



Marine Litter Strategy for the Firth of Clyde Step 1: Defining the status quo

Prepared by

Kirstie Dyson

Firth of Clyde Forum

with support from

Marine Conservation Society

University Marine Biological Station Millport

1 Background

1.1 Introduction

The Firth of Clyde Marine Spatial Plan¹ (the Plan) approved by Marine Scotland on the 28 July 2010, establishes an overarching policy framework to facilitate the sustainable development of activities within the Firth of Clyde. The use of the Plan is voluntary, however many of the Local Authorities in the Firth have agreed to use it as supplementary guidance within their planning process. The Plan was developed during a 3 year project initiated by the Scottish Government and was one of four projects designed to give guidance on how Regional Marine Planning could be achieved for the whole of Scotland. The Plan, completed in March 2010, was given by Marine Scotland to the Firth of Clyde Forum (FoCF) to implement. The FoCF is a voluntary partnership set up to promote an integrated approach to managing the environmental, economic and community resources of the Firth of Clyde. The partnership involves local authorities, public agencies, landowners, businesses, environmental organisations, fisheries, community groups and interested individuals.

1.2 Policy ENV 10: Marine Litter Strategy

This report has been driven by policy ENV 10 of the Firth of Clyde Marine Spatial Plan, which calls for a:

“coordinated marine litter strategy for the Firth of Clyde that should be developed, taking account of any national strategy introduced. This should include establishing a systematic monitoring network in the Firth of Clyde to assess the extent of the problem, identify priority areas and the main sources of marine litter and debris. Existing initiatives should be supported in the efforts to combat the problem of marine litter. These include: Fishing for Litter; the Green Blue; MCS Adopt a Beach and Beachwatch; Bag it and Bin it; Keep Scotland Beautiful; Surfers Against Sewage and the GRAB Trust.”

The aim of this report is to provide a baseline of beach cleaning activity currently taking place within the Firth of Clyde and the sources and extent of marine litter found on these beaches. From this baseline a comprehensive strategy for dealing with marine and coastal litter can be built.

This report will provide a background to the beach cleaning activities currently taking place within the Firth of Clyde. It will explore where and how beaches are being cleaned (mechanical or manual) and by whom (Local authorities or voluntary groups). Using the data provided by the Marine Conservation Society it will give a flavour of the types of beach litter found and the amount of litter collected from the Firth. This report will provide background information to develop a Marine Litter Strategy for the whole of the Firth of Clyde; the Firth of Clyde Forum is in a positive position to bring together all the parties involved in beach cleaning activities in order to develop a coordinated strategy.

[‘Status Quo’ report](#) → [FoC Marine Litter Strategy](#) → [Implementation](#) → [Monitoring](#)

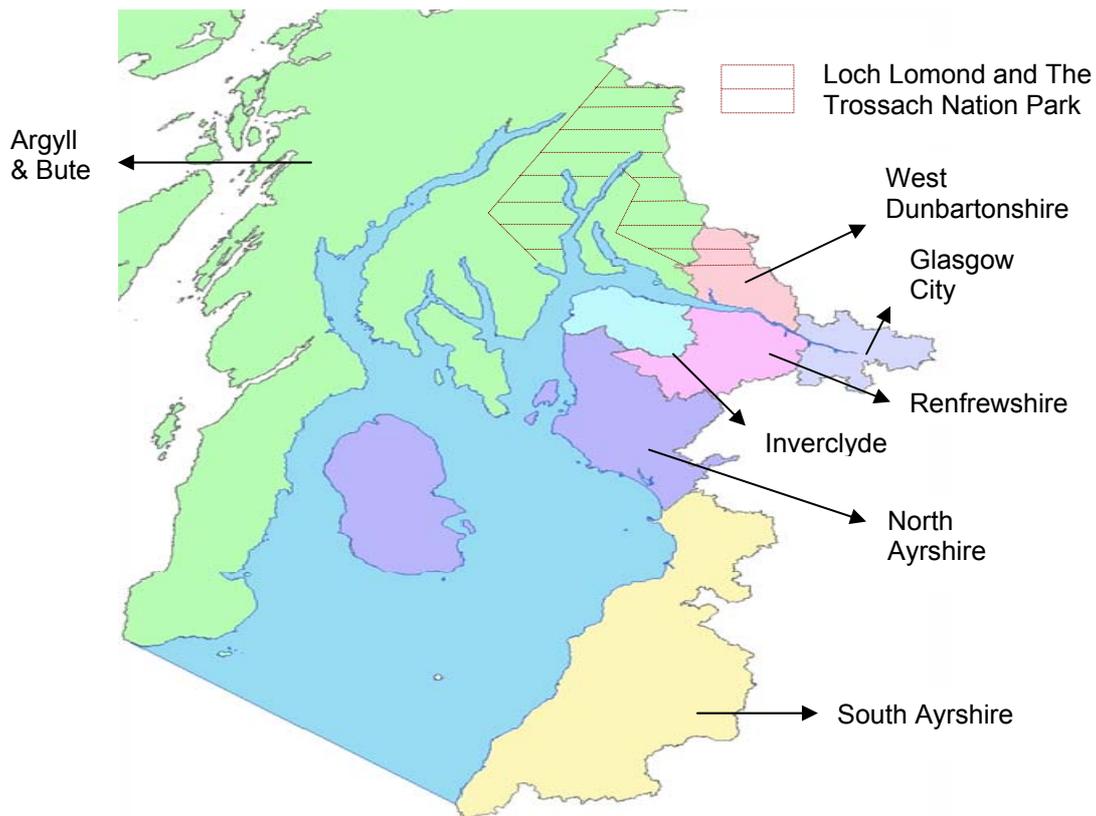
¹ Donnelly, J. E., Thompson, K., Ross, D. 2010. Scottish Sustainable Marine Environment Initiative; Firth of Clyde Marine Spatial Plan. www.clydeforum.com

1.3 Firth of Clyde Area boundaries

The outer Western boundary of the Area where the Firth meets the Irish Sea extends from Finnarts Point, north of Loch Ryan, across the mouth of the Firth to the tip of the Mull of Kintyre. The area extends north to the heads of Loch Long and Loch Fyne and east along the River Clyde Estuary to the tidal weir in the heart of Glasgow City. The area encompasses the marine and tidal extents of the Frith of Clyde including the River Clyde Estuary, the Inner Firth and associated sea lochs, and the Outer Firth. The area defined here as the Firth of Clyde is bordered by 7 local authorities and Loch Lomond and The Trossachs National Park; when developing a Strategy for the Firth of Clyde all these groups will need to be consulted.

Local Authorities

1. South Ayrshire
2. North Ayrshire
3. Inverclyde
4. Renfrewshire
5. Glasgow City
6. West Dunbartonshire
7. Argyll and Bute
8. Loch Lomond and The Trossachs National Park



1.4 Marine and coastal litter

Litter can be defined as anything that is thrown down, dropped or deposited and left that causes defacement, in a public place². In other words marine litter is abandoned objects that do not occur naturally in the marine and coastal environment. This includes the water surface, water column, seabed and seashore.

Coastal and marine litter is usually grouped into eight main material groups

- | | |
|------------|----------------|
| 1. Plastic | 5. Paper |
| 2. Glass | 6. Rubber |
| 3. Metal | 7. Wood |
| 4. Cloth | 8. Polystyrene |

A separate category, sewage related debris (SRD), defines a range of items made from different material types which enter the marine environment from our sewer network. SRD, whilst being a litter problem in itself, also indicates faecal contamination of the water column that is a risk to human health.

Keep Scotland Beautiful³ recognises four main origins of marine and coastal litter; beach visitors, our sewage network, the fishing industry and the shipping industry. Beach litter is not only unsightly; it is also having a knock-on effect on the local economy, human health and wildlife. Marine and coastal litter is unsightly and could be damaging to the Scottish tourism industry by putting people off revisiting an area. Broken glass, sewage related debris, rusting metal and discarded medical waste pose a health risk to beach visitors and can harm and/or kill wildlife through entanglement or ingestion. It is also affecting the fishing and shipping industry by fouling propellers and blocking intake pipes. Fishing boats are subjected to damaged nets and contaminated catch. The removal of marine and coastal litter is costing considerable amounts of money each year. Worryingly, OSPAR figures show that beach litter is becoming a greater and more prevalent problem affecting not only the UK but the whole world⁴. They estimate that some 8 million items of marine litter are being dumped in oceans and seas every day, accumulating to about 6.4 million tonnes per year. Over 46,000 pieces of plastic litter are floating on every square kilometre of ocean today. In the Central Pacific, there are up to 3 kilogrammes of marine litter to every kilogramme of plankton.

1.5 Other groups involved in marine litter collection within the Firth of Clyde

National Bodies:

- Marine Conservation Society (MCS) – Adopt a Beach and Beachwatch are coastal environmental initiatives organised by the MCS, involving local individuals, groups and communities in caring for their coastal environment. A nationwide beach clean-up and litter survey takes place annually, always on the third weekend of September to coincide with the International Coastal Clean.

