Nitrate Vulnerable Zone (NVZ) designation, 2017 Eutrophication (lakes)

Publication Date: June 2016

NVZ Name: Drift Reservoir
NVZ ID: EL132
This document provides a summary of the evidence used in proposing an area of land as one which should be, or should continue to be, designated as a Nitrate Vulnerable Zone (NVZ) for the purposes of the Nitrate Pollution Prevention Regulations 2015.

A full description of the methods used in developing the NVZ proposals is set out in the detailed methodology for eutrophication-related NVZs, available via http://apps.environment-agency.gov.uk/wiyby/141443.aspx. These methods were developed under the guidance of a review group convened by the Defra for the last NVZ review (2011-2013), which included representatives from the farming and water industries as well as independent academic experts. Minor refinements to the methods have been made for the current review.

NVZs are areas of land that drain to polluted waters and which contribute to the pollution of those waters. Polluted waters include those which are eutrophic or may in the near future become so if the Regulations were not to apply there.

Eutrophication is defined as "the enrichment of water by nitrogen compounds, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned".

For both freshwaters and saline waters, a weight-of-evidence based approach to assessing the risks and impacts of eutrophication was employed. The evidence for individual water bodies was assessed against a national suite of criteria for eutrophication in the different categories/types of water for review. The criteria are both quantitative and qualitative and reflect scientific understanding of the process and effects of eutrophication. They are broken down in the same way for each water category as follows:

- Nutrients
- Plants/algae
- Secondary and other effects

For each designated or candidate water body which might meet the criteria for eutrophication, a datasheet such as this one was completed, bringing together information about the water body, its catchment, its uses, evidence of eutrophication and the sources of nitrogen input.

This document is a record of the evidence used in the designation process, including results from national monitoring and assessment programmes, and further information supplied by Area staff. The proposals for NVZ designation are made as a result of close working between Area and national Environment Agency teams, with further quality assurance for the eutrophication designations through the use of a national expert panel.

An accompanying guide to these datasheets is available, which provides an explanation of the contents, acronyms and technical terms.

Some features of the maps within this report are based on digital spatial data licensed from the Centre for Ecology and Hydrology, ©. Please note that any maps shown here have not used detailed field boundaries and therefore represent the indicative 'soft' boundary only. The definitive NVZ area can be seen on the "What's in Your Backyard" (WIYBY) website (http://apps.environment-agency.gov.uk/wiyby/141443.aspx).
Section 1. Lake and catchment characteristics

WB ID: 46547  2013 NVZ status: Not Designated

Lake attributes

<table>
<thead>
<tr>
<th>EA Area</th>
<th>Devon and Cornwall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake grid co-ordinates (Easting/Northing)</td>
<td>143394 / 29319</td>
</tr>
<tr>
<td>Lake waterbody area (ha)</td>
<td>25</td>
</tr>
<tr>
<td>WFD Lake Typology</td>
<td>Moderate alkalinity, shallow, small, lowland</td>
</tr>
<tr>
<td>Lake Alkalinity (ueq/L)</td>
<td>323</td>
</tr>
<tr>
<td>Mean lake depth (m)</td>
<td>5.1</td>
</tr>
<tr>
<td>Is the lake heavily modified according to WFD?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does stratification occur?</td>
<td>Not known</td>
</tr>
<tr>
<td>Is this waterbody a reservoir?</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Natural or artificial lake:
Natural --- Impounded (concrete gravity dam) in 1961 for public water supply (South West Water). 1200Ml capacity.

Type of artificial lake:
n/a

Lake perimeter (% artificial)
<20% (Impounded (concrete gravity dam) in 1961 for public water supply (South West Water).)

Significant changes in lake level due to seasonal drawdown:
Y --- PWS reservoir. Fairly even take with summer increases in demand. In 1976 (drought year) reservoir was drawn down to approx 20%. In 2014 reservoir was drawn down to approx 60%. In 2015 reservoir was drawn down to approx 80%.

