

7 Appendices

These appendices, where possible, contain all the information provided in a format that should be easy to lift and use elsewhere (copy and paste). Please contact Sue Burton directly with any queries or requests for separate files or further information.

Sue Burton , SAC Officer, Pembrokeshire Marine Special Area of Conservation
Suite 5 Cedar Court, Milford Haven, Pembrokeshire, SA73 3LS

Tel: 01646 696108

Email: sacofficer@pembrokeshiremarinesac.org.uk www.PembrokeshireMarineSAC.org.uk



[@PembsMarineLife](https://twitter.com/PembsMarineLife)



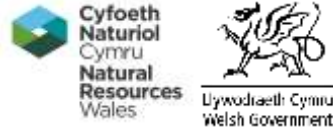
[@PembrokeshireMarineWildlife](https://www.facebook.com/PembrokeshireMarineWildlife)

Appendices Contents

Appendix 1: Volunteer recruitment form (bilingual).....	1
Appendix 2: Survey pack cover note	4
Appendix 3: Information sheet: Why is land run-off an issue for the marine environment in Pembrokeshire?.....	5
Appendix 4: Health and safety guidance note	7
Appendix 5: Detailed risk assessment	11
Appendix 6: Photo locational guide	19
Appendix 7: Survey form	21
Appendix 8: Survey guidance form.....	24
Appendix 9: Parking sign	26
Appendix 10: Kyoritsu PackTest nitrate and phosphate test information.	27
Appendix 11: Survey stretches and surveys completed.....	29
Appendix 12: NRW water testing comparison results	30

[Appendix 1: Volunteer recruitment form \(bilingual\)](#)

This information was provided via email networks and on social media (see next page). Returns were a mixture of e-forms, scans and posted hard copies.



SWEPT (Surveying the Waterway Environment for Pollution Threats) Volunteer Project 2018-19

Are you interested in your local environment?

Do you want to improve it for both wildlife and people?

Would you like to develop your skills and experience?

Do you fancy adding something a little bit different to your walks?

If so why not volunteer with SWEPT?

No previous experience is necessary.

What you will gain through involvement with SWEPT:

- Training in simple survey methodology including what to look out for and how to easily test water samples for nitrate and phosphate levels.
- Full support to enable you to conduct safe foreshore walkover surveys.
- Feedback on your results and a copy of the end of project report.

What we need from you:

- Attendance at one training event (likely in October 2018).
- Four independent visits to a single walkover survey within the upper Milford Haven Waterway (upstream of Pembroke) between November 2018 and February 2019 (ideally 3-4 weeks apart). Length of walk and exact location to be mutually agreed.
- Rapid hand-over of survey information (preferably by electronic means e.g. email or messenger) after each field visit.

If interested in finding out more, simply complete and return the expression of interest form. SWEPT is being led by the Pembrokeshire Marine SAC Officer (Sue Burton, Tel: 01646 696108 / 07881 334047 or sue@pembrokeshiremarinesac.org.uk) and co-delivered with the West Wales Rivers Trust, Pembrokeshire Coastal Forum and the Darwin Centre. **It is funded by Natural Resources Wales.**

[@PembsMarineLife](https://twitter.com/PembsMarineLife) [@PembrokeshireMarineWildlife](https://www.facebook.com/PembrokeshireMarineWildlife)



SWEPT (Surveying the Waterway Environment for Pollution Threats) Volunteer Project 2018-19

If you would like to express an interest in volunteering for SWEPT please print your details below.

Specific area of interest _____
e.g. Pembroke, Milford, Haverfordwest, Carew, Slebech etc

Name _____

Address _____

Postcode _____

Telephone _____

Email _____

How would you prefer we contact you?
What language would you prefer to use?

Email/phone
Welsh/English

Which days are you normally available?

Monday Tuesday Wednesday Thursday Friday Saturday Sunday

Whilst no previous experience is necessary, do you have any skills or qualifications that are relevant to the projects you would like to help with?

Signed:

Date:

Please return this form to: Sue Burton, Pembrokeshire Marine SAC Officer, Suite 5, Cedar Court, Milford Haven, SA73 3LS sue@pembrokeshiremarinesac.org.uk



SWEPT



Prosiect Gwirfoddoli SWEPT (*Surveying the Waterway Environment for Pollution Threats*) 2018-19

Oes diddordeb gennych yn eich amgylchedd lleol?

Ydych chi eisiau ei wella er mwyn bywyd gwyllt a phobl?

Hoffech chi ddatblygu eich sgiliau a'ch profiad?

Chwant ychwanegu rhywbeth ychydig bach yn wahanol at eich teithiau cerdded?

Os felly, beth am wirfoddoli gyda SWEPT?

Nid oes angen unrhyw brofiad blaenorol.

Sut y byddwch yn elwa trwy fod yn rhan o SWEPT:

- Hyfforddiant ar y fethodoleg o gynnal arolygon syml gan gynnwys yr hyn y dylech chwilio amdano a'r ffordd hawdd o brofi samplau dŵr am lefelau nitrad a ffosffad.
- Cefnogaeth i'ch galluogi i gynnal arolygon cerdded diogel ar y blaendraeth.
- Adborth ar eich canlyniadau a chopi o'r adroddiad diwedd prosiect.

Yr hyn y mae arnom ei angen gennych chi:

- Eich presenoldeb mewn un digwyddiad hyfforddiant (mae'n debygol o fod ym mis Hydref 2018).
- Pedwar ymweliad annibynnol ar gyfer un arolwg cerdded sengl o fewn rhannau uchaf Dyfrffordd Aberdaugleddau (i fyny'r afon o Benfro) rhwng mis Tachwedd 2018 a mis Chwefror 2019 (gyda 3-4 wythnos rhyngddynt, yn ddelfrydol). Hyd y daith a'r union leoliad i'w cytuno ar y cyd.
- Trosglwyddo'r wybodaeth o'r arolwg yn gyflym (trwy dull electronig yn ddelfrydol, e.e. e-bost neu negesydd) ar ôl pob ymweliad maes.