² The Environmental Protection Act 1990, Section 87

³ Keep Scotland Beautiful. 2009. Litter & Scottish beaches: A guide for the public & practitioners. www.keepsotlandbeautiful.org.uk/coastal

⁴ OSPAR commission. Marine Litter: Preventing a sea of plastic. www.ospar.org/html_documents/ospar/html/marine_litter_unep_ospar.pdf

- Keep Scotland Beautiful (KSB) – devotes a small amount of time to marine litter issues around the Scottish coastline. They can provide practical advice and equipment, and encourage individual, group and communities to take the initiative to collect litter on local beaches. KSB encourages involvement with the MCS schemes.
- Green Blue – is an environmental awareness initiative by the British Marine Federation and the Royal Yachting Association. It promotes the sustainable use of coastal and inland waters by boating and water sports participants, and the sustainable operation and development of the recreational boating industry.
- The Local Authorities International Environmental Organisation's (known as KIMO), Fishing for Litter – is an initiative that engages the support of the fishing industry in tackling marine litter by providing litter bags for fishermen to fill and deposit on the quayside for collection. The scheme is being adopted by an increasing number of vessels operating out of Scotland's Designated Landing Ports. This project has now reached the end of its funding, although due to its success it is hoped that funding will be continued. Within the Clyde, the scheme is available at Troon, Rothesay, Campbeltown and Tarbert.
- Surfers Against Sewage – campaigns for clean, safe recreational waters, free from sewage effluents, toxic chemicals, marine litter and nuclear waste in the UK. One of the current campaigns encourages the public to return identifiable items of beach litter to the producer; it also targets producers in general to make packaging more sustainable and increase anti-litter advertising.

Local partnerships:

- Group for Recycling in Argyll and Bute (GRAB trust) – the Beaches and Marine Litter Project aims to promote and enhance the sustainability of beaches within Argyll and Bute. It has set up a beach forum for those individuals, community groups and organisations that actively help to manage the beaches of Argyll and Bute. It also organises beach cleans and runs marine litter workshops in schools to warn of the adverse effect of marine litter.
- Helensburgh East Esplanade Protection Group – is a community group that meets monthly to clear areas of East Helensburgh Esplanade from marine litter.
- Beachwatch Bute - charitable organisation formed to monitor the condition of the beaches and shorelines of the Isle of Bute.

1.6 Government marine litter strategy in development

Marine Scotland is currently leading the development of a Scottish marine litter strategy. The Scottish Government recognises that marine and coastal litter is derived from a number of sources and is a challenging problem that incorporates both land and marine issues. The prevention and control of marine pollution from shipping is an issue reserved to the UK Government and the Scottish marine litter strategy will involve co-ordination on these issues. Under the Marine Strategy Framework Directive, Marine Scotland has specific requirements to meet regarding marine litter under Descriptor 10. The Descriptor states that "properties and quantities of marine litter do not cause harm to the coastal and marine environment".

To fulfil this descriptor, Marine Scotland Science needs to monitor the amount of litter in Scotland's seas. In order to do this, litter monitoring commenced in January 2009 with the Clean Seas Environment Monitoring Programme (CSEMP) cruise. During the trawling operations, any litter collected was recorded and as part of the programme this monitoring will continue on an annual basis. In addition, Marine Scotland's research vessels will begin routine marine litter monitoring on all other cruises from 2010 and 2011.

1.7 Legal requirements for beach litter collection

The Environmental Protection Act 1990 (EPA) makes 'Duty' bodies responsible for keeping beaches clear of litter and refuse. It also gives both local authorities and members of the public rights to take legal action to get areas cleaned up. 'Duty' bodies are organisations with a legal responsibility for keeping specified public places clear of litter and refuse. These bodies include local authorities and statutory undertakers such as landowners, and road and rail operators. The 'Duty' bodies are responsible for making sure that beaches under their control are kept free from litter and refuse, as far as is practicably possible and within reason. Details for compliance can be found in the Code of Practice on Litter and Refuse (Scotland) 2006, which accompanies Part IV (section 89) of the EPA.

1.8 Strandline ecosystems

The collection of seaweeds and other organic debris at the high water mark, often referred to as the strandline, is an important habitat for both marine and terrestrial invertebrates. Sandy beaches are often nutrient depleted environments, and therefore the input of organic carbon represents an extremely important source of nutrient. The decaying material fuels secondary production that can support a rich and diverse invertebrate community. The seaweed provides an important link in the food chain as it provides a unique habitat for amphipods which are the food of other invertebrates such as fish and birds.

The strandline may provide shelter and nutrients for pioneering plants that are important in the formation of sand dunes. The few plant species that are adapted to living on the foreshore are of great ecological importance in sand dune formation as they enable the formation of embryonic dunes and subsequently foredunes⁵. The importance of sand dunes as a coastal defence is now accepted internationally; they are a natural solution to sea level rise, an acknowledged consequence of climate change.

The majority of beach cleaning activities take place during the summer months when beach tourism is at its highest. This coincides with invertebrate communities being highly active and needing to consume the greatest quantity of food. Amphipods are dependent on the strandline seaweed as a food source. If this is removed during aggressive beach cleaning, it will have a detrimental effect on amphipod numbers. Further up the food chain other invertebrates that feed on them such as fish and birds could also be affected by mechanically clearing strandline litter. It is thought that beach cleaning using a tractor and rake can reduce or prevent the establishment of seedlings in the upper beach; as with invertebrates, the summer period is the time

⁵ Hannan, F., Cowie, P. R. (2009) The potential risks to human health posed by living, attached seaweeds and dead, beachcast material associated with sandy beaches: a preliminary report. Environment Agency report. Pg 30. ISBN: 978-1-84911-133-1

for maximum growth and seedlings are dependent on the strandline to provide shelter, moisture and nutrients. If these plants are removed or prevented from growing because of litter clearance this will prevent the formation of embryonic sand dunes and ultimately, in time, could cause the collapse of sand dune systems. As sand dunes are important as natural coastal defences, it would seem prudent to act cautiously to preserve them as the alternative cost of engineered coastal defences is huge.

The importance of strandline seaweed to fauna and flora might not be obvious to the average beach tourist who may perceive it as being messy and smelly, and may believe that it reduces the enjoyment of the beach experience. It might be necessary to alert beach tourists by way of notice boards about the importance of seaweed to the beach ecosystem. An explanation as to why a beach is not free of seaweed could change public opinion.

In Guernsey, guidance has been developed on how to clean beaches and prevent seaweed building up that may cause a problem for beach tourism. The guidelines encourage manual beach cleaning so only anthropogenic litter is collected. If seaweed is causing a problem for tourism it can be picked up by mechanical means (after a litter pick) and put back in the sea. This is done at low tide springs to allow the sand to be washed off and accumulate back on the beach; the seaweed can be dispersed but not lost from the system.

2 Data collection

2.1 Methodology

Names and email addresses for Council representatives engaged with marine litter removal were found on the Keep Scotland Beautiful (KSB) website⁶. Where an address was given, an email was sent requesting information on all marine and coastal litter cleaning events and activities that had taken place over the period, April 2009 to March 2010. Details such as beach name, date of clean-up, nature of clean-up (i.e. responding to public concern or voluntary group initiative) were asked for. Each Local Authority (LA) was also asked if mechanical cleaning (tractor pulling rake or similar) took place and on which beaches and how often this occurred. If no response was received within two weeks it was followed up with a phone call and the email message was resent. Of the seven LAs contacted, West Dunbartonshire and Glasgow City Council did not respond. Glasgow City Council has a post-industrial waterfront but does not have beaches and this was perhaps why the enquiry was dismissed. However, the Forum was already aware of, and has information on, the waste disposal boat owned by Glasgow City Council, which patrols the Inner Clyde Estuary. Due to the data already known no action was taken to obtain further information.

Further data sets were obtained from Keep Scotland Beautiful and the Marine Conservation Society. This data set was made freely available providing all

⁶ www.keepsotlandtidy.org/documents/CleanUpContacts.pdf

publications acknowledged MCS as the provider. This data set was cleaned to remove duplicates and erroneous beaches not present in the Firth of Clyde.

2.2 Format of data received

The data received from the five LAs, ranged from minimal information on beach name and month cleaned to more expansive additional information on promenade cleaning, litter bins and 'doggy bin' collections. The data received from the Ayrshire Councils was the most comprehensive, however none of the LAs could give information on the type (plastic, glass, wood etc) of litter being collected or even the amount (weight or number of bags). South Ayrshire could have provided a total tonnage for the year, collected from mechanically cleaned beaches but this weight would have included naturally occurring organic material (e.g. seaweed and sand) which is not litter and would have biased the figures.

