DIVERTING NAPPY/INCONTINENCE WASTE FROM DEEP LANDFILL TO THE RECYCLING WASTE STREAM, ENVIRONMENT TEAM

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Background:

Hywel Dda University Health Board are committed to improving recycling rates in line with the regulatory requirements facing all NHS Wales Health Boards, as well as to meet its commitments to Welsh Governments 'Toward Zero Waste plan'[1] and 'The Waste Circular Economy Strategy'[2] for development of a more circular economy. This includes the following ambitions to be achieved by 2030:

- 70% of all waste to be recycled
- A maximum level of 5% landfill
- A maximum level of 30% waste to energy

In response to these challenges the Health Board has produced its own Waste Strategy in which it has committed to meeting annual targets aligned to the Welsh government targets above. The Health Board currently has a recycling rate of 47%, recovery rate 33%, landfill rate 20%.

In addition, the Health Board has a duty to report its progress to Welsh Government against the carbon reduction targets within the 'All Wales NHS Decarbonisation Strategy'[3]. Waste contributes to the Health Board's carbon footprint so any measures implemented to reduce carbon and promote the circular economy is a positive contribution to Welsh Government's ambition for a net zero public sector in Wales by 2030.

Within the Health Board, the Environment Team has a remit for waste management, and leads on implementing processes to improve recycling and reduce overall waste. Across the Health Board, several waste streams are utilised including clinical (Incineration, Orange bag, Hygiene/Offensive waste), general and recycling. The hygiene (or tiger stripe) waste stream (Image 1) is used for the disposal of non-infectious, non-hazardous items including disposable nappies and incontinence waste.

I**mage** 1 – container of hygiene/tiger stripe waste

The problem:

Disposable nappies/incontinence waste has the capability of being recycled and is already recycled in the community. However, The Health Board (HB) currently sends hygiene/tiger stripe waste to deep landfill. This has a greater carbon emissions impact than if it were to be diverted to the recycling waste stream.

There is little data available, however it has been estimated that circa 58% of hygiene/tiger stripe waste is made up of incontinence waste including nappies[4]. Recycling of this waste could therefore be increased significantly, leading to environmental benefits to the HB. As a key producer of nappy waste, the Environment Team engaged the Special Care Baby Unit (SCBU) team in Glangwili General Hospital (GGH) to pilot this recycling initiative and ascertain if the process could be successfully implemented, with a longer-term plan to replicate across other departments and hospitals within the HB. We believe that Hywel Dda University Health Board will be the first Health Board in Wales to address this issue.

Specific Aims:

- Trial nappy and incontinence waste recycling at departmental level in the Special Care Baby Unit (SCBU)
- Demonstrate that introducing nappy and incontinence waste recycling across the whole Health Board could;
  - Increase overall Health Board recycling rate and reduce clinical waste figures (tiger waste historically reported as part of clinical waste figures by the HB even though it isn't classified as clinical waste by definition)
  - Reduce carbon emissions from waste disposal
  - Improve staff/patient awareness of greener disposal options

Methods:

We started by reviewing and understanding our current waste stream volumes using historical Health Board wide waste figures. Table 1 shows the annual tonnage of different clinical wastes produced in 21/22 by the HB.

Table 1 – Clinical waste figures 21/22

Waste Stream	Tonnage 21/22
Incineration (Sharps/medicines)	130
AT (orange bag)	593
Hygiene (Tiger stripe)	333
Total	**1056**

Based on an assumption that 58% of hygiene/tiger stripe waste is incontinence waste including nappies, and recyclable, there is a potential for 193 tonnes of HB waste to be diverted from landfill to recycling per annum.

We had engaged with the SCBU team previously on other recycling initiatives and they were very keen to find other ways to increase recycling, therefore we felt that this department would be proactive in helping us trial this process for wider roll out within the Health Board and increase sustainability in SCBU.

The purpose of the trial was to;

- understand logistics and test processes
- identify any potential barriers and solutions to these barriers
- evaluate success of the initiative before considering suitability to scale

Logistics

Prior to the project, all nappy and continence waste in SCBU was being sent to landfill. We ensured our proposed changes would meet legislative requirements as per Natural Resource Wales and worked with worked with our HB Infection Prevention Control team to ensure that the change to process would not compromise clinical standards to ensure continued compliance. We identified a local company, NappiCycle[5], to provide a trial of recycling free of charge. For information on NappiCycle see Appendices 1-3. We engaged with departments involved in the disposal process to ensure all were aware of the process and that their work would not be negatively impacted.

