Environment, Housing and Infrastructure Scrutiny Panel

Review of Nitrate Levels in Jersey's Water

Presented to the States on 11th April 2017

S.R.3/2017

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1. PANEL MEMBERSHIP, TERMS OF REFERENCE AND EVIDENCE GATHERING

1.1 For this review the Environment, Housing and Infrastructure Scrutiny Panel comprised the following members:

Deputy David Johnson, Chairman

Deputy Tracey Vallois, Vice-Chairman

Connétable Sadie Le Sueur-Rennard, Panel Member

1.2 Deputy Montfort Tadier joined the Panel on Tuesday 14th March. At such time, the review was in its final stages before publication and, for this reason, the Deputy did not participate in this particular review.

1.3 The Panel appointed Mr. Vincent Fitzsimons from SEPA (Scottish Environment Protection Agency) as its expert advisor for this review (the 'Advisor'). The Advisor requested a series of meetings with various stakeholders which took place in January 2017.

1.4 The following Terms of Reference were agreed for this review:

1. To consider the measures that are being taken, or are proposed, by the Council of Ministers to address the issue of nitrate levels within Jersey's water supply.

2. To assess whether the measures are achievable within the proposed timeframe and resources.

3. To determine whether the proposals are sufficient for addressing the elevated levels of nitrate found in surface waters and groundwater.

4. To assess the challenges faced by the Council of Ministers in maintaining an adequate supply of clean water with reduced concentrations of nitrate.

5. To determine what role the agricultural industry and water utilities have in helping to reduce nitrate levels in Jersey's water.

Evidence Gathered

1.5 The written material provided to us and our Advisor during our review is listed within SEPA's report (Appendix 1). In addition, we held one Public Hearing and received four written testimonies, as follows:

Public Hearing

26th January 2017	The Minister for the Environment, accompanied by the Director of Environment Protection, the Head of Water Resource Management

and Regulation, the Water Resource Management and Regulation Officer and the Head of Plant Health.

Written Submission

18th January 2017	SOS (Save Our Shoreline) Jersey
18th January 2017	The Jersey Royal Company
20th January 2017	Jersey Water
20th January 2017	The Jersey Farmers Union

1.6 The written submissions and the transcript of the Public Hearing are available to read on the Scrutiny website (www.scrutiny.gov.je).

2. EXECUTIVE SUMMARY

2.1 In December 2016, the Environment Minister presented a five year Water Management Plan (WMP) to the States Assembly as a report. The main objective of the WMP is to improve Jersey's water quality and, in order to achieve this, the Plan sets out measures that the Island needs to take in order to ensure clean and sustainable water supplies. A key element of the WMP's objectives are proposals to address the high level of nitrates in our streams and groundwater.

2.2 Nitrate pollution has been a longstanding issue and for the last 15-20 years the Department of the Environment has been working with key stakeholders to create new measures to protect Jersey's water. However, despite this, most of the Island's water bodies (streams, ground and coastal waters) are currently of 'moderate status' and, as a result, Jersey Water cannot guarantee to meet drinking water standards for nitrate in the mains drinking water supply at all times. Furthermore, Jersey still has some of the highest levels of nitrate in the whole of Europe.

2.3 Since the introduction of the Water (Jersey) Law 1972, Jersey Water has been granted five dispensations by the Environment Minister to allow the concentration of nitrate in their water to exceed the regulatory limit of 50mg/l. However, there have been no nitrate breaches in treated water since 2013. It is our understanding that the Medical Officer at Health has indicated her disapproval for the continuous granting of dispensations and has advised the Environment Minister that the latest dispensation, which was granted on 2nd December 2016 for a five-year period, would be the last.

2.4 We found that nitrate contamination is having a clear and significant impact on Jersey's public water supplies, private water supplies and on the sea lettuce problem in St Aubin's Bay. Whilst it is acknowledged that the prevalence of sea lettuce in Jersey is influenced by a number of different factors, we found that measures to reduce nitrate loading on land would significantly improve the sea lettuce problem.

2.5 The dominant cause of high nitrate levels in Jersey's public water supplies is the practice of early potato growing, combined with the subsequent land uses after the early potatoes are harvested. In addition, high nitrate levels that are affecting private water supplies are likely to be the result of poor compliance with basic good practice in nutrient management, the siting of septic tank discharges, farmyard waste management measures and old landfill sites.

2.6 Evidence we received during our review suggests that controlling nitrates at source is key to improving Jersey's water quality. Whilst treatment options for the removal of nitrates have been thoroughly explored by both Jersey Water and the Department for Infrastructure, it was found that such solutions did not support the Water Management Plan's objectives of improving stream water quality. For instance, treatment would not improve water quality for those on private water supplies or reduce nitrate concentration of streams discharging onto Jersey's beaches. In addition, the cost of removing nitrates

via the introduction of facilities at Jersey Water or the new Sewage Treatment Works (STW) would be significant. It has been estimated that a nitrate removal plant at STW would cost in the region of £30 million, with associated running costs, and adding a nitrate removal process as part of Jersey Water's treatment would cost around £3 million, which could increase average annual household bills by £10-20.

2.7 The objectives contained within the WMP provide a good balance between what is desirable and what is reasonable for a sustainable economy. Furthermore a catchment-based approach, which has been adopted by the Department of the Environment, is the best means of addressing the nitrate problem in Jersey. In Scotland, such an approach has raised compliance on farms from 35 percent to 86 percent.

2.8 During the undertaking of our review, the States Assembly approved amendments to the Water Pollution (Jersey) Law 2000. The Law, as amended, will give the Environment Minister greater powers to control the use of fertilisers on land where Jersey's water is being polluted.

2.9 Part 3 of the Water Pollution Law will allow the Department of the Environment to use Water Catchment Management Orders as a new regulatory response to diffuse pollution. We found that the difficulty will not be what is written in the Orders but rather the ability to achieve and assess compliance with the additional requirements that they impose.

2.10 Incentivisation is a fundamental element of the WMP and is vital for the success of the Plan's objectives. Under the new Rural Economy Strategy, the current rural payment will become contingent on claimants having LEAF accreditation. Market assurance schemes, such as LEAF, will provide a strong financial incentive for farmers to comply with the high standards specified by the organisation. As a result, we recommend that the Environment Minister should ensure that the use of incentives, as a tool to encourage best practice and compliance among farmers, is made more explicit within the WMP.

2.11 Over the last decade the farming community has been heavily involved in helping to reduce levels of nitrates in Jersey's water. We understand, from various discussions with representatives from the agricultural industry, that the majority of farmers are fully supportive of the WMP's objectives and the measures that have been proposed to address high levels of nitrates. Voluntary initiatives are being undertaken by the farming community to reduce inputs of fertilisers and pesticides. This year the potato growing sector have begun trialling new machinery that allows for fertiliser placement and, if the trials are successful, there could be a substantial 10-15% reduction in the amount of fertiliser applied to the growing crop of Jersey Royal potatoes. Reducing the amount of fertiliser applied to fields would not only significantly improve Jersey's nitrate problem but would also save farmers a substantial amount of money.

2.12 In order to successfully deliver the objectives of the WMP across the Island, at least one full time equivalent (FTE) post will need to be employed by the Department of the Environment to join the Environment Protection Team. A new FTE post would assume the

role of a catchment/compliance officer and will be crucial for providing both advice to support the achievement of compliance and assessing compliance.

2.13 We understand that the additional requirements of the WMP can be funded out of existing resources until 2018, after such time additional money will need to be identified. However, without the sufficient resources available to fund an FTE post, the success of the Plan and its objectives will be significantly affected. Hence, the Environment Minister must ensure that funding is found without delay to enable a catchment/compliance officer to begin work.

2.14 Monitoring the Island's water supply is essential for determining the ongoing success of the measures contained within the WMP over the five years. The Department of the Environment currently carries out monitoring on all controlled waters but intends to improve its monitoring programme through short, medium and long term objectives set out within the WMP.

2.15 We found that the frequency of water monitoring that currently takes place is sufficient but it must be maintained at current levels throughout the five year duration of the Plan. We also found that an in-depth analysis needs to be undertaken of what the monitoring results mean in order to help understand the relative effectiveness of different types of measures. In addition, the Environment Minister must ensure that regular and effective monitoring of the sea lettuce blooms in St Aubin's Bay is carried out. To support this work, at least one long-term flow measurement point is needed in one of the main streams entering the Bay. Finally, we have recommended that further evidence is gathered to establish how much of a reduction in nitrogen from the freshwater streams and from the Sewage Treatment Works would be needed to avoid elevating available nitrogen above the levels found in the offshore waters that surround St Aubin's Bay.

2.16 In order to successfully address the nitrate problem affecting Jersey's public water supplies, nitrate leaching will have to reduce by 25-33% from 2016 levels. This degree of reduction will present a significant challenge for the Environment Minister and his Department.

2.17 If improvements continue at the same rate as they have been, point sources of nitrate problem affecting private water supplies will be largely addressed within the timescales set out in the WMP. However the rate of improvement in widespread excessive nitrate loading, which largely affects public water supply and sea lettuce, is not currently sufficient to meet the target deadlines contained within the Plan.

2.18 We found that the qualitative assessment of the effectiveness of the WMP's measures are set against 'good ecological status' requirements of the EU Water Framework Directive rather than against the objectives of the Plan itself. In this regard, the Environment Minister should ensure that such requirements are not prioritised until there is clear evidence that the measures of the WMP are successful in improving Jersey's drinking water.

2.19 During the past year significant progress has been made in addressing levels of nitrate due to a growing commitment amongst all stakeholders to improve water quality and by

working closely together to achieve that goal. Undoubtedly, a collaborative working relationship between the Government, the industry and Jersey Water is fundamental to the overall success of the Plan in reducing high levels of nitrate in the Island's water. Thus, it is imperative that the Environment Minister ensures that all key stakeholders continue to work closely together throughout the duration of the Plan in order to effectively address this issue.

2.20 In conclusion, the Environment Minister and his Department are to be commended for the work undertaken in producing the WMP and the ambitious targets contained within for addressing the issue of nitrate levels. The nitrate problem in Jersey is significant but, with the necessary resources in place and continued support from all key stakeholders, the Panel is confident that the Plan's measures will have a positive impact on the quality of Jersey's water.

3. FINDINGS AND RECOMMENDATIONS

Key Findings

3.1 Nitrate contamination is having a clear and significant impact on Jersey's public water supplies, private water supplies and on the sea lettuce in St Aubin's Bay. (5.5)

3.2 Whilst it is acknowledged that the prevalence of sea lettuce in Jersey is influenced by a number of different factors, measures to reduce nitrate loading on land will significantly improve the sea lettuce problem. (5.10)

3.3 Nitrate removal facilities at the Sewage Treatment Plant or Jersey Water should be considered a solution of last resort. Treatment of water at this stage would not improve the quality of our stream water or private water supplies. (5.19)

3.4 The dominant cause of high nitrate levels in Jersey's public water supplies is the practice of early potato growing, combined with the subsequent land uses after the early potatoes are harvested. (5.27)

3.5 High nitrate levels that are affecting private water supplies are likely to be the result of poor compliance with basic good practice in nutrient management, the siting of septic tank discharges, farmyard waste management measures and old landfill sites. (5.29)

3.6 The two main sources of the sea lettuce problem in St Aubin's Bay is a combination of effluent from the Bellozane Treatment Works and nitrates flowing off farmland into surface water streams and onto the beach. (5.31)

3.7 Whilst there are signs of some improvement in widespread excessive nitrate loading across the Island, the rate of improvement is not currently sufficient to meet the target deadlines set out in the Water Management Plan. (5.33)

3.8 The objectives contained within the Water Management Plan provide a good balance between what is desirable and what is reasonable for a sustainable economy. (6.3)

3.9 The Panel supports the Economic Development, Tourism, Sport and Culture Department in undertaking an ecosystem services review to help determine the value of Jersey's environment to our economy and society. (6.8)

3.10 A catchment-based approach is the best means of addressing the nitrate problem in Jersey. In Scotland, such an approach has raised compliance on farms from 35% to 86%. (6.9)

3.11 The amendments made to the Water Pollution (Jersey) Law 2000 will give the Minister for the Environment greater powers to control the use of fertilisers on land where Jersey's water is being polluted. (6.18)

3.12 The new regulatory framework will be considered a backstop, only to be used if and when necessary. (6.19)

3.13 Incentivisation is a fundamental part of the Water Management Plan and is vital for the success of the Plan's objectives. Market assurance schemes, such as LEAF, will provide a strong financial incentive for farmers to comply with the high standards specified by the organisation. (6.23)

3.14 Under the new Rural Economy Strategy, the rural payment will become contingent on claimants having LEAF accreditation. It has therefore been proposed that the compliance around the new payment will be undertaken by LEAF auditors. (6.32)

3.15 The difficulty will not be what is written in the Water Management Catchment Orders but rather the ability to achieve and assess compliance with the additional requirements that they impose. (6.34)

3.16 Over the last ten years the farming community have been heavily involved in helping to reduce levels of nitrates on our Island. (6.37)

3.17 The vast majority of the agricultural industry are fully supportive of the Water Management Plan and the principal of clean water for our Island in general. (6.39)

3.18 Reducing the amount of fertiliser applied to fields would not only significantly improve Jersey's nitrate problem but would also save farmers a substantial amount of money. (6.44)

3.19 At least one new full time equivalent post will be required to undertake both an advisory and compliance role in order to successfully deliver the Water Management Plan objectives across the Island. (7.6)

3.20 The additional requirements of the Water Management Plan can be funded out of existing resources until 2018, after such time additional money will need to be identified. (7.12)

3.21 A potential tax on fertilisers and/or pesticides is worthy of consideration. It is possible that such a tax could help fund the employment of a catchment/compliance officer. (7.16)

3.22 The employment of a new catchment/compliance officer will be crucial for providing both advice to support the achievement of compliance and assessing compliance. (7.20)

3.23 Without the sufficient resources available, the success of the Plan and its objectives will be greatly affected. (7.21)

3.24 Monitoring the Island's water supply is essential for determining the ongoing success of the measures contained within the Water Management Plan. (7.32)

3.25 In order to successfully address the nitrate problem affecting the Island's public water supplies, nitrate leaching from farmland across the Island will need to reduce by 25-33% from 2016 levels. This will present a significant challenge for the Minister for the Environment and his Department. (7.40)

3.26 If improvements continue at the same rate as they have been, point sources of nitrate pollution will be largely addressed within the timescales set out within the Water Management Plan, which in turn will significantly improve nitrate levels in private water supplies. However, further improvements will require continued hard work and a close working relationship between all key stakeholders. (7.42)

3.27 The Water Management Plan does not provide any prediction as to whether or not Jersey's sea lettuce problem will be addressed within the required timeframe. (7.44)

3.28 The qualitative assessment of the effectiveness of Scenario 2b is set against 'good ecological status' requirements of the EU Water Framework Directive rather than the objectives of the Plan itself. (7.48)

3.29 A collaborative working relationship between the Government, the industry and Jersey Water is fundamental to the overall success of the Plan in reducing high levels of nitrate in the Island's water. (7.55)

Recommendations

3.30 The Minister for the Environment should ensure that the use of incentives, as a tool to encourage best practice and compliance among farmers, is made more explicit within the Water Management Plan. (6.24)

3.31 The Minister for the Environment must ensure that funding is found without delay to enable a new catchment/compliance officer to begin work. (7.22)

3.32 The Minister for the Environment should ensure that the following work is carried out in respect of water and sea lettuce monitoring in Jersey:

a) Maintain the frequency of water monitoring at current levels throughout the five year Water Management Plan.
b) Undertake an in-depth analysis of what the monitoring results mean in order to help understand the relative effectiveness of different types of measures.
c) Undertake regular and effective monitoring of the sea lettuce blooms in St Aubin's Bay. To support this work at least one long term flow measurement point is needed in one of the main streams entering St Aubin's Bay.
d) Gather evidence to determine how much of a reduction in nitrogen from the Sewage Treatment Works and nitrate rich freshwater streams would be required to avoid

elevating available nitrogen above the levels found in the offshore waters that surround St Aubin's Bay. (7.33)

3.33 The Minister for the Environment should ensure that broader EU Water Framework Directive requirements are not prioritised until there is clear evidence that the measures of the Water Management Plan are successful in improving Jersey's drinking water. (7.49)

3.34 The Minister for the Environment must ensure that all key stakeholders continue to work closely together throughout the duration of the Plan in order to effectively address the issue of nitrate levels. (7.56)

4. INTRODUCTION

Background

4.1 On 8th December 2016, the Environment Minister presented the Water Management Plan (WMP) to the States Assembly as a Report. The WMP is a five year plan (2017-2021) which sets out measures the Island needs to take to ensure clean and sustainable water supplies. It builds on the assessment of the condition of Jersey's water and the pressures on it. The WMP is the second report in a two part Plan; the first (Challenges for the Water Environment of Jersey, 2014) identified the key water management challenges in Jersey and assigned a status classification to all water bodies on the Island. The main issues that were identified as affecting the health of our waters were the elevated levels of nutrients (particularly nitrate), the risk of high levels of the nutrient phosphorus and the risk of pesticide contamination.[1]

4.2 Over the last 15-20 years the Environment Department has been working to protect the water environment and has implemented new measures to tackle water protection, developed a water monitoring system and introduced legislation to protect water. Whilst we have been advised that ongoing monitoring shows that the quality of the Island's water is improving, the Minister and the Officers within his Department feel that a lot more still needs to be done. Despite recent improvements in water quality, for instance, most of Jersey's water bodies (streams, ground and coastal waters) are currently of 'moderate' status and still have some of the highest levels of nitrate in the whole of Europe. Through a list of short, medium and long term measures and objectives, the aim of the five year plan is to improve the quality of the water resources to a 'good' status.

4.3 The WMP will be largely implemented by controlling potential pollutants at source to ensure good water quality and by monitoring/regulating water abstractions to ensure a sustainable supply of water to meet future Island needs. It has been recognised that high levels of nitrates in Jersey's streams and groundwater are a consequence of diffuse pollution. High nitrate concentrations in raw water sources are mainly dependant on the volume and timing of application of fertiliser during the growing season and of rainfall in the winter and spring months. During this time the stream waters in Jersey can often have nitrate levels in excess of 50 mg/l (half of all samples).

4.4 According to Jersey Water, nitrate levels above 50 mg/l are not continuous but cyclic in nature, generally between January and April. The maximum concentration of nitrates permitted in mains water in Jersey is 50mg/l, consistent with international legislation. As a result, Jersey Water regularly needs to blend water from different sources to meet this level. Nonetheless, Jersey Water cannot guarantee a low nitrate supply to households and needs to apply to the Environment Minister for a 'dispensation' to supply water to the public when it's concentrations exceed 50 mg/l.[2] Since the introduction of the Water (Jersey) Law 1972, five dispensations have been approved; the latest was granted on 2nd December

[1] The Water Management Plan for Jersey, States of Jersey, June 2016
[2] Jersey Water, Written Submission to the Panel's previous "Environmental Polices" review, 6th March 2015

2016 for a five year period. It is worth noting here, however, that in spite of dispensations being granted Jersey Water has not needed one since May 2013.

4.5 It is also important to note that around 10% of households in Jersey rely on private boreholes and wells for drinking water. Those such households are unable to blend their water with cleaner resources, and rarely treat their supply to remove nitrates. It has been estimated that over half of those are using water that is above the nitrate levels set by EU and local legislation.

The Review

4.6 In agreeing to review this topic, the Panel has noted that clean and safe water is a key issue for the public of Jersey. According to the *Shaping our Future Survey* undertaken by the States of Jersey in 2016, more than 50% of Islanders stated that their aspiration for the future was ensuring that Jersey's water resources stay clean and sustainable. Comments provided by members of the public within the survey highlighted widespread disquiet at the apparent impact of the farming industry on the quality of Jersey's water supplies. This also reinforced concerns that so many properties rely on borehole water. In addition to this, the increased presence of sea lettuce in St Aubin's Bay during the summer months raised further concerns as to the amount of nitrates leaching from farms and from the sewage treatment works onto the beach and into the sea.

4.7 The Panel recognises that the problems associated with water quality are not restricted to nitrate and that high levels of phosphorus and pesticide contamination are key issues that have also been identified within the WMP that require immediate attention. At the time of undertaking our review, for example, the Environment Minister ordered an immediate ban on the sale and distribution of pesticides containing Linuron. The pesticide is highly soluble in water and was detected in Island waters, including Val de la Mare reservoir last year.[3]

4.8 For this review, however, the Panel decided to concentrate solely on the issues of nitrate levels in Jersey's water. In 2015 the Panel undertook a review of 'Environmental Polices' and found that there was a significant and worrying situation in respect of nitrate levels. As a result, the Panel recommended that *"the Minister for the Environment should ensure that the prospective Water Strategy will provide a definitive explanation of how the problem of high nitrate levels in Jersey's water will be resolved, with targets for delivering specified reductions in nitrate levels."*[4]

4.9 Nitrate pollution is a long running, Island-wide issue which has been well documented in Jersey going back to the 1980s. Various working groups have been established to examine the problem and to suggest solutions. The most recent was the Nitrate Working Group (now the Action for Cleaner Water Group) who in 2015 were tasked by the States of Jersey to identify the means by which nitrates in water sources could be reduced to a

[3] Media Release, The Department of the Environment, 12th February 2017
[4] Environmental Policies Review (S.R.1/2015), The Environment, Housing and Infrastructure Panel, p3

concentration of below 50 mg/l. The group produced a report with recommendations, many of which have been incorporated into, and form the backbone of, the 41 measures in the WMP.