Pumped storage or other reservoir:
n/a

Information on abstraction (if available)
Lake catchment attributes

<table>
<thead>
<tr>
<th>Lake catchment area (ha)</th>
<th>1915</th>
</tr>
</thead>
<tbody>
<tr>
<td>If pumped, pumped catchment area (ha)</td>
<td></td>
</tr>
</tbody>
</table>

Hydrological character
Primarily surface water

Comments on accuracy of lake catchment:

Is the map representative of the natural catchment?
Yes

Is the map representative of the artificial catchment?
n/a

Please note that the map above has not used the detailed field boundaries and is the indicative ‘soft’ boundary. The definitive NVZ area can be seen on the Environment Agency website (www.environment-agency.gov.uk)
Section II - Waterbody uses

Water Supply:
Controlled water (Section 104 of Water Resources Act):

Public Water Supply:
Yes

Drinking Water Protected Area:
Yes

UWWTD designation
No

Used for hydropower or flow regulation:
n/a --- No hydro, but a recent presentation by South West Water to Cornwall Council has suggested it might be possible in the future. There is a compensation flow requirement.

Recreational use:

Accessibility to public:
Not easily accessible, few visits --- Public access is limited across the dam and to the northern reach of the reservoir. Some car parking (approx 20 cars) but this not a key visitor site.

Recreational fishing:
Significant benefit --- Well established trout fishery - managed by South West Lakes Trust - rainbow trout and brown trout. Recently introduced Arctic Char. Permits are publicly available. The local council is likely to positively regard the benefit to the local community.

Contact watersports
No activity --- Only fishing currently takes place.

Nature of watersports (if applicable):
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Other public benefit visits:
Moderate benefit- Specialist access for members of Cornwall Bird watching & Preservation Society - a hide and footpath exists. The local council is likely to positively regard the benefit to the local community.

Conservation status:

Conservation value of lake:
Local --- SWW Identified Special Protection Zone and Nature Reserve (These are areas are deemed by South West Water as high quality conservation value and do not have any recreational activities taking place within them with the exception of footpaths for walkers. County Wildlife Site with areas designated UK BAP deciduous woodland but again probably parts are actually wet woodland.

Habitats Directive site:
Not SPA or SAC

SPA or SAC for aquatic interest features
n/a ---

SSSI or local conservation designation:
Other (describe in D) --- Not managed for aquatic conservation value

Description of Aquatic interest features:

NVZ Name: Drift Reservoir
NVZ ID: EL132
### Total oxidised nitrogen (TON) data

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean summer TON (mg/l)</td>
<td>2.6</td>
</tr>
<tr>
<td>Total number of summer TON samples</td>
<td>12</td>
</tr>
<tr>
<td>75th percentile annual TON (mg/l)</td>
<td>4.2</td>
</tr>
<tr>
<td>Total number of TON samples</td>
<td>30</td>
</tr>
<tr>
<td>Confidence of annual 75th %ile TON exceeding 1 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Confidence of annual 75th %ile TON exceeding 2 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Date range of TON samples</td>
<td>2010 - 2012</td>
</tr>
</tbody>
</table>

### TON monitoring data

![TON monitoring data graph]

**NVZ Name:** Drift Reservoir  
**NVZ ID:** EL132
Total nitrogen (TN) data

<table>
<thead>
<tr>
<th>Mean annual TN (mg/l)</th>
<th>3.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of TN samples</td>
<td>30</td>
</tr>
<tr>
<td>Confidence of annual mean TN exceeding 1 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Confidence of annual mean TN exceeding 2 mg/l</td>
<td>High</td>
</tr>
<tr>
<td>Date range of TN samples</td>
<td>2010 - 2012</td>
</tr>
</tbody>
</table>

**TN monitoring data**

Does any other (e.g. EA non-WFD, or third party) monitoring data for the lake provide improved evidence of significantly elevated nutrient nitrogen?

