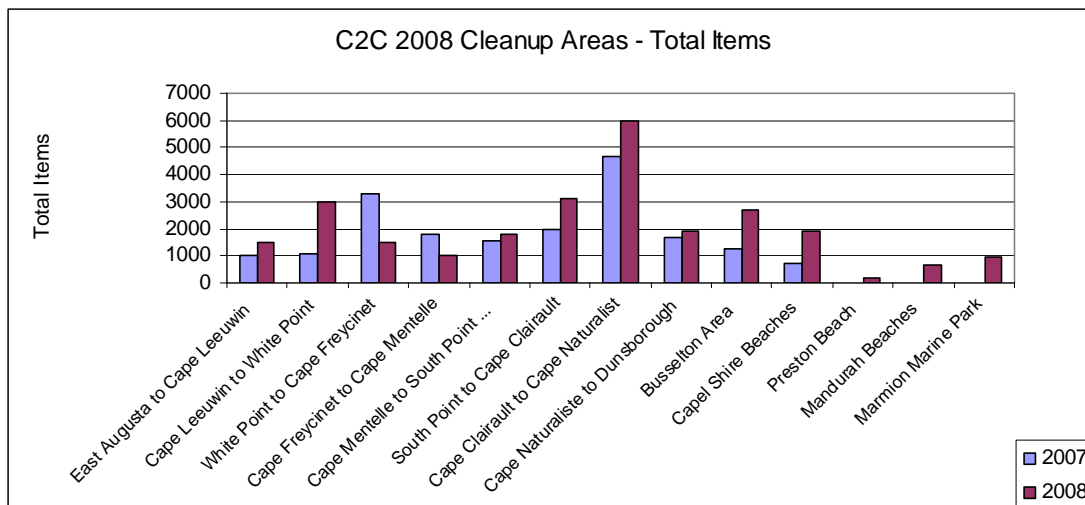


Figure 1

Several sites between White Point (Hamelin Bay) and Cape Mentelle were not cleaned in the 2008 event. Apart from these two areas all other areas showed an increase in debris collected, indicating an overall increase in debris level.

#### Items per Metre of Site

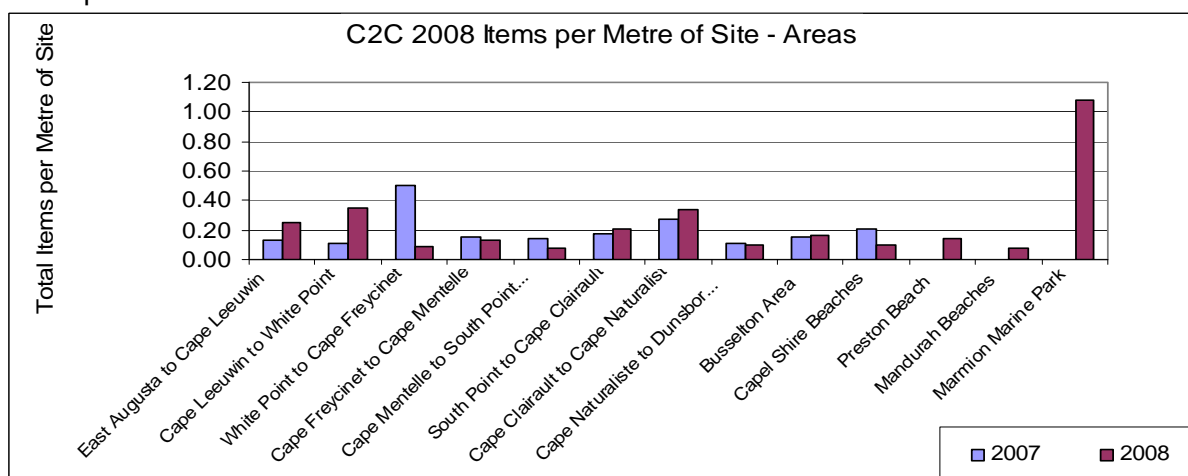


Figure 2

Using the items per metre of site measure it can be seen that four areas stand out – being above the median level of 0.24 items per metre of site. [5]





### Sundry Continued

Metal	98
Plastic Pipe	49
Building Materials	45
Boat Pieces	37
Electrical Cable & starters	24
Cars, Car Parts	16
Carpet	13
Batteries	8
Furniture	8
Marine Engine Parts	6
Tyres	3
Printer Cartridge	1
White Goods - Stoves, Fridges	1

### Remnants Continued

Plastic Bag Remnants	2131
Lids, Bottle Tops, Corks	1517
Polystyrene Foam	858
Fishing Nets	26

Table 3

## 5. 2008 Cape to Cape Beach Clean Up Signature

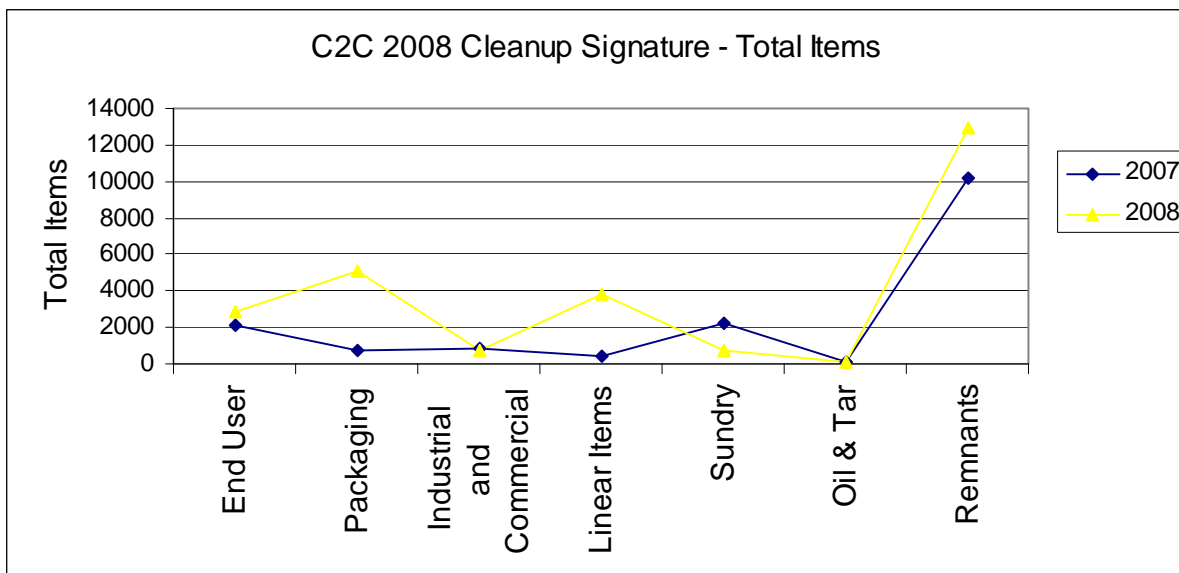


Figure 3

The clean up signature shows the distribution of total items across the main item categories and shows three peaks which broadly reflect:

1. The high numbers of remnant items found especially on the Capes coast proper;
2. High volumes of packaging found especially in high usage areas;
3. A large amount of linear items – the most notable being fishing line recovered from beneath the Busselton Jetty.

## 6. Debris Distribution Patterns

The following graphs, based on total items per category for each area, show the distribution pattern across the clean up area moving from Augusta in the south to Marmion Marine Park in the north.

Note: The trend (green line) seen in figures 4 through 10 is confirmed when items per metre of site figures are used in place of total items.