Internal Process:

Purple bags were supplied to the SCBU team to trial the nappy recycling process and they were briefed as to which items could be disposed of in this stream (Appendix 1). The HB chose to utilise the same colour bags as Local Authorities (LAs) in Pembrokeshire, Carmarthenshire and Ceredigion for their nappy/incontinence waste collections, which provides consistency for new parents. These were placed in designated bins labelled as nappy waste only (Image 2).

Image 2 – Bin set up in SCBU sluice

A 660L yellow clinical bin was provided by Natural UK Ltd, a local partner of NappiCycle, in the main waste compound at GGH.

The Portering staff were briefed on the trial and asked that when returning to the main waste compound after collecting from the ward, the purple bags were to be deposited in the designated bin (Image 3).

Image 3: purple bags and waste compound

Trial implementation:
We have planned a trial with supplier NappiCycle. The trial process has been delayed due to a number of factors including;

- Delivery of purple bags being delayed
- Infection control signing off the change to the process
- Absence of key staff members to set up the process in the department

The SCBU trial is scheduled to commence on 12/12/2022 and continue until end of January 2023. The bin will be collected from the compound on a weekly basis for the trial period to identify any issues in the process. A report will be provided by the contractor to the Environment Team to show the breakdown of material recycled or recovered from the collections. An example report can be seen in Appendix 3. A flow diagram of the disposal process can be found in Appendix 4.

Following the implementation of the process HB wide, we will audit and evaluate if 58% of hygiene waste has been successfully diverted from landfill.

Measurement:

Patient outcomes:

There will be no change or impact on patient care and no patient outcomes were measured.

Environmental sustainability:

As the department starts to collate nappy/incontinence waste data from this trial and wider roll out in the HB, this will be recorded along with all other waste data from waste reports received from the chosen waste contractor.

We could not use data gathered from the trial in SCBU as at the time of writing the report due to delays in starting the trial as highlight above. The HB do not collect data to department level for waste reporting purposes. We have made assumptions on the number of nappies used per baby per day to estimate potential savings in SCBU. We used HB wide historical data as an indicator of potential benefits that could be achieved from introducing this process across the HB. Going forward the reduction in overall tiger stripe waste and recording of recycled nappy waste will be used as indicators of the overall success of this project.

The Health Board's historical data has been used to ascertain the potential for this project to have a positive impact by increasing recycling rates, reducing clinical waste and lowering carbon emissions. Emissions factors for landfill and recycling were taken from the UK government database.

Economic sustainability:

The HB's historical financial waste data based on invoiced costs will be used to compare the financial cost of the current method of disposing of this waste stream compared our current waste disposal with recycling.

Social sustainability:

A parent questionnaire (Appendix 5) was developed to capture qualitative data on parents' knowledge of local nappy recycling as well as to look at current disposal behaviours and whether recycling rates may increase because of the project.

A Staff questionnaire (Appendix 6) was developed to capture data on staff understanding and awareness of recycling in the Health Board and to ascertain whether improvements to process could be identified.

Results:

Environmental sustainability:

SCBU potential impact:
SCBU have on average 13 babies in the unit at any one time and each baby uses on average 7 nappies a day. This equates to approximately 33,124 disposable nappies, or 5.5 tonnes of hygiene waste being generated from this ward alone per annum. If recycled there is a potential to reduce carbon emissions from this nappy/incontinence waste stream in the department by 74%. This is a reduction of 1,810.19 kgCO2e per year.

This calculated as follows:

When sent to landfill 5.5t x 446.242 = 2,454.331 Kg CO_2e
When recycled 5.5t x 21.294 = 644.1435 Kg CO_2e
2,454.331 Kg co_2e – 644.1435Kg CO_2e = 1,810.1875 kg CO_2e
1,810.1875 Kg co_2e ÷ 2,454.331 Kg CO_2e x 100 = 74%

Health board wide potential impact:
The total weight of tiger stripe waste disposed of from the HB in 2021/22 was 333 tonnes. If as suggested above that 58% of hygiene/tiger stripe waste is incontinence waste including nappies, there is a potential for 193 tonnes of HB waste to be diverted from landfill to recycling per annum. This would reduce the HB's total clinical waste by circa 18%.