Strengthens --- South West Water's monitoring data for the raw water from Drift Reservoir shows elevated levels of nitrate. The 75th%ile was >2mg N/l every year from 2010 to 2014.

**NVZ Name:** Drift Reservoir

**NVZ ID:** EL132
Total phosphorus (TP) data

<table>
<thead>
<tr>
<th>Annual geometric mean TP (ug/l)</th>
<th>38</th>
</tr>
</thead>
<tbody>
<tr>
<td>WFD face value TP class</td>
<td>Poor</td>
</tr>
<tr>
<td>Confidence of moderate or worse TP status</td>
<td>100%</td>
</tr>
<tr>
<td>Date range of TP samples</td>
<td>2010 - 2014</td>
</tr>
</tbody>
</table>

Does any other (e.g. EA non-WFD, or third party) monitoring data for the lake provide improved evidence of significantly elevated nutrient phosphorus?

Strengthens --- South West Water's monitoring data for the raw water from Drift Reservoir shows elevated levels of total phosphorus.

NVZ Name: Drift Reservoir
NVZ ID: EL132
## Nutrient sources

### Nitrogen loading estimates based on catchment map area

<table>
<thead>
<tr>
<th>NEAP - N assessment 2014</th>
<th>Leached N (kgN/yr)</th>
<th>Conc. (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From all agricultural sources</td>
<td>48946</td>
<td>4.3</td>
</tr>
<tr>
<td>From agricultural sources minus atmospheric deposition</td>
<td>47202</td>
<td>No data</td>
</tr>
<tr>
<td>From urban sources</td>
<td>199</td>
<td>0</td>
</tr>
<tr>
<td>From all sources</td>
<td>49145</td>
<td>4.3</td>
</tr>
<tr>
<td>From all sources (minus atmospheric deposition)</td>
<td>47401</td>
<td>4.1</td>
</tr>
<tr>
<td><strong>Ranking based on nitrogen loading from agricultural sources</strong></td>
<td></td>
<td>70</td>
</tr>
</tbody>
</table>

### Local assessment 2015

**Significance of loading from agricultural sources to the catchment of the lake**

Principal source --- The catchment is primarily agricultural in nature. The Drift catchment comprises around 25 family-run farms, with roughly an equal proportion of dairy and beef enterprises. Most of the land in this catchment is in short-term grassland or permanent pasture with many farmers growing a small amount of fodder crops for use on their own holding (predominantly cereals and maize). A very small proportion of the catchment is used for growing flower bulbs and vegetables with the main crops being potatoes, cauliflower and daffodils.

**Significance of loading from human habitation to the catchment of the lake**

Minor source --- The exact contribution from sewage discharges is unknown but thought to be minor.

**Significance of any other sources of nutrient loading to the lake or its catchment**

---

**NVZ Name:** Drift Reservoir  
**NVZ ID:** EL132
### Chlorophyll data

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual mean Chlorophyll (ug/l)</td>
<td>20</td>
</tr>
<tr>
<td>total number of Chlorophyll samples</td>
<td>30</td>
</tr>
<tr>
<td>WFD face value Chlorophyll class</td>
<td>Poor</td>
</tr>
<tr>
<td>Confidence of moderate or worse status</td>
<td>100%</td>
</tr>
<tr>
<td>Chlorophyll Good/Moderate boundary value</td>
<td>8</td>
</tr>
<tr>
<td>Date range of Chlorophyll samples</td>
<td>2010-2012</td>
</tr>
</tbody>
</table>

#### Chlorophyll monitoring data

![Chlorophyll monitoring data graph]

**Sample date:**
- 07/07/2010
- 07/09/2010
- 07/11/2010
- 07/01/2011
- 07/03/2011
- 07/05/2011
- 07/07/2011
- 07/09/2011
- 07/11/2011
- 07/01/2012
- 07/03/2012
- 07/05/2012
- 07/07/2012
- 07/09/2012
- 07/11/2012