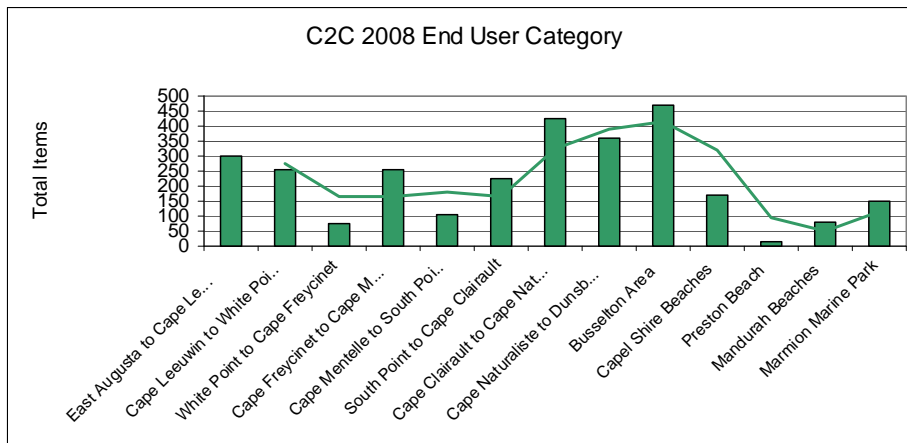


Figure 4

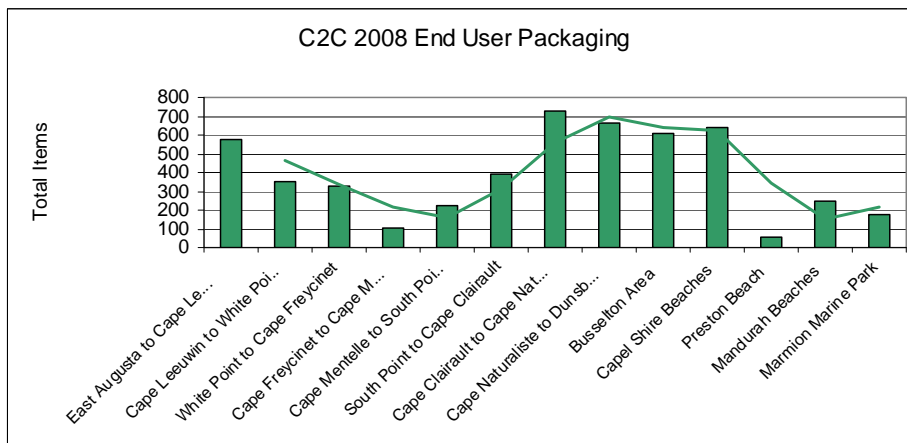


Figure 5

End user items (Figure 4) and packaging trends (Figure 5) across the sites clearly show the impact of beach and coastal facility users on numbers of these items in the more populated and high usage parts of the clean up area.

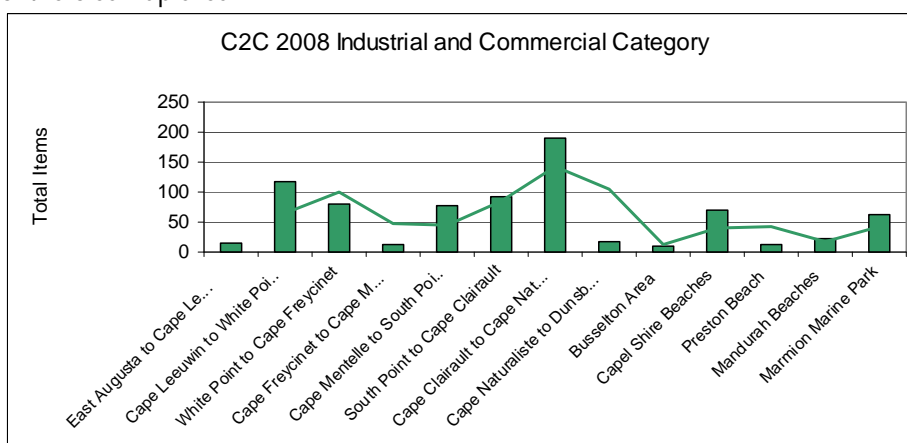


Figure 6

Industrial and commercial items (Figure 6) mainly consisted of buoys and floats, bait container lids and clyume (chemical light) sticks associated with rock lobster fishing and net and line fishing. The pattern shows these items coming ashore strongly on the Capes coast, tailing away in Geographe Bay then beginning to rise again in Capel and the Marmion Marine Park.

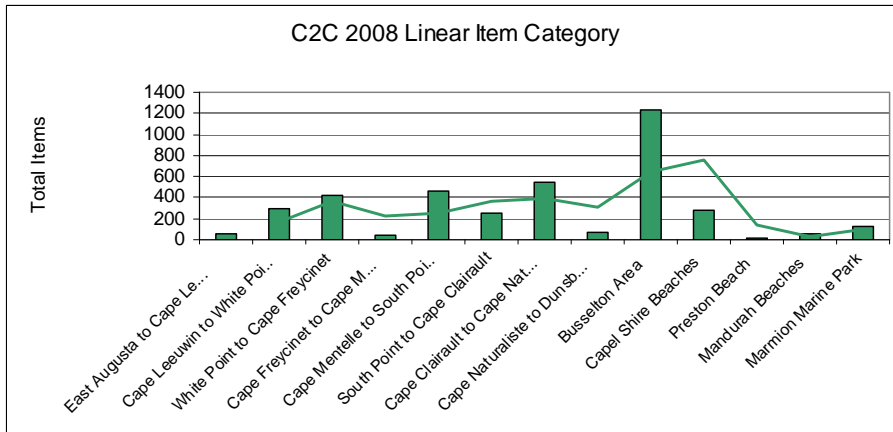


Figure 7

Rope is the major item in the linear item category (Figure 7) and washes ashore episodically, more so on unsheltered beaches. The pattern is also dominated by the 1.2km of fishing line recovered from beneath the Busselton Jetty. Plastic strapping bands turned up regularly across the clean up area but tend to wash ashore in greater numbers in winter. [6]

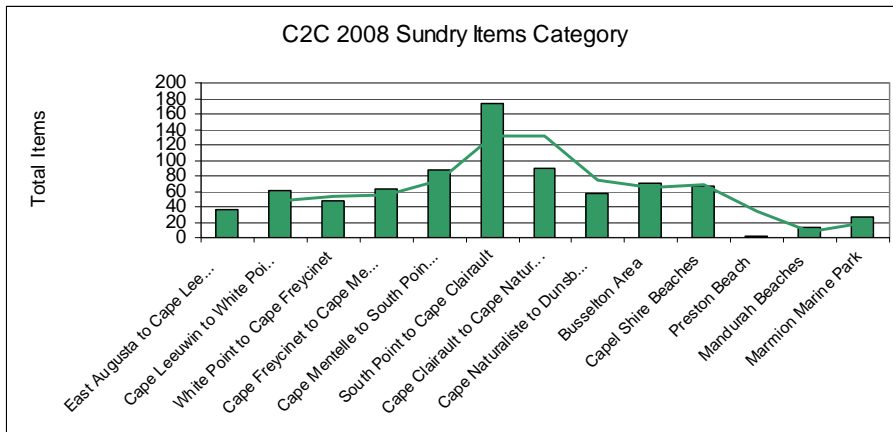


Figure 8

Sundry items (Figure 8) were mainly wood and rubber. Wood items are often timber and chocks lost from shipping. Rubber items are often associated with boat parts such as protective rubber buffering from the sides of boats or rubber seals.

