Implementing Best Management Practices to Reduce Diffuse Pollution[1]

1. Project Document

The States of Jersey Environment Division undertakes a range of activities to collect, record and monitor water quality, and to identify and measure quality objectives.

In Jersey, levels of nitrate in surface and groundwater frequently exceed recommended EU and local drinking water standards.

A voluntary scheme is to be introduced to raise awareness of diffuse pollution issues amongst the agricultural community and encourage good agricultural practice in order to reduce contaminant levels in local waters.

The project aims to implement agricultural 'Best Management Practices' (BMP's) and assess the impact that these have on reducing diffuse water pollution. The project will seek to maximise the participation, engagement and skills of the agricultural industry using a participatory co-management approach.

As a first step, a diffuse pollution pilot project (DPPP) will be established. The DPPP will collect base-line data from a small number of trial farms to determine what benefit on water quality can be achieved through adopting agricultural best management practice.

At the same time, using farmer workshops and results from the trial farms the DPPP will also document current management practises and develop practical steps that need to be taken to ensure the feasibility of island-wide uptake.

Evaluation will include assessment of engagement with farmers and water quality monitoring.

The DPPP will then be extended to the implementation phase for island-wide adoption. This proposal covers activities scheduled to take place under the scheme up until December 2012.

[1] Environment Division, Planning and Environment Department, States of Jersey.

2 Background - The Need for Action

2.1 The Water Framework Directive[2] (WFD) came into force in December 2000 in the EU and covers all waters: inland, transitional (estuaries) and coastal. It has set the direction of EU water policy for the foreseeable future.

The directive requires that pressures on and threats to water quality be identified and measures put in place to combat these. The aim is for all waters to achieve 'good status' by 2015.

One of the most significant pressures on water quality in Jersey is reflected by the commonplace failure of many surface and groundwater samples in relation to the 50mg/l Nitrate (NO_3) limit that is enshrined in EU, UK and local legislation[3].

2.2 The link between Agricultural Activity and Diffuse Pollution

In Jersey, as in the rest of Europe, diffuse nitrate pollution increased throughout the 1980's. This was primarily attributed to the intensification of agriculture. In fact, the severity of the problem in Jersey led to it being used as a case study in a school text book on pollution (Foster, 1991)[4].

The link between diffuse pollution from agriculture and high nitrate concentrations in surface and groundwater in Jersey has been noted in a number of reports over the years[5]. For example, Foster (1989) found that the highest Nitrate concentrations were found in catchments that were under intensive cultivation[6].

Analysis of Environment Division water quality and land use data also points towards a strong correlation between the island-wide area under potatoes, head of cattle and Nitrate levels in local water. (Figures 1 and 1a).

Initial use of nutrient budgeting software (PLANET) on a small sample has also shown that there are a number of improvements to be made to equalise farm imports and off-takes of nutrients (Figure 2)

Tackling agricultural sources of nitrate and other diffuse pollution is now a high priority area of work for the Environment Division. This is a challenge in a place like Jersey where population density is high and there are many competing pressures on land use.

Under the Water Pollution (Jersey) Law, 2000 there are legal means in place to tackle both point and diffuse sources pollution. There are now well established

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[2] EU Water Framework Directive 2000/60/EC.
[3] e.g. Surface Water for Abstraction for Drinking (75/440/EC); Water for Human Consumption (98/83/EC); The UK Private Water Supplies Regulations 1991; and the Water (Jersey) Law 1972.
[4] Cited in "The Jersey Groundwater Study", British Geological Survey Research Report RR/98/5, prepared for the Public Services Department, 1998.
[5] The Nitrate and Pesticide Working Party Report in 1996; the Centre for Research into Environment and Health (CREH) report 'Stream Water Quality on the Island of Jersey' in 1997; British Geological Survey annual and summary reports prepared for the Public Services Dept, 1990-2000; and the Plymouth University final report entitled 'Nitrates and Phosphates in Jersey Surface Waters' of October 2001.
[6] Foster, IDL, Ilbury BW and Hinton MA, Agriculture and Water Quality: A Preliminary examination of the Jersey nitrate problem. Applied Geography (1989), 9, 95-113.

mechanisms in place for dealing with point source pollution under the Law. There are also statutory means to set standards and control catchment activities under the Law[7]. Obviously however, there are disadvantages to resorting to statutory measures to make changes in land-use.