Os hoffech gael gwybod mwy, llenwch y ffurflen i fynegi diddordeb a'i dychwelyd. Arweinir SWEPT gan Swyddog ACA Sir Benfro Forol (Sue Burton, Ffôn: 01646 696108 / 07881 334047 neu sue@pembrokeshiremarinesac.org.uk) ac mae'n cael ei weithredu ar y cyd ag Ymddiriedolaeth Afonydd Gorllewin Cymru, Fforwm Arfordir Sir Benfro a Chanolfan Darwin. **Caiff ei ariannu gan Gyfoeth Naturiol Cymru.**



@PembsMarineLife



@PembrokeshireMarineWildlife



SWEPT

Prosiect Gwirfoddoli SWEPT (*Surveying the Waterway Environment for Pollution Threats*) 2018-19

Os hoffech fynegi diddordeb mewn gwirfoddoli gyda SWEPT, printiwch eich manylion yn eglur isod:

Ardal benodol sydd o ddiddordeb _____
e.e. Penfro, Hwlffordd, Aberdaugleddau, Caeriw, Slebets ayb.

Enw _____

Cyfeiriad _____

Cod post _____

Rhif Ffôn _____

E-bost _____

Sut fydddech chi'n hoffi i ni gysylltu â chi? E-bost / Ffôn

Pa iaith fyddai'n well gennych ei defnyddio? Cymraeg/Saesneg

Ar ba ddiwrnodau ydych chi ar gael fel arfer?

Llun Mawrth Mercher Iau Gwener Sadwrn Sul

Er nad yw'n angenrheidiol fod gennych brofiad blaenorol, a oes gennych unrhyw sgiliau neu gymwysterau sy'n berthnasol i'r prosiectau yr hoffech helpu gyda nhw?

Llofnod:

Dyddiad:

Dychwelwch y ffurflen hon at: Swyddog ACA, Ystafell 5 Llys Cedr, Aberdaugleddau, Sir Benfro, SA73 3LS sue@pembrokeshiremarinesac.org.uk



Surveying the Waterway Environment for Pollution Threats Volunteer Project 2018-19 VOLUNTEER SURVEY PACK

Thank you for being a SWEPT volunteer.

This volunteer survey pack contains all of the information to support your SWEPT surveys and supplements the training that you have been given.

Contained within the pack is the following:

- **Information sheet: Why is land run-off an issue for the marine environment in Pembrokeshire?**
- **Health and safety guidance note** (a separate more detailed risk assessment will be emailed to you. This fulfils project management requirements, but as it duplicates much within the note it is just being sent electronically. You are strongly encouraged to read this and consider your own personal risk assessment).
- **Photo locational guide** (ensure you are happy with this before going out on survey)
- **Survey forms** (for 4 x surveys with 2 x spares)
 - Surveys should ideally be conducted between the following dates:
November 23rd – December 2nd (November 2018 survey)
December 21st – December 30th (December 2018 survey)
January 25th – February 3rd (January 2019 survey)
February 22nd – March 3rd (February 2019 survey)
 - These forms are for your use in the field. Please note that a link to the online form and spreadsheet will be emailed to you.
- **Survey guidance form including:**
 - **Information on how to use the water testing kits**
 - **Example images**
- **A parking sign**

PackTest nitrate and phosphate testing tubes will also be supplied.

If you have any questions regarding this information or queries during the surveys please contact the SWEPT team.

SWEPT is a collaborative project led by the Pembrokeshire Marine SAC Officer and co-delivered with the West Wales Rivers Trust, Pembrokeshire Coastal Forum and the Darwin Centre. It is being funded by Natural Resources Wales.

**Contact: Sue Burton (SWEPT Project Manager)
sue.burton@mhpa.co.uk 01646 696108 / 07881334047.**



Why is land run-off an issue for the marine environment in Pembrokeshire?

Nutrient pollution.

Excessive quantities of nitrates and/or phosphates are referred to as nutrient pollution.

As **nitrates** commonly drain off the land via multiple rivers and many streams, this is called **diffuse pollution**.

Phosphates mainly enter watercourses through specific inputs; this is referred to as **point source pollution**.

Point source pollution is easier to manage than diffuse pollution. Both make their way into the marine environment.

Too much of a good thing.

Every living being requires nutrients to thrive, so why is an abundance of nutrients a problem? Well, as with most things in life, moderation is the key.

Too much nitrogen stimulates excessive plant growth. In the marine environment of the Milford Haven waterway this primarily manifests as dense growth of opportunistic macroalgae (seaweed) species, primarily *Ulva* sp., in the form of mats that cover the saltmarsh and mudflats, and also occasional phytoplankton blooms.

The abnormal mats of green seaweed smother saltmarsh plants and seagrass beds, and can impede feeding birds. In addition, the eventual rotting of the mats consumes all the available oxygen, suffocating wider marine species. Impacts aren't exclusive to the marine wildlife - detached rafts of seaweed cause problems with waterway users by entangling boat propellers and clogging nets, and the smell from decaying mats can impact local communities and tourists.

In addition to nutrient pollution, soil run-off has a negative effect on the marine environment as the increased sedimentation that results can smother and clog seabed species (and fish gills). Sediments can also carry 'hitchhiking' contaminants including pesticides, metals and bacteria.

Improvements in land management and reductions in nutrient runoff would directly benefit the waterway.

Where do these nutrients come from?

There are two main nutrients that cause freshwater pollution - nitrates and phosphates.



Nitrate Pollution

The single largest source of nitrate pollution is fertilizer. Fertilizer is commonly used to improve crop growth in most arable fields and is added to some parks, golf courses and gardens. This seeps into freshwater through the ground and via runoff.



Phosphate Pollution

The main sources are detergents (soap) and sewage. Other sources are from agriculture and high density livestock farming.



Nutrients from the home

Waste water from sinks and toilets goes to treatment works to be filtered before it's released into the environment. Even this treated water is much higher in nutrients than the naturally low background levels that plants and animals need.