**Chlorophyll data**

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**NVZ Name:** Drift Reservoir

**NVZ ID:** EL132
Does any other (e.g. EA non - WFD, or third party monitoring data for the lake provide improved evidence of eutrophication? (local judgement)

Strengthens evidence --- South West Water’s monitoring data for the raw water from Drift Reservoir shows that blue-green algal blooms (>20,000 cells/ml) occurred in 2010, 2011, 2012 and 2014. On many occasions the blooms were so intense that they exceeded 200,000 cells/ml. These large and frequent blue-green algal blooms are putting the Drift Reservoir drinking water protected area at risk. The blooms occur at levels which can have adverse effects on human health. Blue-green algal blooms have resulted in increased levels of treatment at Drift Water Treatment Works i.e. Increased use of coagulant and polyelectrolyte.

To which biological element(s) does it relate?

Cyanobacteria ---

**Palaeolimnology**

| Evidence that designated aquatic interest features associated with the lake show evidence of eutrophic disturbance? (local judgement) |
| Change as Square Chord Distance | No data |
| Change in Diatom community | No data |

n/a

Strength of evidence  (local judgement)

n/a ---

Local judgement on the evidence of eutrophic disturbance

Y, definitely
Review of evidence and recommendations

Comments and decisions

WFD Weight of evidence for eutrophication:

Certainty of eutrophication problem based on core WFD tools: Very certain eutrophication problem

Certainty of eutrophication problem based on overall weight of evidence: Very certain eutrophication problem

WFD overall ecological status: Poor

Confidence in WFD status: Uncertain

Current assessment of weight of evidence supporting designation in 2017

First national panel

Recommended action: Needs further investigation

Comments from first panel:

N is significantly elevated, phytoplankton evidence of impact, check if use impacted and if reservoir has natural catchment.

Second national panel

Comments from second national panel:

Panel agreed with recommendation to designate. Strong evidence of impact.

Recommendation: Designate

Local summary and recommendation:

Environment Agency and South West Water monitoring data shows that the drinking water protected area of Drift Reservoir is eutrophic. There is high confidence that TON exceeds 2mg/l as a 75th %ile, and high confidence that annual mean total nitrogen exceeds 2mg/l. The reservoir is classed as Poor for total phosphorus (very certain), chlorophyll and phytoplankton. Blue-green algal blooms occur frequently and as a result are putting the drinking water protected area at risk. Blue-green algal blooms occur at levels which can have adverse effects on human health. Blue-green algal blooms have resulted in increased levels of treatment at Drift Water Treatment Works. The main source of nitrogen in the catchment is from agriculture. Recommend NVZ designation. Designation would also be appropriate from a recreation (fishery) perspective - the reservoir is actively used.
Lake Description:
Opened in 1960, created by damming the Newlyn river this 25Ha moderate alkalinity reservoir has a large dam and is used for water supply by South West Water. Most of the catchment is in agricultural use.

Why the lake should be designated as a Polluted Water (eutrophic):
Drift Reservoir is not within any existing NVZ designations. The principal source of nitrogen in this catchment is agriculture. The consistently high nutrient levels which have affected chlorophyll and phytoplankton together with associated ecological consequences mean that the catchment of this reservoir is proposed for designation a NVZ.

Nitrogen:
Nitrogen concentrations are significantly above the 2 mg/l threshold value - the 75th percentile TON was 4.2mg/l, and mean annual TN 3.7 mg/l.

Phosphorus:
The WFD classification for total phosphorus is Poor status.

Ecological response:
Chlorophyll and overall phytoplankton are at Poor WFD status, indicating a eutrophic impact.

Supplementary evidence:
South West Water's monitoring data for the raw water from Drift Reservoir shows elevated levels of nitrate. The 75th%ile was >2mg N/l every year from 2010 to 2014. In addition they have recorded large and frequent blue-green algal blooms.
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