There is also a prescribed voluntary 'Water Code', under the Water Pollution (Jersey) Law, 2000 which recommends agricultural practices to reduce nutrient losses, for example by adhering to prescribed Nitrogen application limits. However, it is not known how much these are adhered to in practice.

2.3 Supply of 'wholesome water'

By law[8] Jersey Water must supply drinking water with a concentration of nitrate below 50 mg/l. Jersey Water abstracts approximately 97%[9] of its raw water from surface waters (Figure 3). At some times of the year nitrate in source streams exceeds this and Jersey Water can either mix raw waters between sources or run the desalination plant to achieve this. However this approach is unsustainable.

As a consequence of high levels of NO_3 at source, Jersey Water has to have a derogation under the Water Law, which allows 33% of samples in any one year to exceed the 50 mg/l limit (but be no greater than 70 mg/l) in the Drinking Water supply. This derogation has recently been renewed. However, under consultation Health Protection (Health and Social Services Department) asserted that they could not continue to support this situation unless catchment inputs of nitrogen were tackled. In addition, the Memorandum of Understanding between the Environment Division (as the regulator) and Jersey Water now specifically makes the undertaking that:

"*It is recognised by The Minister, in relation to The Company's said obligations to supply wholesome water, that the possible designation of Water Catchment Management Areas (WCMAs) pursuant to the provisions of Articles 14 – 15 of the Water Pollution (Jersey) Law 2000 ("The Water Pollution Law") should continue to be investigated. The aim of which shall be to improve the quality of water resources and protect the aquatic environment.*"

And

"*The Minister for Planning & Environment shall undertake scientific research, investigations and field trials to determine the benefits or otherwise on the improvement and protection of the water resources and the aquatic environment that the implementation of WCMA's in Jersey would bring. At the completion of the research, investigations and field trials, a report shall be produced by officers containing recommendations for the future implementation of WCMA's in Jersey and the likely contribution they would make toward the improvement and protection of the water resources and the aquatic environment.*"

[7] Water Pollution (jersey) Law, 2000 - Water Quality Orders (Article 12), and also Water Catchment Management Areas and Orders (Article 14 and 15).
[8] According to the definition of wholesome water contained in the Water (Jersey) Law 1972
[9] "The Jersey New Waterworks Company – A Description of the Water Supply of Jersey" (anon company literature).

2.4 Agricultural Industry Drivers

Maintaining a high quality environment in Jersey is fundamental to the marketing of quality agricultural products. Good agricultural practice brings benefits to farmers, consumers and the environment. It avoids waste, minimises pollution and enhances efficiency thereby reducing costs. This project will work in partnership with farmers and empower them, by providing information to enhance their knowledge of how best to manage their business. This has the further encompassing benefit of minimising the risk of environmental pollution.

3 Project Outline

3.1 Project approach

A voluntary scheme is to be set up in Jersey to test the efficacy of several farm management ' Best Management Practices' (BMP's) in reducing losses of diffuse pollutants from agricultural land. The scheme will raise awareness of diffuse pollution issues among farmers and growers, and encourage them to assist in defining workable practices which have less potential to cause diffuse pollution.

Management projects based on centralised government (top-down) intervention are frequently viewed as high cost, distant, impersonal and authoritarian, and often fail to provide long-term protection of resources[10]. Therefore the project will seek to maximise the appropriate skill sets, engagement and participation of the agricultural industry by developing a co-management approach.

This approach means that the responsibility and authority for the protection of the resource is shared within a partnership between the rural community, their representative bodies and the States of Jersey authorities.

3.2 The Diffuse Pollution Pilot Project

As a first step, a Diffuse Pollution Pilot Project (DPPP) has been established.

An initial approach will be made to industry representatives in order to discuss the project with them and to ask them for assistance in identifying two suitable trial areas. Once a small number of representative trial areas have been identified, water quality monitoring will commence in order to gather background data for two years. A control catchment will also be identified and monitored. Following this, the BMP's will be implemented and water quality will continue to be monitored.

While the background data is collected on the trial farms, the participating farmers will be invited to participate in wider skills audits/training needs assessments and discussions about local practices. The DPPP will work closely with this smaller group of farmers (the 'working group').