This was calculated as follows:
Tonnage to be diverted to recycling = 193t
Total clinical waste tonnage 21/22 = 1056t
Therefore 193t ÷ 1056t x 100 = 18% reduction of clinical waste

Deep landfill has an emissions factor of 446.242 (based on 21/22 GHG emissions factors[6]) and the GHG factor for recycling is 21.294 based on the BEIS database. There is therefore a potential to reduce carbon emissions from the nappy/incontinence waste stream across the whole Health Board by 96%.

This calculated as follows:

When sent to landfill 193t x 446.242 = 86,124.706 Kg CO_2e

When recycled 193t x 21.294 = 4,302.742 Kg CO_2e
86,124,706 Kg CO_2e – 4,302.742 Kg C_2e = 82,821.964 Kg CO_2e
82,821.964 Kg CO_2e ÷ 86,124.706 Kg CO_2e x 100 = 96%

Successful implementation of nappy/incontinence waste recycling will therefore lead to savings of up to **82,821.964 Kg CO2e** for the HB. This is based on assumptions that the full 58% of hygiene waste is placed into the new bins, and that 100% of nappy waste sent to NappiCycle is recycled, so the savings may be overestimated.

Economic sustainability:

The cost to dispose of tiger stripe waste is currently £298 per tonne. Therefore, the cost to send 193t of tiger stripe waste to landfill per annum equates to £57,514.

The cost to dispose of nappy/incontinence waste by recycling with the company used during the trial period will be free. If continuing beyond a trial, there will be a cost of £416 per tonne. Therefore, using these costs to send 193 tonnes of tiger stripe waste to be recycled per annum equates to £80,288. To ensure best value, should the trial prove successful the HB would tender this work, which could potentially reduce this cost.

It is approximately **an additional £22,000 more** to recycle this waste stream via NappiCycle rather than send it to deep landfill. The cost discrepancy may reduce slightly year on year as landfill taxes increase on an annual basis. The other benefits of this project such as reduced carbon, clinical waste reduction and improved recycling need to be considered along with financial costs.

Social sustainability:

The outcome of the staff feedback form showed that some staff felt they were more knowledgeable to advise parents on sustainable nappy recycling following this project. Others felt that until they had managed to fully implement the process they were not. All staff felt that the use of the same colour coded bags as the local authorities was beneficial and that it was important on a personal level and for the environment to recycle nappies.

While not a part of our current project, we asked staff about reusable nappies. Staff views was positive. Comments included this would be 'better for the Environment', 'reduced waste within the hospital' and 'would save the hospital money'. Staff also noted some barriers including being 'unsure if reusable nappies are available for babies as small as those in special care' and that currently there are 'no washing machines on site for this purpose and if sent off site could take a long time to return'.

Based on our parent awareness questionnaires, 71% of parents were aware that the local authorities had the purple bag scheme for recycling nappy waste with the rest stating they were unaware. Those unaware said now they would sign up for this process on their return home. 100% of parents asked thought that using the same colour coded bags in the hospital as used in the community setting was beneficial as would prevent confusion. Only 29% of parents asked said they would be interested in the use of reusable over disposable nappies. Reasons included; **'**too much hassle with a new baby', **'**whether the efficiency of washing them and the use of detergents was any better for the environment than disposable nappies being recycled' and the 'time it would take to wash reusable nappies'.

Discussion:

The process to date has shown that nappy/incontinence recycling could be relatively easily implemented HB wide and an analysis of historic data has shown that by diverting this waste from deep landfill to the recycling waste stream, the following potential positive impacts for the Health Board could be recognised;

- 6% increase on recycling rate
- 18% reduction in clinical waste figures (tiger waste historically reported as part of clinical waste figures by the HB even though it isn't classified as clinical waste by definition)
- 96% reduction in carbon emissions from disposal of this waste stream
- Improved staff and patient awareness/empowerment

The parent questionnaires indicated that their preference was the use of disposable nappies and recycling these over the use of reusable nappies. However, as awareness improves and more information is available on the carbon impact of disposable versus reusable nappies this opinion could change, particularly if departments within the Health Sector could work collaboratively with other public sector organisations to disseminate this information and raise awareness. Further projects could be explored to promote reusable nappies and to determine what incentives are available.