4.10 Given the technical nature of this topic, the Panel decided to commission expert advisors to assist with its review and, in particular, to examine the proposals and measures contained with the Water Management Plan for addressing nitrate. SEPA (the Scottish Environment Protection Agency) was appointed in December 2016 and we are grateful for the work that has been undertaken. A copy of SEPA's report is appended to our own.

4.11 We sought written testimonies from key stakeholders and held a Public Hearing with the Environment Minister. The testimonies we considered are available to read on the Scrutiny Website. We are grateful to those who have contributed to our work and to the Minister and his Department for their assistance during the review.

5. THE ISSUE OF HIGH NITRATE LEVELS

5.1 A considerable volume of historic data and documentation, which considers the nitrate problem in Jersey and its causes, is already available. Rather than repeat it here, in this section we wish to simply summarise the main factors which have led to the current situation. SEPA also considered the problem of high nitrate levels and its causes within their report, which can be found in Appendix 1.

The Issue

5.2 It is clear to the Panel, from the information that it has received during the undertaking of this review as well as previous data and documentation, that new measures for addressing the nitrate problem in Jersey are essential. In the introduction we highlighted the fact that the majority of Jersey's water bodies are currently at 'moderate status'[5]. We also highlighted that, as a result of the high levels of nitrate in our streams and groundwater, Jersey Water cannot guarantee to meet drinking water standards for nitrate in the mains drinking water supply at all times.

5.3 In addition, the quality of water found in boreholes and wells is unregulated and commonly untreated and is therefore entirely reliant on the quality of the water in the natural environment.[6] Whilst most households and businesses in Jersey are connected to the public water supply, which flows into reservoirs from surface water streams, there are approximately 3,390 (around 8%) households that are reliant on private boreholes and wells. Many of these households only have access to water that is higher in nitrate than the drinking water standard.

5.4 The Panel's expert advisors concluded from their own work that nitrate contamination was having a clear and significant impact on Jersey's waters. Within their report they noted that from 2006 to 2016 a total of 59% of all surface water samples exceeded the drinking water standard. The equivalent figure for groundwater was 45%. SEPA therefore agreed with the WMP, that there is a significant nitrate problem impacting Jersey's public water supply, the Island's private water supplies and the presence of sea lettuce on St Aubin's Bay.

5.5 KEY FINDING: Nitrate contamination is having a clear and significant impact on Jersey's public water supply, private water supplies and on the sea lettuce in St Aubin's Bay.

5.6 An adequate supply of good quality water in Jersey is crucial for a number of reasons; for the health of our community, to support the Island's reputation, to help provide a healthy and functional natural environment and to support the Island's economy. The impact of pollution on our environment is extensive and therefore the benefits of reducing nitrate

[5] Moderate status indicates that the relevant biological elements are moderately changed from national conditions.
[6] The Water Management Plan for Jersey, States of Jersey, June 2016

levels are far-reaching and affect the whole of the Island. We consider some of these benefits now.

5.7 As we have already mentioned, Jersey has the highest levels of nitrates in Europe. At the Public Hearing, the Environment Minister expressed his concern as to the implications of this status for the Island's reputation. The Minister revealed that he and his Officers feared that Jersey being top of the 'nitrates table' was damaging for the reputation of the Island and wished to work with farmers to reduce the flow of pollutants into Jersey's water supplies.[7]

5.8 Another reason for addressing the nitrate problem is the resulting benefit for our community and environment. Last summer the incidence of sea lettuce in St Aubin's Bay was heavily reported on in our local media and members of the public raised concerns about its increasing presence. The Panel was advised by the Minister during the Hearing that, whilst it is not the only contributor, high nitrates from streams and from the sewage treatment works contribute to the episodic green sea lettuce in St Aubin's Bay. Six major streams empty into the Bay as well as those that come through the works via the First Tower outflow. According to the Head of Water Resource Management, historical work that was undertaken in 1997, and repeated more recently in 2007, demonstrated that there was a 50:50 split between the works and catchment sources in respect of nitrates found in the Bay.[8]

5.9 It is worth noting that Jersey's sea lettuce problem in St Aubin's Bay is also influenced by seasonal water temperatures, shallowness of the water, tidal and wind action, and the amount of sunshine it receives. Nevertheless, the Minister anticipates that reducing nitrates entering into the Bay will result in less green lettuce and this in turn will save on clean-up costs, make the sea more accessible and boost local businesses.[9] SEPA concur with this view and agree that measures to reduce nitrate loading on land would significantly improve the sea lettuce problem.[10]

5.10 KEY FINDING: Whilst it is acknowledged that the prevalence of sea lettuce in Jersey is influenced by a number of different factors, measures to reduce nitrate loading on land will significantly improve the sea lettuce problem.

5.11 Excess nutrients can also impact on Jersey's biodiversity, as they encourage particular types of plant and growth which can then out-compete other species. In addition, the

[7] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017
[8] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017, p25
[9] The Water Management Plan for Jersey, States of Jersey, June 2016
[10] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017

oxygen depletion that occurs in water bodies when algal blooms die off can cause harm to other water dependant animals.

5.12 The effect of high nitrate levels on tourism and recreation must also be recognised when considering the benefits of addressing this issue. It can be argued that Jersey's unique coastal and inland environment is one of the key motivators for attracting visitors to the Island. Unfortunately the 'green bay' is the first impression of Jersey that most business and leisure visitors get, and it is a focus for many leisure activities. The Environment Department has estimated that the value of water based recreation to the Jersey economy is between £2.8 million and £4.4 million a year. This estimate was based on visitor surveys and, whilst it provides us with an understanding of the value of water-based recreation for tourists, it does not take into account local residents. Unfortunately, such data is not yet available to the Department. The Panel also notes that no further analysis on the impact of nitrate levels on tourism has been undertaken to date.

5.13 Controlling nitrates at source (where the problem happens) is the approach that has been adopted by the Environment Department and is key to the success of the new Water Management Plan (discussed in greater detail in Chapter 6). The Panel has been advised that one of the many advantages of addressing the issue at source is the potential benefit to Jersey's economy.

5.14 Firstly, if nitrate levels do not reduce, the Department for Infrastructure would have to add additional nutrient removal facilities to the new sewage treatment plant. It has been estimated that such treatment would cost £30 million with associated high running costs.[11] It is worth mentioning here that the Infrastructure Department has estimated that the new sewage treatment works plant, if plans are approved, will remove 10-12% more nitrates than the current plant. This by itself would therefore result in improvements to the quality of treated effluent entering St Aubin's Bay.

5.15 Secondly, if the situation does not improve, Jersey Water would have to add a nitrate removal process as part of their treatment. It was been estimated that this would cost in the region of £3 million. The Chief Executive of Jersey Water advised the Panel that the capital and operating costs of such a project could add an estimated £10-20 (3-6%) onto average household bills. The Chief Executive further advised however, that more work would need to be undertaken in order to provide a definite figure.

5.16 These options do not appear viable - and for reasons greater than their potential costs. For instance, in a written testimony to the Panel, Jersey Water highlighted a number of significant disadvantages to treatment which, in the Company's opinion, would render it a solution of last resort. In addition to the considerable costs, one of the key issues is where the nitrate would go once it is removed from the water. The treatment waste stream would contain concentrations of nitrate of approximately 64 times the drinking water regulatory limit. According to Jersey Water, *"the waste stream would not be able to be discharged to*

[11] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017

streams or to the sewage network and discharging to sea would be highly controversial, even if it were permissible."[12]

5.17 Another disadvantage, and one that would conflict with the objectives of the Water Management Plan, is that treatment at the waste plant or at Jersey Water would not improve the quality of stream water. The nitrate from the fields would continue to enter the streams and impact on the quality of water for those on boreholes or wells. Moreover, treatment solutions would not reduce the nitrate concentration of streams discharging into the shoreline or the concentration entering the Bay from the sewage plant.

5.18 The Minister for the Environment expressed similar sentiments at the Public Hearing:

"…even if the Department for Infrastructure can take nitrate out, even if Jersey Water can take nitrates out, the challenge – and the one that we must face up to – is removing the nitrates in streams and groundwater, because in St Aubin's Bay, a significant percentage of water that goes into the Bay comes from streams. It does not come via Jersey Water and it does not come via the Department for Infrastructure. The challenge is to address the nitrate issue on the Island as a whole, via agricultural predominantly, so that Jersey Water and Infrastructure does not need to address it there. We address it at source."[13]

5.19 KEY FINDING: Nitrate removal facilities at the Sewage Treatment Plant or Jersey Water should be considered a solution of last resort. Treatment of water at this stage would not improve the quality of our stream water or private water supplies.

The Cause

5.20 There is widespread acknowledgment that Jersey's surface and groundwater resources are widely polluted with nitrate from agricultural fertiliser that is used predominately by the potato growing sector. According to Jersey Water, *"nitrate concentrations peak in the potato growing season between January and May at levels consistently well in excess of the 50mg/l regulatory limit for drinking water."*[14] Within their own report our Advisors have considered the cause of high nitrate levels in Jersey in great depth[15] and we therefore do not wish to repeat it here. However, we will provide a summary of their findings along with consideration of other evidence we received during our review.

Public Water Supply

5.21 With regard to Jersey's public water supply, SEPA are of the view that the nitrate problem is a result of 'chronic problems'. 'Chronic problems' has been defined as widespread excessive nitrate loading across the Island. The Advisors also found that the fertiliser applied to potato crops was the dominant source of nitrogen applied to land in Jersey. During our review we were advised of a number of other factors that would help give

[12] Jersey Water, Written Submission, 20th January 2016, p3
[13] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017, p24-25
[14] Jersey Water, Written Submission, 20th January 2016, p1
[15] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p13

explanation to Jersey's particularly high levels of nitrate and which set the Island apart from many places in the UK. We touch on some of these now.

5.22 We have been advised that one of the dominant causes of high nitrates impacting the public water supply is the practice of early potato growing. In Jersey the earliest outdoor fields are planted in the first and second weeks of January and the earliest crops are available from early April, with peak volumes through May and June. All of the required fertiliser is applied in one go prior to covering with plastic. According to our advisors, *"the problem with applying fertiliser so early in the year is that crop uptake is often far less, and rainfall is higher, than later in the year."*[16] As a result, the likelihood of nitrate leaching from the soil into groundwater is far higher when potatoes are planted early.

5.23 According to The Jersey Royal Company, one of the most important factors that exacerbates our nitrate problem is the complex nature of land use on the Island. Farming land in Jersey is swapped and rotated between different sectors of the farming industry on a very short term basis. We were advised by the Company that it was not uncommon for a field to be used by a dairy farmer in January and February, planted in by a potato farmer in March, harvested in July and put into a crop of brassicas by a different vegetable farmer in September. We were advised that such a use of land can present issues when determining the total amount of nutrients applied in any 12 month period. Thus, the Jersey Royal Company believe that *"...this short term swapping, although good from a rotational aspect could result in increased nutrients in water."*[17]

5.24 The Company also highlighted the fact that Jersey was unique in that the majority of its water catchment areas covered the same land mass that is utilised by farmers. In contrast, the UK and many other countries within the EU (European Union) usually take water from non-intensive land areas where there are few agricultural inputs.

5.25 SEPA also identified the practice of double cropping as a significant contributor to the overall issue of nitrogen loading and nitrate leaching in Jersey. For instance, it was found that *"the main risk is that farmers using the land after the potatoes are harvested may be tempted to add an insurance dressing of extra nitrogen just to make sure they get a good yield from the second crop. This may occur even if the crop doesn't need it due to likely high residual nitrogen in the soil."*[18]

5.26 Soil acidity was also identified by our Advisors as a contributor to nitrate leaching. The review undertaken by the Nitrate Working Group in 2014/2015 found that Jersey soils were more acidic than they should be. According to SEPA, acidic soils mean that plants cannot use nitrogen as effectively which, in turn, can make soils more vulnerable to nitrate leaching.

[16] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p14
[17] The Jersey Royal Company, Written Submission, 18th January 2017, p2
[18] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p15

5.27 KEY FINDING: The dominant cause of high nitrate levels in Jersey's public water supplies is the practice of early potato growing, combined with the subsequent land uses after the early potatoes are harvested.

Private Water Supply

5.28 The Panel's Advisors are of the view that the nitrate problem in private water supplies is caused by 'acute problems' local to the water supplies, plus the 'chronic problems' identified for public supplies, as described above. 'Acute problems' has been defined as point sources of pollution occurring close to the sampling points. Point sources are any single, identifiable source of pollution from which pollutants are discharged such as pipe, ditch, etc. SEPA found that the 'acute problems' were likely to be the result of *"poor compliance with basic good practice in nutrient management, the construction and siting of septic tank discharges, farmyard waste management measures, old landfill sites etc."*[19] It was recognised that the delayed introduction of legislation in Jersey, in respect of water pollution and resources, may help to explain some of the legacy compliance issues.

5.29 KEY FINDING: High nitrate levels that are affecting private water supplies are likely to be the result of poor compliance with basic good practice in nutrient management, the siting of septic tank discharges, farmyard waste management measures and old landfill sites.

Sea lettuce

5.30 Similar to the Environment Minister and his Officers, the Advisors believe that local sources of nitrogen entering St Aubin's Bay are likely to be the main source of the sea lettuce problem (see pages 9-11 of Advisors report for more information). Furthermore, SEPA agree with previous studies that found evidence to suggest that the two main sources of the sea lettuce problem on the coastline were a combination of the Bellozane Sewage Treatment Works effluent and the 'chronic' problems from farmland.

5.31 KEY FINDING: The two main sources of the sea lettuce problem in St Aubin's is a combination of effluent from the Bellozane Treatment Works and nitrates flowing off farmland into surface water streams and onto the beach.

Has the nitrate issue improved over time?

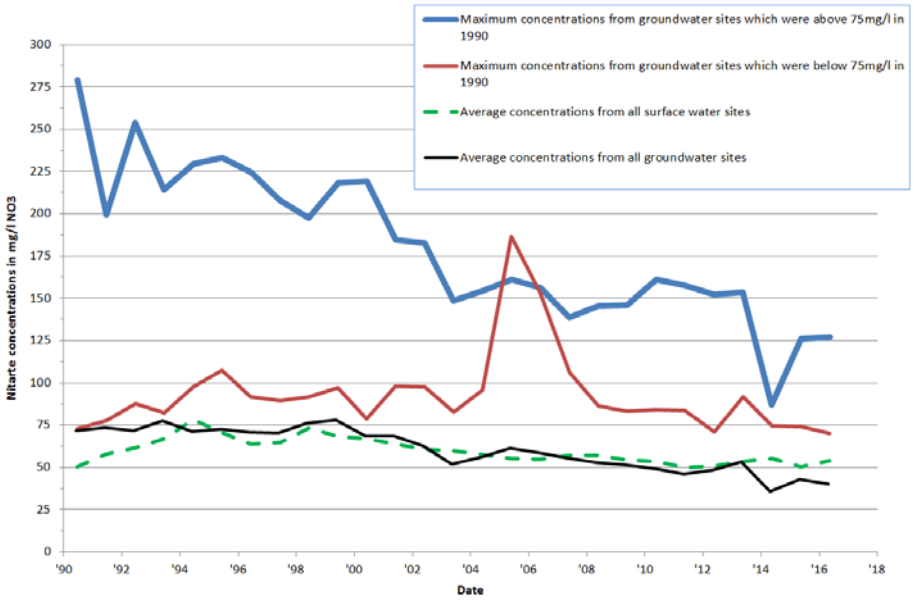
5.32 The Water Management Plan says that improvements in water quality have been achieved over the past 10-15 years. Our Advisors agree that there is some evidence to suggest an improvement in nitrate concentrations. For instance, data shows that average concentrations in groundwater have decreased from approximately 75mg/l in 1990 to 50 mg/l in 2016 (see Figure 1). However, SEPA are of the opinion that *"improvements are more marginal than they may first appear."*[20] The evidence suggests that many 'acute' problems that occur close to monitoring sites have been resolved. The evidence also

[19] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p17
[20] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p10

shows a more recent improvement in 'chronic' nitrate problems across the Island. However, our advisor found that the rate of improvement in the chronic problem was not sufficient to meet the target deadlines set out within the WMP. According to SEPA:

"Acute nitrate problems are usually solved by basic good practice measures, and they are the key to resolving the private water supply problem. Chronic nitrate problems usually come as a result of widespread high loadings from agriculture and these are the key to resolving the impacts on the public water supply and on the sea lettuce problem. Unfortunately, chronic problems are much harder to solve." [21]

Figure 1 – Nitrate Concentrations in Groundwater (courtesy of our Advisors)



5.33 KEY FINDING: Whilst there are signs of some improvement in widespread excessive nitrate loading across the Island, the rate of improvement is not currently sufficient to meet the target deadlines set out in the Water Management Plan.

[21] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p11

6. ADDRESSING THE NITRATE ISSUE

How does the Minister intend to address the nitrate problem in Jersey?

6.1 In order to address the high levels of nitrate in Jersey's water the Environment Minister has developed a five year Water Management Plan. According to the Minister, the WMP provides the means to be able to *"access, manage and improve our water resources."*[22] It has been acknowledged throughout the Plan, however, that water quality issues in the Island are complex to resolve and maintaining a sufficient water supply is a challenge.

6.2 The WMP contains eight objectives and sixteen Key Performance Indicators (KPIs), five of which are relevant to nitrates (see page 18 of the advisor report). Our Advisors reviewed the objectives of the Plan and, based on their own experiences, found that they offered *"a good balance between what is desirable and what is reasonable for a sustainable economy"*[23].

6.3 KEY FINDING: The objectives contained within the Water Management Plan provide a good balance between what is desirable and what is reasonable for a sustainable economy.

6.4 The Water Management Plan, has adopted a 'catchment management approach' for improving water quality in Jersey. This approach aims to limit or prevent the pollutant getting into the water in the first place, rather than treating the water once it has already been contaminated. In this case the WMP proposes to introduce catchment management measures to reduce the amount of nitrate entering our waters from agricultural practice. Similar to the approach used in Scotland to deal with rural diffuse pollution, the WMP suggests a combined catchment approach using site visits and advice underpinned by regulation targeted at the control of land management activities that are likely to cause pollution.[24]

6.5 SEPA agree that a catchment based approach is the best means of addressing the nitrate problem in Jersey. The Advisors described to the Panel their own experiences of using this approach in Scotland:

"In Scotland, catchment officers identify issues of compliance to farmers and also provide advice on how to address them. Interim results show that the compliance rate of diffuse pollution rules over 3,221 farms at the time of SEPA's initial inspection was 35%. SEPA provided advice on compliance needs, and by our first re-visit, 86% of the farmers were fully compliant or significantly working towards compliance in priority catchments."[25]

[22] The Water Management Plan for Jersey, Overview Document, July 2016, p2
[23] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p18
[24] Water Management Plan for Jersey 2017-2021, July 2016
[25] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p18

6.6 A number of benefits of using 'a catchment approach' have been considered within the WMP. Firstly, the Plan states that solving water quality at source is much cheaper than solving it via treatment (the Panel has considered this in some detail in Chapter 5). Secondly, we have been told that this approach is much more likely to deliver other ecosystem service benefits. In this regard, the WMP states that *"addressing the underlying problem at source has a cascade effect of multiple benefits in terms of ecosystem health, downstream damage costs avoided and benefits to other users."*

6.7 During the Public Hearing, we were advised by the Head of Plant Health that the Economic Development, Tourism, Sport and Culture Department was due to undertake an ecosystem services review, which would provide a calculation, in monetary terms, as to the value of Jersey's environment to our economy and society. From the review, it is anticipated that the Department would be able to establish what the cost of inaction would be and who should be contributing towards improving the Island's water supply.[26] Our Advisors endorse the completion of an ecosystem services review and believe that it could become invaluable in the future if difficulties in implementation of the Plan or a change in economic or political circumstances were to arise.[27]

6.8 KEY FINDING: The Panel supports the Economic Development, Tourism, Sport and Culture Department in undertaking an ecosystem services review to help determine the value of Jersey's environment to our economy and society.