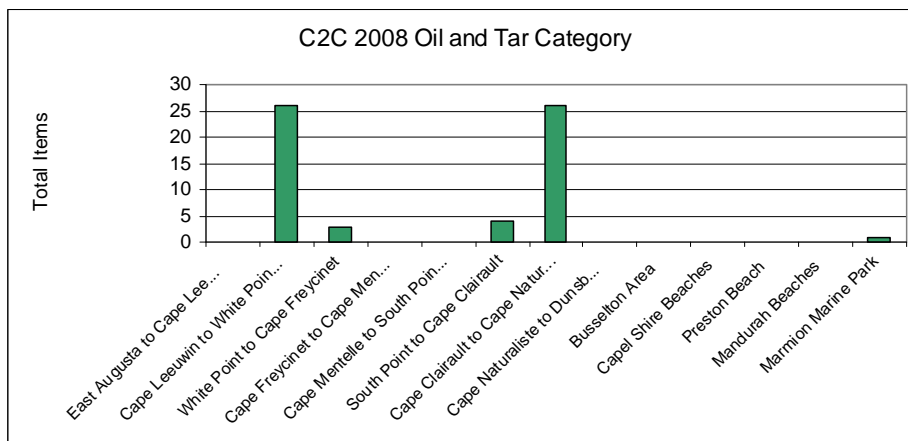


Figure 9

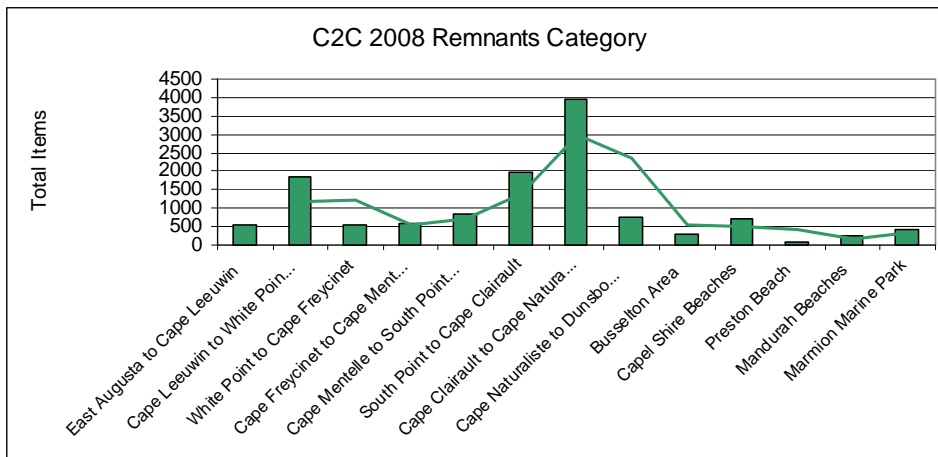


Figure 10

Pieces of plastic (Figure 10) (6098), broken glass (2256) and plastic bag remnants (2131) were the items with the highest numbers. The curve shows higher numbers of remnants on the Capes coast highlighting the “shredding” capacity of that coast.

## 7. Clean Up Areas – Graphs and Tables

The following section shows the signature for each clean up area with a table listing the most frequently occurring items for each category. The most affected sites within the area are also listed.

### 7.1 East Augusta to Cape Leeuwin

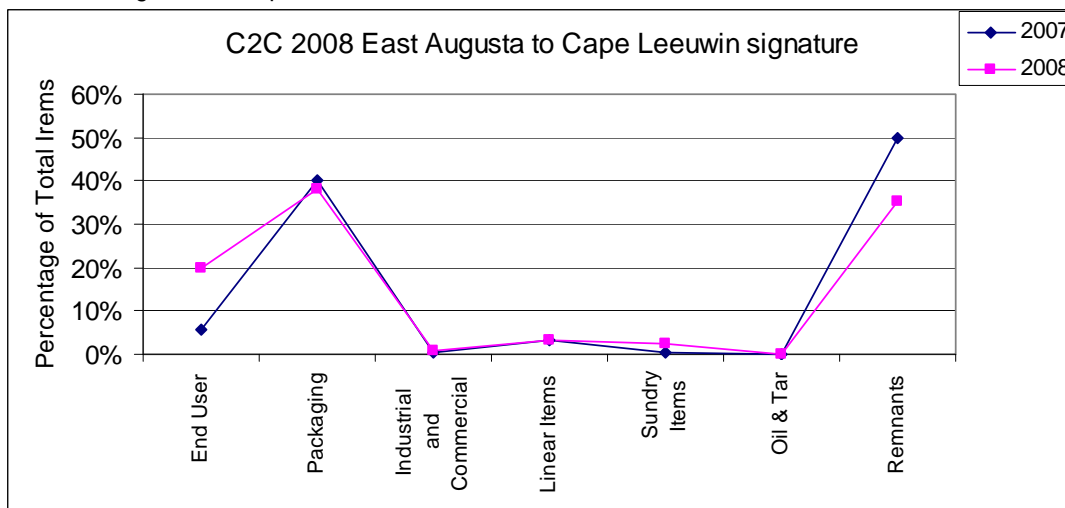


Figure 11

Category	Most Numerous Items
End User	Cigarette Butts, Tissues, Straws & Stirrers, Cloth & Clothing
Packaging	Food Wrap, Aluminium Cans, Plastic Bags
Industrial & Commercial	Buoys & Floats, Bait Container & Lids
Linear	Rope, Fishing Line
Sundry Items	Wood, Car Parts, Rubber
Oil & Tar	No oil found
Remnants	Pieces of Plastic, Plastic Bag Remnants, Broken Glass
2 Most Affected Sites	Colour Patch Café to Flinders Bay, East Augusta

Table 4

## 7.2 Cape Leeuwin to White Point (Hamelin Bay)

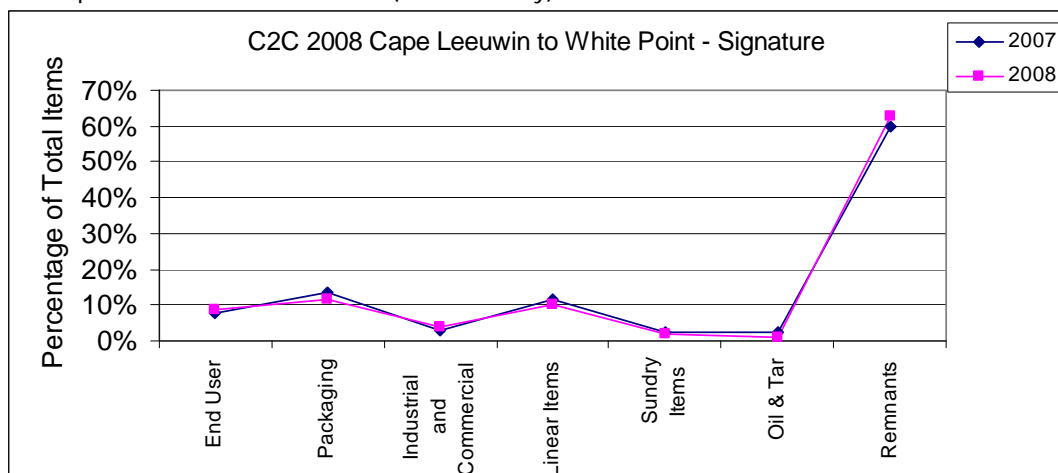


Figure 12

Category	Most Numerous Items
End User	Cigarette Butts, Fishing Floats, Shoes, Straws & Stirrers
Packaging	Plastic Drink Bottles, Glass Drink Bottles, Food Wrap, Plastic Containers
Industrial & Commercial	Cylume Sticks, Bait Lids, Buoys & Floats
Linear	Rope, Fishing Line
Sundry Items	Rubber, Wood
Oil & Tar	26 oil globules found mostly at Deepdene
Remnants	Pieces of Plastic, Lids & Tops, Polystyrene Pieces
<b>2 Most Affected Sites</b>	Deepdene South, Deepdene North

Table 5

## 7.3 White Point to Cape Freycinet

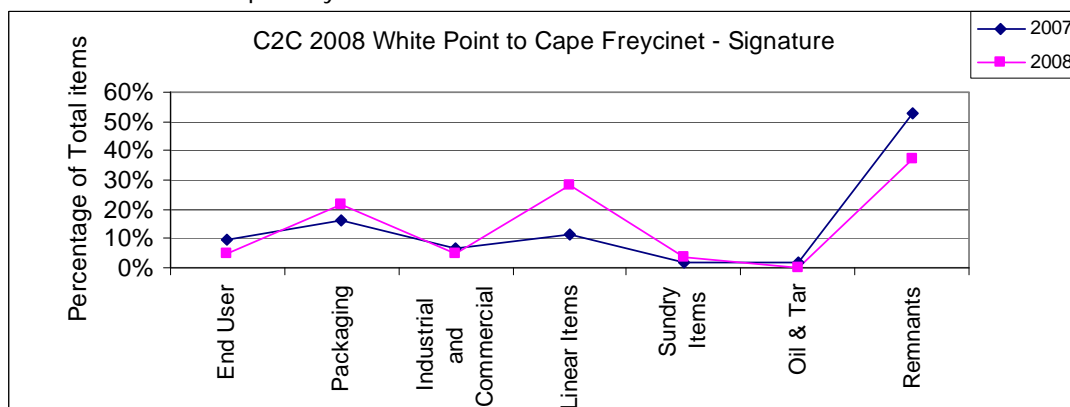


Figure 13

Category	Most Numerous Items
End User	Shoes, Fishing Floats, Straws & Stirrers
Packaging	Plastic Drink Bottles, Aluminium Cans, Glass Drink Bottles, Food Wrap, Plastic Containers
Industrial & Commercial	Buoys & Floats, Cylume Sticks, Light bulbs & Fluorescent tubes
Linear	Rope, Strapping Band
Sundry Items	Wood, Rubber
Oil & Tar	3 oil globules found
Remnants	Pieces of Plastic, Lids & Tops, Polystyrene Pieces
<b>2 Most Affected Sites</b>	Boranup Beach, Bob's Track to Grace Road