The DPPP will initially collect base-line data from the trial farms to determine what benefit on water quality can be achieved through adopting the BMP's. The working group will document current management practises, contribute to a vision of what best practise should look like, and undertake training needs assessments in order to assess their current levels of knowledge and identify gaps. Training recommendations will also be implemented. This will point the way to developing practical steps for island-wide uptake.

A number of BMP's have been selected to provide an initial starting point for the project, in terms of both a platform for implementation on the trial farms and to form the basis for a discussion of local practices with farmers:

[10] Raakjær Nielsen, J., Degnbol, P., Kuperan Viswanathan, K. and Ahmed, M. (2002). Fisheries co-management: an institutional innovation. Perspectives and challenges ahead. *IIFET 2002 Conference, Aug. 19-22, Wellington, New Zealand*. Paper no. 216. 10pp.

- **Diffuse Pollution Audits.**
- **Nutrient Management Plans/Budgets.**
- **Soil Management Plans.**
- **Farm Manure and Waste Management Plans.**
- **Field by field Record keeping of land use, crop type and nutrient inputs and outputs.**

Detailed discussion of BMP selection is covered in a separate report[11] that was commissioned by the Department[12].

Expected Outcomes by December 2012

- Water quality monitoring at trial farms and the control area will be established
- Engagement with a working group of farmers will be ongoing.
- The working group of farmers will have completed training needs assessments in relation to soil and nutrient management, and record keeping.
- The working group of farmers will have described what current practices are on farms
- Field by field record keeping will have started.
- The working group of farmers will have contributed to what they believe is achievable best practice.
- The content of local soil and nutrient management plans will be formulated.
- Management Plans in place on trial farms
- Training designed to meet identified needs will have been delivered.
- Two years background water quality data will have been collected, and one year of data post changes.

At this point, and depending on progress and outcomes, further consideration will need to be given to Island-wide implementation.

A schematic of the process and how it fits into the wider picture is shown in Figure 4.

[11] Catchment Management in Jersey – Towards agricultural best management to reduce diffuse water pollution. Jemma Batten, Black Sheep Countryside Management, August 2009

[12] Environmental Protection, Environment Division, Planning and Environment Department, States of Jersey.

4 Project Aims, Objectives Activities and Outcomes

4.1 Project aim

To identify and promote environmental best practice farming in Jersey in relation to nutrient and soil management in order to limit diffuse pollutant losses and bring about an improvement in water quality.

4.2 Project objectives

- **Define what achievable soil protection, nutrient and manure management 'best practice' looks like within Jersey agriculture.**
- **Pilot how best practise can be defined and adopted by the agricultural community through engagement, participation and training needs and skills updates.**
- **Implement examples of best practice in selected trial areas in order to demonstrate the benefits and refine the measures to be implemented.**
- **Bring about improvements in water quality as measured by levels of Nitrogen, Phosphorus and Suspended Solids in stream water in target areas.**

4.3 Project activities

The table below shows the activities that are necessary in order to achieve the objectives, and their associated timescales.

Activity	Responsibility (lead officer)	Due Date
Identify suitable farms/areas for trial areas in conjunction with industry: ➢ Meeting with various stakeholders.	EP, EMRE, Industry	Dec 2009
Set up water quality monitoring to establish base-line data in trial areas: ➢ Identify suitable stream reach and select sampling points ➢ Set up routine monitoring runs ➢ Install and programme auto samplers	EP (KR[13])	Dec 2010
Set up flow/discharge monitoring to establish base-line data in trial areas: ➢ Identify suitable stream reach and select sampling points ➢ Install pressure transducer level monitors ➢ Develop stream profile and flow recording or install weirs	EP (KR)	Dec 2010

[13] Kate Roberts, Project Co-ordinator- DPPP, Environment Division, States of Jersey.