6.9 KEY FINDING: A catchment-based approach is the best means of addressing the nitrate problem in Jersey. In Scotland, such an approach has raised compliance on farms from 35% to 86%.

6.10 In order to achieve the objectives outlined in the WMP under the preferred scenario 2b, it is proposed that a core set of measures be implemented through Water Catchment Management Orders (WCMOs) (see Figure 2). These being; fertiliser imports and sales, nutrient planning and management, field operations and applications, soil protection, and pesticide storage and application. According to the Department, most of these measures will put in place a legal requirement to follow what is already considered good practice and is mandatory for anyone already claiming rural payments (e.g. Single Area Payments (SAPs)), as set out in the Water Code.

[26] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017
[27] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017

Figure 2 – Proposed Areas for Regulation using WCMOs (Page 54 WMP)

	WCMO TITLE	KEY PRESSURE CONDITION ADDRESSES	SECTORS CONDITION APPLIES TO
WCMO 1	Fertiliser imports and sales	Nitrates and Phosphates	All non-domestic users of fertilisers
WCMO 2	Nutrient Planning and Management	Nitrates and Phosphates	All non-domestic users of fertilisers and organic manures
WCMO 3	Field operations and applications	Nitrates and Phosphates	Agricultural sector
WCMO 4	Soil Protection	Nitrates, Phosphates and Pesticides	All non-domestic land managers
WCMO 5[53]	Pesticide storage and application	Pesticides	All non-domestic users of pesticides

6.11 In order for the measures to be implemented a number of changes were required to the existing legislation. For instance, the Water Pollution (Jersey) Law 2000 did not allow the Environment Minister, or his Department, to react and deal with the issue of diffuse pollution because, in contrast to point sources of pollution, it is very difficult to prove a definite connection between source and impact in any individual case.

6.12 Whilst undertaking our review, the Environment Minister lodged the Draft Water Pollution (Amendment No.3) (Jersey) Law 201-. The amendment to the Law meant that, in the future, controls on activities that can cause diffuse pollution would be introduced solely by Ministerial Orders, rather than as at present via a combination of States' Regulations and Ministerial Orders. The proposals would therefore allow the Minister to act more quickly to address contamination issues and deal with farmers who use fertilisers irresponsibly.[28] The amendments to the primary legislation would also allow part 3 of the Law to be effectively utilised. This part of the Law gives the Minister power to set water objectives and achieve those objectives through the use of the WCMOs, thus enabling a more appropriate regulatory response to the issue of diffuse pollution. On 15th March 2017, the amendments to the Draft Water Pollution (Jersey) Law were approved by the States.

6.13 The intention of the Minister, under the WMP, is to designate the whole Island as a Water Catchment Management Area and impose conditions for the prevention, control, reduction or elimination of pollution in controlled waters in those areas through the use of WCMOs. It is widely recognised that the use of fertilisers in agriculture is the primary cause of high nitrate concentrations in our water supply. However, by introducing the concept of WCMOs, the Minister is also requiring broad-scale action across multiple sectors. Thus, under the WMP, anyone who uses nutrients and pesticides will have to follow and comply with the WCMOs.

6.14 The Panel has been advised that the amended Law will give the Environment Minister greater powers to control the use of fertilisers on land where Jersey's water is being polluted. For instance, in a Public Hearing the Minister stated:

[28] Draft Water Pollution (amendment no.3) (Jersey) Law 201-

"We are now moving into a situation with the water plan that when the legislation comes through if farmers misbehave and we find we can prove that they are misbehaving with fertilisers or with chemicals, we can take action. We can take it to court and we can fine them or they will be sentenced accordingly by the court."[29]

6.15 Jersey Water advised the Panel that it endorsed the enhancement of the existing regulatory framework and the introduction of new powers to enforce minimum acceptable standards. In addition, Jersey Water sees the enhancement of the existing framework as *"fundamental to the success of the plan."*[30] Similarly, the Jersey Farmers' Union supports the future use of WCMOs and believes that they will help to regulate the small minority of farmers who might not be inclined to do things on a voluntary basis.[31]

6.16 The new Water Plan adopts an "integrated water management planning" approach. Such an approach encourages the collaborative working of all stakeholders towards the common goal of improved water quality and sustainable water resources. During the Public Hearing, the Minister stressed the importance of working together with the farming industry and the water industries for the success of the Plan. He advised the Panel that through working more closely with the farmers and Jersey Water, the *"ability to address this issue has increased dramatically over the last 18 months".*[32] In written testimonies to the Panel, representatives from Jersey Water, Jersey Farmers' Union and The Jersey Royal Company agreed with the view expressed by the Minister.

6.17 Despite the proposal to introduce a regulatory framework for addressing non-compliance, the Minister told the Panel during a public hearing of his desire to reduce levels of nitrate without the need for "heavy-handedness" via the legal process. Instead, he hoped that hard work and a close working relationship between all stakeholders would have a significant impact on the nitrate issue in Jersey.[33]

6.18 KEY FINDING: The amendments made to the Water Pollution (Jersey) Law 2000 will give the Minister for the Environment greater powers to control the use of fertilisers on land where Jersey's water is being polluted.

6.19 KEY FINDING: The new regulatory framework will be considered a backstop, only to be used if and when necessary.

6.20 According to SEPA, a key component of partnership working in the WMP is incentivisation. Under the preferred scenario (2b) it is proposed that the Economic Development, Tourism, Sport and Culture Department (EDTS&C) would continue to provide incentives in the form of rural payments, which support the implementation of best practice. Although rural payments will continue, the Panel was advised during its Hearing with the Environment

[29] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017, p7
[30] Jersey Water, Written Submission, 20th January 2016
[31] Jersey Farmers' Union, Written Submission, 20th January 2017
[32] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017, p3
[33] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017

Minister that they would be delivered differently under the new Rural Economy Strategy (RES). Presently, farmers receive single area payments (a set amount of money per vergée) with some conditions attached. However, going forward, the EDTS&C Department has proposed a more performance-based approach. For instance, the Head of Plant Health advised the Panel:

"Year 1 all land managers in receipt of public money will be required to have reached a level called Red Tractor, which is a basic full food chain compliance audit process. Half the SAP (Single Area Payment) recipients are already at that standard. By year-end 2018 we expect everybody to be 50 per cent through the compliance checking, through the process of adopting LEAF [Linking Environment and Farming]*, and by the year-end 2019 we are expecting everyone who wants to receive public money in a farm environment to be LEAF accredited. LEAF is a series of questions, checkpoints, gates and advice that really focus people's minds as to how they are tackling their day to day farming operations with things like nutrient loading, biodiversity etc."*[34]

6.21 It is intended that the future requirement for all farmers to be LEAF accredited, in order to receive States payments, will provide a strong financial incentive to comply with the high standards specified by the organisation. SEPA support the proposal for Jersey to work with LEAF and believe it will help to provide a farm assurance system, showing that food has been grown sustainably with care for the environment. In their own report, the Advisors spoke of the benefits of such proposals:

"The Advisors agree that incentivisation is a crucial part of the success of the plan. We support linking government incentives to the concept of farmers' provision of a public service. It is likely that Jersey farmers will need to go beyond basic compliance with regulation, which deal mainly with acute problems, in order to address chronic problems and achieve the objectives of the Plan. We see the proposed link between market assurance schemes and government incentives as going beyond compliance, and it is therefore particularly important and welcome. The proposed LEAF uptake in Jersey will be much higher than the current level of 3% in the UK. These market assurance schemes turn the environment into an economic opportunity."[35]

6.22 Given the potential advantages of the proposals, SEPA has suggested that an explanation of the incentivisation and market assurance schemes is made more explicit in the Water Management Plan.

6.23 KEY FINDING: Incentivisation is a fundamental part of the Water Management Plan and is vital for the success of the Plan's objectives. Market assurance schemes, such as LEAF, will provide a strong financial incentive for farmers to comply with the high standards specified by the organisation.

[34] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017, p4
[35] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p21

6.24 RECOMMENDATION: The Minister for the Environment should ensure that the use of incentives, as a tool to encourage best practice and compliance among farmers, is made more explicit within the Water Management Plan.

Why only now?

6.25 Whilst there has been a number of initiatives and working groups looking at Jersey's nitrate problem over the last two decades, there has not, until now, been a comprehensive plan by the States of Jersey as to how the quality of Jersey's untreated water could be improved to an acceptable standard. Many people have therefore asked the question - why has the Plan only now been put in place?

6.26 The Panel queried this with the Environment Minister at the Public Hearing and he provided a number of explanations. These have been summarised below:

- Reduced EU limits for nitrates in water generated more attention to this issue.
- Culture – Islanders are now taking more notice of their environment.
- The Department now has an improved relationship with the farming industry, which has led to better communication and a more co-ordinated approach to addressing nitrates.
- The Medical Officer at Health has indicated that she does not approve of the continuous granting of dispensations and Jersey Water concurs with this position.
- The Minister needed to revise the WMP to give more prominence to the issue of pesticide contamination. This led to a delay in bringing the Plan forward.

6.27 In addition to the above, it is clear to the Panel that willingness on the part of the Environment Minister to push forward with the Water Management Plan is another reason as to why we have started to see change. The Minister has, on many occasions, confirmed his view that the impact of nitrates, and pollution in general, on Jersey's water cannot be ignored.

Compliance vs Advisory

6.28 In order to help apply the new measures more effectively, the Minister is proposing to separate the roles of advisory and compliance. Under the current system, for example, compliance in respect of the present EDTS&C subsidy has been carried out mainly by Rural Economy staff. Due to the amount of manpower available, the assessment was carried out on 10% of claimants. Whilst water protection was not the primary aim of the compliance assessments, in the absence of any direct regulation for diffuse pollution, they have been extremely important to the Environment Protection team, who sit within the Environment Department.

6.29 The Panel was advised by the Head of Plant Health at the Public Hearing that the current annual compliance checks created an operational tension because, due to limited

manpower resources, the same staff were being used to advise the farmers as well as carrying out compliance assessments.[36]

6.30 Under the new Rural Economy Strategy, the EDTS&C payment will become contingent on claimants having LEAF accreditation. It has therefore been proposed that the compliance around the new payment will be undertaken by LEAF auditors. We were advised that the change would remove the operational tension for Rural Economy staff as well as reduce the administration burden on the team, which has suffered staff losses as a result of departmental savings targets.

6.31 Furthermore, we were told that the change would mean that compliance checks, in respect of EDTS&C payments, would increase from 10% to 100% every year. SEPA support this move, *"provided that the LEAF audit is focused on raising the baseline environmental performance on farms, particularly that water protection fully supports the objectives of the Water Management Plan."* The Advisors also noted that the focus on cross compliance inspections and reporting non-compliance back to the government is not the typical role of LEAF auditors. As a result, it has been suggested that EDTS&C will need to ensure that this role is fully implemented.[37]

6.32 KEY FINDING: Under the new Rural Economy Strategy, the EDTS&C payment will become contingent on claimants having LEAF accreditation. It has therefore been proposed that the compliance around the new payment will be undertaken by LEAF auditors.

6.33 Going forward, the Environmental Protection team will be responsible for bringing in and enforcing the WCMOs. This additional regulation, proposed under the Water Management Plan, will complement the LEAF audit but will operate independently of the EDTS&C payment scheme. The new regulation will involve additional compliance work and will therefore require additional compliance staff. One of the targets of the KPIs (Key Performance Indicators) within the WMP is to achieve 95% compliance with WCMO requirements by 2020. One way of achieving this target, which is specified within another KPI, is by increasing the current 20 days per year of compliance checking (currently undertaken by the Rural Economy Staff) to 100 days per year, by 2020.[38] According to SEPA, the key difficulty will not be what is written in the WCMOs. Rather, it will be achieving and assessing compliance with these additional requirements. The impact of these targets on manpower resources within the Environment Department is considered in Chapter 7 of our report.

6.34 KEY KINDING: The difficulty will not be what is written in the Water Management Catchment Orders but rather the ability to achieve and assess compliance with the additional requirements that they impose.

[36] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017
[37] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p23
[38] Water Management Plan for Jersey 2017-2021, July 2016

The role of the agricultural industry and Jersey Water

6.35 The way in which land is managed on the Island is key to the success of the WMP in reducing diffuse pollution at source. The majority of measures in the plan therefore focus around controlling the application and timing of fertilisers and nutrients to the land as well as managing and reducing the risks from pesticides. Thus, the farming community, in addition to other landowners, have a big role to play in helping to address the issue of nitrates and to assist the government in achieving the measures set out in the WMP.

6.36 We are aware that the industry, both the growing sector and the dairy sector, have been involved in work to reduce nitrates in raw water for the last decade. We note that the cattle industry built new slurry stores to allow for extra storage in the winter months so that no spreading took place during the winter. We also recognise that the farming industry participated significantly in the Diffuse Pollution Project that was started in 2009 by the Department of the Environment.[39] The project used a mixture of education, advice and incentives to better understand the barriers to good practices and how the quality of water would be achieved.[40]

6.37 KEY FINDING: Over the last ten years the farming community have been heavily involved in helping to reduce levels of nitrates on our Island.

6.38 As we have mentioned previously, the Panel has received evidence to suggest that the vast majority of the agricultural industry are fully supportive of the WMP and the principal of clean water for our Island in general. Through the Action for Cleaner Water Group (previously the Nitrate Working Group), representatives from the farming community have worked closely with the Environment Department and Jersey Water to examine the problem of nitrate pollution and to make recommendations. Many of those recommendations have been incorporated into the new Water Management Plan.

6.39 KEY FINDING: The vast majority of the agricultural industry are fully supportive of the Water Management Plan and the principal of clean water for our Island in general.

6.40 In addition, we have been informed that the activities of the Action for Cleaner Water Group have resulted in voluntary measures by the farming community to reduce inputs of fertilisers and pesticides.[41] This year, for example, the potato growing sector has begun trialling new machinery that allows for fertiliser placement. This would mean a move away from broadcast application of fertiliser over the whole field to placement of fertiliser where the potatoes are planted.

6.41 According to The Jersey Royal Company, many of the potato growers in the Island are keen to make this move.[42] If the trials are successful, the Panel has been advised that there could be a substantial 10-15% reduction in the amount of fertiliser applied to the

[39] The Jersey Farmers' Union, Written Submission, 20th January 2017
[40] The Water Management Plan for Jersey, Overview, July 2016
[41] Jersey Water, Written Submission, 20th January 2016
[42] The Jersey Royal Company, Written Submission, 18th January 2016

growing crop of Jersey Royal potatoes. Whilst it may take a year or two before such machinery can be up and running, the Jersey Royal Company feel that "*this could potentially provide the biggest reduction in fertiliser inputs in a few short years, more than the industry has achieved in the past 15 years."*[43]

6.42 The added benefit of this move for the industry itself is the money it could save from reducing the amount of expensive artificial fertiliser it uses, without any crop loss. The Jersey Royal Company has suggested that these economic savings could help pay for any new equipment required. It has also been suggested that the same approach should be taken by the dairy sector. The Jersey Royal Company advised the Panel:

"Whilst placement of inorganic fertiliser to grass crops is not economic or practical, the injection of slurries and sludges rather than surface application will ensure that nutrients are utilised more effectively and reduce nitrates and phosphates entering water supplies."[44]

6.43 At the Public Hearing, the Environment Minister agreed with the view that reducing the amount of fertiliser applied to fields could not only save the farmers money but would also reduce the levels of nitrates in Jersey's water. In their own report, our Advisors have estimated that the value of nitrogen leached by farmers is equivalent to approximately £200,000 to £300,000 per year. It has been acknowledged however that leaching, though wasteful, cannot be eliminated completely in practice and some loss of nitrogen is inevitable. With regard to the above, our Advisors agree that the nitrate problem represents a significant potential for a win-win situation. For example, they found that:

"the problem of high nitrate concentrations in water represents a waste of resources to farmers. The amount of nitrate leaches is well in excess of best practice, representing a loss to farmers of many tens of thousands of pounds per year. Any reduction in nitrate leaching will therefore bring an improvement both to drinking waters and, with time, the sea lettuce. A further reduction to levels considered best practice elsewhere could solve the problem in the long term."[45]

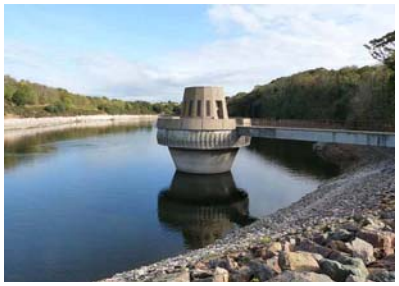
6.44 KEY FINDING: Reducing the amount of fertiliser applied to fields would not only significantly improve Jersey's nitrate problem but would also save famers a substantial amount of money.

6.45 Jersey Water, being the only water supply company in Jersey, plays a vital role in helping the government to safeguard and protect the water environment on the Island. The Company is bound by the requirements set out in the Water (Jersey) Law 1972 to supply water that meets particular quality parameters. Similar to the farming industry, Jersey Water has worked closely with the Environment Department, as a member of the Action

[43] The Jersey Royal Company, Written Submission, 18th January 2016, p3
[44] The Jersey Royal Company, Written Submission, 18th January 2016, p3
[45] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p16

for Cleaner Water Group (and previously the Nitrate Working Group), to help identify ways in which nitrate pollution could be reduced.

6.46 In addition, Jersey Water advised the Panel that it had a number of initiatives that were underway to manage nitrate in the treated water supply. For instance, we were told that the Company had been working closely with farmers, providing them with water quality data to enable them to develop pollution mitigation strategies (as addressed above). We were also advised of plans to install bypass arrangements on the West Stream at Val De La Mare and Queen's Valley reservoirs. Where reservoir levels permit, the bypasses would allow water polluted with nitrate, pesticides or other pollutants in the streams that are feeding the reservoirs to be diverted around the reservoir and out to sea.[46]



6.47 It must be recognised however that, firstly, the ability to bypass reservoirs or blend water is reliant on sufficient water resources. According to Jersey Water:

"In the event that reservoir levels are low, there may be the need to impound the water causing nitrate concentrations in reservoirs to increase and threaten the ability to manage nitrate levels in treated water."[47]

6.48 Secondly, bypass arrangements will not address nitrates at source nor will they help to tackle Jersey's sea lettuce problem or the potential implications of high nitrate levels for the Island's aquatic ecosystem.

6.49 In the UK it is common practice in catchment sensitive farming areas for water boards to contribute towards supporting farming and the required changes in practice. It has been argued that Jersey Water could undertake a similar role here in the Island. Both the Minister and The Jersey Royal Company, for instance, are of the opinion that Jersey Water could be doing more to assist in either providing or financing extra resources. In a written testimony to the Panel, The Jersey Royal Company advised:

"This could be a real way forward for Jersey and more cost effective for Jersey Water to support change in farming practices rather than invest in nitrate removal at their treatment works. This could also be achieved without the need for increased Government funding."[48]

6.50 The Environment Minister shared a similar viewpoint:

"Maybe we should look at putting a bit more resource in but I would like to think that we should do that in conjunction with the industry and in conjunction with Jersey Water. With Jersey Water, at the end of the day, they are a business making money out of selling water

[46] Jersey Water, Written Submission, 20th January 2016
[47] Jersey Water, Written Submission, 20th January 2016, p2
[48] The Jersey Royal Company, Written Submission, 18th January 2016, p4

to the people. If we help them to spend less money and make more profit…it is a 2-way street."[49]

6.51 We will consider the potential role of Jersey Water, in respect of resources, in greater detail in the next chapter of our report.

[49] Transcript, Public Hearing with the Minister for the Environment, p42, 25th January 2017

7. THE CHALLENGES

7.1 Whilst the need for a Water Management Plan is widely accepted, there are a number of matters that require consideration in order to ensure that the key objective of improving water quality and reducing levels of nitrate is achieved. We consider these next.

Resources

7.2 The WMP proposes additional regulation in the form of WCMOs which will operate independently from the subsidy regime that is carried out by the Economic Development, Tourism and Sport and Culture Department. This new regulation will be the responsibility of the Environment Protection Team, which sits within the Department of the Environment, and will involve additional compliance work.

7.3 As we stated earlier, one of the targets of the WMP is to achieve 95% compliance with WCMO requirements by 2020. Currently, 20 days per year are spent on compliance checking and one of the required outcomes of the Plan is to increase this to 100 days per year by 2020. However, in the WMP alongside this target, there is a caveat that says *"subject to resource constraints."*[50]

7.4 With regard to WCMOs, our Advisors argue that the key difficulty will not be what is written in these Orders. Rather, the stumbling block will be achieving and assessing compliance with these additional requirements. Hence, *"the employment of an additional new catchment & compliance officer (FACTS and BASIS qualified) will be crucial to both providing advice to support achievement and assessing compliance."*[51] Based on the Advisors' own experiences they feel that practical advice is the most important factor in determining whether or not the right actions are taken by farmers:

"Support by a range of individuals to farmers can greatly improve the effectiveness of measures to tackle diffuse pollution, by increasing the likelihood of behavioural changes and targeting measures to the most appropriate locations."[52]

7.5 It has been estimated by the Department that approximately 0.5 of an FTE (full-time equivalent) will be required to undertake the additional compliance checks on farms and another 0.5 of an FTE to provide the Environment Protection Team with internal advice on farming and water related matters. Based on Scottish experience and resourcing, SEPA agrees that a single additional full time post will be needed to deliver the WMP across Jersey.[53]

[50] Water Management Plan for Jersey 2017-2021, July 2016
[51] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p22
[52] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p22
[53] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017

7.6 KEY FINDING: At least one new full time equivalent post will be required to undertake both an advisory and compliance role in order to successfully deliver the Water Management Plan objectives across the Island.