The data received from MCS from their Adopt a Beach and Beachwatch cleaning campaigns was the only data set that had information on the source and quantity of litter collected. The information gathered is from volunteers, so the geographical and temporal (over the year and throughout the 10 years surveying) spread of data is not evenly distributed. The largest percentage of beaches cleaned took place in 2009 (23%) and most clean-ups took place in September during the Beachwatch survey (66%). The geographical distribution of beach cleans, taking into account each Local Authority's length of coastline, is greatest (i.e. over represented) in South Ayrshire and Inverclyde and smallest (i.e. under represented) in Argyll and Bute.

Table 1 Geographical distribution of survey data in the Firth of Clyde

Local Authority	Total Surveys ¹	Coastline (Km) ²	% Coastline ³	Desirable no. surveys ⁴
Argyll & Bute	70	475	64	95
Ayrshire – North (inc. Islands)	26	140	19	28
Ayrshire – South	33	70	9	14
Inverclyde	14	25	3	5
Renfrewshire	1	15	2	3
West Dunbartonshire	4	15	2	3

¹ Total number of MCS surveys taken from Sept 2000 until Sept 2010 from each LA within the Clyde Estuary boundary.

² Calculated as the total length of coastline for each LA within the Clyde Estuary boundary

³ Proportion of LA coastline within the Firth of Clyde (x 100)

⁴ Calculates the number of beaches needed to get a reasonable indication of the state of the whole coastline.

Table 2 Temporal distribution of data in the Firth of Clyde

Survey type	No. of surveys	% of data
Beachwatch (3 rd week in Sept.)	89	66%
Spring	21	16%
Summer	15	11%
Autumn	9	9%
Winter	0	0%

Beach cleans are organised by volunteers; each group is asked by MCS to fill out a survey sheet (Appendix I), indicating the location of the beach, number of volunteers, length of beach, weather and information about the type of litter collected. Litter sources are divided into 12 categories and each category subdivided into the most

typical items found; each subcategory also has the option of 'other' i.e. something not pre-selected on the survey form.

Data was also received from the KIMO Fishing for Litter campaign. Of the four ports in the Firth of Clyde with Fishing for Litter skips, only Troon and Tarbert have data available. Only the Tarbert data has a rough break down of litter sources; however, the litter disposed of into the skips from fishing vessels may not have come from the Firth of Clyde but further afield depending on where fishing had taken place (data Appendix II).

2.3 Local Authority Contact list

See Appendix III

3 Results

3.1 Local Authority Data

Not enough Local Authority data was collected to do any meaningful statistical analysis. However it is interesting to know how little information is known about the quantities and source (type) of litter being removed from the Firth of Clyde.

3.1.1 Argyll and Bute

Within the last year six voluntary groups took part in beach cleaning activities, two of which were undertaken as part of the MCS Beachwatch scheme. The remaining four beach cleans were undertaken by Brownie, Scout and primary school children to help raise funds. Within Argyll and Bute, groups can apply for a beach cleaning grant through the GRAB Trust and payment is made on the length of beach cleaned.

3.1.2 Ayrshire (North)

In the 2009/10 period, North Ayrshire Council mechanically cleaned large sections of the coastline during the prime summer holiday months (May to Sept). This included three primary amenity beaches and three secondary amenity beaches being cleaned 3 times a week by a tractor pulling a rake. The largest section cleaned in this way was from Largs to West Kilbride which is approximate 15km of coastline. At all these beaches manual cleaning also took place on the days the tractor was not operating and further cleaning took place on the promenade by small street cleaning vehicles. Waste bins and doggy bins on primary beaches were cleaned daily, on secondary beaches this was reduced to 3-4 times a week.

3.1.3 Ayrshire (South)

Mechanical cleaning took place at 12 beaches in South Ayrshire. On the six primary beaches a daily service ran from May to September although this period could have been extended or reduced due to weather and/or funding. Another six secondary beaches were cleaned mechanically, as and when required. Royal Troon beach is a SSSI and therefore only manual cleaning took place at this beach on an *ad hoc* basis.

3.1.4 Glasgow City

Glasgow City has a waterfront on the Inner Clyde Estuary consisting mainly of defensive walls and dockland. There are no beaches. Glasgow City Council employs a boat that was active during normal office hours (9am – 5pm) to clean up litter and debris in the water. The boat operates from the Glasgow tidal weir out to the Erskine Bridge which is outside Glasgow City Council boundaries. The boat's main purpose is to keep the waterways clear of objects that are hazardous for watercraft using the inner estuary, however, when the boat is not removing these objects, it will clear up all floating and partially submerged objects.

3.1.5 Inverclyde

Inverclyde Council identified two primary beaches - Cardwell Bay and Esplanade – which are cleaned on an *ad hoc* basis throughout the year. Other beaches within the LA boundary were also cleaned on an *ad hoc* basis. For either the primary or secondary beaches it is not known when, or how many times, they were cleaned within the last year. The Council has not highlighted any voluntary beach cleaning taking place.

3.1.6 Renfrewshire

In Renfrewshire, two beaches have been cleaned by voluntary groups as part of the Clean Renfrewshire Campaign. The Council's Wardens Service helped community groups with the cleaning and these events took place in March and September 2010.

3.1.7 West Dunbartonshire

West Dunbartonshire Council did not provide us with beach cleaning activity information, although from observations they do not have a beach cleaning program. The Firth of Clyde Forum has been involved with West Dunbartonshire to arrange litter collection after two voluntary beach cleaning events. These were carried out in association with Scottish Business in the Community and the Council's Warden Service.

3.1.8 Loch Lomond and The Trossachs National Park

The Loch Lomond and the Trossachs National Park are not directly responsible for litter removal within the National Park area, this falls to the Local Authorities. However, the park Rangers do support voluntary beach cleans, most of which are undertaken as part of the Marine Conservation Society surveys. In addition to these surveys the Park Rangers clean above the waterline in Lochgoilhead as they consider this to be a litter trap.

3.2 MCS data

This is the only data providing information on the source of beach litter and has been analysed in order to answer the following questions:

1. What is the worst affected area in the Firth?
2. What source(s) contribute to the greatest proportion of litter in the Firth?
3. Does each Council have the same source litter problem?

Caution: Before looking at the results please keep in mind that this data would not stand up to rigorous scientific scrutiny. However, as it is the only data available within the Firth of Clyde, it can be used to give us a flavour of marine litter issues.

3.2.1 Question 1

The worst affected area in the Firth is taken as the one with the largest number of bags collected during a beach cleaning survey (graph 1). By calculating the average number of bags collected during each survey it appears that West Dunbartonshire (23 bags) and South Ayrshire (15 bags) are the worst affected areas, and that North Ayrshire (4 bags) and Argyll and Bute (7 bags) are the least affected areas. However this method of analysis did not take into consideration the area of beach cleaned or the number of volunteers taking part. To account for this, the amount of litter affecting a beach was measured by the amount of effort used to clean it

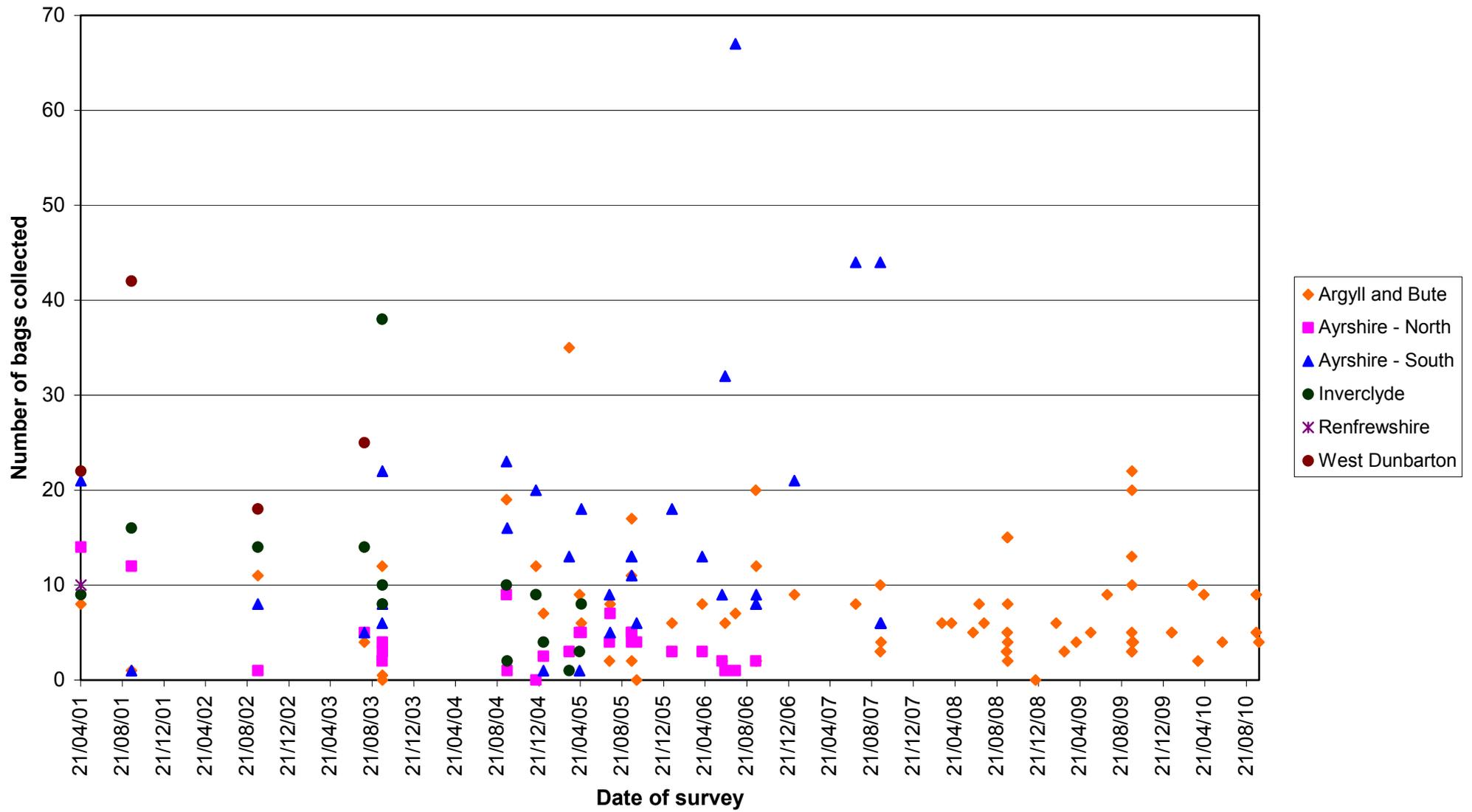
$$\text{effort} = \text{area (m}^2\text{)} / \# \text{ of volunteers} / \text{no. bags}$$