Work with 'Working Group': Year 1 ➢ Assess current farmer knowledge of soil protection, nutrient and manure management by training needs assessment (+ attitudinal questionnaire?). ➢ Formulate way forward based on training needs identified. ➢ Document and assess current farming practise in Jersey in relation to nutrient, soil and manure management. ➢ Discuss what constitutes workable good practice. ➢ Farmers to self-quantify impact on profit, produce and sustainability of the Island's farming practise by adhering to best practise. ➢ Incorporate feedback on trial farm progress.	EP (TDF and KR), EMRE, Industry 'Working Group', Consultant(s)	Dec 2010
Work with 'Working Group': Year 2 ➢ Training put in place in response to identified needs. ➢ Formulate Soil and Nutrient Management Plans	EP (TDF and KR), EMRE, Industry 'Working Group', Consultant(s)	Dec 2011
Work with 'Working Group': Year 3 ➢ Implement Management Plans in trial areas	EP (TDF and KR), EMRE, Industry 'Working Group', Consultant(s)	2012
On selected pilot farms/areas year 1: ➢ Start Field by Field Record Keeping of appropriate information ➢ GIS based maps and database prepared for record keeping	EP (TDF and KR), EMRE, Industry 'Working Group',	Dec 2010
On selected pilot farms/areas year 2 ➢ Prepare Soil Erosion and Sediment Control Plan ➢ Prepare Farm Manure and Waste Management Plan. ➢ Carry out Diffuse Pollution Audits	EP (KR), EMRE, Trial Farmers,	Dec 2011
On selected pilot farms/areas year 3: ➢ Implement Management Plans in trial areas	EP (KR), EMRE, Pilot Farmers, consultancy input	2012