7.7 Contained within the WMP is a table that sets out the additional costs borne by different sectors as a result of the adoption of Scenario 2b, relative to the current position, over the five years of the Plan (summarised in Figure 3). It has been estimated that, in order to achieve the measures under Scenario 2b, the government would require an additional £100k per year (total cost over the 5 years is £494k). These costs occur mainly *"from making sure the legislation and supporting codes of practice are fit-for-purpose and funding the increasing compliance burden (employment of a compliance officer), as well as increased monitoring costs."*[54] The extra £100k per year, therefore, includes the above mentioned additional required resources.

Figure 3 – Additional costs borne by different sectors as a result of adoption of Scenario 2b

The shared costs of implementing Scenario 2b over the 5 year period have been explained in detail within the WMP and will therefore not be repeated here. Below we have simply summarised the anticipated costs:

Sector	Average cost over 5 years	What for?
Water Industry	£1,188k	Mainly for the implementation of a reservoir bypass scheme. This is a £1m one-off cost.
Government	£494k	£100k a year for making sure legislation and supporting codes of practice are fit for purpose, to finance compliance burden and for increased monitoring costs.
Land Managers, including farmers	£648k	£130k per year for the whole sector. Costs associated with demonstrating compliance with new regulatory baseline of good practice.
Industry (other)	£188k	£37k per year for discharge permit charges.

7.8 In an amendment to the 2013-2015 MTFP (Medium Term Financial Plan), Deputy John Young secured an additional £300,000 of new revenue expenditure for the Environment Department to allow for the funding of three environmental projects identified by the Deputy: Countryside Infrastructure, Island Plan 2011 Implementation, and Strengthening the Protection and Regulation of the Island's Environment.

7.9 Part of the £300,000 was used to fund the work that was undertaken in respect of "Challenges for the Water Environment of Jersey" and some of the money was saved to fund the delivery of the WMP. According to the Head of Water Resource Management and Regulation, Officers worked out that they could service the additional requirements

[54] The Water Management Plan for Jersey, Overview Document, July 2016, p10

out of the remaining available funds until 2018, but after that additional money would need to be identified.[55]

7.10 Similarly, the Water Management Plan itself strongly emphasises the need for additional resources in order to successfully deliver the 5 year Plan:

"Delivery of the Water Management Plan cannot be achieved using in house resources past the point of preparation and production of the WCMOs. Additional money needs to be found to ensure compliance checking and advice is deliverable."[56]

7.11 When we questioned the Environment Minister on this matter at a Public Hearing, he advised the Panel:

"Carrying on as we are or have done for the last 5 years is not going to be acceptable. We need to do better and we will. If we find in 18 months' time or by the time we get to the end of the potato season in 2018, for example, if we are not seeing the results starting to go the right way, we feel we need to commit a bit more resource, well we will either have to find that inside the Department or we will have to go away and see if we can find some more resources."[57]

7.12 KEY FINDING: The additional requirements of the Water Management Plan can be funded out of existing resources until 2018, after such time additional money will need to be identified.

7.13 It must be recognised, however, that the Environment Department has already made considerable savings over of the course of the current MTFP. The Department had the highest departmental savings target as a percentage of its total cash limits in 2015. For instance, the Department committed to making a total saving of £2million, which equates to around 32% of the budget it had to spend in 2015. The majority of these savings have been made from the reduction of staff costs. Moreover, a previous Scrutiny review concluded that the Environmental Protection Team was already under resourced to deliver its extensive and expanding mandate.

7.14 The WMP recognises that in order to fund the Government costs proportion of the Plan in the medium to longer term under Scenario 2b, a number of options will need further investigation. One of the options it identifies is a potential tax on fertilisers and/or pesticides which could be levied on all nitrate-based fertilisers or plant protection products imported into or sold in Jersey.

7.15 According to the Plan, a tax of this sort *"has the advantage of being directly consistent with the polluter pays principle, being proportional to use and acting as a disincentive to over-application."*[58]SEPA recommended that a tax on fertiliser is worthy of consideration,

[55] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017
[56] Water Management Plan for Jersey 2017-2021, July 2016, p63
[57] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017, p32
[58] Water Management Plan for Jersey 2017-2021, July 2016, p63

as it is consistent with the 'polluter pays principle'. Furthermore, they are of the opinion that such a tax would also help fund the catchment/compliance officer.[59]

7.16 KEY FINDING: A potential tax on fertilisers and/or pesticides is worthy of consideration. It is possible that such a tax could help fund the employment of a catchment/compliance officer.

7.17 As already mentioned in the previous chapter, the Minister is of the opinion that Jersey Water should help contribute towards providing additional resources. For instance, by helping to support farmers and investing in the control of diffuse pollution now, Jersey Water could achieve a considerable saving in expenditure on water treatment facilities in the future. During the Public Hearing, the Minister alluded to a potential catchment officer position that would undertake an advisory role by offering advice to farmers and landowners. It was unclear to the Panel as to how exactly this extra resource would be funded. We were told, however, that the Minister and his team were currently holding discussions with Jersey Water to determine how this could be achieved. In a written testimony to the Panel, Jersey Water itself recognised the need for adequate funding in order to implement the measures contained within the WMP:

"Water quality needs to remain a top priority for the Council of Ministers and there needs to be sufficient financial resources to fund the implementation and ongoing costs."[60]

7.18 In the view of our Advisors, the employment of a catchment/compliance officer will be crucial for providing advice to support the achievement of compliance as well as assessing compliance. For instance, SEPA found:

"The work of the catchment & compliance officer is absolutely crucial to the success of the Plan. Whatever the source of funds, it is important that funding is found very quickly to enable one officer to begin work. It is equally important that all parties visiting farms work seamlessly together and that there is no possibility of incurring waste via duplication of effort or unnecessary additional burden on farmers via multiple visits from different people."[61]

7.19 The Panel agrees that increased agricultural compliance checking and monitoring is a fundamental principle of the preferred option in the Water Management Plan. Thus, it is our concern that without the sufficient resources available, the success of the Plan and its objectives will be greatly affected. It is imperative that the necessary compliance checks are undertaken to ensure that the new regulatory requirements are being adhered to.

7.20 KEY FINDING: The employment of a new catchment/compliance officer will be crucial for providing both advice to support the achievement of compliance and assessing compliance.

[59] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017
[60] Jersey Water, Written Submission, 20th January 2016, p4
[61] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p24

7.21 KEY FINDING: Without the sufficient resources available, the success of the Plan and its objectives will be greatly affected.

7.22 RECOMMENDATION: The Minister for the Environment must ensure that funding is found without delay to enable a new catchment/compliance officer to begin work.

Monitoring

7.23 Careful and accurate monitoring will be required to determine the ongoing success of the measures contained within the WMP. In addition to the increased compliance checks, which will be essential for ensuring conformity with the new regulations, one of the Plan's Key Performance Indicators (KPI 8) is to develop an enhanced and more focused environmental monitoring programme. The Plan states that over the past 20 years, the Water Resource Management and Regulation Team has already developed a water management network, which means that monitoring is carried out on all controlled waters, including the Island's fresh water (ground water and streams) and marine water.

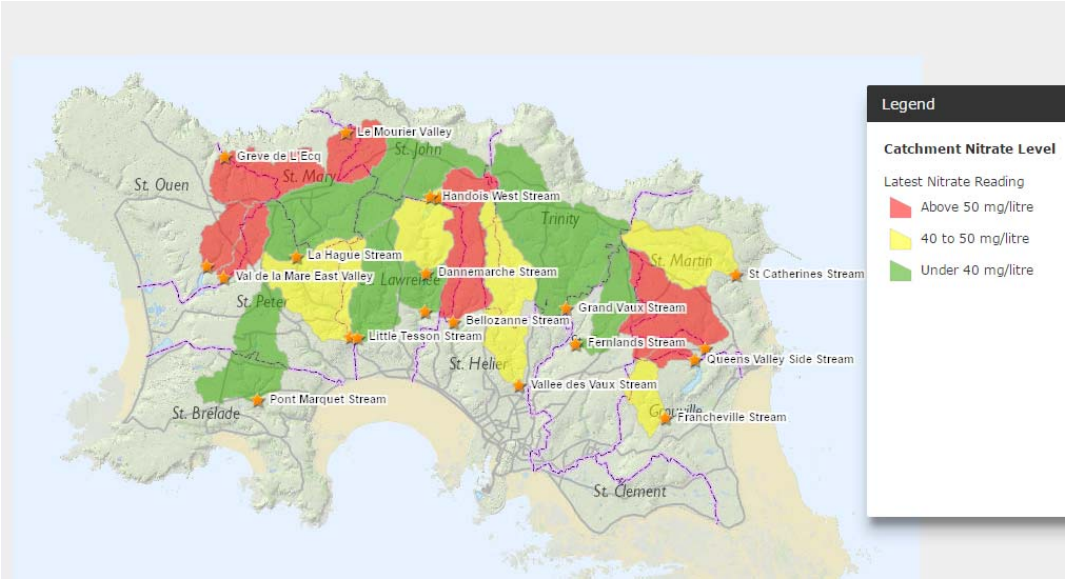
7.24 Going forward, however, we have been advised that the Department hopes to improve its monitoring programme and has set out short term, medium term and long term objectives within the WMP to achieve this. These are as follows:

- Short term objective (2017-2018): Rationalise the ongoing environmental monitoring programme (already underway) to incorporate phosphates and pesticide monitoring.
- Medium Term objective (2017-2021): Increase frequency and coverage of existing environmental monitoring for pesticides and phosphorus such that a high number of Jersey's water bodies can undergo classification in 2020 ready for the next round of the WMP.
- Long term objective (beyond 2021 to 2015): Have an established and effective monitoring programme in place which allows for progressive and iterative classification of Jersey's water bodies in each cycle of the WMP, including coastal waters.[62]

7.25 Currently, the Environment Department relies greatly on data that is produced by Jersey Water to access the levels of nitrate in the water around the Island and within individual catchment areas. The Department then reports what they have found back to the farmers and the Action for Cleaner Water Group. Jersey Water has also established an interactive map of the Island which allows farmers to observe their own streams or their own catchment areas and determine what level of nitrate are present where they are farming (see Figure 4).[63] This data can be used by the Department to ascertain where more advice needs to be given or where the Minister may need to introduce WCMOs to ensure best practice.

[62] Water Management Plan for Jersey 2017-2021, July 2016
[63] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017

Figure 4 – Snap shot taken of Jersey Water's interactive map (7th April 2017)



7.26 The Panel was advised during the Public Hearing that Jersey Water currently monitors 29 sites throughout the Island on a weekly basis.[64] Under the new WMP, Jersey Water will continue to share their data and work with the Department to support and undertake proactive catchment engagement as part of their water safety planning.

7.27 To ensure that the data is accurate, the Minister advised the Panel that the Department does its own testing on different sites throughout the Island. In addition to the Department's and Jersey Water's datasets, monitoring is also carried out by the Environmental Health Team, the States Analysts (boreholes) and the Infrastructure Department (Energy from Waste Plant and La Collette).

7.28 As we mentioned above, one of the short term objectives of the WMP is to rationalise the monitoring programme. We were advised during the Public Hearing that rationalisation of the Department's monitoring would help prevent the replication of data collection. We were further advised that it would also help the Department to take a more risk-based approach to their data collecting i.e. target known problem areas.[65]

7.29 In order to ensure that the proposals contained within the WMP are sufficient for addressing high levels of nitrate, it is imperative that the Minister and his Department continue to closely monitor the impact of the measures on the quality of our water. We were told by the Water Resource Management and Regulation Officer that *"at the end of the 5 year-plan you review how you are doing and you adjust accordingly so that if the*

[64] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017
[65] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017

measures do not appear to be sufficient, you then have another look at it and make some decisions then about whether or not you need to implement some further measures."[66]

7.30 The WMP also recognises the need for ongoing monitoring to allow the Department to respond to emerging issues in future iterations of the Plan. For instance, upward trends in population may place pressure on the availability of Jersey's water, climate change could affect water temperature, and economic trends may result in a changing agricultural focus of the island.[67] Up-to-date information will allow the Minister to make quick decisions and, where necessary, make changes to the Department's priorities and policies.

7.31 In their own report our Advisors have recommended the following with respect to water and sea lettuce monitoring on Jersey:

- *The frequency of water monitoring is sufficient but it needs to be maintained at current levels throughout the Plan timescales.*
- *More in-depth analysis of what the results mean is required. It is important to understand the relative loads associated with monitoring results at each location. This requires understanding flow associated with each sampling location. For each borehole sampling point, an approximate annual abstraction rate should suffice. For surface waters, it requires measurement of river flows. This is expensive but we recommend at least one long term flow measurement point is needed in one of the main streams entering St Aubin's Bay.*
- *There is a critical need to provide for effective monitoring of the sea lettuce bloom occurrence. The Advisors understand this has commenced around St Aubin's Bay, however more detailed information was not available at the time of completing the review.*
- *Evidence should be gathered to determine how much of a reduction in nitrogen from the Bellozane STW and nitrate rich freshwater streams would be required to avoid elevating available nitrogen above the levels found in the offshore waters that surrounds St Aubin's Bay."*[68]

7.32 KEY FINDING: Monitoring the Island's water supply is essential for determining the ongoing success of the measures contained within the Water Management Plan.

7.33 RECOMMENDATION: The Minister for the Environment should ensure that the following work is carried out in respect of water and sea lettuce monitoring in Jersey:

a) Maintain the frequency of water monitoring at current levels throughout the five year Water Management Plan.
b) Undertake an in-depth analysis of what the monitoring results mean in order to help understand the relative effectiveness of different types of measures.

[66] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017, p6
[67] Water Management Plan for Jersey 2017-2021, July 2016
[68] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p34

c) Undertake regular and effective monitoring of the sea lettuce blooms in St Aubin's Bay. To support this work at least one long term flow measurement point is needed in one of the main streams entering St Aubin's Bay.
d) Gather evidence to determine how much of a reduction in nitrogen from the Sewage Treatment Works and nitrate rich freshwater streams would be required to avoid elevating available nitrogen above the levels found in the offshore waters that surround St Aubin's Bay.

Timeframe

7.34 One of the Terms of Reference for our review was to assess whether the issue of high nitrate levels in Jersey's water could be addressed in the timeframe proposed within the Water Management Plan. Our Advisors have considered this issue in great detail and we would therefore recommend readers to consider section 6 of the appended report. Here we will summarise the Advisors' main findings.

7.35 During our Hearing with the Environment Minister, we were advised by one of his Officers that *"…as far as actually getting to the target of 50* [mg/l] *and not having any peaks by the end of the 5 years, I do not believe evidentially that we can say 100 per cent that this is going to happen. But our measures plus the fact that Jersey Water are putting in some engineering works are going to make a difference. The point of a 5-year plan is that you review it."*[69]

7.36 This view is shared by The Jersey Royal Company who advised us that, even in light of the proposed changes, *"the speed and level of reduction of nitrates in Jersey's waters cannot be guaranteed."*[70]

7.37 It has been recognised that the biggest problem that the Island faces in respect of nitrates is their impact on surface water, which in turn is impacting on our public water supply.

7.38 Our advisors have estimated that in order to address the problem effecting the Island's public water supply, nitrate leaching from farmland across the Island will need to reduce by 25-33% from 2016 levels. It has been noted that this level of reduction is significant and will therefore present a challenge for the Minister and his Department. It is worth noting that a 25-33% reduction in leaching is close to the best performance that SEPA is aware of in Europe and at least double the effectiveness estimated for the nitrate levels in England.[71]

7.39 During the Public Hearing with the Minister, we queried whether any analysis had been undertaken to determine if the preferred Scenario 2b will achieve satisfactory nitrate

[69] Transcript, Public Hearing with the Minister for the Environment, 25th January 2017, p6
[70] The Jersey Royal Company, Written Submission, 18th January 2016, p3
[71] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017

concentrations by 2035. Nevertheless, no details of any predictions of the effectiveness of the Plan's measures were provided. With regard to this matter, our Advisors found:

"Implementation of the Plan should not be delayed by detailed predications of the effectiveness of the Plan. We agree with the emphasis on monitoring as the Plan develops and then adjusting measures if monitoring shows it is not on track. We would characterise this as a 'suck it and see' approach, and we endorse it, reiterating that it benchmarks well with the rest of the UK. Therefore it is key that the resources and partnership agreements are set in place to enable implementation without delay. Obviously, the improvement measures themselves are the most important but the Advisors stress that any 'suck it and see' approach will only work if sufficient resource is allocated for supporting and demonstrating compliance via catchment officers and water monitoring."[72]

7.40 KEY FINDING: In order to successfully address the nitrate problem affecting the Island's public water supplies, nitrate leaching from farmland across the Island will need to reduce by 25-33% from 2016 levels. This will present a significant challenge for the Minister for the Environment and his Department.

7.41 As we mentioned earlier, there is evidence to suggest that there has been a significant reduction in the levels of nitrates present in Jersey's private water supplies. In our Advisor's opinion, this is due to improvements in best practice and compliance with regulations related to locally acute point sources, such as the storage of slurries.[73] It has been found that if improvements continue at the same rate, we can expect the point source problem to be largely addressed within the timescales set out within the WMP, which in turn will significantly improve nitrate levels in private water supplies. However, the Advisors have drawn our attention to two important caveats:

- *"Further improvements in point sources will require continued hard work and close working between farmers, catchment officers and LEAF auditors.*
- *Even once the point source problem is resolved, nitrate levels in many private supplies will remain above the standard until the chronic problem across the Island is also resolved."*

7.42 KEY FINDING: If improvements continue at the same rate as they have been, point sources of nitrate pollution will be largely addressed within the timescales set out within the Water Management Plan, which in turn will significantly improve nitrate levels in private water supplies. However, further improvements will require continued hard work and a close working relationship between all key stakeholders.

7.43 The WMP does not provide any prediction as to whether or not the sea lettuce problem will be addressed within the required timescales. According to our Advisors, there is an element of uncertainty with sea lettuce as each coastal water is different and sea lettuce will respond to varying nitrate levels in each case. For this reason, it has been

[72] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p27
[73] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p27

recommended that "*the best approach is to address the drinking water problems on the Island and then regularly monitor the sea lettuce extent to assess if this is also sufficient to address sea lettuce."*[74]

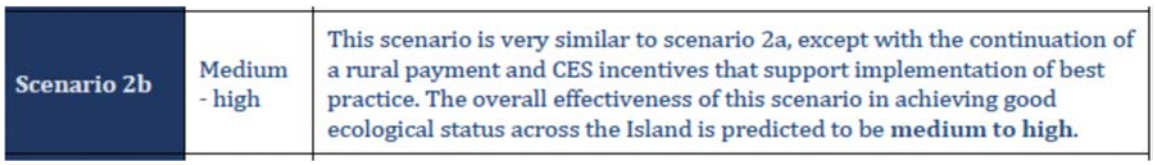
7.44 KEY FINDING: The Water Management Plan does not provide any prediction as to whether or not Jersey's sea lettuce problem will be addressed within the required timeframe.

7.45 Having considered the evidence, it is clear to the Panel that the Island faces a significant task in achieving the WMP's nitrate targets within the required timeframe. It has been suggested that in order to reach these ambitious targets, but at the same time ensure that farming continues in a sustainable manner (as highly promoted within the Plan), Jersey needs to turn the environment from a problem into an economic opportunity. In this regard SEPA strongly encourages careful consideration of the following:

- *"Careful calculating, and then explaining to the farmers, the amount of money they are wasting in excessive nitrate application. With a little expertise and a lot of monitoring, the concentrations in Jersey's waters can be directly compared with sacks of fertiliser wasted.*
- *Developing and fostering both government incentives and market assurance schemes, to make it economically advantageous to reduce nitrate losses.*
- *All Stakeholders working in partnership to advise, to share best practice, and to educate, but also to ensure good practice is rewarded and clear examples are made of bad practice through financial penalties.*
- *Other potential initiatives to generate revenue from the problem. For example, using Jersey's wastes in anaerobic digesters or developing oyster farms to feed off the sea lettuce. The Advisors are aware that some initiatives of this kind have already been assessed and identified as unviable. However, we recommend that new ideas continue to be encouraged and assessed in a partnership approach."*[75]

7.46 The Panel notes that, other than a qualitative graph of effectiveness on page 44, the WMP does not provide any further analysis of whether the measures will be effective and, as such, whether the objectives will be achieved within the required timeframe. The qualitative assessment of effectiveness is set against 'good ecological status' requirements of the EU Water Framework Directive rather than the objectives of the Plan itself (see Figure 5).