Assumptions: To calculate 'effort' a number of assumptions must be made: e.g. that the distribution of litter over the area is even and the volunteers pick litter at the same rate (assumptions about bags being the same size, filled to the same level and time spent on each survey is also needed for the first analysis).

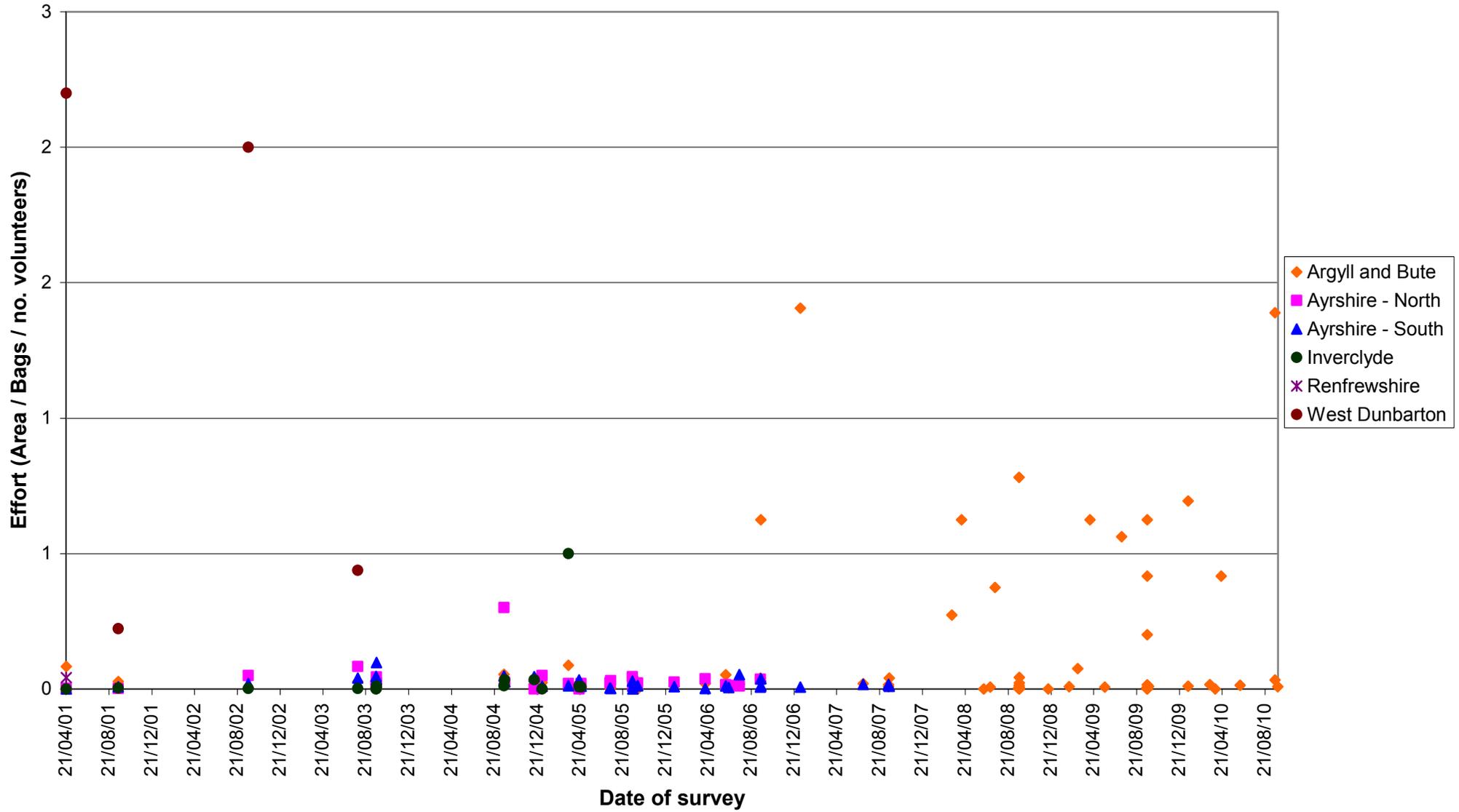
Using 'effort' as a measure of the amount of litter affecting a beach keeps West Dunbartonshire at the top of the list, having almost 10 times more litter than the second most affected LA, Argyll and Bute (Graph 2). South Ayrshire, the 2nd most affected LA using the 1st method, became the cleanest LA measured by effort.

3.2.2 Question 2

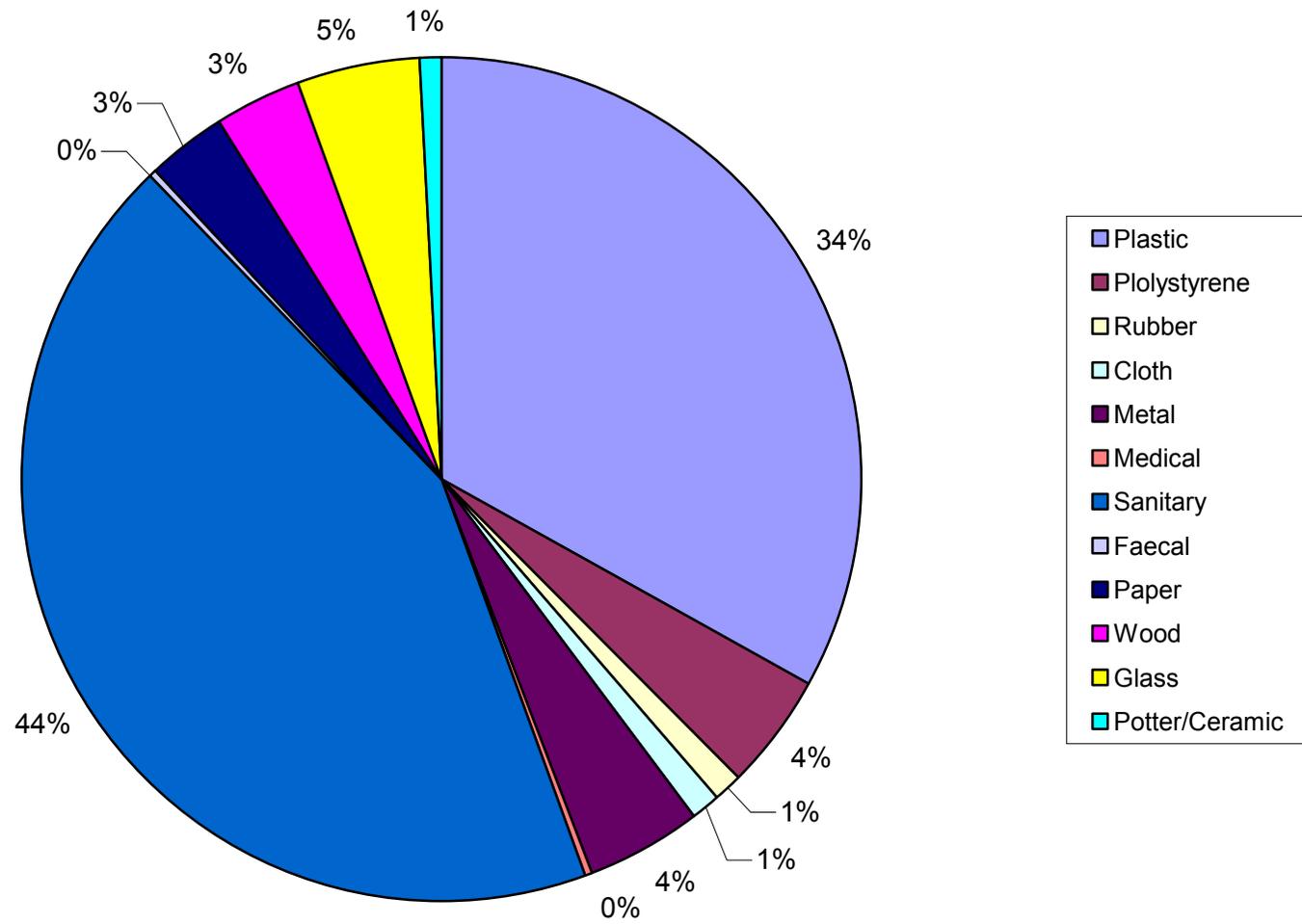
Over the last 5 years (2005 to 2010) the main sources of litter in the Firth have come from plastic (34%) and sanitary waste (44%), (graph 3). The percentage of sanitary waste, in general, has decreased while the percentage of plastic has increased (graph 4). From the 34% of plastics found, 25% is from unidentifiable pieces, 21% is from crisp/sweet and lolly packets, 12% from fishing line, 11% from drinks bottles and 7% from plastic bags (graph 5). The majority of the sanitary waste is made up of cotton buds (95%) with the next largest contribution from sanitary towels and panty liners (2%) (graph 6).