Develop Support and Policy Measures:	EMRE, EP	Ongoing

Abbreviations:
EP: Environmental Protection, Planning and Environment Department
EMRE: Environmental Management and Rural Economy, Planning and Environment Department
KR: Kate Robert, Project co-ordinator, Planning and Environment Department
TdF: Tim du Feu, Head of Water Resources, Planning and Environment Department

4.4 Project Outcomes

- **Define what achievable soil protection, nutrient and manure management 'best practice' looks like within Jersey agriculture.**
- Work has been carried out to select a small number of BMP's to focus on in the short-medium term. The most important are nutrient management plans, soil management plans, farm manure and waste management plans and improved record keeping. What exactly this entails need to be refined in the Jersey context. A record of the discussions with farmers will be kept. Any resulting research or trial of farming methods or variations in local practice will be documented.

- **Pilot how best practise can be defined and adopted by the agricultural community through engagement, participation and training needs and skills updates.**
- Farmer participation and take-up will be recorded. Training needs assessments will be carried out.

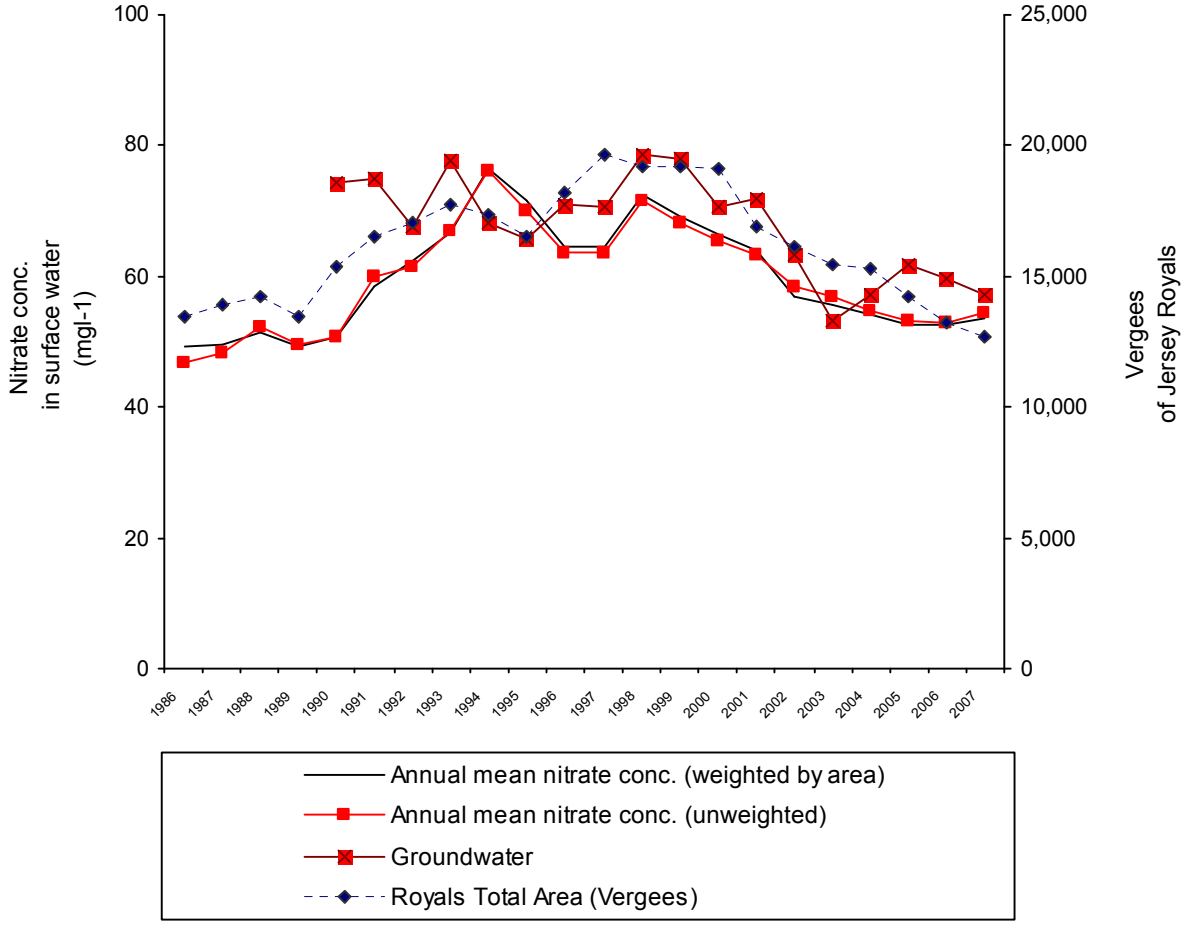
- **Implement examples of best practice in selected trial areas in order to demonstrate the benefits and refine the measures to be implemented.**
- Progress on the demonstration areas/farms will be monitored and documented.