Figure 5 – Qualitative effectiveness of Scenario 2b (WMP p44)



[74] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p28
[75] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p28

7.47 In this regard, our Advisors have recommended that Jersey prioritises human health in the first instance and above all else. SEPA advised the Panel:

"The ecological requirements of the Water Framework Directive should only be prioritised when there is clear evidence that the drinking water problem is well on the way to being addressed."[76]

7.48 KEY FINDING: The qualitative assessment of the effectiveness of Scenario 2b is set against 'good ecological status' requirements of the EU Water Framework Directive rather than the objectives of the Plan itself.

7.49 RECOMMENDATION: The Minister for the Environment should ensure that broader EU Water Framework Directive requirements are not prioritised until there is clear evidence that the measures of the Water Management Plan are successful in improving Jersey's drinking water.

Ensuring a Collaborative Approach

7.50 The notion that underpins the WMP, is that water quality is an issue that is caused by, and affects, everyone. As such the Department is of the opinion that *"since everyone is part of the problem, everyone should also be part of the solution."*[77] Thus, in order to effectively tackle the issue of high nitrate levels, all parties will be required to work together harmoniously.

7.51 An opinion that was expressed to the Panel throughout its review, and which was shared by all of the key stakeholders, was that a collaborative working relationship between the Government, the industry and Jersey Water was fundamental to the overall success of the Plan in reducing high levels of nitrate in the Island's water.

7.52 The Chief Executive of Jersey Water recognised that during the past year significant progress had been made due to the growing commitment amongst all stakeholders to improve water quality and by working closely together to achieve that goal.[78]

7.53 Similarly, The Jersey Royal Company are of the opinion that, whilst the addition of the proposed WMP will have some impact on the level of nitrates, a collaborative approach between the Department, Jersey Water and the main industry bodies (The Jersey Royal Company, Albert Bartlett, Jersey Dairy and The Jersey Farmers Union) would have the greatest effect.[79] Hence, the Panel found that the Environment Minister must ensure that the key stakeholders continue to work well together toward the common goal, as has recently been the case through the work of the Action for Cleaner Water Group.

[76] SEPA, Review of Nitrate Levels in Jersey's Water, March 2017, p25
[77] Water Management Plan for Jersey 2017-2021, July 2016, p62
[78] Jersey Water, Written Submission, 20th January 2016
[79] The Jersey Royal Company, Written Submission, 18th January 2016

7.54 It was also clear from the evidence we received during the review that continued support from the Council of Ministers is essential for ensuring that Jersey's water quality remains a top priority for the Island. The WMP is a five year Plan, thus the challenge will be to maintain momentum over that period of time to achieve the target goals.

7.55 KEY FINDING: A collaborative working relationship between the Government, the industry and Jersey Water is fundamental to the overall success of the Plan in reducing high levels of nitrate in the Island's water.

7.56 RECOMMENDATION: The Minister for the Environment must ensure that all key stakeholders continue to work closely together throughout the duration of the Plan in order to effectively address the issue of nitrate levels.

8. APPENDIX 1: ADVISOR'S REPORT

Review of nitrate levels in Jersey's water

Report for the Environment, Housing and Infrastructure Scrutiny Panel

FINAL

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About the Scottish Environment Protection Agency

The Scottish Environment Protection Agency (SEPA) is a non-departmental public body of the Scottish Government and Scotland's principal environmental regulator. Our purpose is to protect and improve the environment in ways that, as far as possible, also help create health and well-being benefits and sustainable economic growth.

Our services include: monitoring and reporting on the state of our environment; working with partners to promote sustainable resource use; environmental regulation; providing public warning systems, and responding to environmental emergencies.

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This report has been produced by the Scottish Environment Protection Agency (SEPA) under contract to the States of Jersey Environment, Housing and Infrastructure Scrutiny Panel

Executive Summary

Jersey suffers from very high levels of nitrate, affecting its water supplies and its beaches. The Minister for the Environment has developed a Water Management Plan (the Plan, Reference 01) to address it. Under an established system of independent Scrutiny, a Panel of elected officials has been asked to review the Plan. SEPA has been asked to provide advice to the Panel, involving discussions with partners on the Island, support at a Public Hearing, and a review of documentation. This report collates the findings of the Advisors[1]. There are 18 separate findings but they can be summarised as follows:

1. Jersey faces a significant challenge:

    - The nitrate problem poses risks to health and to the tourism economy. The solution poses challenges to maintaining sustainable economic development.

    - There are three main sources of the nitrate problem; 'chronic' excess fertiliser application in growing potatoes across most of the Island, 'acute' localised point sources of pollution near private water supplies, and the sewage treatment works discharging into St Aubin's Bay.

    - There is evidence of a recent rapid improvement in the point source problem, but no evidence of significant improvement so far in the other problems.

    - The hardest problem to solve will be the chronic problem. This involves applying more fertiliser than is needed; particularly in January / February as part of the drive to produce early potatoes. The excess is 'leached' by rainfall out of the soil zone and downwards into groundwater. From there it moves into private and public water supplies. This leaching represents a waste to farmers; if it's in the water then it's not in the crop. The Advisors estimate that many tens of thousands of pounds are wasted by Jersey farmers every year on excess fertiliser application.

    - The Advisors agree there is a potential win-win here. A reduction in waste will save the farmers money and will at least improve – if not solve – the main remaining chronic nitrates problem on Jersey.

2. The Advisors endorse the measures in the Plan. We particularly welcome the focus on a) partnership working, b) incentivising improvements in farming via market assurance schemes and the delivery of environmental benefit to the Island as a whole, and c) on the need for support to farmers via catchment officers. The Plan is, in fact, more ambitious than most of the rest of the UK. However, it needs to be; the stakes are higher than most of the UK. To achieve its target, Jersey will need to deliver a reduction in nitrate leaching some 3 times higher than the plan for England. The Advisors would therefore stress the following, all of which are intended to ensure the current tremendous level of partnership engagement does not fade away:

    - It is vital that implementation begins at the earliest possible opportunity. This includes staffing resource for both advisory support and compliance checking of farm practice.

[1] Herein the term 'Advisors' refers to the SEPA Team contracted by the States of Jersey Environment, Housing and Infrastructure Scrutiny Panel.

Good compliance needs to be rewarded and poor compliance fined. The Advisors agree that at least one full time equivalent post is required for this work.

- It is vital that regular, frequent monitoring continues of raw waters feeding the public and private drinking water supplies. In addition, more in-depth analysis of what the results mean is required, for example differentiating acute and chronic problems or calculating waste equivalent figures.

- Regular and frequent monitoring of the extent of the sea lettuce problem on the beaches needs to continue.

In conclusion, the nitrate problem in Jersey is considerable, but the approach to tackling it is commended. This is particularly with regard to the level of buy-in and cooperation that is clear amongst those with a stake in the solution. The key now is to build momentum. To ensure resources are in place as soon as is possible, both to implement the Plan and to show evidence of progress.

Contents

1. Introduction

Jersey's Minister for the Environment has published the Water Management Plan (the Plan) (Ref 01) to improve Jersey's water quality. This Plan sets out steps that Jersey needs to take to ensure clean and sustainable water supplies, and builds on the assessment of the condition of Jersey's water and the pressures on it. A key element included in the Plan is proposals for addressing the high level of nitrate in streams and groundwater.

Jersey has a well-established system of independent scrutiny. This is an evidence-based process, the principal purpose of which is to hold the Government to account for its policies and actions. Scrutiny does not act as a political opposition but seeks to clarify key elements of the policy and their impact on the population, through examination of evidence provided by the States of Jersey government departments, stakeholders and the general public.

Accordingly, the Environment, Housing and Infrastructure Scrutiny Panel is undertaking an independent review of the Water Management Plan. It has a set of terms of reference for the review, and has commissioned SEPA to provide expert Advisors. SEPA's Advisors have been asked to undertake discussions with partners on the Island, support the Panel at a Public Hearing, and review technical documentation. Taking the terms of reference of the Panel, and the requirements of the Advisors, SEPA has identified 6 objectives for the report:

1. To consider the measures that are being taken, or are proposed, by the Council of Ministers to address the issue of nitrate levels within Jersey's water supply.

2. To assess whether the measures are achievable within the proposed timeframe and resources.

3. To determine whether the proposals are sufficient for addressing the elevated levels of nitrate found in surface waters and groundwater.

4. To assess the challenges faced by the Council of Ministers in maintaining an adequate supply of clean water with reduced concentrations of nitrate.

5. To determine what role the agricultural industry and Jersey Water have in helping to reduce nitrate levels in Jersey's water.

6. To advise the Panel on further research it might undertake to develop a broad understanding of the issues involved.

The report is written primarily for the Environment, Housing and Infrastructure Scrutiny Panel (the Panel) which comprises elected representatives from the States of Jersey. The report will be publically available. Therefore, the report is written for an audience of stakeholders on the Island who are not necessarily technical specialists on the subject of nitrate.

The two key pieces of documentation reviewed by the Advisors are the Water Management Plan and the transcript of the associated Public Hearing. However, a total of 48 other documents (some of which are referenced within this report) were also reviewed. Annex 1 sets out all the sources of information reviewed by SEPA.

2. Appreciation of the problem

Improving Jersey's water quality is a priority for the Island's residents. The 'My Jersey' survey (Ref 02) in 2016 asked islanders to indicate what they think of Jersey now, and their hopes for the future. The public rated whether 'Jersey's fresh water resources are clean and sustainable' in the top 3 of all their future ambitions for Jersey.

The Water Management Plan for Jersey states that '*Jersey's untreated water resources have some of the highest concentrations of nitrate in water in the whole of Europe: approximately half of all samples taken from either surface or groundwater contain more than 50 mg/l nitrate*[i] *… In comparison, across the EU approximately 3% of surface water and 15% of groundwater samples exceed 50 mg/l*'. The Plan provides more details on three main impacts which are summarised by the expert Advisors as follows:

i. '*Jersey Water cannot guarantee to meet drinking water standards for nitrate in the mains drinking water supply at all times*.' The water company supplies approximately 42,000 households in Jersey, as well as many businesses.

ii. '*Many of the 3,400 households on borehole/well water only have access to water that is higher in nitrate than the drinking water standard*.'

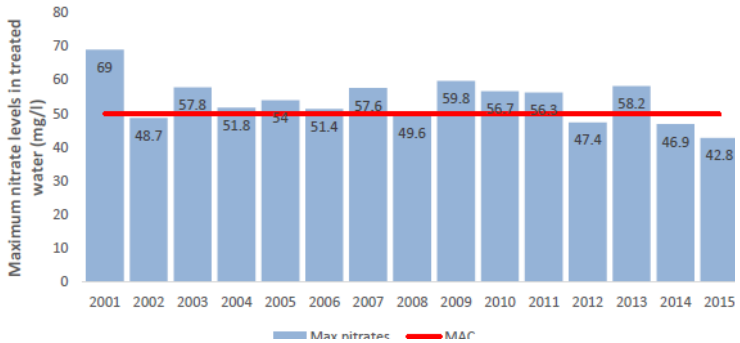
Figure 1: Sea lettuce growth in St Aubin's Bay *(courtesy Jersey Water Management Plan)*

iii. Nuisance growth of sea lettuce in summer, which is a particular problem in St Aubin's Bay (Fig 1).

The relevant health standard in drinking water is 50 mg/l of nitrate. During the Public Hearing (Ref 03) the Minister for the Environment indicated that "*Jersey Water are advised by Professor John Fawell…[who]… sits on the World Health Organisation group….his indication is that the 50 [mg/l] limit is not going to change any time soon*." The Advisors would stress that the drinking water standard is assessed as a 'Maximum Admissible Concentration'. This means peak concentrations must not exceed 50 mg/l, and the average concentration therefore needs to be below this figure.

The Water Management Plan states that '*Jersey Water has to take active measures to control the nitrate levels in supply by careful blending and dilution.'* Figure 2 shows maximum nitrate levels in the public water supply exceeding the drinking water standard in every year up to 2013. The Plan also states that '*The*

Figure 2: Peak nitrate levels in the mains water supply set against the drinking water standard *(courtesy Jersey Water)*

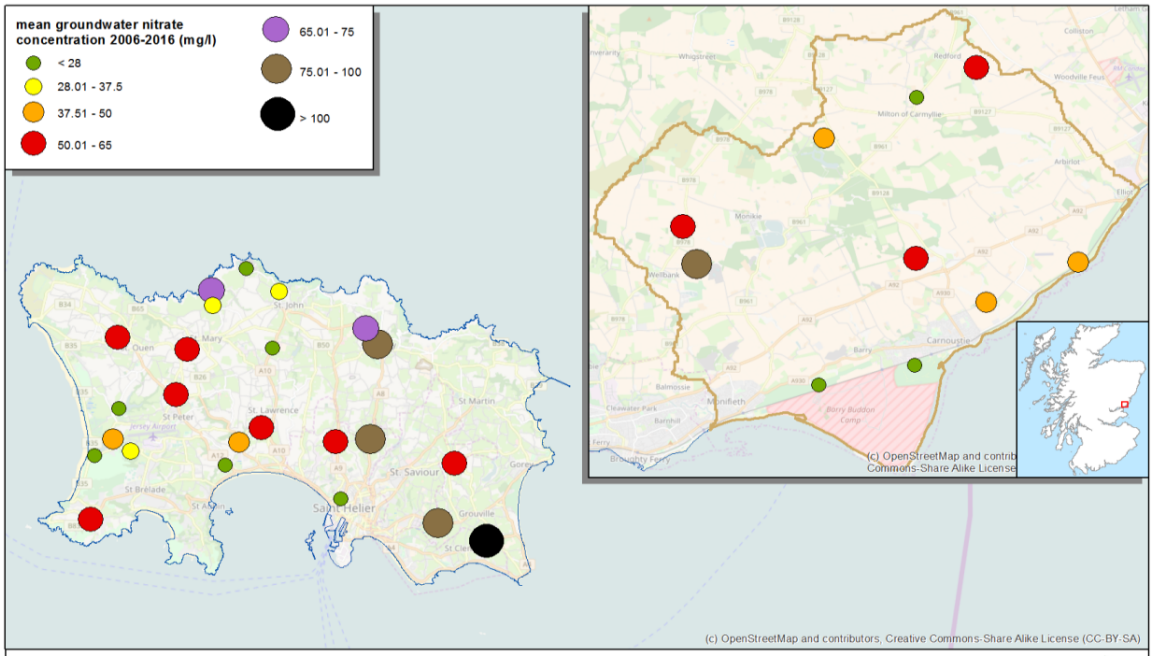


Health and Social Services Department agreed to [a] dispensation [to allow the Company to exceed nitrate standards], but advised that they would not continue to support it unless steps were taken to tackle catchment inputs of nitrogen, which are the source of the problem.'

During the Public Hearing (Ref 03) the Minister for the Environment indicated that the current dispensation "*is very likely to be the last derogation [Jersey Water] will get*" and that this will last until 2021.

The Advisors have undertaken an analysis of water quality analysis from Jersey (Ref 04).

Figure 3: Average groundwater nitrate concentrations in Jersey and Carnoustie (*using States of Jersey and SEPA data****)***



A summary of our conclusions is:

i. There is a clear and significant impact on Jersey's waters from nitrate contamination. From 2006 to 2016 a total of 59% of all surface water samples exceeded the drinking water standard. The equivalent figure for groundwater was 45%.

ii. Concentrations in groundwater are in excess of areas with similar land use, topography and climate in Scotland. Figure 3 provides an example from the Angus area of Scotland. The pattern of groundwater exceedances in Jersey shows a wide variation with no clear spatial pattern. In the experience of the Advisors this is indicative of a cause related to acute problems; point sources[2] of pollution occurring close to the sampling points.

iii. As well as high nitrate levels in groundwaters, the Carnoustie area shown in Figure 3 also has three out of the six rivers with the highest levels of nitrates in Scotland. This includes the Buddon Burn, which is the highest. The Buddon has a catchment area of 12 km^2 and is therefore comparable in size to Jersey streams. The Advisors note that the nitrate levels in the Buddon are lower than the Jersey average and significantly lower than Val de la Mare West (Figure 4). The river with the highest nitrate concentrations in Scotland has similar levels to the streams with the lowest

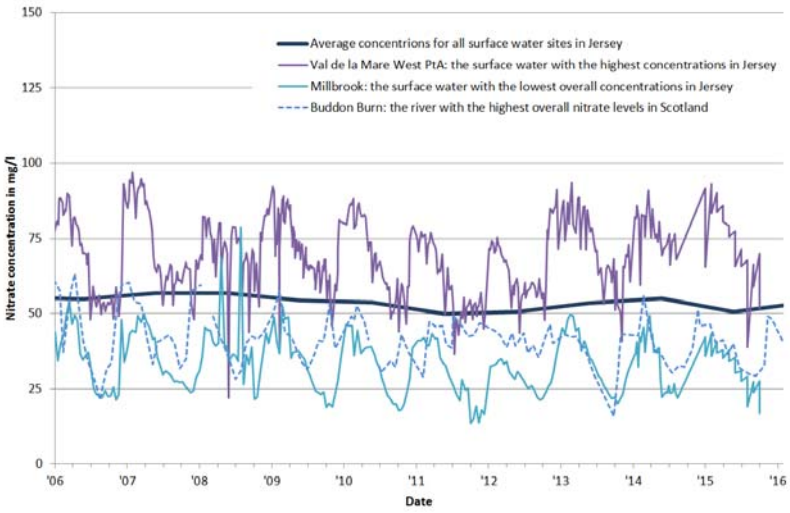
[2] Point sources are any single identifiable source of pollution from which pollutants are discharged, such as a pipe, ditch, ship, etc

concentrations in Jersey. River nitrate concentrations are typically less affected by small individual sources than are groundwater sampling points. Therefore, the Advisors are of the view that the high concentrations in rivers are indicative of a cause related to chronic problems; widespread excessive nitrate loading across the Island.

iv. Most of the surface water sampling is undertaken by Jersey Water. It occurs on a weekly basis in the waters feeding the public supply. The sampling shows that there is a strong seasonality to nitrate concentrations in Jersey. Levels rise sharply in December/January and peak in March/April. They then decline more slowly to their lowest at the end of the autumn. The pattern is typical of nitrates from agriculture. The seasonal variation is more pronounced in Jersey than in Scotland, but the timings are similar.

v. There has been a sea lettuce problem in St Aubin's Bay for decades. This is caused by high levels of nitrogen in the water, combined with availability of light and warmth in the affected area (Annex 2). The evidence indicates that levels of nitrogen in the wider sea around Jersey are not normally high enough to cause excessive growth of sea lettuce. This is supported by the lack of sea lettuce problems in similar bays around the Island. Therefore, in terms of the evidence made available to the advisors, there is no evidence that contributions from France into the wider seas are one of the main causes of the sea lettuce problem in Jersey. Recent comparative data for England (2015) shows that macroalgae blooms (e.g. sea lettuce) are a very rare occurrence in the coastal waters around the UK (Ref 16). This shows the significance of the sea lettuce problem in St Aubin's Bay.

Figure 4: Nitrate levels in surface water (using Jersey Water data)



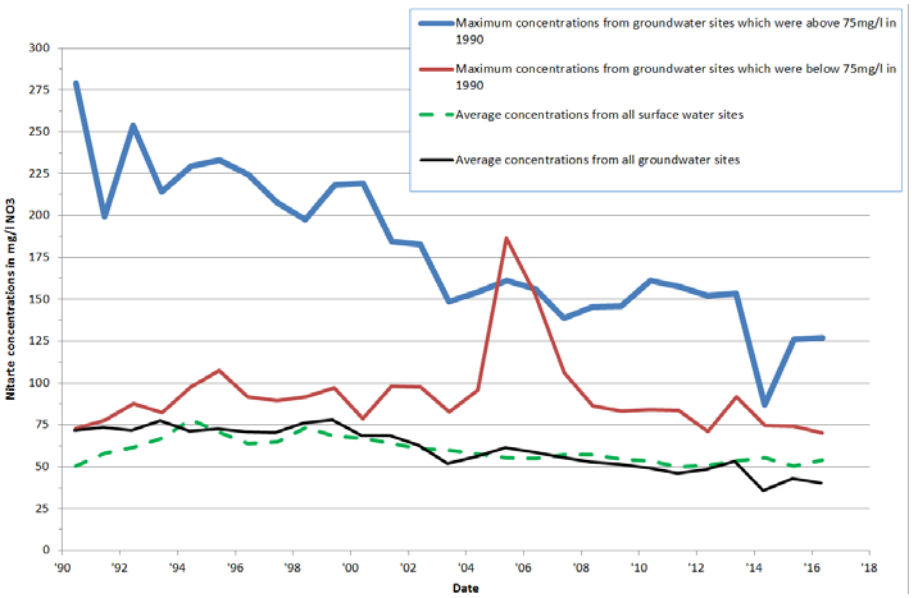
Finding #1: The Advisors agree with the Water Management Plan that there is a significant nitrate problem impacting a) Jersey's public water supply, b) Jersey's private water supplies and c) sea lettuce in Jersey's St Aubin's Bay.