Sometimes the waste water bypasses the treatment works, going from the road drains directly into our rivers and streams, e.g. soap from washing your car, overflowing sewage drains during floods, or misconnections in old houses where the sink water flows into the road drains instead of the sewage drains.



Green algal (seaweed) mats cover many of the mudflats.

Statutory regulation.

Natural Resources Wales (NRW) are required by law to monitor water quality. Evidence from this monitoring in the Milford Haven waterway shows that dissolved inorganic nitrogen (DIN) levels are too high. The waterway is “hypertrophied”.

Compliance with the current Water Framework Directive (WFD) regulation demands that the waterway improve from moderate to good status by 2027.

As well as monitoring water quality, data on phytoplankton and opportunistic macroalgae (as algal (seaweed) mats) is also recorded. These records also report moderate status for the ‘inner’ waterway (upstream of Pembroke river), although there is localised evidence throughout the whole waterway of impacts from excessive algal mats.

As well as failing to meet WFD targets, many of the Pembrokeshire Marine SAC’s species and habitats are in unfavourable condition. Land run-off is a major contributory factor in this.



Many small streams and drainage channels feed into the Milford Haven waterway.

Sue Burton sac.officer@pembrokeshiremarinesac.org.uk (Nov 2018). Some content reproduced with kind permission of the Freshwater Habitats Trust’s *Clean Water for Wildlife* project.

Working to make improvements.

In agriculture generally, the trend towards greater intensification and higher productivity has been accompanied by a significant increase in the use of both organic (slurry and manure) and inorganic nitrogen and phosphorous fertilizers. The application of these allows farmers to make the most of a short growing season.

Dairy farms predominate over arable in Pembrokeshire and many farms are increasing their dairy herd size, resulting in much greater production of slurry. Unfortunately in many cases the farms do not increase their slurry storage capacities or acquire more land due to cost, and therefore have to spread slurry more frequently on fields that do not need fertilizers, or in weather conditions not suitable for spreading. **Instead of the slurry being valued and used as a natural fertilizer it is often viewed as a waste by-product that needs disposing of.**

There is little legislation in place to tackle nutrient overloading unless a direct pollution is caused (i.e. when slurry, silage leachate or any other damaging substance actually enters a watercourse, be it by storage failure or inappropriate land spreading). **There are Agricultural Codes of Practice that farms should follow, but these are not legislation, and therefore not enforceable.**

Concerns about nitrate pollution in the Milford Haven waterway have led to calls to declare the area a Nitrate Vulnerable Zone (NVZ) under EU law. **Legislation is stronger in Nitrate Vulnerable Zones (NVZs) where there are enforceable rules that must be adhered to regarding fertilizer spreading.** However, there are also some concerns that an NVZ will not actually reduce nitrate pollution and that it will put many farmers out of business.

Relying on best practice for environmental protection is not adequate in a commercial world; a tightening of agricultural regulations will be needed in order to make improvements. However, the land-run-off issue is far more than just nitrates or just farmers. The problem of land run-off is created by multiple users and inadequacies, and it will take a collective and concerted approach to improve the issue.



Health and Safety Guidance Note for volunteer surveyors

This guidance note provides an outline of best practice in terms of health and safety when conducting your SWEPT survey and collecting your water samples. This includes the use of the PackTest nitrate and phosphate water testing kits and considers the risks you should be aware of when collecting samples from small rivers, streams and ditches.

In an emergency please contact the emergency services - 999

Your responsibility

Whilst taking part in the SWEPT survey you have the responsibility of ensuring that you undertake the sampling considering you own health and safety and the health and safety of others around you. You should not put yourself in a position that could place you, or others, in danger. You are under no obligation to participate in or continue with the survey if it is not safe to do so. You are under no obligation to visit a particular site, even if the survey organisers have suggested it. If you have any health and safety concerns about the survey, you should stop the survey and raise your concerns with the SWEPT project manager Sue Burton sue.burton@mhpa.co.uk 01646 696108 / 07881334047.

Risk assessment

Before undertaking the SWEPT survey, you should consider the health and safety hazards associated with the site where you plan to collect your water sample and whether individual circumstances or any medical conditions expose you to particular hazards. Generic areas of risk when undertaking the SWEPT survey are given below. However, you should identify the potential risks specific to the site you are visiting and apply practical precautions to minimise the level of any risks. You should also pass this health and safety information on to anyone else who is helping you to undertake the SWEPT survey.

Access permission

It is intended that SWEPT volunteers keep to public rights of way and so should not be on private land. In the event that access over privately owned land would benefit your survey, please contact the project manager who can pursue the relevant permission as appropriate in advance. Always obtain permission from the landowner or tenant to enter any private land not subject to open access legislation. You do not need permission to collect a water sample where the stream or ditch can be accessed from a public footpath, or where the waterbody is within open access land. If you know the landowner, feel free to explain what you are doing and why, this is always the best option. Do not continue with the survey if access permission is refused. In all cases, please abide by The Countryside Code www.countrysideaccess.gov.uk .

Parking

When visiting a site take care to park cars sensibly, preferably off-road, and do not block entrances. A notice in the car window can be useful to alert locals to your purpose and contact details (a car windscreen sign will be provided in the volunteer pack).

Mobile phones

It is advisable to carry a mobile phone, as they may be useful in case of an emergency. Please note that mobile phones may not work in some remote areas. In case of an emergency you can use either the European Emergency Number (112) or 999 (see www.eena.org for more information). 112 can be dialled even if the keypad is locked.

Collecting a water sample

Freshwater habitats can be dangerous places with deep water, steep and slippery banks, unsafe floating mats of vegetation and fast flowing water. Any survey near water includes a serious risk of injury or drowning. You should not enter the water to collect a sample for the

SWEPT survey. It may be useful to use a small container to collect a water sample from the bank /alongside the water source.