Table 6

## 7.4 Cape Freycinet to Cape Mentelle

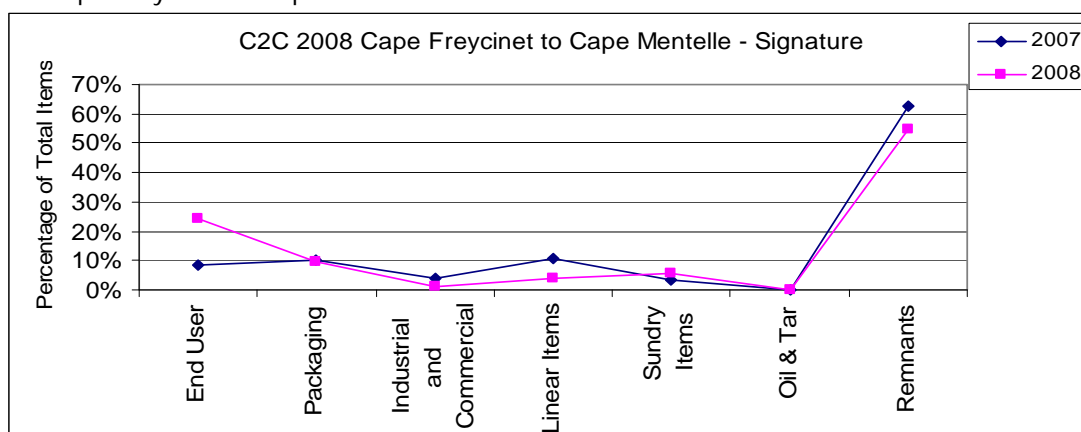


Figure 14

Category	Most Numerous Items
End User	Cigarette Butts, Binding/Thread/String, Tissues, Cloth/Clothing, Straws & Stirrers
Packaging	Food Wrap, Paper/Cardboard, Plastic Drink Bottles, Aluminium Cans, Glass Drink Bottles
Industrial & Commercial	Bait Containers & Lids
Linear	Rope, Strapping Band
Sundry Items	Wood, Electrical Caps
Oil & Tar	No oil found
Remnants	Pieces of Plastic, Plastic Bag Remnants, Broken Glass
<b>2 Most Affected Sites</b>	Gnarabup Beach, Gas Bay

Table 7

## 7.5 Cape Mentelle to South Point (Gracetown)

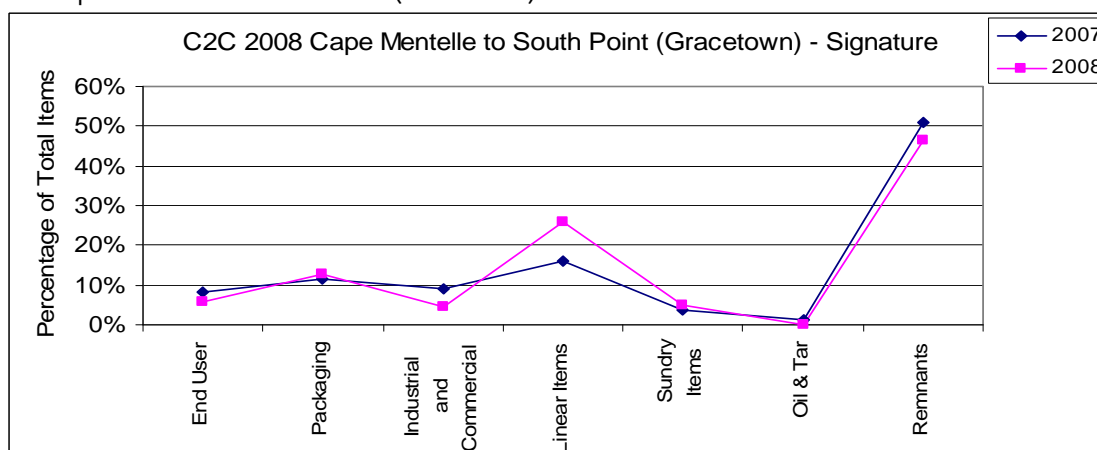


Figure 15

Category	Most Numerous Items
End User	Fishing Floats, Shoes, Cigarette Butts, Cigarette Lighters
Packaging	Plastic Drink Bottles, Food Wrap, Plastic Containers, Glass Drink Bottles, Aluminium Cans
Industrial & Commercial	Bait Containers & Lids, Buoys & Floats
Linear	Rope, Strapping Band
Sundry Items	Wood, Rubber
Oil & Tar	No oil found
Remnants	Pieces of Plastic, Lids & Tops, Broken Glass
<b>2 Most Affected Sites</b>	Ellensbrook South, Ellensbrook under lookout

Table 8

## 7.6 South Point to Cape Clairault

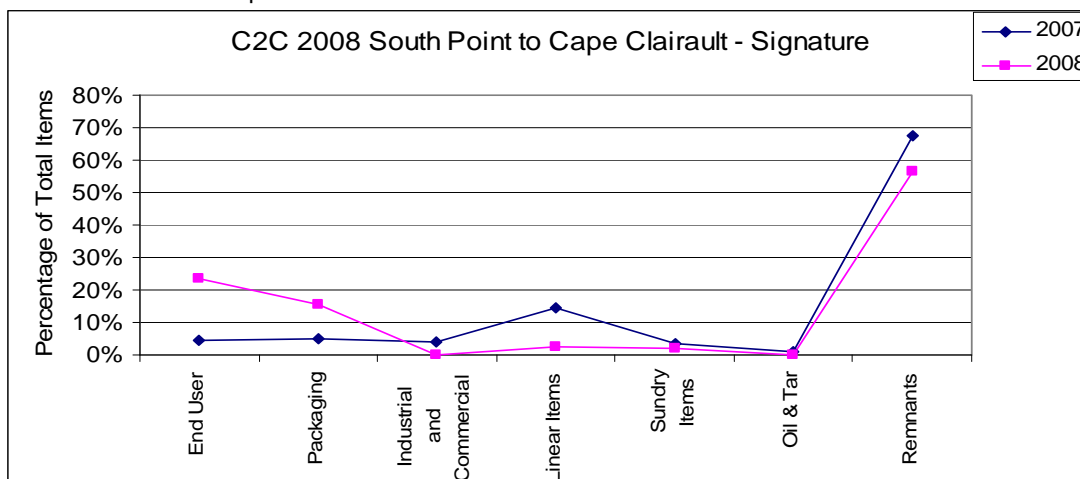


Figure 16

Category	Most Numerous Items
End User	Cigarette Butts, Binding/Thread/String, Cloth & Clothing, Straws & Stirrers
Packaging	Food Wrap, Plastic Drink Bottles, Aluminium Cans
Industrial & Commercial	Buoys & Floats, Bait Containers & Lids
Linear	Rope, Strapping Band
Sundry Items	Wood, Metal, Rubber
Oil & Tar	4 oil globules found
Remnants	Broken Glass, Pieces of Plastic, Polystyrene Pieces
<b>2 Most Affected Sites</b>	Wyadup, Gallows