3. Appreciation of trends in the problem over time

There are indications that nitrate concentrations are improving. The Water Management Plan (Ref 01) describes a drop in the need for dispensations to Jersey Water in 2014 and 2015 (Figure 2). Diagrams within the Plan show improvements in surface water in some areas, and in average groundwater concentrations across the Island.

The Advisors agree that there is some evidence of improvement. Average concentrations in groundwater have shown the most marked decrease from approximately 75 mg/l in 1990 to 50 mg/l in 2016 (Figure 5).

Figure 5: Nitrate concentrations in groundwater (*using States of Jersey data)*



However, the Advisors are of the opinion that improvements are more marginal than they may first appear. This is for two reasons:

i. Reduction in public water supply dispensations: Jersey Water has indicated (Ref 05) that the improvement was due to the wet autumns in 2014 and 2015 and that wet winters in future could bring back the need for dispensations unless nitrate reduction measures are successful. In a letter addressed to the Environment, Housing and Infrastructure Scrutiny Panel, Jersey Water states:

> *'It should be noted that there have been no nitrate breaches in treated water since May 2013. This is explained by having enough rainfall in autumn to get reservoirs full by the start of the growing season (enabling reservoirs to be bypassed where possible) coupled with the predominantly higher than average rainfall diluting water entering reservoirs not on bypass (e.g. Val De La Mare West)…The absence of a breach during the last three years should not be misconstrued as an amelioration of the nitrate situation in Jersey. Until underlying nitrate concentrations are reduced significantly (especially in the Western catchments) there will be vulnerability to nitrate breaches in treated water.'*

ii. Groundwater improvements: Average concentrations have undoubtedly improved. However, peak concentrations remain well above the drinking water standard of 50 mg/l nitrate. Furthermore, Figure 5 shows that almost all of the improvement comes from sites which had the highest nitrate levels back in 1990 (33% of all sites). These sites have shown a rapid and significant amount of improvement in peak concentrations since 1990 from roughly 250 mg/l to roughly 100 mg/l. The remaining groundwater sites (67%) have shown only a marginal net long term improvement since 1990; peak concentrations are only slightly lower in 2016 than levels they were in 1990.

In the experience of the Advisors, this pattern provides evidence that many 'acute' problems that occur close to monitoring sites have been resolved. This is good news. Overall, there is also evidence of a more recent improvement in 'chronic' nitrate problems across the island. In the experience of the Advisors, the chronic problems can be identified via the average concentrations in surface water and via average concentrations in the groundwater sites with lower initial concentrations. It is clear there has been an improvement in average surface water concentrations since 2000, and since 2007 in the selected groundwater sites. However, it is also clear that the rate of improvement in the chronic problem is not yet sufficient to meet the target deadlines in the Water management Plan. Acute nitrate problems are usually solved by basic good practice measures, and they are the key to resolving the private water supply problem. Chronic nitrate problems usually come as a result of widespread high loadings from agriculture and these are the key to resolving the impacts on the public water supply and on the sea lettuce problem. Unfortunately chronic problems are much harder to solve.

Finding #2: The Advisors interpret the overall trends in monitoring results as showing: There is a clear improvement in average groundwater levels of nitrate, but this is mainly due to a significant improvement in acute nitrate problems local to the groundwater monitoring points. There is also evidence of a recent improvement in the underlying chronic problem but the rate of improvement is not currently sufficient to meet the target deadlines in the Water Management Plan.

Anecdotal evidence suggests that the sea lettuce problem has been getting worse, although there is little monitoring data pre-2012 on the extent of the sea lettuce growth over time. The most recent survey data, between 2012 and 2015 (Ref 06 and 07), indicate that sea lettuce was worse in 2015 than in previous years of the survey. On the other hand, levels of nitrogen in the wider bay are not generally high, and this would support the conclusions of previous studies (Ref 18) that local sources of nitrogen entering St Aubin's Bay are likely to be the main source of the sea lettuce problem

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Finding #3: The Advisors recommend the following with respect to water and sea lettuce monitoring on Jersey:

- The frequency of water monitoring is sufficient but it needs to be maintained at current levels throughout the Plan timescales.
- More in-depth analysis of what the results mean is required. It is important to understand the relative loads associated with monitoring results at each location. This requires understanding flow associated which each sampling location. For each borehole sampling point, an approximate annual abstraction rate should suffice. For surface waters, it requires measurement of river flows. This is expensive but we recommend at least one long term flow measurement point is needed in one of the main streams entering St Aubin's Bay.
- There is a critical need to provide for effective monitoring of the sea lettuce bloom occurrences. The advisors understand this has commenced although no evidence was available at the time of undertaking this review.

This monitoring is essential to help all partners understand whether the Plan is working or not. This is, in turn, essential to maintain engagement.

4. Appreciation of the cause

Sections 2 and 3 provide an analysis of the scale of the nitrate problem. In this section, the Advisors examine evidence for the cause of the problem before making an assessment of the proposed solution in Section 5.

The Water Management Plan (Ref 01) states that *'nitrogen and phosphorus are plant nutrients required by plants to grow so they are used in agriculture in the form of fertilisers and are also used in domestic gardening and amenity horticulture. Organic manures such as slurry and manure applied to land also contribute to the nutrient loading to land, as do private drainage systems such as septic tanks and soakaways. Private drainage systems are in fairly widespread use in Jersey where no mains drains are available. Water falling as precipitation carries these nutrients into streams and reservoirs and/or percolates down through the soil and into groundwater*.'

During the Public Hearing (Ref 03) the Minister for the Environment was more specific about the cause, stating that **"***Nitrates are part of our agricultural community and particularly with the 2 main crops that we grow in the Island, one being potatoes and the other one being grass, we know that both those crops respond very well to fertiliser. Over the years, with our dominant agricultural community, we have put a lot of fertiliser on the ground. I do not think there is any doubt about that*."

No more detailed statements are made in the Plan about the cause, though there is a clear emphasis on agriculture in the proposed measures and in the ongoing partnership working on the Island. The Advisors consider it important to understand the cause more thoroughly. This will prove essential in the long run if the Plan meets difficulties due to changes in the economic environment, political circumstances or partnership co-operation.

Section 2 indicates there are three main impacts on Jersey from the nitrate problem a) impacts on private water supplies, b) impacts on public water supplies and c) impacts on tourism via the build-up of sea lettuce on the beaches and in the coastal waters. Evidence for the causes of each will be examined below.

a) Evidence for the cause of impacts on public water supplies

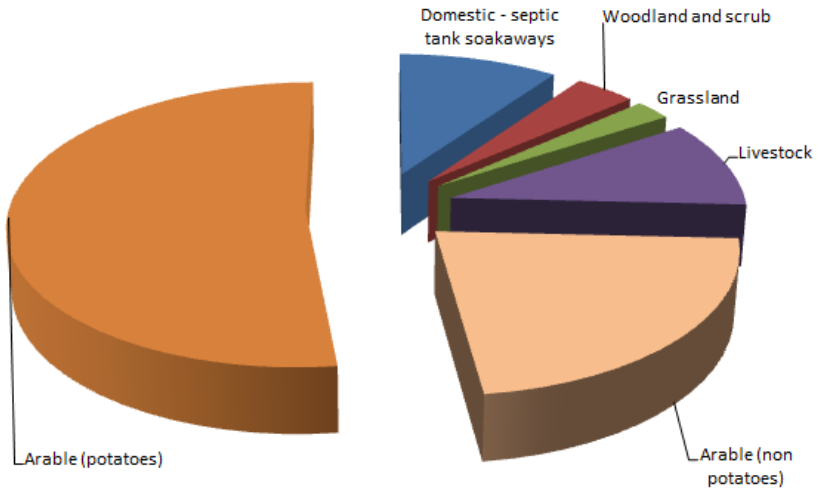
The Advisors are of the view that the nitrate problem in the public water supply is a result of chronic widespread nitrogen loading across large parts of the Island. The nitrogen is converted to nitrate in the soil and water environment. A study from 1999 on the Val de la Mare catchment (Ref 08) showed the relative size of the sources of nitrogen, as shown in Figure 6. The study concluded that the main source is clearly arable, with just over 50% of all nitrogen loading to land coming from the cultivation of early potatoes. Only 10% of the total arises from domestic sources (soakaways, septic tanks) or livestock.

More recent information, from 2015, on organic nitrogen applications across the Island is available in Reference 09. Unfortunately, there is no recent information available on inorganic fertiliser nitrogen application, of the kind used in potato farming. However, the Advisors are aware that the area of Jersey used for potato cultivation in 2015 was approximately 2980 hectares (Ref 10). A report from Jersey in 2001 (Ref 11) stated typical fertiliser application rates of 170-200 kg of nitrogen per hectare.

This rate is representative of current practices as confirmed by the Department who provided information to the Advisers which showed that the average nitrogen fertiliser application is 180 kg N per hectare. Using this figure, the Advisors can derive an estimate of the proportion of the total nitrogen applied to potatoes in 2015. This can be done by combining the estimate from potatoes with the figures in Reference 09, and an approximate estimate of the contribution from septic tank discharges. The 2015 estimate for potatoes agrees well with the figure from the 1999 study; with the figures for potato farming remaining a little over 50% of the total nitrogen input across the whole Island.

It is clear that fertiliser applied to potato crops is the dominant source of nitrogen applied to land in Jersey.

Figure 6: Sources of nitrogen in the Val de la Mare catchment (Lott et al, 1999)



In conversations with stakeholders whilst on the Island, the Advisors heard opinions that the high nitrate concentrations in water are unavoidable due to the absence of high ground on Jersey and therefore the absence of dilution from rainfall. The Advisors do not consider that such high nitrate concentrations are unavoidable. Section 2 (Figures 3 and 4) showed that nitrate levels in Jersey are significantly higher than areas in Scotland with similar topography, climate and land use.

The Advisors are aware of three other factors that are more likely to be significant. These comprise land use practices that the Advisors consider make Jersey unusual compared to most of the UK:

i. **Early potatoes**. The earliest outdoor fields are planted in the first and second weeks of January. Earliest outdoor crops are available from early April, with peak volumes through May and June. The potatoes are covered by plastic soon after planting. This means all necessary fertilisers are applied in one dressing prior to covering. The problem with applying fertiliser so early in the year is that crop uptake is often far less, and rainfall is higher, than later in the year. Together, these factors mean the likelihood of nitrate leaching is far higher in early potatoes than in many other agricultural situations. Leaching means washing nitrate downwards out of the soil and into the ground water.

ii. **Double cropping**. Potatoes are harvested so early that fields can be used for an additional one or more purposes thereafter. From conversations with farmers, the Advisors understand that this is often for livestock feed, but it can be for a number of other crops or livestock grazing. In terms of nitrate, the main risk is that farmers using the land after the potatoes are harvested may be tempted to add an insurance dressing of extra nitrogen just to make sure they get a good yield from the second crop. This may occur even if the crop doesn't need it due to likely high residual nitrogen in the soil. If this occurs, it will contribute significantly to the overall nitrogen loading and nitrate leaching across Jersey.

iii. **Soil acidity**- Lime is very expensive in Jersey as it has to be imported by sea, and the Advisors understand that application rates have reduced over time. The Jersey Nitrate Working Group report (Ref 12) stated that Jersey soils are more acidic than they should be. This means that plants can't use nitrogen as effectively. Therefore a risk that soils is becoming deficient in lime, making them more vulnerable to nitrate leaching. Without adequate application of lime, the acidic soils will be more vulnerable to leaching of nitrogen down to groundwater. Goulding (Ref 13) reported that reducing or omitting the application of lime to correct acidity risks caused significant economic loss through unachieved crop yield and wasted fertiliser, plus an increased risk of the pollution of water and air by nitrogen and phosphorous fertilisers. While the nutrient management of early potato fields is likely to be the main agricultural factor, the impact of soil acidification and inadequate liming on Jersey is also likely to be a contributor to the nitrate leaching.

Taken together, these three practices could explain why nitrate levels in Jersey are so much higher than most of the UK. The practices will lead to excessive leaching of nitrate. Leaching is often also termed as 'loss' by soil scientists, meaning a loss to the plants and a waste of money. If it's in the groundwater then it's not in the crop and it's lost to the farmer. Once in groundwater, nitrate will move onwards into private groundwater supplies or discharge into streams to affect the public water supply and the beaches. This leaching is therefore bad for farmers, and it is a central cause of the nitrate impacts on water supplies and tourism.

Finding #4: The Advisors find that the dominant cause of the chronic nitrate levels impacting public water supplies is the practice of growing early potatoes, combined with the subsequent land uses after the early potatoes are harvested. More fertiliser is applied than is needed by the potatoes and subsequent crops. Due to the time of year that it is applied, the excess nitrate is rapidly flushed out of the soil (where the farmer needs it) into groundwater (where it becomes a problem). From groundwater it then discharges into surface water which then, in turn, discharges into the public water supply and beaches.

The Advisors do not consider valid the argument from stakeholders that high nitrate is unavoidable due to the absence of high ground on Jersey, and therefore the absence of dilution from rainfall.

The Jersey Nitrate Working Group report (Ref 12) estimated that potato plots on Jersey lost an estimated 90 kg of nitrogen per hectare out of the base of the soil zone, from typical fertiliser application rates of 170-200 kg onto the soil.

It is possible to cross check this figure with the amount of nitrate measured in surface and groundwater. If we can measure Nitrate in the water environment then it is truly 'lost' to the

farmer. To make an approximate estimate, we can take the leaching rate of 90 kg/hectare as an average across 2,980 hectares of potatoes and dilute this into the typical effective rainfall across the whole island. This gives a predicted average concentration of roughly 40-45 mg/l of nitrate that would be expected in surface and groundwaters across the whole island. This is close to the actual measured average concentration in surface water and groundwater (since 2002) of 50-55 mg/l. The Advisors would expect the estimate to be close to, but below, the actual measured figure in the water environment because the estimate does not take into account leaching from sources other than potatoes. Therefore, this rough exercise does suggest that the Nitrate Working Group's figure of 90 kg/hectare is a reasonable value to use as a generalisation of the amount of leaching from potato farming across the island.

Therefore, using this leaching figure of 90 kg/hectare, the advisors have made a second approximate estimate; this time of the value of nitrogen lost to the water environment. Combining the leaching figure with a fertiliser price of £300 per tonne of ammonium nitrate, and an area of application of 2,980 hectares of potatoes, the value of nitrogen leached is equivalent to approximately £200,000 to £300,000 per year. Leaching, though wasteful, can't be eliminated completely in practice and some loss of nitrogen is inevitable. Rainfall itself adds a certain amount of nitrogen, for example. Therefore the farmers will never be able to reduce the leached figure to £0. However it's clear that even a modest improvement in the efficiency of nitrogen fertiliser use will generate a saving of many tens of thousands of pounds to the agricultural economy as a whole. In the process they would reduce – or possibly even solve - the nitrate problem.

The Advisors therefore very strongly agree with the Minister for the Environment who stated during the Public Hearing (Ref 03) that "*The technology is going to help us amazingly in the next 10, 20 years and it may well be that with reduced, but very accurate, inputs of fertiliser, we can do great things, we can get the crops to grow even better, but still use an awful lot less fertiliser. The cost to the industry would be enormous if we made them stop using fertiliser. If I put it the other way around: I believe it can be a win-win situation, where they spend less money on fertiliser, but do not have a reduction in output from their land. That is going to come out of technology*."

It is clear that many in the farming community also agree with the Minister. The Jersey Royal Company (Ref 15) reported that switching to a controlled release fertiliser boosted potato yields by 8% and also minimised nitrogen leaching. Jersey Farmers' Union also advised the Advisors that in 2017 direct placement of fertiliser is being trialled. They stated that this will bring an instant reduction of 7 - 8% simply by not sowing areas of the field that are not planted. Further reductions in the amount of nitrogen fertiliser applied may be made if trial work shows that direct placement in the row itself is successful.

Finding #5: The Advisors agree that the nitrate problem also represents a significant potential for a win-win. The problem of high nitrate concentrations in water represents a waste of resources to farmers. The amount of nitrate leached is well in excess of best practice, representing a loss to farmers of many tens of thousands of pounds per year. Any reduction in nitrate leaching will therefore bring an improvement both to drinking waters and, with time, the sea lettuce. A further reduction to levels considered best practice elsewhere could solve the problem in the long term.

b) Evidence for the cause of impacts on private water supplies

The Advisors are of the view that the nitrate problem in private water supplies is a result of acute problems local to the water supplies, plus the chronic problems already described for public water supplies. There is no specific evidence available on local sources in Jersey, but in the experience of the Advisors they are likely to be related to poor compliance with basic good practice in nutrient management, the construction and siting of septic tank discharges, and with farmyard waste management measures. Jersey has only had water pollution legislation since 2000, regulation on water resources since 2007, and waste management legislation since 2005. This may help explain some of the legacy compliance issues.

Finding #6: The source of the acute problems affecting private water supplies is likely to be poor compliance with basic good practice in nutrient management, the construction and siting of septic tank discharges, farmyard waste management measures, old landfill sites, etc.

c) Evidence for the cause of the impacts on the sea lettuce problem in St Aubin's Bay

The most recent evidence relating to the sea lettuce problem (Ref 07) confirms previous studies (Ref 18) showing that the excess nitrogen in St Aubin's Bay comes from two sources: a) effluent from the Bellozanne Sewage Treatment Works and b) surface water streams flowing into the bay.

A cautionary note is suggested by other studies (e.g. in Dublin Bay, Ref 19) that show that it may take time for improvements to be seen. This is because nitrogen stored in sediment on the sea bed will gradually be released into the water and will need to be used up before overall levels start to drop.

Finding #7: The Advisors agree that the two main sources of the sea lettuce problem on the coastline is a combination of the Bellozanne Sewage Treatment Works effluent and the 'chronic' problems from farmland.

5. Appreciation of the Plan as a whole

There are eight objectives and sixteen specific performance indicators for the Water Management Plan (Ref 01). Key objectives and indicators relevant for nitrates are highlighted as follows:

- [By 2021]… '*Reduce the levels of nitrate found in surface waters and groundwaters (maximum and mean levels)* …'
- [By 2021]… '*Remove the need for the nitrate dispensation ….* [in the public water supply]'
- [By 2021] … '*Increase compliance monitoring for the measures identified in the Plan across the land*' ….[from 20 days per year to 100 days per year]… '*subject to resource constraints*'
- [By 2035]… '*Achieve a nitrate level of below 50 mg/l in all drinking water sources (streams and groundwater).'*
- [By 2035]… '*Have an established and effective monitoring programme in place which allows for progressive and iterative classification of Jersey's water bodies in each cycle of the WMP, including coastal waters.*'

Finding #8: The Advisors, based on our experience, agree that the objectives of the Plan are a good balance between what is desirable and what is reasonable for a sustainable economy.

The Water Management Plan is clear that addressing the problem at source is more cost-effective than treatment of the symptoms. This means '*a catchment approach*' focused primarily on reducing nitrate loads from agriculture. The Plan cites one English Water Company which estimates that the cost of solving water quality problems at source is cheaper than solving them via treatment by a ratio of 1:6.

The Advisors agree. In Scotland, catchment officers identify issues of compliance to farmers and also provide advice on how to address them. Interim results show that the compliance rate of diffuse pollution rules over 3,221 farms at the time of SEPA's initial inspection was 35%. SEPA provided advice on compliance needs, and by our first re-visit, 86% of the farmers were fully compliant or significantly working towards compliance in priority catchments.

The Plan provides a cost benefit analysis of different measures, but there is no explicit estimation of the relative value to the economy and society of the waters of Jersey set alongside the value of agriculture. It also states that '*the potential negative costs in respect of inaction have not been considered …'.* It is useful to draw a comparison with Scotland. Although monetary values for ecosystem services as a whole (land, water, air, ecosystems) are impossible to determine as some, such as providing oxygen to breathe, have infinite value, those that can be valued have been estimated to be worth between £21 - £23.5 billion per year in Scotland (2009 prices). Were it possible to compare, this number is just under a fifth of Scotland's Gross Domestic Product. The value of Jersey's ecosystem services has not been estimated, but assuming a similar proportionate relationship to Scotland would

suggest that the value of ecosystem services to Jersey might be in the region of £700 million per annum[3].