- Only access the water from a safe point, ensure your footing is secure and do not overstretch to reach the water.
- Deep silt and thick mud can build up around the edges of water sources. Test any bank edges before stepping on them.
- Water sources may be surrounded by dense vegetation which can be a trip hazard, or cause abrasions to the body, face and eyes. Don't bend down or kneel in areas of known sharp grasses or plants.
- Approach streams where the flow is slow (i.e. near an obstruction or from the shallows).
- Never attempt to collect a water sample from fast-flowing rivers which are swollen following heavy rain.
- Consider attaching a cup to a pole or hold within a net to reach difficult places. A cup lowered using a piece of string or crabbing line is another option. If you take a sample using a cup and pole, make sure you use a small cup, rather than a bucket. Water is heavy and the additional weight on the end of the pole could pull you in.
- If using a cup and pole, watch out for overhead hazards (such as telephone/power lines).
- Do not sample from areas that present a particular danger (i.e. steep slopes, cliffs, unstable banks and rivers during flood).
- For health and safety reasons we recommend that you should always undertake your SWEPT survey in pairs.

Lone working Code of Practice

Always leave a note of your whereabouts with a responsible person (buddy system). For health and safety reasons we recommend that you should always undertake your SWEPT survey in pairs. If you find it necessary to carry out a SWEPT survey alone or you are accompanied, but working in a remote place, please ensure you have left the following details with a responsible person and make sure they know how to raise the alarm if you do not return by your base when expected.

Details should include: date and time of departure, method of travel to and around the survey site, proposed itinerary, expected time of leaving the site and return to base, and vehicle identification details. The person to whom these details are given should be told who to contact if you do not return and at what time to raise the alarm.

Under 16s

Under 16s can take part in the SWEPT survey if they are accompanied by a responsible adult. There is no age limit on taking part in the SWEPT survey, but we would advise that parents or guardians inform their child of the associated risks and accompany them when collecting a water sample. If your child is taking part in the SWEPT survey as part of a school or youth group activity, parents or guardians will be asked to sign a Parental Consent Form, stating that you agree to your child undertaking the SWEPT survey and have made them aware of the associated risks.

Care in handling the PackTest nitrate and phosphate kits before and after use

Both the nitrate and phosphate kits contain a small amount of reagent powder which reacts with the water sample to produce a colour change. The kits are low risk because the reagent is contained within the tube. It is unlikely to come into contact with the user if sensible precautions are taken and the instructions given in the SWEPT survey leaflet are followed.

If the reagent powder does come into contact with the user before the water sample is taken, or after dilution, the following first aid measures apply:

- **Eye contact:** Immediately rinse eyes with water for at least 15-20 minutes. Seek medical attention.
- **If swallowed:** Do not induce vomiting. Give one or two large glasses of water to dilute and seek medical attention.
- **Dust breathed in:** Move to fresh air. You may need to seek medical attention if symptoms such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest occur.
- **Skin contact:** Flush the skin with water. No further attention should be required. If redness or irritation does develop, seek medical attention.

For your information the main reagents in the PackTest kits are as follows: nitrate kits contain zinc and naphthylethylenediamine; phosphate kits contain enzyme and 4-aminoantipyrine.

General precautions

Check weather reports before you go out and wear appropriate clothing e.g. walking or wellington boots and long-sleeved clothes and trousers to prevent scratches and nettle stings. Make sure you drink plenty of water and take food if out for long periods of time. Avoid or abandon outdoor activities in bad weather.

Foreshore and tides

Take special care when carrying out the SWEPT survey along the foreshore. Know where your safe access/egress points are and how these are likely to change under different tidal conditions. Make sure you know the tide times for when you are surveying. It is recommended that the surveys are done over the low water period to avoid the risk of getting cut off and present the best access opportunities. Some stretches of the foreshore in survey areas will be intertidal muds and sediments that can be deep and very sticky which could lead to getting stuck. If in doubt, do not attempt to walk on the mud. Do not take short-cuts over creeks. Should you become stuck, an aid such as a large clipboard, rock or tree branch can be used to provide a large surface area to lean on and spread weight to allow you to work your foot free of the mud. If unable to free a stuck person, call the emergency services on 999 and ask for the Coastguard.

Difficult terrain and traffic

Take special care when carrying out the SWEPT survey along watercourses, cliff edges, or in areas that contain boggy ground, reed beds, loose rocks or areas with underground burrows (e.g. badger and rabbit holes) often found along field edges. Do not cross potentially hazardous sites, such as quarries, ravines and railway lines. Please heed warning signs and do not enter private (non-access) land that has been deliberately obstructed by fencing or barbed wire. Take care when crossing roads or sampling near roads or bridleways. Always be alert when walking in areas of poor visibility that may be used by motorbikes or horses. Wear bright clothing to ensure that you can be seen.

Livestock and agricultural machinery

Take special care when entering areas with livestock, especially cattle, rams and horses. If livestock are likely to be present on the site do not take a dog with you to do the SWEPT survey. Do not enter fields containing bulls. Avoid undertaking the SWEPT survey in close proximity to working agricultural machinery or forestry operations.

Human confrontation and dogs

Consider your personal safety when taking a SWEPT survey within the vicinity of known or likely trouble spots. Avoid confrontation with landowners, land workers or members of the public. You may wish to carry some information to confirm the activities you are undertaking (e.g. a spare SWEPT survey form). Be wary of dogs off leads. Disinfect any bites and seek medical attention. If you have any concerns about your personal safety, do not continue with the survey.

Adders

Check the area you are visiting to see whether adders are likely to be present. Take care to look at the ground when kneeling or placing your hands on the ground. Wear stout boots. Take extra care if lifting debris from the ground.

Waterborne diseases

Working near water is a potential source of disease including leptospirosis or Weil's disease, hepatitis A and tetanus. In all cases the best preventative measures are:

- Be aware of where and how these diseases can be caught and take precautions based on this knowledge.
- Ensure tetanus jabs are up to date.
- Ensure that any cuts on hands are covered with waterproof plasters, and carefully clean and cover any cuts or grazes that occur whilst working in water.
- Wear protective clothing such as gloves (this is strongly recommended if you are under 16, gloves will be provided if you are undertaking the SWEPT survey as part of a schools group).