Challenges / Barriers:

- Waste Contractor: Finding a local contractor that could provide this service and accommodate the quantities generated. The Environment Team contacted current clinical waste providers to ascertain whether this service was available locally.
- Legislative compliance for waste disposal: National Resources Wales (NRW) have the legal responsibility for ensuring that waste is assigned correctly for disposal and that waste is processed by properly licenced facilities. Hygiene waste in a healthcare setting is categorised as EWC 180104. Liaising with the regulator was a crucial step to ensure that by changing the route of disposal this did not change its categorisation.
- Hotel Services/Portering staff - Staff from this department are key to ensuring that new waste processes can be implemented. Ensuring they were aware of the purpose and responsibilities of keeping this waste separate to ensure it entered up in the recycling waste stream was an essential part of the project process.
- Sourcing purple bags – As previously mentioned the HB decided to use the same colour bags as LAs for this waste stream to ensure standardisation and consistency and to prevent confusion and mixed messages. It was important that we engaged with the local authorities to see where we could obtain a supply of these bags and then with our own Procurement. Due to the timescales available for the trial it was challenging getting the information we needed and raising the orders at the early stages of the project.
- Delay in purple bag delivery and availability of staff - This has prevented the process starting as early as planned

Risks:

- There is a potential risk for infectious hygiene waste to end up in the recycling waste stream however this is no more of a risk than this ending up in landfill currently. With reiteration through training from IPC and re-emphasis by the Environment Team through clinical waste training of the purpose of the various colour coded waste streams the risk of this occurring is

minimal. Staff also have access to the HB's waste policy and HTM-07-01 (Management and Disposal of Healthcare waste)[7] guidance document on Sharepoint.

- Potentially there is an affordability risk due to the cost to recycle this waste stream currently being more expensive than sending it to deep landfill.

Next steps

Following the trial, we aim to begin engagement and roll out the process across the wider HB site by site, starting with other departments on the GGH site. The following factors must be taken into consideration if this is rolled out further across the Health Board:

- Engaging with all relevant parties at the start of the process to avoid problems as the roll out progresses.
- Consideration of what additional resources would be required and the financial implications of that.
- Providing training to ensure all staff are aware of what waste materials are able to go into the nappy recycling waste stream and in what circumstances they should go into the clinical waste orange bag waste stream. IPC will be key in assisting with the ongoing monitoring of this

In addition, we aim to

- Roll out a poster to raise awareness of sustainable nappy options (Appendix 7). Alongside the poster we will consider other opportunities with SCBU and Maternity to
  - encourage new parents to use the nappy recycling scheme offered by local authorities within Hywel Dda's catchment area.
  - Encourage new parents to consider the use of reusable rather than disposable nappies.
- Engage with Local Authorities to see how reusable nappies could be explored as a collaborative venture. Given that SCBU produce circa 33,000 disposable nappies per annum the social and environmental impact of encouraging the use of reusable nappies instead could be significant. Additional resources and the financial implications of introducing reusable nappies would need to be considered.
- Share case study findings with colleagues in other HB's across Wales to identify the potential benefits this could bring to their organisations and share lessons learnt throughout the process.

Conclusions:

It can be concluded that there are multifaceted benefits to the HB diverting incontinence/nappy waste from the clinical waste stream to the recycling waste stream and from the bottom of the waste hierarchy (landfill) to the recycling waste stream. The HB also has a moral and legislative duty to reduce its impact on the environment and the roll out of this project can contribute to a number of the Wellbeing goals including a globally responsible Wales and resilient Wales, as well as compliance with the mandatory standard ISO14001 that the HB has to comply with.