During the Public Hearing (Ref 03), an expert official stated that "*another piece of work we are doing in the department … is an ecosystem services review, which starts to try ... … to calculate what the value of the green space in Jersey is, what the value of the health benefits to residents walking on the cliff paths are, what the benefits you are bringing in external .. residents. It tries to put a handle on what all these things are worth to us. Also it starts to put a handle on who the key providers are and who the beneficiaries are as well*."

Finding #9: The Advisors agree that a catchment-based approach is the best means of addressing the nitrate problem in Jersey. In our experience, the approach works. In Scotland, compliance was raised on farms visited from 35% to 86%.

Though the catchment-based decision is already made, the Advisors support the plan to complete an ecosystem services type review. This does not need to delay starting work on implementing the Plan. The analysis can be done in parallel. We suggest it will prove invaluable in future years should the Plan come under pressure via difficulties in implementation or a change in economic or political circumstances.

The Plan provides a cost benefit analysis of various scenarios for addressing the problem at source. The result is summarised as follows: *'Our chosen course of action is taking Scenario 2b during this ..[*Plan cycle]… *Under this scenario, rural payments (the SAP or equivalent) continue and Water Catchment Management Orders (WCMOs) are introduced. The level of compliance checking and advice giving is increased, as is regulatory action for non-compliance. However, under this scenario, farmers are still also incentivised financially to provide environmental goods and services as well as the food or other materials they produce and so there is not the potential fall in compliance that may be seen if this support is removed (Scenario 2a).'*

The Advisors have picked out three key tools in the Plan: a) partnership working, b) regulatory framework, and c) catchment officers. Each of these is summarised briefly below.

a) Partnership working

During the Public Hearing (Ref 03) the Minister for the Environment explained the link between partnership working and regulatory framework as follows: "*It is very much my hope that with the farmers working with the department and with Jersey Water very closely, and certainly in the last 18 months we have worked much more closely together than we ever have done before….. It is very much my hope that the laws we are going to put in place I will not need to use because certainly it is my desire to work as hard as we possibly can to make sure we reduce the levels of nitrate without the need for heavy-handedness via the legal process*."

Partnership working is not explicitly emphasised in the Water Management Plan as written, but it is implicit in many of the measures proposed. For example, the Plan (Ref 01) states '…*our primary focus has been on how best to increase uptake of best practice and ensure it*

[3] *The value of £700m is very approximate. A simple proportionate relationship with Scotland is unlikely owing to Jersey's large financial services sector*

is undertaken consistently across the Island, alongside gaining a better understanding of the nutrient balance of the Island through monitoring fertiliser imports and usage.'

Another example of partnership working is the Nitrates Working Group, which the Plan states '*met approximately every 6 weeks between mid-2014 and 2015. The group had an independent chairman and was composed of representatives from various departments of the States of Jersey, Jersey Water and the farming community and was tasked by the Minister for the Environment to make recommendations to address the nitrate issue in Jersey's waters*.'

It was also clear to the Advisors during our visit to Jersey that farmers' representatives in Jersey also feel partnership working is the key to the Plan.

Finding #10: The Advisors strongly agree that partnership working, combined with incentivisation, is by far the most effective tool for addressing the problem at source. We understand and agree that regulations will be seen as a backstop only to be used if necessary. We recommend that these elements are made more explicit in the Water Management Plan.

A key component of partnership working in the Plan is incentivisation. Again, this is not highlighted to any great extent in the Plan, but the Advisors understand that it is key to the Plan. We understand that there are two elements: i) government incentives, linked to ii) market assurance schemes, linked to supermarkets such as Tesco or Waitrose. During the Public Hearing, the Minister for the Environment and an expert official provided some more information on incentives for farmers as follows:

- "*Whereas in the past we have had single area payment, which meant that farmers received a set amount of money per vergée [unit of area] pretty much regardless of what they did, in this new scheme we are going to continue with the amount of total money we give them, but we are going to ask something back in return……returning to the public some levels which the farmers must attain if they are going to get this money*."

- "*The previous 2 Rural Economy Strategies have been ... or certainly the last one was area based. So if you farmed 2,000 vergées [unit of area], you got £33,000 in money, with some conditionality attached to it. What we are doing this time is going for much more of a performance-based approach. So, year 1, all land managers in receipt of public money will be required to have reached a level called Red Tractor, which is a basic full food chain compliance audit process. Half the S.A.P. (single area payment) recipients are already at that standard. By year-end 2018 we expect everybody to be 50 per cent through the compliance checking, through the process of adopting LEAF, and by the year end 2019 we are expecting anyone who wants to receive public money in a farm environment to be LEAF accredited. ... Alongside that, there are various components within the Rural Economy Strategy that have been designed to sit in parallel with the water plan, so we will be offering training to the farmers. We are looking at precision agriculture, particularly placements of fertiliser in potato crops. Currently, fertiliser is broadcast, so there are certain areas of the field that are not planted in potatoes…"*.

The Advisors support the proposal for Jersey to work with LEAF (Linking Environment And Farming). This will help provide a farm assurance system, showing that food has been grown sustainably with care for the environment through the adoption of LEAF's Integrated Farm Management (IFM). Only 3% of the total farmed area in the UK is LEAF Marque

certified. In a 2010 survey of LEAF members, 66% of LEAF farmers agreed with the statement 'by adopting LEAF and IFM principles we have benefitted financially'; on average each farm saved £14,000 (or £40.00 per hectare).

LEAF Marque is independently inspected and certified by third party certification bodies to EN45011.

The LEAF Audit consists of 370 statements with guidance and links to relevant documents and websites. LEAF collects the data and analyses them on an annual basis, and LEAF can automatically transfer who has completed the audit to the relevant authority.

Finding #11: The Advisors agree that incentivisation is a crucial part of the success of the Plan. We support linking government incentives to the concept of farmers' provision of a public service. It is likely that Jersey farmers will need to go beyond basic compliance with regulations, which deal mainly with acute problems, in order to address chronic problems and achieve the objectives of the Plan. We see the proposed link between market assurance schemes and government incentives as going beyond compliance, and it is therefore particularly important and welcome. The proposed LEAF uptake in Jersey will be much higher than the current level of 3% in the UK. These market assurance schemes turn the environment into an economic opportunity.

We recommend that an explanation of the incentivisation and market assurance schemes is made more explicit in the Water Management Plan.

b) Regulatory Framework

The Water Management Plan (Ref 01) states that '*The existing primary water management legislation (the Water Pollution (Jersey) Law, 2000) is a very effective tool to enable us to better prevent, control and respond to point sources of pollution. However, it doesn't currently allow us to effectively react and deal with the issue of diffuse pollution…* [equivalent to the term chronic used by the advisors in this report] *……because, unlike point sources of pollution, it is extremely difficult to prove a definite and clear connection between source and receptor in any particular case. However, using* …[Water Catchment Management Orders] *…will allow us to have a more appropriate regulatory response to the problem of diffuse pollution using the concept taken from elsewhere of General Binding Rules (Scotland) and the new 'Basic Rules' being considered for England and we propose to implement this mechanism.*' Table 1 summarises what the Orders are intended to address.

Table 1: Water Catchment Management Orders (WCMOs): Proposed Regulatory Controls (Water Management Plan)

	WCMO TITLE	KEY PRESSURE CONDITION ADDRESSES	SECTORS CONDITION APPLIES TO
WCMO 1	Fertiliser imports and sales	Nitrates and Phosphates	All non-domestic users of fertilisers
WCMO 2	Nutrient Planning and Management	Nitrates and Phosphates	All non-domestic users of fertilisers and organic manures
WCMO 3	Field operations and applications	Nitrates and Phosphates	Agricultural sector
WCMO 4	Soil Protection	Nitrates, Phosphates and Pesticides	All non-domestic land managers
WCMO 5[53]	Pesticide storage and application	Pesticides	All non-domestic users of pesticides

During the Public Hearing (Ref 03) the Minister for the Environment provided some more information on how the Water Catchment Management Orders will be used as a back-stop for incentives as follows: "*If we can see that* …[a particular area retains very high nitrate concentrations]… *the catchment officer goes in, we go in and advise, and if the advice does not seem to be working …. the Minister may decide to make some orders in a particular catchment area where he will say: "I am sorry, what we have done thus far is not good enough. I am going to reduce the amount of fertiliser you can use in this catchment." … If the data shows we are not achieving the results move to the next stage. If that does not show improvement we move to the next stage. We have to get this problem right*."

Finding #12: The Advisors agree that existing (2000) legislation is focused on acute (point) source problems. We see that these measures are applicable to all sectors. We agree that this legislation is insufficient to deal with chronic (diffuse) problems related to potato farming. We agree with the focus on addressing unnecessary excess nitrogen loading in the proposals for the additional Water Catchment Management Orders. In our experience, the key difficulty will not be what is written in these Orders. Rather it will be achieving and assessing compliance with these additional requirements. The employment of an additional new catchment & compliance officer (FACTS and BASIS qualified) will be crucial to both providing advice to support achievement and assessing compliance.

c) Catchment Officers

The Water Management Plan (Ref 01) for Jersey recognises the need for '*increased compliance checking*'. It states that '*Currently, 20 days per year are spent on compliance checking. Under the chosen scenario we are increasing this to 100 days per year by 2020, subject to resource constraints*.' The Advisors note the caveat here and recommend that this is a crucial aspect underpinning whether the Plan will succeed or not. The remainder of this section represents our experience and advice on this aspect.

The catchment approach should include a sequential process of evidence gathering, awareness-raising, farm visits to identify hotspots, targeting of measures, and crucially the provision of advice. This approach has been successful in ensuring changes were made to farm practices in order to help make improvements to water quality in Scotland.

The catchment approach should be risk-based, flexible and integrated, and should ensure that regulation is not unnecessarily burdensome for farm businesses. The approach requires working in partnership with others in the agricultural sector, particularly farmers. A key need is to provide information, advice and guidance where appropriate, and also to promote funding for measures. A sound scientific and evidence base will be required to support the mitigation of nitrate pollution, both in terms of farmer buy-in and to accurately target measures to achieve the most cost-effective improvements. The Jersey work reported by the Nitrates Working Group produced very useful research outputs on soil management, sources and transport of nitrate, as well as their impact on water quality and farm management practices.

The Advisors experience indicates that practical advice is the most important factor in determining whether or not the right actions are taken by farmers. Support by a range of organisations and individuals to farmers can greatly improve the effectiveness of measures to tackle diffuse pollution, by increasing the likelihood of behavioural change and targeting measures to the most appropriate locations. Advice is provided to farmers from several different sources on Jersey. It is important to ensure that all advisors are appropriately

trained and have access to materials for their clients that deliver a consistent message on avoiding nitrate pollution. Good advice will help ensure the right measures are put in the right place in order to maximise their effectiveness and get best value for money. This is best delivered through one-to-one advice. There is also a need to embed understanding of how to mitigate nitrate pollution risks in training events and education courses for farmers. This will foster good practice for the next generation of farmers, and others undertaking further training and education. There is a need to review how funding support is targeted so that farmers can be funded to take appropriate actions over and above basic good environmental practice.

Under the Water Management Plan, the payment for the new Rural Economy Strategy and of agricultural subsidies will become contingent on claimants having LEAF accreditation and the compliance around this will be done by LEAF auditors. The SEPA Advisors support this provided that the LEAF audit is focussed on raising the baseline environmental performance on farms, particularly that water protection fully supports the objectives of the Water Management Plan. The focus on cross compliance inspections and reporting non-compliance back to the State of Jersey is not the typical role of LEAF auditors. It will be important to ensure this is fully implemented. To complement the LEAF audit, the Advisors also support that Environmental Protection will be responsible for bringing in and enforcing the new Water Catchment Management Orders which will operate independently of the agricultural subsidy regime.

This regulation will involve additional compliance work and additional resources will be required for the State of Jersey staff to carry out compliance checking on farms and to provide internal advice on farming and water related matters. Based on Scottish experience and resourcing, the Advisors agree that a single additional full time post will be needed to help deliver this across Jersey. Note that this figure does not include resources required for additional monitoring and legislation development.

In relation to the additional compliance and advisory capacity required to achieve the objectives of the Water Management Plan, the Advisors understand from the State of Jersey officials that compliance assessments are currently carried out on about 10% of ‘Single Area Payment’ claims. These assessments are mainly carried out by Rural Economy staff and are not largely focussed on water pollution risks. Cross compliance provides an economic incentive/penalty system which has various objectives, although water protection was not the primary aim. The Advisors strongly agree and support that the cross compliance for subsidies includes a requirement to protect water quality from nitrates (and other diffuse pollutants).

Staff involved in gathering the evidence required for serving financial penalties should have a good knowledge of Jersey agriculture; have experience of undertaking diffuse pollution inspections; and a good working knowledge of diffuse pollution mitigation, the Water Management Plan and the new Water Catchment Management Orders. Crucially they must be able to interact constructively with farmers and should be fully aware of guidance for undertaking and identifying risks of diffuse pollution in the field.

Key to the success of the Water Management Plan will be that non-compliance is dealt with appropriately. This will illustrate to those farmers who have complied, that Jersey will deal with everyone fairly. Financial penalties should be appropriate for dealing with low level harms on an individual basis and will demonstrate to those who have worked positively that the State of Jersey will take action against non-compliant land managers. Fixed monetary

penalties are an effective mechanism to increase compliance by an agreed timescale. It will also be important to escalate to enforcement action against consistently non-compliant farms.

Additionally, the Advisors were asked to consider the '*role of Jersey Water …in helping to reduce nitrate levels.*' (refer to Section 1). The Plan notes that Jersey Water '*has for many years advocated for the need for additional protection for water catchments through increased regulation by Government to reduce pollution from the Island's agricultural and horticultural activity and to avoid the need for dispensations for nitrates being necessary… We will continue to work with Jersey Water in terms of their quality concerns, on monitoring and data-sharing and also on the issue of nitrate dispensations. Jersey Water will continue to share their data with us and work with the Department to support and undertake proactive catchment engagement as part of their water safety planning…. Although an engineering solution rather than a catchment management one, Jersey Water are also making contributions to the WMP objectives that relate to drinking water through planned implementation of a reservoir bypass scheme. They will also continue to contribute as a major water abstractor and licence holder and through the charges for discharge permits which are proposed*.'

The Advisors understand that there are additional considerations for Jersey Water to potentially fund a catchment officer. This would follow the practice adopted by some water companies in the UK, whereby taking action at source is considerably cheaper than treatment of the water supply. Whilst this principle is well established, has merits and is agreed by the Advisors, we do note certain special circumstances in Jersey:

- It is understood that Jersey Water is over 80% owned by the States of Jersey.
- It is understood from the Plan that resources are only available for one catchment officer at most (refer to Section 5).
- It is understood from the Hearing that a considerable reliance is being placed on LEAF auditors to help deliver compliance (refer to Section 5).

The Plan also states that '*To fund the Government costs proportion of the plan in the medium to longer term under Scenario 2b there are a number of options that need to be investigated further …. a) A tax on fertilisers and/or pesticides …. ….*'

The Advisors would recommend that a tax on fertiliser is worthy of consideration as it is consistent with the 'polluter pays principle'. It is possible that such a tax would also help fund the catchment & compliance officer.

Finding #13: The work of the catchment & compliance officer is absolutely crucial to the success of the Plan. Whatever the source of funds, it is important that funding is found very quickly to enable one officer to begin work. It is equally important that all parties visiting farms work seamlessly together and that there is no possibility of incurring time wastage via duplication of effort or unnecessary additional burden on farmers via multiple visits from different people.

6. Appreciation on whether the Plan will work

The Water Management Plan (Ref 01) has clear objectives and performance indicators, as explained in Section 5. However, there is only a qualitative assessment of whether the measures will work. The assessment is not set against the objectives of the Plan but instead is set against 'good ecological status' requirements of the EU Water Framework Directive. The preferred option (scenario 2b) is assessed as follows '*The overall effectiveness of this scenario in achieving good ecological status across the Island is predicted to be medium to high*'. Other than a qualitative graph of effectiveness, there is no further analysis of whether the measures will be effective; i.e. will achieve the Plan objectives in the given timescales.

During the Public Hearing (Ref 03) no details of any predictions on the Plan's effectiveness were provided. In answer to questions in this regard, the Minister responded by indicating "we are going to do a lot more monitoring." A number of other comments by the Minister (summarised in Sections 4 and 5) indicated the importance placed by Jersey on implementing the most reasonable plan possible, monitoring effectiveness and then adjusting the measures if necessary. An expert official for the Minister stated "*as far as actually getting to the target of 50 and not having any peaks by the end of the 5 years, I do not believe evidentially that we can say 100 per cent that that is going to happen. But our measures plus the fact that Jersey Water are putting in some engineering works are going to make the difference. The point of the plan being a 5-year plan is that you review it*."

Finding #14: The Advisors note that the Plan only predicts performance against the ecological requirements of the Water Framework Directive. However, we recommend Jersey prioritises human health in the first instance. This means prioritising the nitrates and other quality problems in the water supply. Addressing this priority should bring knock-on improvements in the sea lettuce problem. The ecological requirements of the Water Framework Directive should only be prioritised when there is clear evidence that the drinking water problem is well on the way to being addressed.

In the absence of an analysis of effectiveness within the Plan, the Advisors can still provide some perspective based on their experience. As ever, our analysis is split between the key impacts on the Island; the public water supply, the private water supply and the sea lettuce in St Aubin's Bay.

a) **Will the nitrate problem in the public water supply be addressed within the timescales laid out in the Water Management Plan**?

The significant scale of the task facing Jersey is outlined in Sections 2 and 3, where we explained the issue is associated with both acute and chronic causes. The biggest problem by far is the impacts on surface water which in turn are impacting the public water supply. This problem is due to excessive agricultural application of fertiliser. Section 3 explains that there is no evidence that there has been an improvement in the fundamental cause of this problem so far. Section 3 also explains that although the need for dispensations has halted in recent years, this could well be merely due to an accident of the weather.

To achieve the objectives of the Plan, a further reduction in peak concentrations of approximately 33% by 2035 is required across the Island. If peaks have to reduce by 33% then the average will have to reduce by a little less – in the experience of the Advisors by

approximately 25%[4]. Though some areas will require less and some more, overall we can say that the required reduction in the chronic inputs of nitrate across the Island as a whole is 25-33%

The Advisors would note that this level of reduction is significant. Nitrate improvement is very difficult to achieve. This is because:

- Nitrate is very mobile in the water environment and readily leaches out of the soil where it is needed and useful, and into water, where it is wasted and problematic.
- The first place nitrate reaches after leaving the soil is groundwater. From there it moves slowly until it discharges into streams and springs. Groundwater acts as a reservoir, from which nitrate can continue to enter surface waters for years after improvements in practice have been achieved.
- Nitrogen is an essential plant nutrient without which modern agriculture would be unsustainable.

The European Union has noted (Ref 23) that very little information on the effectiveness of nitrates measures has been reported by Member States. It has noted this 'gives cause for concern'. This reflects the difficulty member states have in achieving nitrate improvements. In the absence of EU-wide comparisons, three case studies are provided by the Advisors by way of illustration of the difficulty in achieving improvements in nitrates:

i. There are some 40 groundwater bodies in Scotland which we have identified as being impacted (poor status) for nitrate under the Water Framework Directive. Almost half of these water bodies have been set a restoration deadline beyond 2027, including the Carnoustie example shown in Figure 3. This long deadline is set because it is 'technically infeasible or disproportionately costly' to address the nitrate problem earlier than 2027. These water bodies have no defined deadlines for improvements beyond this point.

ii. In England, the Agricultural Development and Advisory Service (Ref 20) estimated that the Action Programmes in England '*reduce nitrate leaching from agricultural land within NVZs by 1-8%, with potential to perhaps double this (at most) by further measures…..There are many areas of the country where nitrate concentrations will remain above 50 mg/l unless there is substantial land use change and/or reduction in livestock numbers*.'

iii. Denmark is widely regarded as one of the most successful European countries in implementing nitrate measures. They achieved a reduction of 48% in nitrogen discharges from agriculture between 1985 and 2003 (Ref 21). Since that time they have implemented additional measures to attempt a further 13% reduction by 2015. These measures included a nitrogen quota some 10% under the economic optimum. Final performance results are not yet available but an interim evaluation showed no significant additional reduction in nitrate leaching as a result of the new measures.

[4] *UK Technical Advisory Group advise that achieving an average of 37.5 mg/l nitrate should ensure no peaks exceed 50 mg/l (Ref 17). Average levels in both surface and groundwater over the last 10 years in Jersey are very close to 50 mg/l. A reduction of 25% from the current average of 50 mg/l will bring the future average down to 37.5 mg/l.*

Finding #15: In order to address the chronic nitrate problem affecting the public water supply, the Advisors estimate nitrate leaching from farmland across the Island will need to reduce by 25%-33% from 2016 levels. This is a significant challenge. It is close to the best performance that the Advisors are aware of in Europe, and at least double the effectiveness estimated for the nitrate measures in England. Jersey faces a significant task.