Table 9

## 7.7 Cape Clairault to Cape Naturaliste

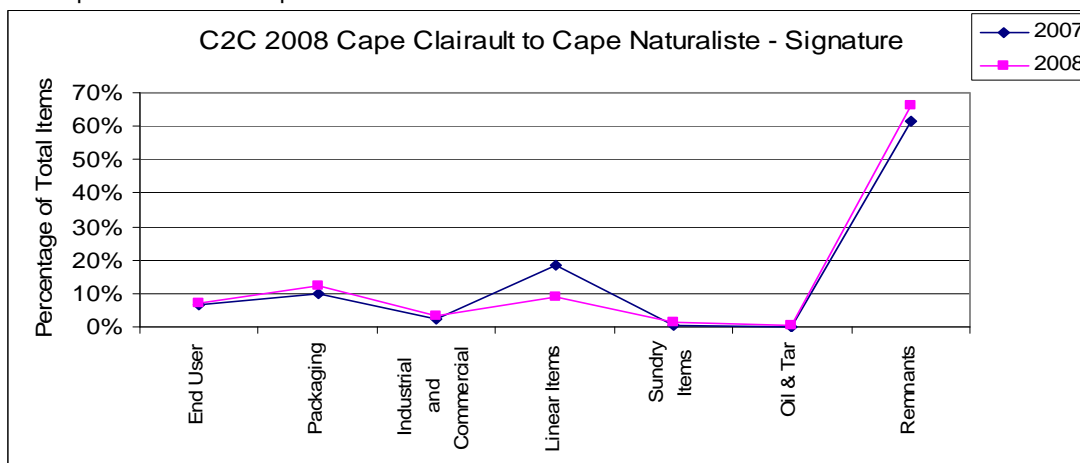


Figure 17

Category	Most Numerous Items
End User	Cigarette Butts, Cloth & Clothing, Straws & Stirrers
Packaging	Food Wrap, Plastic Drink Bottles, Plastic Wrap Non Food
Industrial & Commercial	Lobster Traps, Cylume Sticks, Bait Containers & Lids
Linear	Rope, Strapping Band, Fishing Line
Sundry Items	Wood, Rubber
Oil & Tar	26 oil globules found between Windmills and Lighthouse Beach
Remnants	Pieces of Plastic, Plastic Bag Remnants, Broken Glass
<b>2 Most Affected Sites</b>	Windows to Lighthouse, Three Bears, Yallingup Beach

Table 10



## 7.8 Cape Naturaliste to Dunsborough

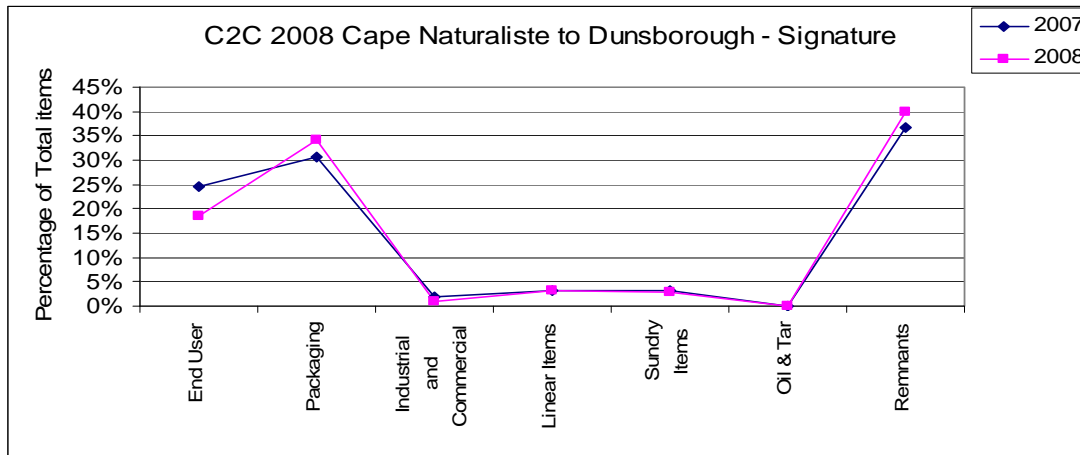


Figure 18

Category	Most Numerous Items
End User	Cigarette Butts, Shoes, Cloth & Clothing, Straws & Stirrers
Packaging	Paper & Cardboard, Plastic Bags, Plastic Containers, Aluminium Cans, Glass Drink Bottles
Industrial & Commercial	Bait Containers & Lids
Linear	Rope, Fishing Line
Sundry Items	Building Materials, Plastic Pipe, Wood
Oil & Tar	4 oil globules found
Remnants	Broken Glass, Pieces of Plastic, Lids & Tops
<b>2 Most Affected Sites</b>	<b>Dunsborough Primary School Boat Ramp Area, Meelup Beach</b>

Table 11

## 7.9 Busselton Area

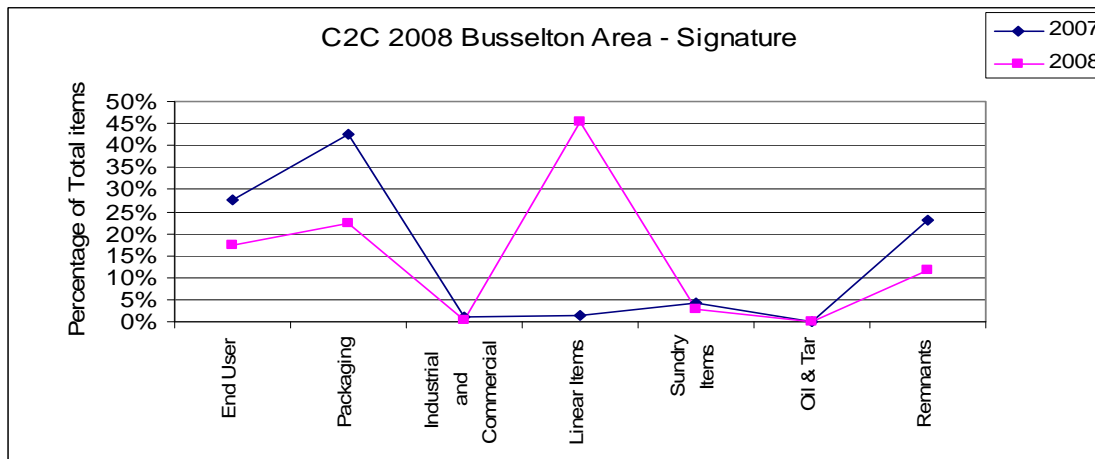


Figure 19

Category	Most Numerous Items
End User	Cigarette Butts, Fishing Lures, Straws & Stirrers, Cloth & Clothing
Packaging	Food Wrap, Glass Drink Bottles, Plastic Wrap Non Food, Aluminium Cans
Industrial & Commercial	Bait Containers & Lids
Linear	Fishing Line
Sundry Items	Metal, Plastic Pipe
Oil & Tar	No oil found
Remnants	Broken Glass, Pieces of Plastic, Lids & Tops
<b>2 Most Affected Sites</b>	<b>Busselton Jetty Underwater Clean Up, Busselton Jetty to Siesta Park</b>

Table 12

## 7.10 Capel Shire Beaches

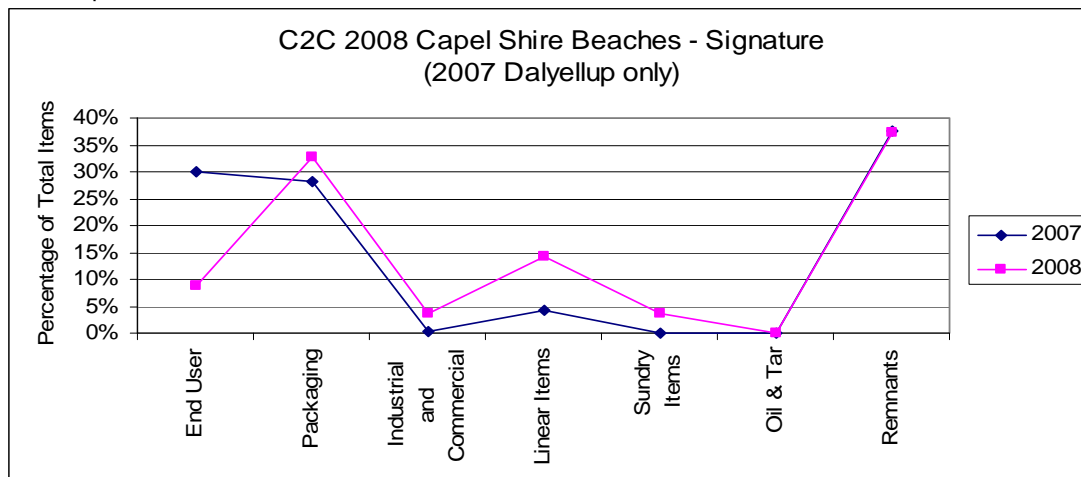


Figure 20

Category	Most Numerous Items
End User	Cloth & Clothing, Straws & Stirrers, Cigarette Butts, Shoes
Packaging	Plastic Drink Bottles, Glass Drink Bottles, Aluminium Cans, Food Wrap
Industrial & Commercial	Buoys & Floats, Bait Containers & Lids
Linear	Rope, Plastic Strapping Band
Sundry Items	Wood, Plastic Pipe
Oil & Tar	No oil found
Remnants	Pieces of Plastic, Broken Glass, Plastic Bag Remnants
<b>2 Most Affected Sites</b>	<b>Minninup Beach, Stirling Beach</b>