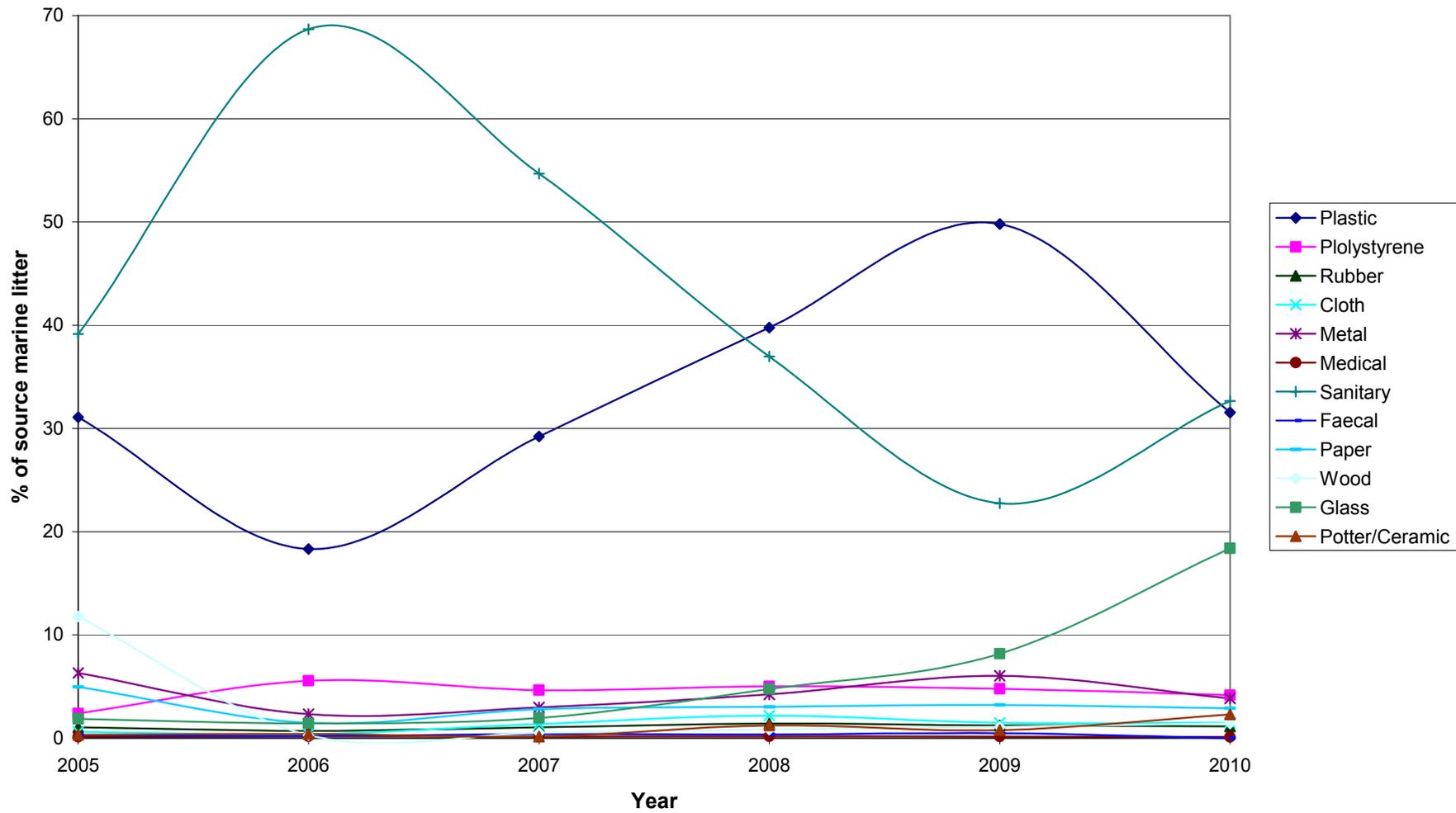
Graph 1 Number of litter bags collected over the duration of a survey



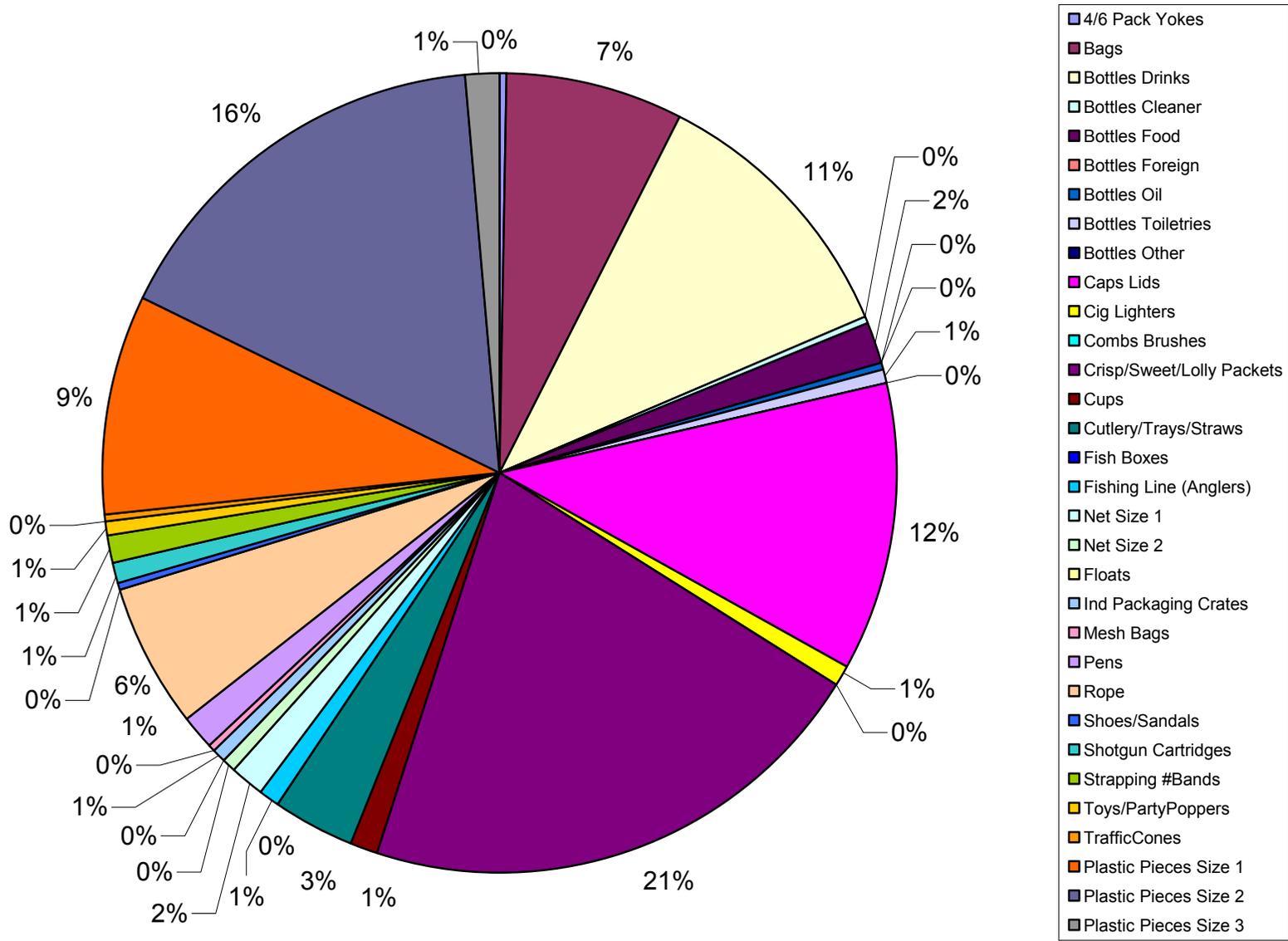
Graph 2 Amount of effort calculated for each litter survey