- **Bring about improvements in water quality as measured by levels of Nitrogen, Phosphorus and Suspended Solids in stream water in target areas.**
- Water quality will be monitored in the BMP implemented trial areas for Nitrogen, Phosphorus and Suspended Solids. This will include background monitoring, storm event monitoring and discharge monitoring. A control area will also be identified and monitored.

5 Project Timescales and Future Work

It is envisaged that the pilot scheme involving several trial farms should be up and running by December 2012 with all monitoring in place and measures being implemented, and a local model of good practice in the process of being developed in conjunction with industry. After this point, consideration will need to be given to Island-wide implementation.

Figure 1 Annual mean concentration of nitrate (NO3 mgl^{-1}) recorded in surface water (Jersey Water data) and groundwater (Environmental Protection borehole data) and the total cultivated area of Jersey Royals (vergées). (Back to text)

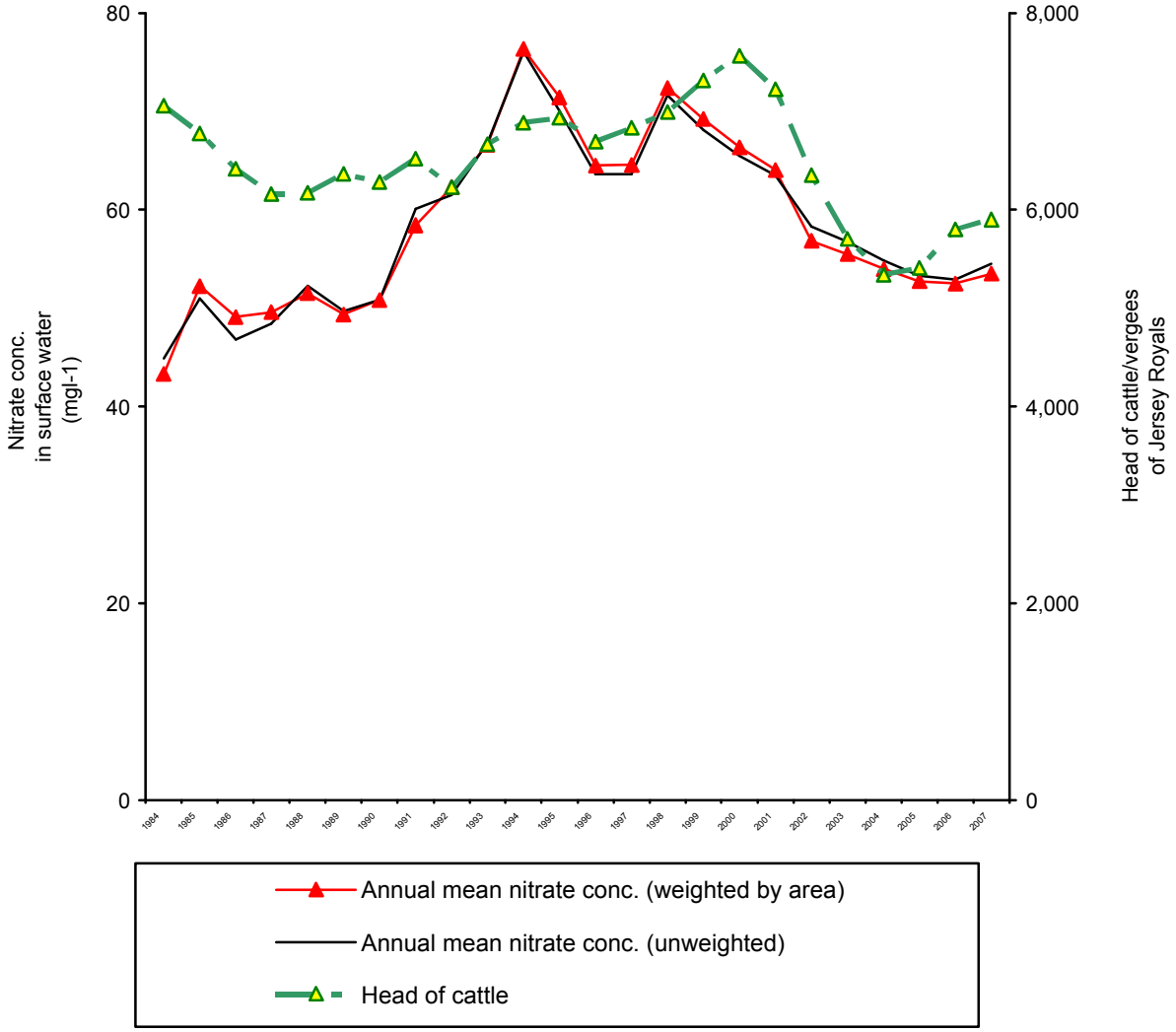


Annual mean concentration of nitrate (NO3 mgl^{-1}) recorded in surface water (Jersey Water data) and groundwater (Environmental Protection borehole data) and the total cultivated area of Jersey Royals (vergées). Concentrations of nitrate are given both as a weighted annual mean (weighted by the surface area of the water catchment management area) and as an unweighted mean (annual mean of all data taken across Jersey).

Note 1: The annual mean concentration (weighted mean) of nitrate in surface water was significantly correlated to the groundwater nitrate concentration (Pearson's correlation coef: = 0.582, p=0.11).

Note 2: the weighted mean of the annual nitrate concentration was strongly correlated to the total area of Jersey Royals farmed between 1986 and 2007 (Pearson's correlation coeff. 0.836, p=0.00, n=22). The unweighted annual mean also showed a high correlation (Pearson's correlation coeff. 0.825, p=0.00, n=22).

Fig 1a Annual mean concentration of nitrate (NO3 mgl^{-1}) recorded by Jersey Water in surface water and the total number of cattle in Jersey, 1984-2007



Annual mean concentration of nitrate (NO3 mgl^{-1}) recorded by Jersey Water in surface water and the total number of beef and dairy cattle in Jersey, 1984-2007. Concentrations of nitrate are given both as a weighted annual mean (weighted by the surface area of the water catchment management area) and as an unweighted mean (annual mean of all data taken across Jersey).

Note: the weighted mean of the annual nitrate concentration was correlated to the total number of cattle farmed between 1984 and 2007 (Pearson's correlation coeff. 0.541, p=0.01, n=22). The unweighted mean also showed a significant correlation (Pearson's correlation coeff. 0.505, p=0.01, n=6,629).