- Avoid ingestion of water.
- Ensure that hands are washed after contact with water especially before eating, drinking or smoking.
- If you have entered the water, wash thoroughly and as soon as possible.
- If feeling unwell after taking part in the survey, seek medical attention and notify them of the activities you have undertaken.

Lyme's disease is a bacterial disease transmitted by animal ticks associated with rank vegetation, which can lead to severe symptoms if left untreated. A variety of animals act as hosts for the bacteria, including sheep, deer and pheasants. For more information, see: www.bada-uk.org. Make regular checks of skin and hair. Remove ticks from the skin as soon as possible. Wear light-coloured clothing so that ticks are visible, tuck trousers into socks so that ticks cannot attach or climb up the inside of clothing without being seen.

Tetanus is a serious but rare condition caused by bacteria getting into a wound. It may result from the infection of even minor wounds and scratches with *Clostridium tetani*, a common micro-organism in soil. The symptoms include muscle spasm, stiffness and fever, and can be fatal if left untreated. The most effective treatment is to ensure you have been fully vaccinated, but if you are unsure about your vaccination status or concerned about a wound you should contact your GP or visit your nearest minor injuries unit. For more information visit: www.nhs.uk/conditions/tetanus/pages/introduction.aspx.

Weil's disease (leptospirosis) is an uncommon bacterial infection spread by animals, but the risk is increased if you regularly come into contact with rivers and waterbodies. The organism is carried by rats and other animals, and excreted in their urine. Many people only experience mild flu-like symptoms but the condition can be very serious in others and even fatal if left untreated, so if you experience any symptoms check with your GP. You can avoid the risk of Weil's disease by washing your hands thoroughly after taking your water samples and by cleaning and covering wounds before you collect the sample (e.g. by wearing latex free gloves). For more information visit: www.nhs.uk/conditions/leptospirosis/Pages/Introduction.aspx.

By accepting to survey for the SWEPT volunteer project it is assumed that this risk assessment has been read, and that you will take all possible care to assess and avoid the hazards listed and perform the survey in a safe manner.

If any incidents, accidents or near-accidents occur during the course of your survey, please ensure you contact the project manager as soon as possible.

SWEPT is a collaborative project led by the Pembrokeshire Marine SAC Officer and co-delivered with the West Wales Rivers Trust, Pembrokeshire Coastal Forum and the Darwin Centre. It is being funded by Natural Resources Wales.

Contact: Sue Burton (SWEPT Project Manager)

sue.burton@mhpa.co.uk 01646 696108 / 07881334047.

Appendix 5: Detailed risk assessment

Port of Milford Haven		RISK ASSESSMENT FORM			No.
Task/Activity Assessed: SWEPT Volunteer Survey November 2018 - March 2019.		Location/Area: Coastal fringe of the Milford Haven Waterway within the SAC. Walking where possible on the foreshore, otherwise on nearby public rights of way. SWEPT is a project undertaken by volunteers and coordinated by the SAC officer in partnership with other organisations.			
Ref	Hazards Identified	Severity	Likelihood	Risk	
001	Rough, uneven ground, slips/trips/falls/strains	Harmful	Likely	Substantial	
002	Intertidal soft sediments	Harmful	Likely	Substantial	
003	Tidal Conditions	Harmful	Likely	Substantial	
004	Weather	Harmful	Likely	Substantial	
005	Water bourne/transmitted diseases	Ex Harmful	Unlikely	Substantial	
006	Taking water samples	Harmful	Unlikely	Moderate	
007	Traffic	Harmful	Likely	Substantial	
008	Parking	Slightly	Likely	Moderate	
009	Contact with dogs or failure to control dogs	Harmful	Likely	Moderate	
010	General public & countryside workers	Slightly	Likely	Moderate	
011	Route planning and lone working	Harmful	Likely	Substantial	
012	Dehydration, fatigue, hypothermia	Harmful	Likely	Substantial	
013	Medical emergency, First Aid provisions	Harmful	Likely	Substantial	
014	Dual use paths (e.g. cycling, walking, traffic, and bridleways)	Harmful	Likely	Substantial	
015	Inclines, steep gradients or descents	Harmful	Likely	Substantial	
016	Stiles & Gates	Harmful	Likely	Substantial	
017	Falls from Height	Harmful	Likely	Substantial	
018	Risk of drowning	Ex Harmful	Unlikely	Substantial	

019	Pollution	Moderate	Likely	Substantial
020	Litter/unidentified objects	Moderate	Likely	Moderate
021	Fire	Harmful	Unlikely	Moderate
022	Livestock, (horses, sheep, cattle)	Harmful	Likely	Substantial
023	Crops & Plants	Moderate	Likely	Moderate
024	Local landowners & rights of way	Moderate	Likely	Tolerable
Persons at Risk: 1. SWEPT Volunteers 2. Emergency services.		Frequency: Unexpected times during surveys along designated stretch of waterway. 4 surveys between November – March.		

Existing Controls & Precautionary Measures:

All volunteers have been issued with the ‘SWEPT Health and Safety Guidance Note for Volunteer Surveyors’ which provides an outline of best practice in terms of health and safety when conducting the SWEPT survey and collecting water samples. This includes guidance on the use of the PackTest nitrate and phosphate water testing kits and considers the risks volunteers should be aware of when collecting samples from small rivers, streams and ditches. All volunteers have also attended training to ensure that they are familiar with what is expected from them during the course of the surveys, and have been liaised with individually to discuss in detail assigned survey stretches.