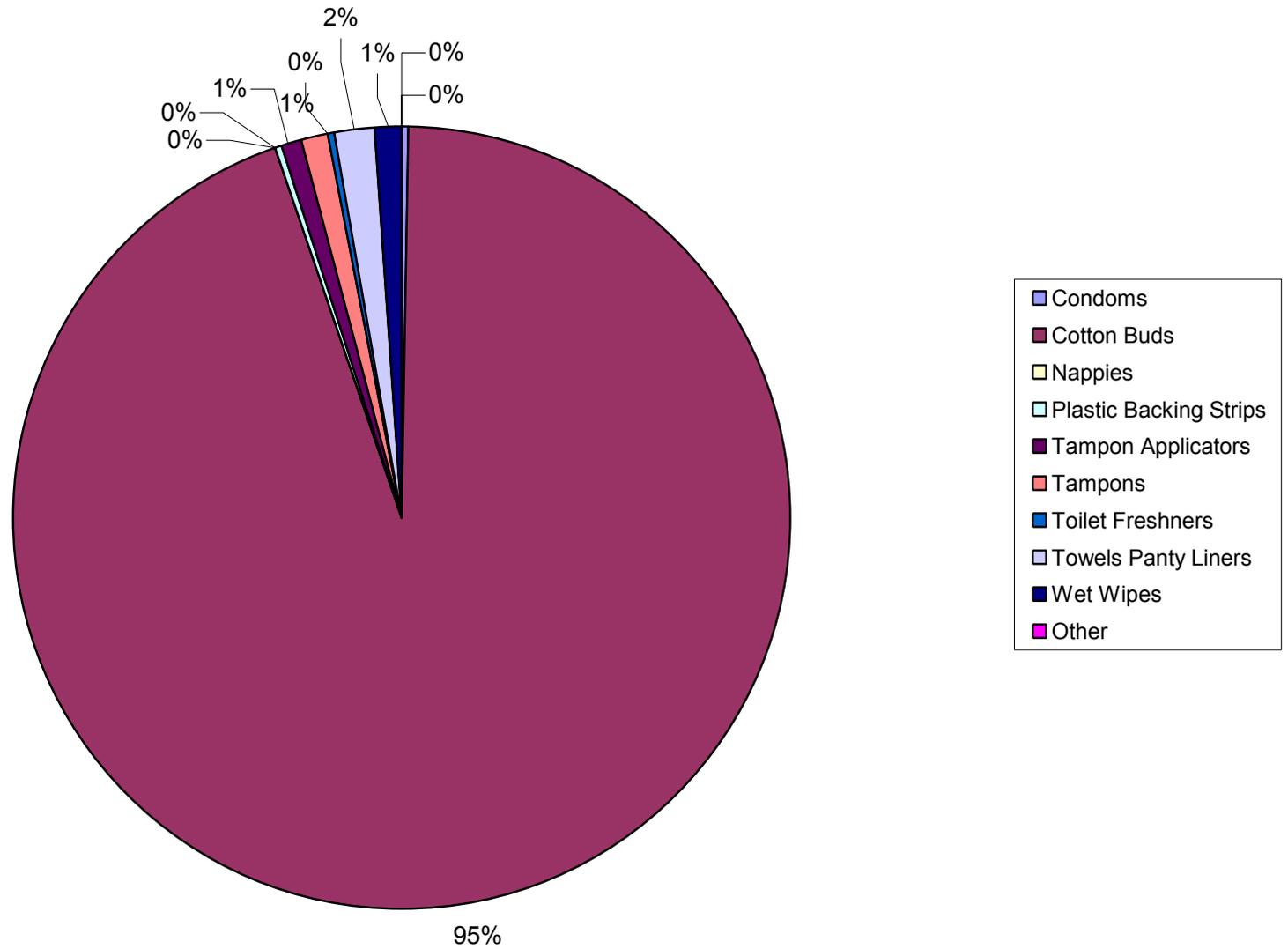
Graph 3 Sources of beach litter



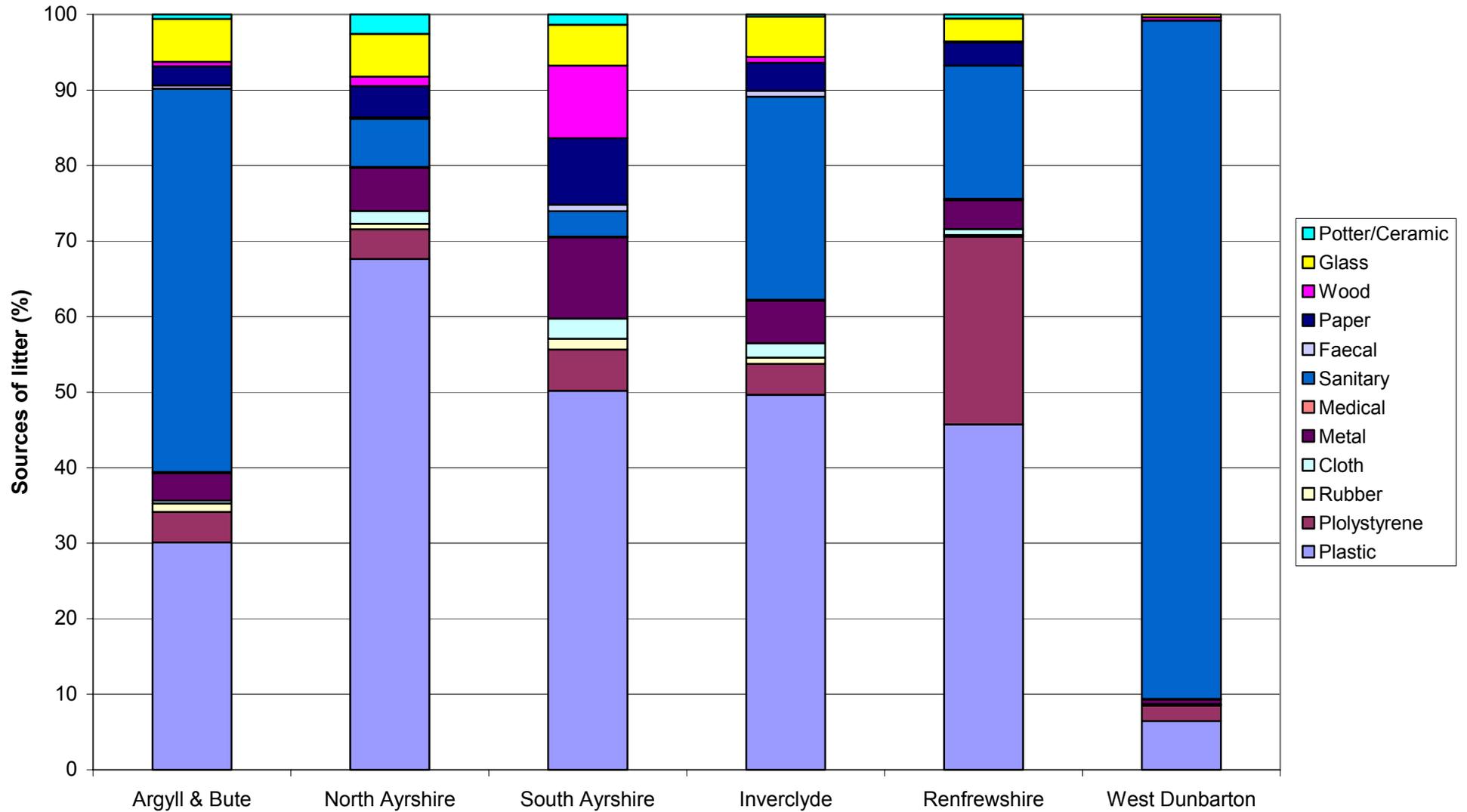
Graph 4 Change in source litter over time



Graph 5 Sources of plastics



Graph 6 Sources of Sanitary Waste



Graph 7 Type of source litter found in each Local Authority

Question 3

For the majority of Local Authorities, plastic is the major source of marine litter and accounts for around 50% of all litter gathered (graph 7). This is taken from the MCS data for 2005-2010. However, for Argyll & Bute and West Dunbartonshire the main source is sanitary waste with plastics being second. Sanitary waste is the biggest source due to the vast number of cotton buds being counted. Volunteers at East Bay Helensburgh, in Argyll & Bute are counting so many cotton buds that this beach alone is biasing the results for the whole LA. Omitting East Bay from the Argyll & Bute data results in plastic being the major source of marine litter. However, this does highlight a concern that a vast quantity of SRD is being washed up on the northern shore of the Outer Clyde estuary (between Helensburgh and Dumbarton).