References:

1. Towards zero waste: our waste strategy | GOV.WALES
2. Circular economy strategy | GOV.WALES
3. NHS Wales Decarbonisation Strategic Delivery Plan (gov.wales)
4. Measuring and reducing plastics in the healthcare sector | Health Care Without Harm (noharm-europe.org)
5. Who We Are – NappiCycle

6. www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021
7. NHS England » (HTM 07-01) Management and disposal of healthcare waste
8. https://www.lse.ac.uk/GranthamInstitute/publication/the-economics-of-climate-change-the-stern-review/
9. https://www.healthaffairs.org/doi/10.1377/hlthaff.2020.01109
10. Home | Sustainable Quality Improvement (susqi.org)
11. Environmentally Sustainable Healthcare - elearning for healthcare (e-lfh.org.uk)
12. Sustainability in Quality Improvement (SusQI) explained - YouTube
13. Green Ward Competition | Centre for Sustainable Healthcare

Appendices:

Appendix 1 - List of items that can go into purple bag stream

- papier mâché bed pans and other such products
- babies and adult nappies
- sanitary towels
- wipes
- paper towels
- gowns
- aprons
- plastic nappy sacks

Appendix 2 - What is NappiCycle

NappiCycle – Nappy Recycling & Collection Services

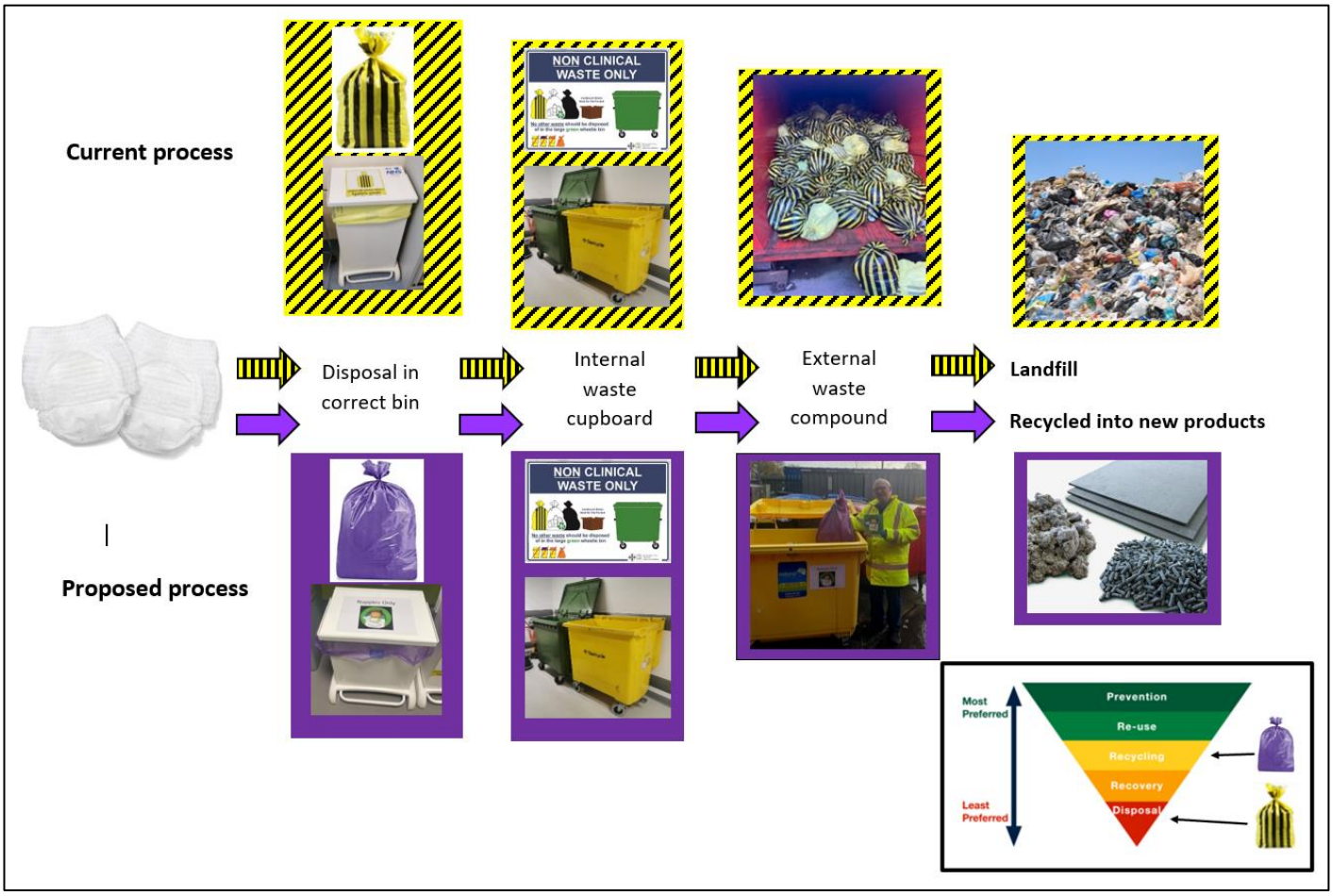
The concept for NappiCycle started back in 2009, to provide a low impact, cost-efficient nappy and absorbent hygiene products recycling facility in Wales. The purpose was to provide a facility that had the capability of serving the business community at large on a scale that would assist the public sector to achieve challenging recycling targets set by Welsh Government, in the drive 'Towards Zero Waste'. Natural UK Ltd are an exclusive partner of NappiCycle. NappiCycle has undertaken comprehensive research and development of a unique and innovative treatment system for the recovery of cellulose and plastics from nappy and incontinence wastes, this results in 100% diversion of this waste stream from the traditional landfill disposal method as well as providing the added element of recovery and recycling. The products of the recycling process have become a resource, with the cellulose fibre being used for a wide variety of commercial purposes, including the production of fibre boards and acoustic panelling, and the plastics sent to secondary re-processors for recycling. The plastic fibres can also be added to other materials and used for road surfacing. NappiCycle/Natural UK are a local company and based within the Hywel Dda catchment area.