001 - Rough, uneven ground, slips/trips/falls/strains:

Special care should be taken when carrying out the SWEPT survey along watercourses, cliff edges, or in areas that contain boggy ground, reed beds, mud, loose rocks or areas with underground burrows (e.g. badger and rabbit holes) often found along field edges. Different substrates present their own individual risks, from loose rocks, exposed tree roots, loose and uneven surfaces such as sand, gravel or mud, short grass on coastal areas and seaweed covered substrate on the shore, particularly when wet, can be slippery. Extreme care should be taken to ensure that you have a good firm and stable footing. Suitable walking footwear with good grip and ankle support is highly recommended when participating to lessen the risk of any possible injury or sprain. Do not cross potentially hazardous sites, such as quarries, ravines and railway lines. Please heed warning signs and do not enter private (non-access) land that has been deliberately obstructed by fencing or barbed wire. Take care when crossing roads or sampling near roads or bridleways. Remain stationary when filling out the survey form to prevent tripping. Always be alert when walking in areas of poor visibility that may be used by motorbikes or horses. Wear bright clothing to ensure that you can be seen.

002 – Intertidal Soft Sediments

Some stretches of the foreshore in survey areas will be intertidal muds and sediments. These muds can be deep and very sticky, making access and egress difficult which could lead to getting stuck. If in doubt, do not attempt to walk on the mud. Do not attempt to cross creeks, instead keep to the edges where ground is likely to be firmer. If there is evidence of a water input visible in the mud, try and trace the source of the input from the bank and sample from there.

Avoid standing in one spot for any length of time. Should you become stuck, an aid such as a large clipboard, rock or tree branch can be used to provide a large surface area to lean on and spread weight to allow you to work your foot free of the mud. If unable to free a stuck person, call the emergency services on 999 and ask for the Coastguard.

003 – Tidal conditions

Volunteers will need to access the shore if possible during their survey. Prior to any access the volunteers must be aware of the local tide times. It is recommended the surveys are done over the low

water period to avoid the risk of getting cut off and present the best access opportunities. Volunteers should be aware that access/egress routes may change with different tidal conditions and plan their routes appropriately. Tide times are provided to volunteers and any concerns/questions can be directed to the project manager Sue Burton.

004 – Weather

You are responsible for your own safety and that of others in your care (U16s) so be prepared for changes in the weather. Carry appropriate warm and waterproof clothing. Getting cold and wet increases the risk of hypothermia. If you find yourself feeling cold and are wet do not continue with the survey and go home to dry off and warm up. Walking surfaces can vary considerably with changes in the weather so wear suitable footwear for variable terrain. Check the local weather forecast before you leave. If you do find yourself in a thunder and lightning storm whilst outdoors, abandon exposed pointed metal items like fishing rods, tools, walking sticks or rucksacks and if in a group move several yards away from each other.

005 – Water borne disease

Working near water is a potential source of disease including leptospirosis or Weil's disease, hepatitis A and tetanus. In all cases the best preventative measures are:

- Be aware of where and how these diseases can be caught and take precautions based on this knowledge.
- Ensure tetanus jabs are up to date.
- Ensure that any cuts on hands are covered with waterproof plasters, and carefully clean and cover any cuts or grazes that occur whilst working in water.
- Wear protective clothing such as gloves (this is strongly recommended if you are under 16, gloves will be provided if you are undertaking the SWEPT survey as part of a schools group).
- Avoid ingestion of water.
- Ensure that hands are washed after contact with water especially before eating, drinking or smoking.
- If you have entered the water, wash thoroughly and as soon as possible.
- If feeling unwell after taking part in the survey, seek medical attention and notify them of the activities you have undertaken.

More information on these diseases is available in the SWEPT Health and Safety Guidance note. If you feel unwell following any contact with potentially contaminated water sources contact a doctor and tell them where you have been.

006 – Taking Water Samples

Freshwater habitats can be dangerous places with deep water, steep and slippery banks, unsafe floating mats of vegetation and fast flowing water. Any survey near water includes a serious risk of injury or drowning. You should not enter the water to collect a sample for the SWEPT survey. It may be useful to use a small container to collect a water sample from the bank /alongside the water source.

- Only access the water from a safe point, ensure your footing is secure and do not overstretch to reach the water.
- Deep silt and thick mud can build up around the edges of water sources. Test any bank edges before stepping on them.
- Water sources may be surrounded by dense vegetation which can be a trip hazard, or cause abrasions to the body, face and eyes. Don't bend down or kneel in areas of known sharp grasses or plants.
- Approach streams where the flow is slow (i.e. near an obstruction or from the shallows).
- Never attempt to collect a water sample from fast-flowing rivers which are swollen following heavy rain.
- Consider attaching a cup to a pole or hold within a net to reach difficult places. A cup lowered used a piece of string or crabbing line is another option. If you take a sample using a cup and pole, make sure you use a small cup, rather than a bucket. Water is heavy and the additional weight on the end of the pole could pull you in.
- If using a cup and pole, watch out for overhead hazards (such as telephone/power lines).
- Do not sample from areas that present a particular danger (i.e. steep slopes, cliffs, unstable banks and rivers during flood).

- For health and safety reasons we recommend that you should always undertake your SWEPT survey in pairs.

Both the nitrate and phosphate kits contain a small amount of reagent powder (nitrate kits contain zinc and naphthylethylenediamine; phosphate kits contain enzyme and 4-aminoantipyrine) which reacts with the water sample to produce a colour change. The kits are low risk because the reagent is contained within the tube. It is unlikely to come into contact with the user. Further instructions and details are given in the SWEPT health and safety guidance note.

007 – Traffic

Take care when crossing roads and walking in traffic areas such as roads, farm tracks or car parks. If walking along a road with no pavement walk on the right hand side and cross over before blind bends if needed. Take care when sampling near roads or bridleways. Always be alert when walking in areas of poor visibility that may be used by motorbikes or horses. Wear bright clothing to ensure that you can be seen.

008 – Parking

When visiting a site take care to park cars sensibly, preferably off-road, and do not block entrances such as gateways, tracks or driveways. Where possible leave your vehicle at home and consider sharing lifts, using public transport or cycling. A notice in the car window can be useful to alert locals to your purpose and contact details (a car windscreen sign will be provided in the SWEPT volunteer pack).