Questions not answered in this data set

- Where does the majority of litter gather due to currents/winds/tides?
- It would be useful to plot data on a map using GIS.

4 Discussion

The amount of information each Council has on beach cleaning activities and the approaches used to tackle beach litter was varied. It appeared the amount of effort and, therefore, money spent on beach cleaning was dependent on the economic importance of the beach to the area. No economic data could be found on beach tourism to support this but the Visit Scotland website shows that North and South Ayrshire, Inverclyde and Argyll & Bute make reference to the Firth of Clyde or Clyde Estuary for tourism activities such as walking, cycling or sightseeing in the opening paragraph to the area. Based on this, it was assumed that beach based activities are important to tourism in these areas.

The amount of information received from each of the LAs also suggested that beach cleaning activities are higher up the agenda of some Councils than others. Mechanical cleaning may largely be dependent on how beach users are dispersed; high users on few beaches will suit mechanical cleaning whereas lower use on many beaches will better suit manual beach cleaning. Geographical features and designation of biologically sensitive sites (Sites of Special Scientific Interest) also seemed, in some instances, to have a bearing on what cleaning approach was taken. The open coastline of North and South Ayrshire and, to a lesser extent, Inverclyde makes mechanical cleaning a viable option; beaches are generally easily accessed by tractors and the long length of beach makes the effort of getting onto the beach worthwhile. Accessing the beaches of Argyll and Bute is generally not as easy. The remote and rugged coastline with small bays and rocky promontories would prevent easy access and the short stretches of beach would not make building an access point worthwhile. The Argyll and Bute area have a different solution to litter collection. Manual beach cleaning, the only type of cleaning in Argyll and Bute, is largely achieved by voluntary groups who are encouraged and supported by the GRAB trust. The Trust itself is funded by Environmental Body Scotland Ltd (Score Environment), the Crown Estate and Scottish Natural Heritage. The remaining councils in the Firth are probably not so economically dependent on beach tourism and this is reflected in the amount of effort and expense given to it. Glasgow City Council is an exception as it does not have beach tourism due to there being no beaches inside the City Council's boundaries. It does, however, obtain revenue from

waterborne craft and therefore has a responsibility to keep the water ways clear of debris likely to cause harm or damage. This service must prevent a huge amount of wind blown and river litter being carried into the outer Firth.

To better understand the sources of marine litter, LAs could be asked to report on the type and amount of litter found at each beach. Better information about where the litter has come from would help any future anti-litter campaigns target the offending groups. For example, if the LA reported large amounts of one type of litter from one local retailer where the packaging is easily identifiable, they could be asked to promote better litter disposal at the point of retail and this could have an instant effect on the quality of the beach. All LAs would need to report to the same standard methodology so analysis of the data would be the same across the whole of the Firth of Clyde. The survey sheet used by the MCS has recently been altered by OSPAR and is currently the standard form used for identifying marine litter throughout most of Europe. It would therefore seem sensible to adopt this standard format for future surveying in the area. However the way the data is presented would need to be standardised and agreed by Core Group members.

Cotton buds have been a major problem along the northern reaches of the Outer Clyde from Erskine Bridge to Helensburgh. The Marine Scotland⁷ website attributes this to sewage related debris entering the water from combined sewer overflows which release excess water from the sewerage network during storms. Some overflows are screened to trap this material but small items such as cotton buds can pass through these screens. Many of the overflows in the Clyde are not screened so cotton buds and other small non degradable items are carried by tidal currents to beaches where they accumulate and cause an aesthetic nuisance. An upgrade to the Glasgow City Waste Water Treatment Works and surrounding area is planned for the near future in line with the Commonwealth Games in Glasgow in 2014; this should help reduce the problems of SRD on these beaches. The public also has a responsibility to use the sewage system responsibly and not flush sanitary products or cotton buds down the toilet. The problem of flushing solid objects down the toilet is highlighted in the current 'Bag it and Bin it - Don't Flush It' campaign led by Scottish Water.

This report raises the question about the potential damage mechanical beach cleaning can do to the natural beach environment. The positive aspect is a large area of beach can be cleaned of litter with relatively little effort which will help prevent wildlife ingesting or becoming trapped in shoreline litter. The negative aspect is that this method takes away organic debris (seaweed) and sand that is important to the stability of the natural environment. Wildlife seeks shelter and food within this balanced ecosystem and removal of either seaweed and/or sand may disrupt this dynamic system. Each LA, before beach cleaning takes place, should consider if it is needed or if there is a better way of doing it which is more sensitive to the natural environment. Beach tourists have a large part to play in how the beach is cleaned, if the public perceive seaweed as something that is smelly and needs to be removed, the LAs will be forced to move it to retain tourism. Beach tourists, community groups and councils may need to be educated on the importance of seaweed and seaweed decay to the beach ecosystem.

⁷ www.scotland.gov.uk/Publications/2011/03/16182005/40

The best source of data has been collected by the MCS. This has been statistically interpreted to provide information on the type and distribution of litter but not the origins of where the litter came from. It is commonly agreed to derive from four main origins:

1. Beach visitors
2. Fishing industry
3. Shipping industry
4. Sewage network

Despite there being legislation and investment to tackle such sources, coastal/marine litter levels are still unacceptably high. The common element to litter is humans and is costing us large sums of money cleaning up the mess. On average KSB have estimated a cost of £65million a year for cleaning public areas (not just beaches), and this does not include litter enforcement costs. Litter ultimately originates from us and to tackle this problem we need a change, to our attitude to discarding litter.

Keep Scotland Beautiful commissioned research into the public attitudes to Litter and Littering in Scotland⁸, it was found that young adults were more likely to be blamed for littering and admitted to littering. However every age group (without exception) proved guilty of contributing to the problem. The type of litter each age group admitted to drop differed, with the younger ages more likely to drop gum and the older ones being more likely to leave dog poo. Of the people admitting to dropping litter they indicated that they knew it was wrong but found various excuses to justify their behaviour. Justification for littering included the belief that their litter would biodegrade, that it did not harm anyone, that their little bit of litter was insignificant to the large amounts that were already in-situ, not enough bins and someone else would tidy up after them. There was a certain amount of apathy or resignation towards the problem of litter; it was seen as inevitable in our society today. However, a little hope was taken from the report as many people interviewed revealed that they were bothered by litter and this should help turn around the attitudes and challenge the notion of litter as a 'social norm'.

The major source of litter, within the Firth and beyond⁹, is plastic and much of this is identified as drink bottles and crisp, sweet and lollypop wrappers. The campaigning group, Surfers Against Sewage, is asking its members to return items they find on beaches back to the manufactures. By doing this the general public is asking manufactures to think about their packaging ethics, to question if it could be done in a more sustainable manner and how can they promote a positive anti-littering ethos.

The MCS has shown that plastic litter on beaches has increased 121% since 1994. This is a major problem as plastic never biodegrades; it just breaks down into small pieces but never disappears. Microplastic particles are now found inside filter feeding

⁸ Keep Scotland Beautiful (2007). Public Attitudes to Litter & Littering in Scotland. Survey carried out by TNS System Three.

⁹ Marine Conservation Society. 2009. Beachwatch: Big weekend results.

www.mcsuk.org/downloads/pollution/beachwatch/Summary%20report_2009_e-mail.pdf

animals and amongst sand grains on our beaches¹⁰. Microplastics are derived from fragmentation of larger plastic debris in the coastal environment. Most plastics are highly persistent in the marine environment and only breakdown slowly when exposed to ultra-violet radiation. Due to the limited quantities of UV radiation that can penetrate seawater the degradation of plastic items occurs at a much slower rate in the sea compared to on land. Plastics at sea eventually undergo fragmentation, leading to the formation of microscopic particulates of plastic or so called 'microplastics'. Due to their buoyant and persistent properties, microplastics have the potential to become widely dispersed in the marine environment via hydrodynamic processes and ocean currents. Plastic pellets and plastic fragments have been collected in trawls in the North Pacific Central Gyre (large system of rotating ocean currents) in a ratio of 6:1 plastic to plankton mass. The time taken for such plastic fragments in the marine environment to fully degrade (mineralize) back to their constituent components (carbon and hydrogen) through oxidative or biological degradation is not currently known.

Litter is a major problem in the Firth of Clyde and many beaches around the world; it is an issue that needs to be addressed at a regional scale and beyond. All litter is unsightly and can cause harm to wildlife and the natural environment but it is a human problem and it is preventable.