Table 13

## 7.11 Preston Beach

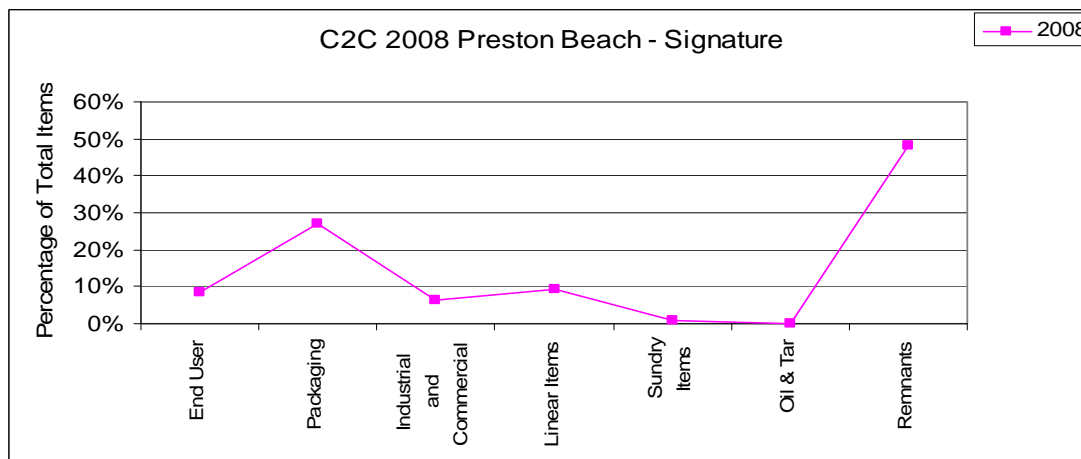


Figure 21

Category	Most Numerous Items
End User	Straws & Stirrers
Packaging	Plastic Bags, Aluminium Cans
Industrial & Commercial	Bait Containers & Lids
Linear	Plastic Strapping Band
Sundry Items	Rubber
Oil & Tar	No oil found
Remnants	Plastic Bag Remnants, Lids & Tops
<b>Single Site</b>	

Table 14

## 7.12 Mandurah Beaches

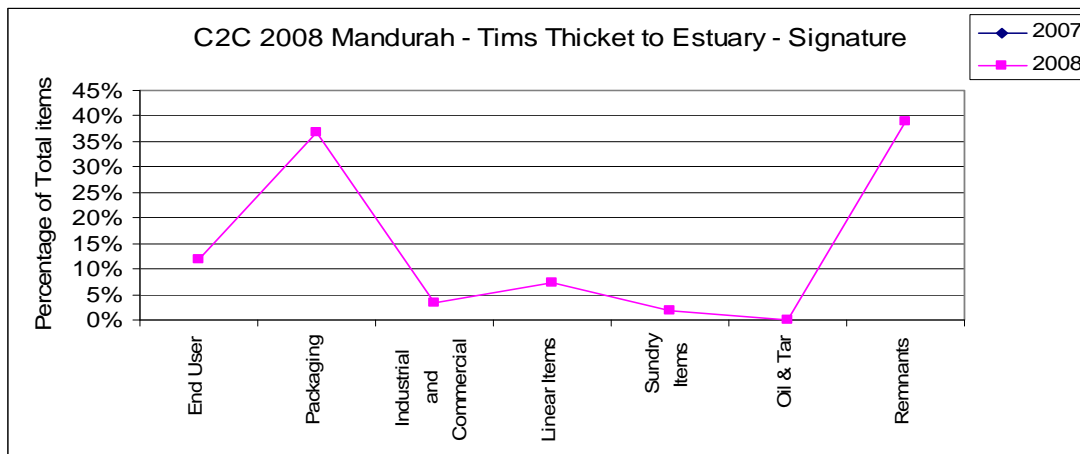


Figure 22

Category	Most Numerous Items
End User	Cigarette Butts, Straws & Stirrers
Packaging	Aluminium Cans, Glass Drink Bottles, Plastic Drink Bottles
Industrial & Commercial	Crab/Lobster/Fish Traps
Linear	Rope
Sundry Items	Rubber
Oil & Tar	No oil found
Remnants	Broken Glass, Plastic Bag Remnants, Pieces of Plastic
2 Most Affected Sites	Tim's Thicket to Melros, Seascapes Beach Halls Head

Table 15

## 7.13 Marmion Marine Park

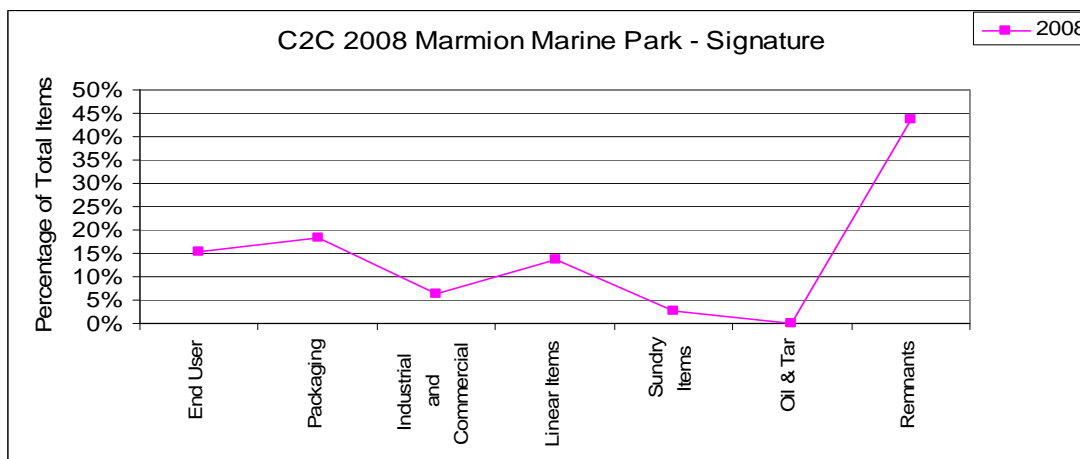


Figure 23

Category	Most Numerous Items
End User	Straws & Stirrers, Cigarette Butts, Cloth Clothing
Packaging	Paper & Cardboard, Plastic Bags, Plastic Drink Bottles, Bait Bags & Packaging
Industrial & Commercial	Bait Containers & Lids
Linear	Rope, Plastic Strapping Band, Fishing Line
Sundry Items	Wood
Oil & Tar	1 oil globule found
Remnants	Pieces of Plastic, Lids & Tops
Single Set of Data	The Friends of Marmion Marine Park conducted this clean up which included ten sites. A detailed report was produced by the group.

Table 16

## 8. Debris Signatures for Differing Coastal Sections

The following signatures show the general pattern of marine debris for the different facing coastal sections.