009 – Contact with dogs or failure to control dogs:

Should you take your dog into the countryside you need to ensure it does not disturb wildlife, farm animals, horses or other people by keeping it under effective control. This means that you:

- Keep dogs on a lead or keep it in sight at all times, where it can be recalled upon prompt command.
- Ensure dogs do not stray of the path or stray into areas that have no right of access.
- Dogs may be banned from certain areas that people use, or there may be restrictions, byelaws or control orders limiting where they can go. It is your responsibility to ensure you understand and comply with these restrictions.
- It is good practice (and a legal requirement on ‘open access’ land) that you keep dogs on lead around farm animals and horses, for your own safety and that of the animals. A farmer may shoot a dog which is attacking or chasing his farm animals without being liable to compensate the dog’s owner. However, if cattle or horses chase you and your dog, it is safer to let your dog off the lead – don’t risk getting hurt by trying to protect it. Your dog will be much safer if you let it run away from farm animals in these circumstances and so will you be.
- Everyone knows how unpleasant dog mess is and it can cause infections, so always clean up after your dog and dispose of it responsibly.
- Be aware dogs can bite, fight with other dogs and can carry infections so be wary of approaching unfamiliar or unknown dogs, no matter how friendly they may seem. Be wary of dogs off leads. Disinfect any bites and seek medical attention.

010 - General public & countryside workers:

Respect the needs of locals and visitors alike be courteous and do not knowingly obstruct their passage, co-operate with people at work in the countryside e.g. keep out of the way of forestry operations and pay attention to all warning notices, keep out of the way of farm animals being herded and follow any instructions from the farmer. Do not interfere with or climb on any farm machinery or equipment.

Consider your personal safety when taking a SWEPT survey within the vicinity of known or likely trouble spots. Avoid confrontation with landowners, land workers or members of the public. You may wish to carry some information to confirm the activities you are undertaking (e.g. a spare SWEPT survey form). If you have any concerns about your personal safety, do not continue with the survey.

011 – Route planning and lone working:

When planning your survey route use the resources provided by the SWEPT team and ensure you enquire about any uncertainties before conducting the survey. For health and safety reasons we recommend that you should always undertake your SWEPT survey in pairs. If you find it necessary to carry out a SWEPT survey alone or you are accompanied, but working in a remote place, please ensure you have left the following details with a responsible person and make sure they know how to raise the alarm if you do not return by your base when expected. Details should include: date and time of

departure, method of travel to and around the survey site, proposed itinerary, expected time of leaving the site and return to base, and vehicle identification details. The person to whom these details are given should be told who to contact if you do not return and at what time to raise the alarm.

012 – Dehydration / Fatigue/Hypothermia:

Even in cold, wet weather is still possible to become dehydrated. Ensure enough water is carried with you for the duration of the survey. Symptoms of dehydration include fatigue and tiredness, headaches and poor concentration. Fatigue could occur due to a long walk, lack of food or dehydration. To avoid this ensure you have planned your survey, thinking of time and length of walk. Carry appropriate warm and waterproof clothing in case of bad weather; getting wet and cold could lead to hypothermia.

013 - Medical Emergency & First Aid Provision:

Whilst taking part in the SWEPT survey you have the responsibility of ensuring that you undertake the sampling considering your own health and safety and the health and safety of others around you. Even with precautions and knowing the risks and possible side effects of medication, a medical incident could occur. If you are on any medication or have a pre-existing medical condition be sure to let your survey buddy know. If needed, carry any personal medicine/information with you and wear meditags or medibands in case of an emergency (in the case of an emergency dial 999). When completing the survey keep an eye on where you are on the map (so you could communicate your location in an emergency) and carry a charged mobile phone.

014 - Dual use paths (e.g. cycling, walking, traffic & horses)

Within Pembrokeshire many of the marked permissible footpaths have a shared or dual usage purpose, from farm tracks, paved & unpaved roads, byways open to all traffic, cycle paths and bridleways, so extreme care is needed. Further sources of information on the types of permissible paths and their identification can be found within the Natural Resources Wales information leaflet 'The Countryside Code'.

015 – Inclines, steep gradients or descents:

Most paths within Pembrokeshire due to the nature of the countryside will involve an incline of some description, be aware of your surroundings and exercise extreme care on paths where steep gradients, climbs or descents are present, which in coastal areas are often also surrounded by steep or sheer cliffs as an added danger. Ensure you have a good foothold at all times and take care not to dislodge rocks that could fall onto someone below you, be aware that after periods of rain many paths could become slippery or unstable.

016 – Stiles & Gates:

Use gates, stiles or gaps in field boundaries where available as climbing over walls, hedges and fences will not only damage them and increase the risk of farm animals escaping, but can also cause potential injury from severe cuts and abrasions from barbed wire or thorn bushes, or possible old weakened structures could potentially collapse underneath the weight of someone causing severe injury.

A farmer will normally close gates to keep livestock in, but they may sometimes be left open to allow the animals to reach food and water. Leave gates as you find them and follow any instructions on signs, ensure that if walking in a group the last member knows how to leave the gates.

017 – Falls from height:

Keep to the path and stay away from cliff edges and overhangs, follow all advisory signs and waymarks. Whilst it is tempting to go close to cliff edges to peer over you should always stay back from them, as a slip could prove fatal. Some cliffs overhang and or are unstable which is not always obvious, take particular care when the grass is short, as when wet it can become extremely slippery. Always supervise children when near cliff edges and keep dogs on a lead.

018 – Risk of drowning

Water habitats can be dangerous places with deep water, steep and slippery banks, unsafe floating mats of vegetation and fast flowing water. Any survey near water includes a serious risk of drowning. You should not enter the water to collect a sample for the SWEPT survey. It may be useful to use a small container to collect a water sample from the bank /alongside the water source. Volunteers should use their best judgement whilst taking into consideration the safety points in 006 taking a water sample above (these points also appear in the SWEPT Health and Safety Guidance document). By ensuring that

surveys are done during low water, and being mindful of tidal state and how it affects access, volunteers can minimise their proximity to water (see 003 tidal conditions).