Finding #16: The Advisors agree that implementation of the Plan should not be delayed by detailed predictions of the effectiveness of the Plan. We agree with the emphasis on monitoring as the Plan develops and then adjusting measures if monitoring shows it is not on track. We would characterise this as a 'suck it and see' approach, and we endorse it, reiterating that it benchmarks well with the rest of the UK. However, we also reiterate that the stakes are higher for Jersey than for the UK. Therefore it is key that the resources and partnership agreements are set in place to enable implementation without delay. Obviously, the improvement measures themselves are most important but the Advisors stress that any 'suck it and see' approach will only work if sufficient resource is allocated for supporting and demonstrating compliance via catchment officers and water monitoring.

b) **Will the nitrate problem in the private water supplies be addressed within the Plan timescales**?

Section 3 explains that there is evidence of a significant reduction in nitrate levels in the private water supplies. It also explains that, in the opinion of the Advisors, this is due to improvements in best practice and compliance with regulations related to locally acute point sources such as the storage of slurries. Levels remain in excess of the drinking water standard, but the trend is one of significant improvement.

Finding #17: If improvements continue at the same rate, there is a basis to expect the point source problem will be largely addressed within the Plan timescales. This will significantly improve the water quality in the private water supplies. However, the Advisors would stress that there are two important caveats:

- Further improvements in point sources will require continued hard work and close working between farmers, catchment officers and LEAF auditors.
- Even once the point source problem is resolved, nitrate levels in many private supplies will remain above the standard until the chronic problem across the Island is also resolved.

c) **Will the sea lettuce problem in St Aubin's Bay be addressed within the Plan timescales**?

In Sections 2 and 3, the Advisors have agreed that the two main sources of the sea lettuce problem are a) the discharge from Bellozanne Sewage Treatment Works and b) the chronic problem from agricultural nitrate application affecting surface waters which then discharge into St Aubin's Bay.

As with other problems, Water Management Plan (Ref 01) provides no prediction as to whether the sea lettuce problem will be addressed in the required timescales. The sea lettuce problem has an additional element of uncertainty, which is the required standard against which the problem can be considered fixed. Each coastal water is different and sea

lettuce will respond to different nitrate levels in each case. Therefore the Advisors recommend the best approach is to address the drinking water problems on the island and then regularly monitor the sea lettuce extent to assess if this is also sufficient to address the sea lettuce.

The Plan recognises that the sea lettuce problem requires improvement in the sewage treatment discharges into St Aubin's Bay. It states the following: the '*Wastewater sector (Department for Infrastructure, formally Transport and Technical Services) will play a vital role over the next 5 to 10 years in safeguarding the inland and coastal waters of Jersey. This work was already planned and precedes this Plan….. The phased replacement of Bellozanne sewage treatment works will be central to this, producing a more stable and compliant effluent which is easier to treat and regulate, ensuring St. Aubin's Bay is protected in a cost-effective way. The planned upgrade will also increase the full flow to treatment capacity, and therefore reduce 'storming events' significantly that result in the secondary process of treatment being bypassed*.'

Finding #18: The Advisors agree with the Plan that the measures to reduce nitrate loading on the land will also significantly help the sea lettuce problem. The Advisors also agree that, alongside losses from farmland, the sewage treatment works feeding into St Aubin's Bay is one of the two main causes of the sea lettuce problem.

d) Other possible mitigating measures

The Advisors are aware of representations to the Panel about the use of organic composts instead of inorganic fertilisers. The Advisors note that these composts would certainly reduce nitrate losses, but there may be an issue in terms of reduced agricultural productivity. The Advisors stress that this is therefore a matter for the farming community to decide in terms of the relative costs of implementing nitrate reduction measures set against longer term benefits of organic farming in terms of improving soils etc.

The Minister for the Environment made the following comments with regard to organic farming in general at the Public Hearing (Ref 03):

> "…*But we should have more organics. I said only this week to the Council of Ministers. I am looking at the land that the States owned and the Crown own and looking to see whether we can increase the percentage, but government have a policy of reducing nitrates and pesticide and we should back that up by saying where we own small bits of land - and we do not own as much land as I thought we did - but where we have bits of land maybe we should be saying to our tenants: Okay, in return for a reduced rent we will expect you to farm the land organically. Organic farming ticks a lot of boxes where some of the directions of travel we have the Environment Department. But we need to recognise that the agricultural industry on the Island would not be the same if we were all organic. So we balance the 2, we move along. But there are outlets for organic produce, Waitrose particularly are very keen to take local produce, local organic produce. We will do all we can to help local organic farmers market into those supermarkets. We put money into Woodside Farms pack house last year specifically so that a whole range of Jersey farmers have access to the supermarkets. One of the secrets, in my view, to making more money off organics is for the organic farmers to work together more closely to identify markets that they can fulfil as a group, which they cannot fulfil as individuals.*

That is the secret. If you can get a consistent order for a reasonable large amount of produce you can see some targets, you can see some prices, you can see a marketing programme coming down the line. But they will only do that by working together. We have said to them: "We will help you to make more money out of your produce but you need to talk to each other more."

The Advisors would agree with the point made in relation to market acceptance schemes having much wider relevance. Jersey faces a significant task in reaching its nitrate targets in the required timescales. Much of the focus needs to be on reducing nitrate losses from potato farming. We note that the Plan is very sensitive to ensuring farming can continue in a sustainable manner on Jersey. The Advisors agree that this is essential. So, in order to both achieve this and reach the ambitious nitrate targets, Jersey needs to turn the environment from a problem into an economic opportunity. In this regard we strongly encourage very careful attention be given to:

- Carefully calculating, and then explaining to farmers, the amount of money they are wasting in excessive nitrate application. With a little expertise and a lot of monitoring, the concentrations in Jersey's waters can be directly compared with sacks of fertiliser wasted.

- Developing and fostering both government incentives and market assurance schemes, to make it economically advantageous to reduce nitrate losses.

- All stakeholders working in partnership to advise, to share best practice, and to educate, but also to ensure good practice is rewarded and clear examples are made of bad practice through financial penalties.

- Other potential initiatives to generate revenue from the problem. For example, using Jersey's wastes in anaerobic digesters or developing oyster farms to feed off the sea lettuce. The Advisors are aware that some initiatives of this kind have already been assessed and identified as unviable. However, we recommend that new ideas continue to be encouraged and assessed in a partnership approach.

7. Findings and Recommendations

This section brings together the findings contained in Sections 2 to 6 of the report. They have been re-ordered to fit under the Terms of Reference for the Panel review (as described in Section 1).

a) To assess the challenges faced by the Council of Ministers in maintaining an adequate supply of clean water with reduced concentrations of nitrate

Finding #1:
The Advisors agree with the Water Management Plan that there is a significant nitrate problem impacting a) Jersey's public water supply, b) Jersey's private water supplies and c) sea lettuce in Jersey's St Aubin's Bay.

Finding #2:
The Advisors interpret the overall trends in monitoring results as showing: There is a clear improvement in average groundwater levels of nitrate, but this is mainly due to a significant improvement in acute nitrate problems local to the groundwater monitoring points. There is also evidence of a recent improvement in the underlying chronic problem but the rate of improvement is not currently sufficient to meet the target deadlines in the Water Management Plan.

b) To consider the measures that are being taken, or are proposed, by the Council of Ministers to address the issue of nitrate levels within Jersey's water supply

Finding #4:
The Advisors find that the dominant cause of the chronic nitrate levels impacting public water supplies is the practice of growing early potatoes, combined with the subsequent land uses after the early potatoes are harvested. More fertiliser is applied than is needed by the potatoes and subsequent crops. Due to the time of year that it is applied, the excess nitrate is rapidly flushed out of the soil (where the farmer needs it) into groundwater (where it becomes a problem). From groundwater it then discharges into surface water which then, in turn, discharges into the public water supply and beaches.

The Advisors do not consider valid the argument from stakeholders that high nitrate is unavoidable due to the absence of high ground on Jersey, and therefore the absence of dilution from rainfall.

Finding #5:
The Advisors agree that the nitrate problem also represents a significant potential for a win-win. The problem of high nitrate concentrations in water represents a waste of resources to farmers. The amount of nitrate leached is well in excess of best practice, representing a loss to farmers of many tens of thousands of pounds per year. Any reduction in nitrate leaching will therefore bring an improvement both to drinking waters and, with time, the sea lettuce. A further reduction to levels considered best practice elsewhere could solve the problem in the long term.

Finding #6:
The source of the acute problems affecting private water supplies is likely to be poor compliance with basic good practice in nutrient management, the construction and siting of septic tank discharges, farmyard waste management measures, old landfill sites, etc.

Finding #7:
The Advisors agree that the two main sources of the sea lettuce problem on the coastline is a combination of the Bellozanne Sewage Treatment Works effluent and the 'chronic' problems from farmland.

c) To determine whether the proposals are sufficient for addressing the elevated levels of nitrate found in surface waters and groundwater

Finding #8:
The Advisors, based on our experience, agree that the objectives of the plan are a good balance between what is desirable and what is reasonable for a sustainable economy.

Finding #9:
The Advisors agree that a catchment-based approach is the best means of addressing the nitrate problem in Jersey. In our experience, the approach works. In Scotland, compliance was raised on farms visited from 35% to 86%.

Though the catchment-based decision is already made, the Advisors support the plan to complete an ecosystem services type review. This does not need to delay starting work on implementing the Plan. The analysis can be done in parallel. We suggest it will prove invaluable in future years should the Plan come under pressure via difficulties in implementation or a change in economic or political circumstances.

Finding #10:
The Advisors strongly agree that partnership working, combined with incentivisation, is by far the most effective tool for addressing the problem at source. We understand and agree that regulations will be seen as a backstop only to be used if necessary.

Finding #11:
The Advisors agree that incentivisation is a crucial part of the success of the Plan. We support linking government incentives to the concept of farmers' provision of a public service. It is likely that Jersey farmers will need to go beyond basic compliance with regulations, which deal mainly with acute problems, in order to address chronic problems and achieve the objectives of the Plan. We see the proposed link between market assurance schemes and government incentives as going beyond compliance, and it is therefore particularly important and welcome. The proposed LEAF uptake in Jersey will be much higher than the current level of 3% in the UK. These market assurance schemes turn the environment into an economic opportunity.

Finding #12:
The Advisors agree that existing (2000) legislation is focused on acute (point) source problems. We see that these measures are applicable to all sectors. We agree that this legislation is insufficient to deal with chronic (diffuse) problems related to potato farming. We agree with the focus on addressing unnecessary excess nitrogen loading in the proposals for the additional Water Catchment Management Orders. In our experience, the key difficulty will not be what is written in these Orders. Rather it will be achieving and assessing compliance with these additional requirements. The employment of an additional new catchment & compliance officer (FACTS and BASIS qualified) will be crucial to both providing advice to support achievement and assessing compliance.

Finding #13:
The work of the catchment & compliance officer is absolutely crucial to the success of the Plan. Whatever the source of funds, it is important that funding is found very quickly to enable one officer to begin work. It is equally important that all parties visiting farms work seamlessly together and that there is no possibility of incurring time wastage via duplication of effort or unnecessary additional burden on farmers via multiple visits from different people.

d) To assess whether the measures are achievable within the proposed timeframe and resources

Finding #14:
The Advisors note that the Plan only predicts performance against the ecological requirements of the Water Framework Directive. However, we recommend Jersey prioritises human health in the first instance. This means prioritising the nitrates and other quality problems in the water supply. Addressing this priority should bring knock-on improvements in the sea lettuce problem. The ecological requirements of the Water Framework Directive should only be prioritised when there is clear evidence that the drinking water problem is well on the way to being addressed.

Finding #15:
In order to address the chronic nitrate problem affecting the public water supply, the Advisors estimate nitrate leaching from farmland across the Island will need to reduce by 25%-33% from 2016 levels. This is a significant challenge. It is close to the best performance that the Advisors are aware of in Europe, and at least double the effectiveness estimated for the nitrate measures in England. Jersey faces a significant task.

Finding #16:
The Advisors agree that implementation of the Plan should not be delayed by detailed predictions of the effectiveness of the Plan. We agree with the emphasis on monitoring as the Plan develops and then adjusting measures if monitoring shows it is not on track. We would characterise this as a ‘suck it and see’ approach, and we endorse it, reiterating that it benchmarks well with the rest of the UK. However, we also reiterate that the stakes are higher for Jersey than for the UK. Therefore it is key that the resources and partnership agreements are set in place to enable implementation without delay. Obviously, the improvement measures themselves are most important but the Advisors stress that any ‘suck it and see’ approach will only work if sufficient resource is allocated

for supporting and demonstrating compliance via catchment officers and water monitoring.

e) To determine what role the agricultural industry and Jersey Water have in helping to reduce nitrate levels in Jersey's water

Finding #17:
If improvements continue at the same rate, there is a basis to expect the point source problem will be largely addressed within the Plan timescales. This will significantly improve the water quality in the private water supplies. However, the Advisors would stress that there are two important caveats:

- Further improvements in point sources will require continued hard work and close working between farmers, catchment officers and LEAF auditors.
- Even once the point source problem is resolved, nitrate levels in many private supplies will remain above the standard until the chronic problem across the Island is also resolved.

Finding #18:
The Advisors agree with the Plan that the measures to reduce nitrate loading on the land will also significantly help the sea lettuce problem. The Advisors also agree that, alongside losses from farmland, the sewage treatment works feeding into St Aubin's Bay is one of the two main causes of the sea lettuce problem.

f) To advise the Panel on further research it might undertake to develop a broad understanding of the issues involved

Finding #3:
The Advisors recommend the following with respect to water and sea lettuce monitoring on Jersey:

- The frequency of water monitoring is sufficient but it needs to be maintained at current levels throughout the Plan timescales.
- More in-depth analysis of what the results mean is required. It is important to understand the relative loads associated with monitoring results at each location. This requires understanding flow associated which each sampling location. For each borehole sampling point, an approximate annual abstraction rate should suffice. For surface waters, it requires measurement of river flows. This is expensive but we recommend at least one long term flow measurement point is needed in one of the main streams entering St Aubin's Bay.
- There is a critical need to provide for effective monitoring of the sea lettuce bloom occurrences. The advisors understand this has commenced although no evidence was available at the time of undertaking this review.

This monitoring is essential to help all partners understand whether the Plan is working or not. This is, in turn, essential to maintain engagement.

Recommendations

Arising from these findings, the Advisors would recommend the following over-and-above what has already been proposed in the Plan:

- Implementation of the Water Management Plan should begin at the earliest possible opportunity, including staff resource for both advisory support and compliance checking of farm practice. Key additional recommendations are as follows:

    - The catchment approach is key to implementation and should include a sequential process of evidence gathering, awareness-raising, farm visits to identify hotspots, targeting of measures, and crucially the provision of advice. The approach should also be risk-based, flexible and integrated, and should ensure that regulation is not unnecessarily burdensome for farm businesses.

    - The plans for partnership working, incentivisation and market assurance schemes are excellent and should continue in order to effectively address the nitrate problem and support the implementation of the Plan. They would ideally be made more explicit in the Water Management Plan. However, any changes to the Plan should not be made if they would slow down implementation.

    - Broader Water Framework Directive requirements should not be prioritised until the nitrate and other problems in the water supply and on the beaches are shown to be well on the way to success.

- Monitoring is essential to help all Partners understand whether the Plan is working or not. This is, in turn, essential to maintain engagement. More details are as follows:

    - Frequent monitoring of raw water feeding the public and private drinking water supplies should continue throughout the timescale of the Water Management Plan.

    - Regular and frequent monitoring of the extent of the sea lettuce problem on the beaches should be undertaken. The Advisors understand that this has commenced around St Aubin's Bay however more detailed information was not available at the time of completing the review. To support this work, at least one long term flow measurement point is needed in one of the main streams entering St Aubin's Bay.

    - More in-depth analysis of what the monitoring results mean should be undertaken to help understand the relative effectiveness of different types of measures.

    - Evidence should be gathered to determine how much of a reduction in nitrogen from the Bellozanne STW and nitrate rich freshwater streams would be required to avoid elevating available nitrogen above the levels found in the offshore waters that surrounds St Aubin's Bay

- Going beyond compliance: Key to success will be turning the environment from a problem to an economic opportunity. This includes calculation of monetary value of waste due to excessive nitrate application; developing and fostering both government incentives and market assurance schemes; sharing and promoting best practice; and consideration of other potential initiatives to generate revenue from the nitrate problem.

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Annex 2: Impact of nitrogen loads on excessive growths of sea lettuce in Jersey

Excessive growths of sea lettuce have been reported at St Aubin's Bay, for decades and this has become a matter of public concern as reported by the media on many occasions.

Nuisance growths of sea lettuce are caused by a combination of available nitrogen, light, warm sea temperatures and hydrographic conditions (see review in Ref 22). There is clear evidence that sea lettuce can out compete other marine plants by taking advantage of excess available nitrogen. It is highly likely that the excessive growth of sea lettuce is caused by high nitrogen levels in St Aubin's Bay.

Environmental monitoring of coastal waters around Jersey has been quite limited prior to 2012. The most recent surveys were carried out from 2012 to 2015 (Ref 07) and demonstrated that the coastal waters of St Aubin's Bay failed European standards for sea lettuce and for nitrogen. The data on which this assessment was based is limited to four years for sea lettuce and two years for nitrogen so continued monitoring is needed to increase certainty.

The assessment for sea lettuce indicated that the situation is getting worse. For nitrogen, on the other hand, the assessment indicated that the nitrogen in St Aubin's Bay is fluctuating between acceptable and unacceptable levels.

The severity of the problem in Jersey is highlighted by the fact that recent comparative data for England (2015) shows that macroalgae blooms (e.g. sea lettuce) are a very rare occurrence in the coastal waters around the UK (Ref 16).

The sources of available nitrogen into St Aubin's Bay are 1) nitrate and ammonia from the Bellozanne Sewage Treatment Works (STW) effluent and 2) nitrate loadings from streams flowing into this Bay. If nitrogen is acceptable (i.e. meets 'good' water quality status in relation to EU standards) in the overall area of St Aubin's Bay (recommended to be confirmed by further monitoring) the implication is that reasonable efforts to reduce nitrate and nitrogen loadings to St Aubin's Bay from both sources would eventually lead to significant reductions in sea lettuce growth. However, the general background concentration of nitrogen in Jersey coastal waters should also be taken into account. This is important since efforts to reduce nitrogen loadings in St Aubin's Bay might be confounded by continual or occasional re-supply of nitrogen from sources external to Jersey.

We note that the David Kay review (2014) (Ref 18) maintained that there was no statistical difference in nutrient concentrations between Jersey coastal waters and wider offshore waters. Assessments in the review indicated that the regional seas in which Jersey is located were not likely to be a primary cause of sea lettuce blooms. Furthermore, there were no similar blooms of sea lettuce in similar Jersey bays. The review suggested that despite the evidence that available nitrogen is only occasionally unacceptable in the Bay as a whole, it is likely that the effluent from the STW, along with the local stream waters, forms a nitrogen rich freshwater plume that moves across the Bay twice a day on the rising tide. This may be sufficient to fuel the sea lettuce blooms. The review recommended that evidence should be gathered to determine how much reduction in nitrogen from the streams and the STW effluent would be needed to reduce available nitrogen to the levels found in surrounding offshore waters which did not appear to cause sea lettuce blooms in similar Jersey bays. The Advisors understand that nearshore monitoring is currently being conducted around St Aubin's Bay however this was not available at the time of completing this review.

It is also well known that excessive growths of sea lettuce caused by excessive nitrogen loadings are a frequent occurrence on the coasts of Northern Brittany although these appear to be much more of an acute problem than in Jersey. This review, when undertaken, considered previous studies on the water quality of St Aubin's Bay and offered an interpretation of the evidence with respect to eutrophication and the cause of sea lettuce blooms.

There is evidence from other studies (eg. Dublin Bay Ref 19) that sea lettuce may also respond to nitrogen released from sediments while blooms are active although the original source of sediment nitrogen was from sewage effluent. This might also imply that sea lettuce blooms will not necessarily respond immediately to reductions in sources of available nitrogen but that longer-term control can be achieved by reducing the supply of nitrogen to sediments.

We conclude that sea lettuce blooms are caused by excess available nitrogen acting in combination with other factors in St Aubin's Bay and that it is reasonable to expect a reduction in bloom frequency and extent by reducing loadings of nitrogen from the Bellozanne STW and nitrate rich freshwater streams. Evidence should be gathered to determine how much of a reduction would be required to avoid elevating available nitrogen above the levels found in the surrounding offshore waters (as recommended by David Kay).