'With nearly 200 million nappies thrown away in Wales every year, or over half a million nappies each day, NappiCycle offers an innovative and environmentally-friendly solution to this problem'.[5]

Appendix 3 – Example Waste Report from Waste Contractor

Overall Plant Performance	HDUHB	Total
Waste Input: KGS, based on 4.333 weeks x 55kgs per 660L wheelie bin	238.32	238.32
Material Sent for Disposal	0.00	0.00
Waste Treated at Nappicycle	238.32	238.32
Volumes of Plastic and Cellulose Generated (a)	100.57	100.57
Liquid byproduct Recovered and reused in process	137.75	137.75
(a) Plastics and cellulose are recovered via permitted MRF		
and production of composite panel boards	1.91	1.91
Materials sent for secondary fuels	98.66	98.66
SRF delivers a further total recovery of 23% via Ash aggregate recovery	23.13	23.13
Total recycled by Weight	25.04	25.04
Total bi-product allowable	137.75	137.75
Current average plant Recycling percentage	68.31%	68.31%
Current Landfill Diversion percentage	100%	100%

Appendix 4 – Flow diagram of disposal process



Appendix 5 – Parent Awareness Questionnaire

GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol Hywel Dda University Health Board

Parent Awareness Questionnaire – Nappy recycling project

1. How do you currently/intend to dispose of your baby's nappies?
   _____
   _____

2. Your Local Authority provide a free AHP (Absorbent Hygiene Product) collection service, where they provide purple bags and the nappies you dispose of are diverted from landfill and the majority is recycled. Were you aware of this? Y/N (please circle)

3. Will you be setting-up and using this service when you return home? Y/N (please circle)

4. Is it useful using the same colour (purple) bags in the hospital and when you return home? Y/N (please circle)

5. Are you using or would you be interested in using reusable nappies?
   _____
   _____

For more information on AHP collections and reusable nappy incentives please contact your Local Authority

Appendix 6 – Staff Project Feedback

Staff Nappy Recycling/Purple Bag Project Feedback

1. Why do you think it is important to recycle nappies?
   a) To improve Health Board recycling figures ☐
   b) To reduce carbon ☐
   c) It's better for the environment ☐
   d) It's important to me personally ☐
   e) All of the above ☐
   f) Other:

2. Do you think it is beneficial to have the same colour-coded bags in the department as parents would use at home? Y/N (please circle)

2. Has implementing this process improved your knowledge of the benefits of recycling?

3. Do you feel more informed on advising parents on sustainable nappy disposal? Y/N (please circle)

4. If the purple bag project was to be rolled out to other departments and sites across the HB, do you have any suggestions on how the process could be improved?

5. Any other feedback on this project:

6. Do you think the use of reusable nappies should be encouraged in the hospital? Y/N (please circle). What are you reasons:

Appendix 7 – 'Things to consider when picking a nappy' poster