### South Facing Coast (East Augusta to Cape Leeuwin)

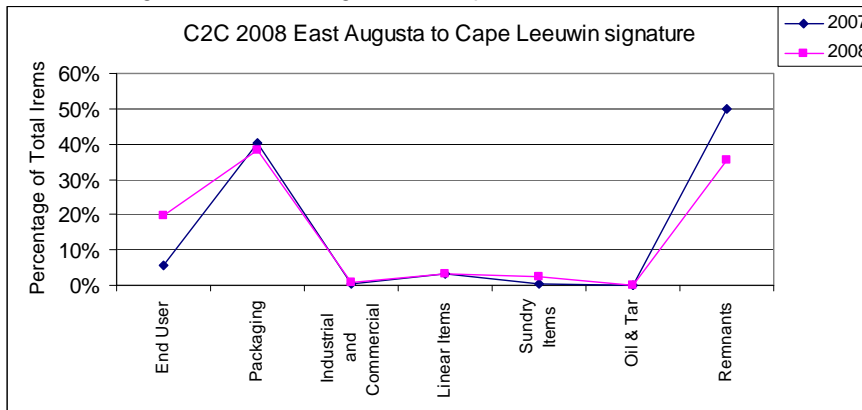


Figure 24

Starting at East Augusta the data reflects littering in the high usage areas in and around Augusta together with high remnant items which were distributed throughout the area.

### Cape to Cape Coast (Cape Leeuwin to Cape Naturaliste)

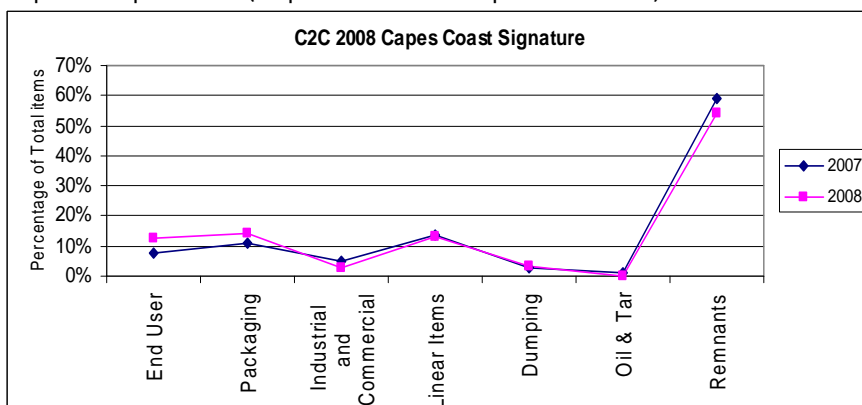


Figure 25

Moving around Cape Leeuwin to the West facing Cape to Cape coast the strong tendency for debris to fragment in this environment is evident in the high remnant numbers.

### Dunsborough Area (Cape Naturaliste to Whalers Cove)

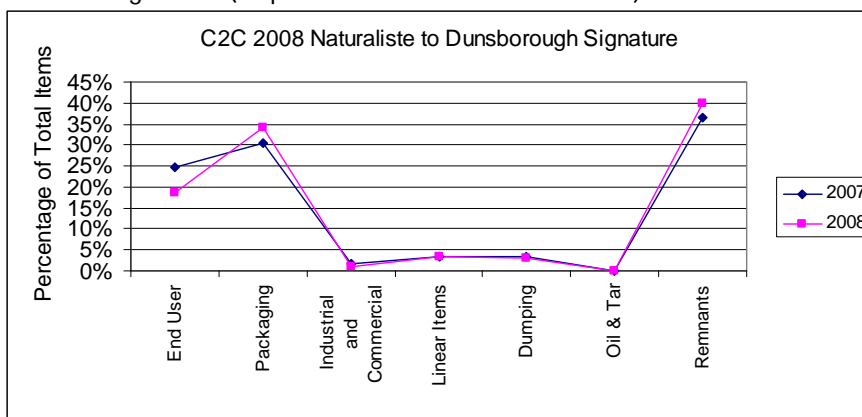


Figure 26

Once around Cape Naturaliste and into the sheltered and highly visited area of Geopraphe Bay, packaging and end user items begin to take over as the dominant feature.

### Busselton Area (Siesta Park to Busselton Jetty Foreshore)

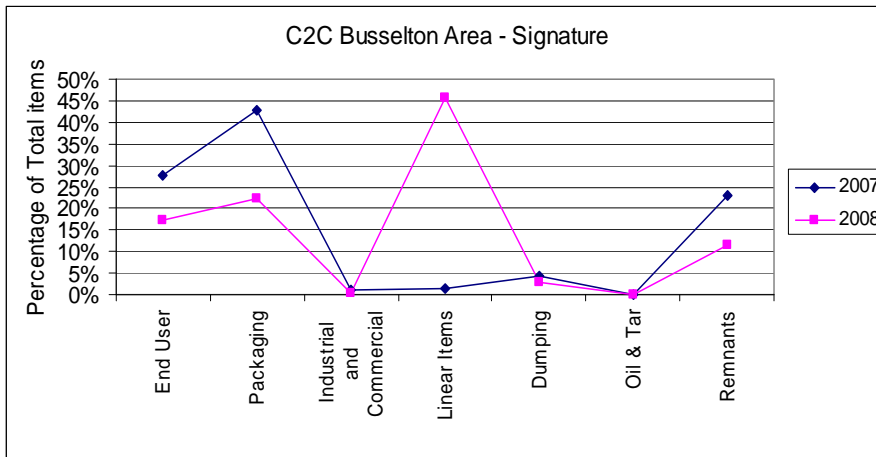


Figure 27

In the Busselton area the impact of beach and jetty users predominates in the data. The linear data shows 1.2km of fishing line recovered from beneath the jetty in the underwater part of the clean up. Remnants included items such as lids and tops and broken glass which are mostly litter related items in the context of this area.

### Capel Shire Beaches

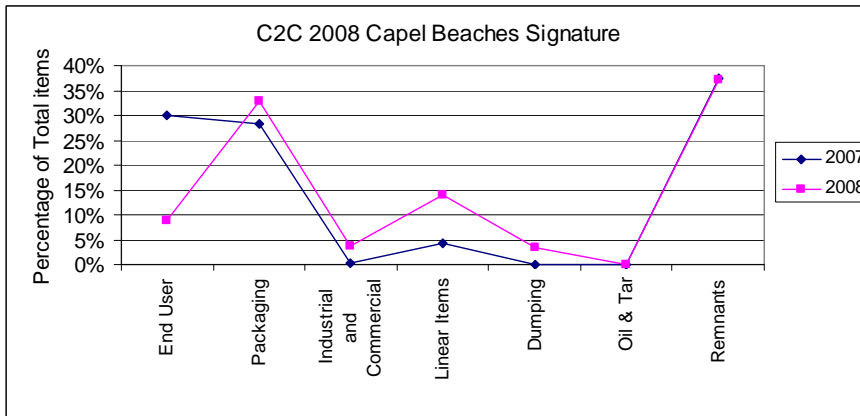


Figure 28

Note: 2007 curve represents Dallyellup Beach only.

Moving North along Geographe Bay the Capel Shire beaches show continuing high packaging numbers but the context of the overall data suggests some of this debris is from offshore or has accumulated over time. Remnants are also reasserting their background presence.

### West Coast

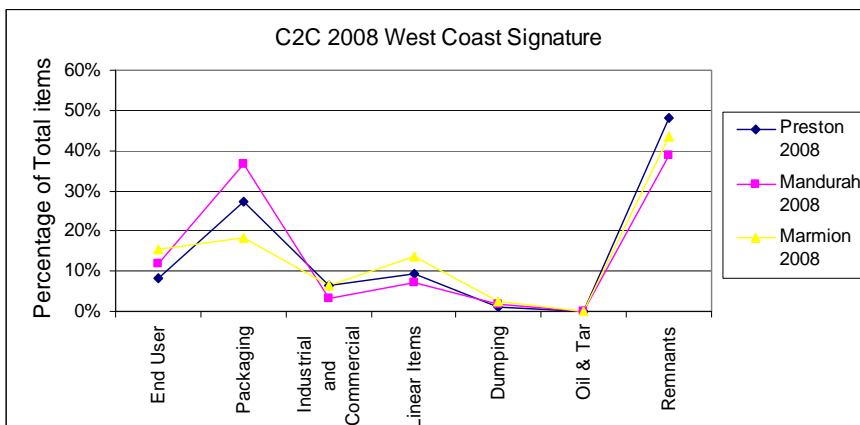


Figure 29

Along the West coast the high percentage of packaging data shows the continuing litter problem. The remnant items, lids and tops and broken glass featured strongly in Mandurah and Marmion Marine Park indicating that remnants here were partly litter related.