Figure 2 Sample Nutrient Budget (PLANET) output on two farms in Jersey

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Dairy Farm

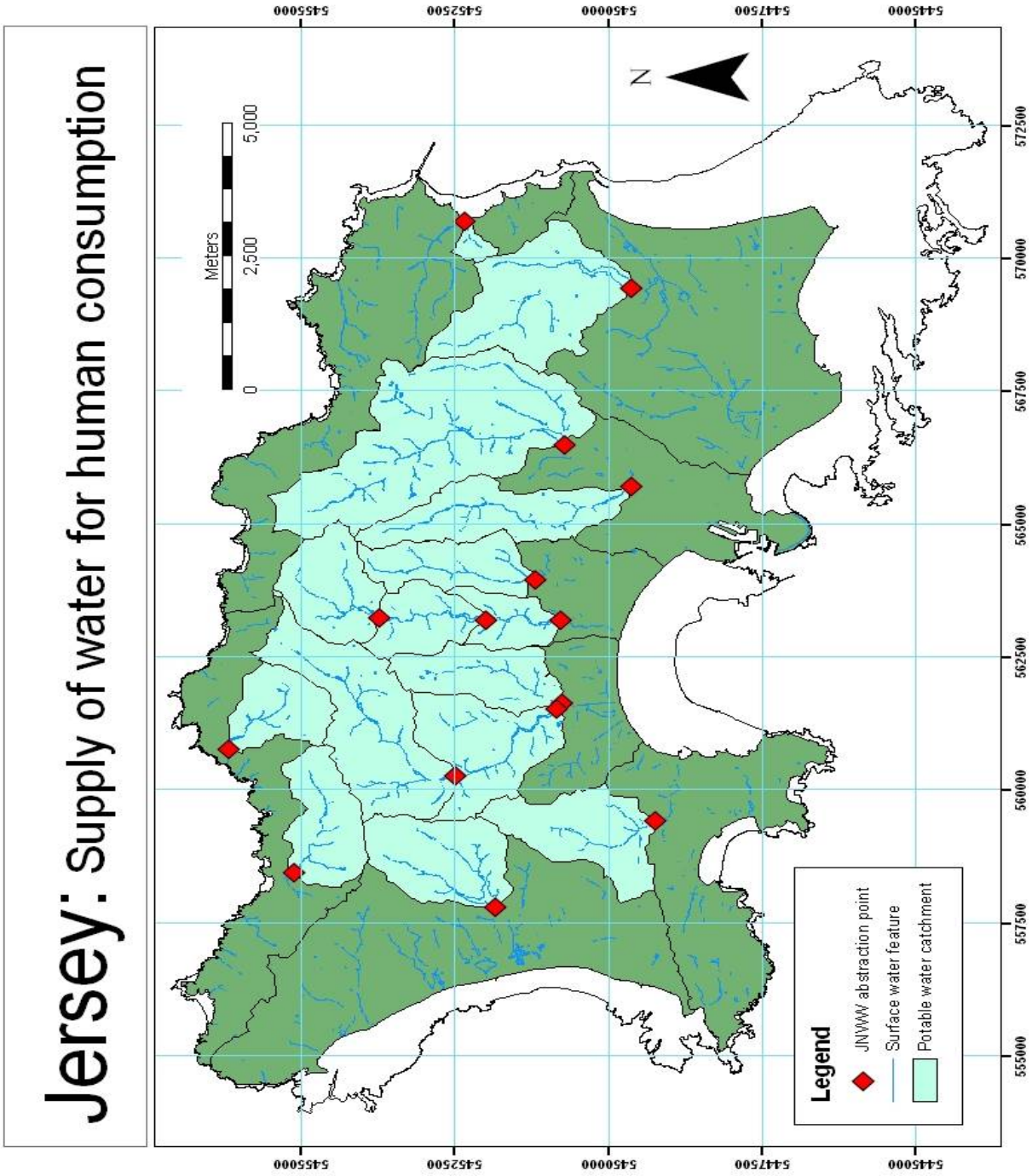
	Nitrogen (N) kg	Phosphate (P_2O_5) kg	Potash (K_2O) kg
Total Imports	24,700	8,966	9,408
Total Exports	12,295	4,610	8,402
Nutrient balance for the whole farm	12,405	4,356	1,006
Benchmark	No benchmark	No benchmark	No benchmark
Nutrient balance for each ha of farmed land	111	39	9

Arable Farm (with slurry)

	Nitrogen (N) kg	Phosphate (P_2O_5) kg	Potash (K_2O) kg
Total Imports	20,985	5,452	19,342
Total Exports	10,057	2,995	13,101
Nutrient balance for the whole farm	10,928	2,457	6,241
Benchmark	No benchmark	No benchmark	No benchmark
Nutrient balance for each ha of farmed land	110	25	63

Figure3 Sources of supply of water for human consumption in Jersey [14]

(Back to text)



[14] Reproduced from Water Quality Objectives and Water Catchment Management on the Island of Jersey', CREH, 2003.

Figure 4 How does the Pilot Phase project link to the bigger picture?

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