5 Main Issues and priorities

	Issue	Risk if not resolved	Priority
1	Lack of understanding about source of litter (Sea or Land)	Inability to effectively target polluter	High
2	Lack of understanding on the deposition of litter	Compromises our ability to target highly polluted areas	Med
3	Lack of understanding on the composition of litter (plastic, paper, wood etc)	Reduces our ability to target manufactures for better packaging	Low
4	Amount of sewage related debris in the Firth	Health risk	High
5	People's attitudes/behaviour towards litter	Litter will continue unchecked	High
6	Discourage the use of plastics for more sustainable methods of packaging	Inability to reduce the amounts of plastic entering the environment	Med
7	Agree guidelines for best beach cleaning practices	Wildlife sensitive areas are adversely affected by cleaning	Med
8	Communicate the importance of the strandline for coastal biodiversity	Misunderstanding could lead to lack of community participation	Low
9	Devise a standard methodology for	Progress for understanding	High

¹⁰ Murry, F and Cowie, P. R. 2011. Plastic contamination in the decapod crustacean *Nephrops norvegicus* (Linnaeus, 1758). *Marine Pollution Bulletin*, xxx, xxx-xxx.

	reporting on the amount of litter	litter is compromised	
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KEY



Phase 1 (prior to national litter strategy development)



Phase 2 (Inline with national litter strategy implementation)

Appendix I

Beachwatch Survey Summary

- Use this form to summarise your survey data and return it to MCS
- Please fill in one form for each beach surveyed
- Please call MCS if you need more copies



* This is essential information

Beach name *

Beach county & nearest town

OS Reference*

Organiser's name*

Organiser's contact details*

Address:

Telephone:

E-mail:

About your survey

What was the date of your survey?*

What time did you start your survey?*

What time did you finish your survey?*

How many volunteers took part?*

What is the length of the beach you surveyed (m)?*

What is the average width of beach you surveyed?*

Did you clean, but not survey, any extra areas? If so, please tell us the length (m)

How many bags of rubbish did you collect from the survey area?*

What was the total weight of all the bags of rubbish you collected from the survey area(kg)?*

What was the weather like in the week before the survey?

Winds: offshore onshore
light strong

Seas: calm moderate rough

Other comments:

About what you found

Did you find any foreign or traceable items?

Note down all the foreign or traceable items indicating identifying marks, such as country of origin, company, serial no. etc.

Did you find any unusual items?

Include all these items when calculating the total numbers overleaf.

Did you find any stranded, entangled or dead animals?

Please describe the animal, or note the species name if known, and describe any injuries, the nature of the entanglement or possible causes of death. If you find a stranded or injured animal phone the RSPCA on 0300 1234999 or the SSPCA in Scotland on 03000 999999 immediately.

Was there any oil, tar or other pollutants?

If you encounter a pollution event or algal bloom, please report it to the Environment Agency or Scottish Environment Protection Agency Hotline 0800 807060

Oil/tar:

absent trace some objectionable

Plastic pellets: Small, round, white or coloured pellets approx. 3-5mm in diameter

absent present

Any other information?

PLEASE TURN OVER

The Marine Conservation Society is the UK charity for our seas, beaches and wildlife
MCS Unit 3 Wolf Business Park, Alton Road, Ross-on-Wye, Herefordshire HR9 5NB Tel: 01989 566017 Fax: 01989 567815

Beachwatch Survey Summary contd.

Please enter actual values only - 'lots', 'many', 'bag fulls' or '100s' can't be used. Complete one survey summary per event.

Plastic		total number	Metal		total number
4/6 pack yokes			Aerosol cans		
Bags (including supermarket)			BBQ's (disposable)		
Bottles, containers and drums			Bottle caps		
- Drinks			Car parts / car batteries		
- Cleaner			Drink cans		
- Food (e.g. pots, tubs, sachets)			Fishing weights / hooks / lures		
- Foreign			Foil wrappers		
- Oil			Food cans		
- Toiletries			Lobster / crab pots & tops		
Caps / lids			Oil drums		
Cigarette lighters / tobacco pouches			Scrap / metal appliances / paint tins		
Combs / hair brushes / sunglasses			Household batteries		
Crisp / sweet / lolly / sandwich wrappers			Wire / wire mesh / metal pieces		
Cutlery / trays / straws / cups			Other (specify)		
Fish boxes			Medical		
Fishing line (anglers)			Inhaler		
Fishing net & net pieces < 50 cm			Plasters		
Fishing net & net pieces > 50 cm			Syringes		
Floats (fishing buoys) / reels			Other (specify)		
Industrial packaging / crates / sheeting			Sanitary		
Lobster / crab pots & tops			Condoms		
Mesh bags (eg. vegetable)			Cotton bud sticks		
Pens			Nappies		
Rope / cord / string			Tampon applicators / tampons		
Shoes / sandals			Toilet fresheners		
Shotgun cartridges			Towels / panty liners / backing strips		
Strapping bands			Wet wipes		
Toys / party poppers / fireworks / dummies			Other (specify)		
Traffic cones			Animal faeces Don't touch!		
Plastic pieces < 2.5 cm			In bags		
Plastic pieces > 2.5 cm			Not in bags		
Other (specify)			Paper		
Polystyrene			Bags		
Buoys			Cardboard		
Fast food containers / cups			Carton / tetrapack e.g. juice		
Fish boxes			Carton / tetrapack milk		
Fibreglass			Cigarette packets		
Foam / sponge / insulation			Cigarette stubs		
Packaging			Cups		
Polystyrene pieces < 50 cm			Newspapers / magazines		
Other (specify)			Other (specify)		
Rubber			Wood		
Balloons / balloon string			Corks		
Boots			Lobster / crab pots & tops		
Gloves (heavy duty)			Pallets / crates		
Gloves (light weight)			Ice lolly sticks / chip forks		
Rubber pieces < 50 cm			Paint brushes		
Tyres without holes / wheels			Wood pieces (not twigs etc.)		
Tyres with holes			Other (specify)		
Other (specify)			Glass		
Cloth			Bottles		
Cloth pieces			Light bulbs / tubes		
Clothing / shoes / beach towels			Glass pieces		
Furnishings			Pottery/ceramic		
Sacking			Any pottery or ceramic		
Other (specify)					

Appendix II – Tarbert’s Fishing for Litter data (courtesy of Tom Piper, Fishing For Litter)

Material/Items	22/08/2007	04/04/2007	25/04/2007	09/05/2007	06/09/2007	24/10/2007	05/02/2008	26/02/2008	17/04/2008
Plastic and Polystyrene									
Buoys	3	4		6	3		3		2
Fish boxes	4	6		3	4		10	6	4
Packaging, Plastic sheeting	3	1		4			4	3	
Rope/cord	1 (100 fathoms)	1 (150m)	1 (200 fathoms)	1 (300m)	1 (Greel 240 fathoms)		200m	200m	300m
Jerry cans	4			2	2		3	4	5
Nets	5	3	1	4	1 (Cod ends)	2	5	4	6
Oil Drums	2	1	6	1	2	1	2	2	4
Strapping bands									
Fertiliser/Animal feed bags									11
Fiberglass	3	1 (part of wheel house)	1	1 large piece 6x4		1 tank	1 (large section)	1	1
Foam	4m ²							3 (large pieces)	
Bottles	60			1			3 large bags		
Other large items									
Metal									
Oil Drums			1	2	1	1	8		
Wire	1 (100m)	1 (50m)	1 (50 fathoms)	1 (150m)		1	200m	300m	
Paint Tins	6	4		2			10		
Oil Filters				1					
Other large items		7 (car bonnet, 5 wheels, 1 trolley)	3 (coal bin, office chair, bike)		1 fridge freezer		1 cooker	2 (car door, car engine)	
Wood									
Crab/Lobster pots	5	8	3	10	12	20	11	21	11
Crates	3			3	3		4	4	5
Pallets	2	2	4	4	2	2	3	4	2
Other large items	2 trees	1 tree		1			1 truck tyre	2	2 empty cable reels
Rubber									
Gloves									
Tyres & Belts	2	5	1	2	3	3	3	8	4

Boots	1			4					
Other large items	2 wheels & discs						1 conveyor belt		
Textiles									
Rope	1 (100 fathoms)			1 (200m)		1 (120m)		100m	200m
Clothing & Shoes			3						
Other large items	3		1 carpet					1 ball	1 tarpaulin

Appendix III

Local Authority	Contact	Email / Phone
Argyll & Bute	Brian Hennan	Brian.Hennan@inverclyde.gov.uk
North Ayrshire	Wallace Turpie	WallaceTurpie@north-ayrshire.gov.uk
South Ayrshire	John Morrison	John.Morrison@south-ayrshire.gov.uk
Glasgow	Dougie Gellen	07795232313
Inverclyde	Bert Muir	Bert.Muir@inverclyde.gov.uk
Renfrewshire	Joanne McKendrick	wardens.es@renfrewshire.gov.uk
West Dunbarton	Sandra Anton	sandra.anton@west-dunbarton.gov.uk
Loch Lomond & the Trossachs National Park	Zoe Morris	zoe.morris@lochlomond-trossachs.org