## 9. Attachment 1

Table of Areas and Sites

Area/Site	Total Items	Length km	Items/Metre
<b>East Augusta to Cape Leeuwin</b>			
Augusta East	329	1	0.33
Augusta Primary School - Blackwood River foreshore	215	1	0.22
Augusta Colour Patch to Flinders Bay	398.75	2.2	0.18
Augusta Flinders Bay to Dead Finish	102	0.5	0.20
Augusta Dead Finish	94.25	0.5	0.19
Augusta Dead Finish to Lookout	331	0.5	0.66
Augusta Ringbolt Bay to Lighthouse	42	0.3	0.14
<b>East Augusta to Cape Leeuwin Totals/ Average</b>	<b>1512</b>	<b>6</b>	<b>0.25</b>
<b>Cape Leeuwin to White Point (Hamelin Bay)</b>			
Augusta Lighthouse to Quarry Bay	190	1	0.19
Skippy Rock	175	0.6	0.29
Deepdene South	1917	2.5	0.77
Deepdene North	290	1.5	0.19
Cosy Corner	227	1	0.23
Foul Bay South	88	1	0.09
Foul Bay North	79	1	0.08
Stinkies	78	2.5	0.03
<b>Cape Leeuwin to White Point Totals/ Average</b>	<b>3044</b>	<b>11.1</b>	<b>0.34</b>
<b>White Point to Cape Freycinet</b>			
Hamelin Bay - Bob's Track - Grace Rd	555	8	0.07
Boranup Beach	878	6	0.15
<b>White Point to Cape Freycinet Totals/ Average</b>	<b>1433</b>	<b>14</b>	<b>0.09</b>
<b>Cape Freycinet to Cape Mentelle</b>			
Conto's	110	1	0.11
Redgate Beach	144	1	0.14
Boodjidup Beach	72.2	1.5	0.05
Gas Bay	317	2	0.16
Gnarabup Boat Ramp & Beach	349	2	0.17
Prevelly – Surf Pt – Georgette Rd	54.75	0.75	0.07
<b>Cape Freycinet to Cape Mentelle Totals/ Average</b>	<b>1046.95</b>	<b>8.25</b>	<b>0.13</b>
<b>Cape Mentelle to South Point (Gracetown)</b>			
Margaret River mouth to Joey's Nose	67	12	0.01
Joey's Nose to Gnoocardup	264	1	0.26
Ellensbrook South	604	2	0.30
Ellensbrook – 19.10.08	54	1.5	0.04
Ellensbrook Under Lookout	383	1	0.38
Ellensbrook to Lefties	230	3	0.08
Gracetown South Point to Lefties	195	2	0.10
<b>Cape Mentelle to South Point (Gracetown) Totals/ Average</b>	<b>1797</b>	<b>22.5</b>	<b>0.08</b>
<b>South Point to Cape Clairault</b>			
Gracetown Cowaramup Bay 17.10.08 Cowaramup Primary School	539	1	0.54
Gracetown South Point to North Point	216.95	1.5	0.14
Gracetown North Point to Veryiucia Creek	136	3.5	0.04
Guillotines	191.25	1	0.19
Gallows	432.5	2	0.22
Wyadup	1022	1	1.02

Willyabrup Nth	121	1	0.12
Moses Rock	221	1	0.22
Quinninup	234.3	3	0.08
<b>South Point to Cape Clairault Totals/ Average</b>	<b>3114</b>	<b>15</b>	<b>0.21</b>
<b><i>Cape Clairault to Cape Naturaliste</i></b>			
Injidup – clean up 1	315	6.5	0.05
Injidup – clean up 2	137.5	1	0.14
Canal Rocks South	725	2	0.36
Smiths Beach	564	1.5	0.38
Yallingup Beach	672	1.5	0.45
3 Bears	688	1.2	1.38
Sugarloaf Rock North	586	0.8	0.73
Windmills to Lighthouse Beach	2276	3	0.76
<b>Cape Clairault to Cape Naturaliste Totals/ Average</b>	<b>5963.5</b>	<b>17.5</b>	<b>0.35</b>
<b><i>Cape Naturaliste to Dunsborough</i></b>			
Bunker Bay	126	1.5	0.08
Eagle Bay Dog Beach	77.7	1.25	0.06
Pt Piquet to Eagle Bay & Gannet Rock	23	2.5	0.01
Meelup Beach	572	2	0.29
Castle Rock	174	1.5	0.12
Quindalup Boat Ramp	200	1	0.20
Dunsborough – Old Dunsborough	84	2	0.04
Dunsborough Foreshore	61	5	0.01
Dunsborough Primary School 23.11.08 Boat Ramp – Beach Rd	578	2	0.29
Dunsborough Beach to Elmore St to Whalers Cove	40	0.5	0.08
<b>Cape Naturaliste to Dunsborough Totals/ Average</b>	<b>1935.7</b>	<b>19.25</b>	<b>0.10</b>
<b><i>Busselton Area</i></b>			
Busselton Jetty to Siesta Park	602	2	0.30
Busselton Foreshore Queen Elizabeth Rd – Jetty	553	3	0.18
Busselton Jetty Foreshore	73	10	0.01
Busselton Jetty Underwater Clean Up	1479	1.2	1.23
<b>Busselton Area Totals/ Average</b>	<b>2707</b>	<b>16.2</b>	<b>0.17</b>
<b><i>Capel Shire Beaches</i></b>			
Capel - Forrest Beach	246	3	0.08
Capel - Peppermint Grove Beach	360	2	0.18
Capel - Stirling Beach	444	2	0.22
Capel - Minninup	678	2	0.34
Dallyellup Beach	216	10	0.02
<b>Capel Shire Beaches Totals/ Average</b>	<b>1944</b>	<b>19</b>	<b>0.10</b>
<b><i>Preston Beach</i></b>			
Preston Beach	206	1.5	0.14
<b>Preston Beach Totals/ Average</b>	<b>206</b>	<b>1.5</b>	<b>0.14</b>
<b><i>Mandurah Beaches</i></b>			
Tim's Thicket to Melros Beach	324	5	0.06
Mandurah - Dodies Beach to Blue Bay Halls Head	32	1.5	0.02
Mandurah Seascapes Beach Halls Head	195.5	1	0.20
Mandurah Soldiers Cove	136	1	0.14
<b>Mandurah Beaches Totals/ Average</b>	<b>687.5</b>	<b>8.5</b>	<b>0.07</b>
<b><i>Marmion Marine Park</i></b>			
Marmion Marine Park	972	0.9	1.08
<b>Marmion Marine Park Totals/ Average</b>	<b>972</b>	<b>0.9</b>	<b>1.08</b>
<b>72 Sites Totalling/ Averaging</b>	<b>26362.65</b>	<b>159.5</b>	<b>0.24</b>

## 10. Notes

1. Accrued offshore and longshore debris refers to debris which was blown ashore sometime during the winter period. This debris can come from either the open ocean or from upstream of the site via localised inshore currents and longshore movement.
2. Debris from lobster fishing activities is prominent due to its proximity to the coast. Debris from long-line fishing activity may also be significant but being located well off the coast only part of this will reach the local coast.
3. Plastic resin pellets, generally disappear from view at this time of year due to burial in the warmer and dry conditions.
4. Data and reports are available from the author.
5. While the items per metre of site statistics are to an extent an approximate measure it does provide a cross reference with which to assess the amount of debris at a given site or across an area. Site length measurement is usually recorded as estimation by the clean up participant, sometimes measured off a map and sometimes accurately measured. Whether the clean up participants remain within or go beyond the area they have defined also comes into play. Generally, however, the lengths are reasonably accurate.
6. TBOCS has been lobbying for safer forms of packing tape to be used for a number of years. We are currently researching ways of monitoring the beaching of strapping bands. An initial report is available on request.