019 – Pollution:

Recording potential pollution is one of the tasks for the SWEPT surveys. Volunteers are provided with information about pollutants that they are most likely to encounter (e.g. slurry, silage leachate, oil). If something appears out of the ordinary, do not touch it. Photograph it and report it to NRW immediately on 03000 653000.

020 – Litter/unidentified objects:

Litter and leftover food doesn't just spoil the countryside and damage the environment, it can be dangerous to wildlife and farm animals, take your litter home with you or use a litter bin where provided, dropping litter and dumping rubbish are criminal offences. Recording litter is one of the tasks for the SWEPT surveys.

Coastlines around Pembrokeshire can have unexploded ammunition or other military debris washed up on the foreshore from MOD activity. If you come across anything suspicious do not touch it and call the police or coastguard (following advice on the National Park Website).

021 – Fire:

Fire can be devastating to wildlife and habitats as they are to people and property, so exercise care with naked flames and discarded cigarettes at all times of the year, not to set light to the surrounding vegetation. Sometimes between 1st October and 31st March controlled fires are used to manage vegetation, particularly on heaths and moors, should you discover an unattended fire report it immediately by calling 999.

022 – Livestock, (horses, sheep, cattle):

Take special care when entering areas with livestock, especially cattle, rams and horses. If livestock are likely to be present on the site do not take a dog with you to do the SWEPT survey. Do not enter fields containing bulls. Avoid undertaking the SWEPT survey in close proximity to working agricultural machinery or forestry operations. The countryside is working environment and it's important to be mindful and respectful of farms and farm animals, particularly during spring when cattle are rearing their young. Stop, look and listen on entering a field, look out for any animals and watch how they are behaving, particularly bulls or cows with calves, try to avoid getting between cows and their calves. Be prepared for cattle to react to your presence, especially if you have a dog with you, Keep your dog close, on a short lead, and under effective control. Don't hang onto your dog if you are threatened by cattle - let it go as the cattle will chase the dog and not you. When cattle are obstructing the path, find another way, by going around the cattle. If cattle are blocking a path through a field, you're well within your rights to find a safe way, away from the path to avoid them. You should then re-join the footpath as soon as possible – and when you consider it safe to do so. Remember to close gates behind you when walking through fields containing livestock and report any frightening incidents or attacks to the landowner, the highway authority, the Health & Safety Executive (HSE), and also the police if it's of a serious nature. When walking in places where horses are grazing it's best to exercise the same caution as when walking near livestock, keeping dogs – which could frighten horses – close by and under control and avoiding walking between mares and their foals. The British Horse Society has also produced a useful leaflet on minimising risks when horses encounter dogs.

023 – Crops & Plants:

Crops are the private property of the grower, regardless of the stage of growth, it is therefore illegal to damage any agricultural crop. The only exceptions to this is where they interfere with a public right of way, which you then are entitled to access provided you take care to minimise damage or disturbance to the crop; where possible keep to the edge of the field.

Protecting the natural environment means taking special care not to damage, destroy or remove features such as rocks, plants and trees. They provide homes and food for wildlife, and add to everybody's enjoyment of the countryside. The Wildlife and Countryside Act 1981 gives some legal protection to all wild plants. Plant and fungi species as listed on Schedule 8 have greater protection. Offences include sale and intentionally picking, uprooting or destroying.

024 – Local landowners & rights of way:

It is intended that SWEPT volunteers keep to public rights of way and so should not be on private land. In the event that access over privately owned land would benefit your survey, please contact the project

manager who can pursue the relevant permission as appropriate in advance. Always obtain permission from the landowner or tenant to enter any private land not subject to open access legislation. You do not need permission to collect a water sample where the stream or ditch can be accessed from a public footpath, or where the waterbody is within open access land. If you know the landowner, feel free to explain what you are doing and why, this is always the best option. Do not continue with the survey if access permission is refused. In all cases, please abide by The Countryside Code www.countrysideaccess.gov.uk.

No.	Further Actions Required	Priority
001	All volunteers are required to sign a registration form which confirms that the volunteer is happy to take part in the surveys and has read and understood the health and safety information provided.	01
002	Proper prior planning of routes and conditions beforehand including knowing times of low water tides.	02
003	Project manager (Sue Burton) is to be contacted should any queries arise or should volunteers face any difficulties.	03
004	All volunteers will be expected to have a mobile phone and to avoid lone working.	04

Residual Risk:

The level of risk is set as Moderate, therefore, this risk assessment is set at ALARP and dependant on the measures taken by participating volunteers to avoid the risk.

<p>Assessed by: _____ Sue Burton _____ (print name)</p> <p>Designation: _____ SAC Officer _____</p>	<p>Date: _____ 13/11/18 _____ Time: _____ hrs</p> <p>Signed: _____</p>
<p>Authorised by: _____ (print name)</p> <p>Designation: _____</p>	<p>Date: _____ Time: _____ hrs</p> <p>Signed: _____</p>

Risk Categories

	Slightly Harmful	Harmful	Extremely Harmful
Likely	Moderate Risk	Substantial Risk	Intolerable Risk
Unlikely	Tolerable Risk	Moderate Risk	Substantial Risk
Highly Unlikely	Trivial Risk	Tolerable Risk	Moderate Risk

Actions

Risk Definition	Action and Timescale
TRIVIAL	No action is required and no documentary records need to be kept.
TOLERABLE	No additional controls/ precautionary measures are required. Consideration may be given to a more cost-effective solution or improvement that imposes no additional cost burden. Monitoring is required to ensure that the controls/ precautionary measures are maintained.
MODERATE	Efforts must be made to reduce the risk, but the costs of mitigation must be carefully measured and limited. Risk reduction measures must be implemented within a defined time period.
SUBSTANTIAL	Activities must not be allowed to continue until the risk has been reduced. Considerable resources may have to be allocated to reduce the risk. Where the risk involves activities already in progress, urgent action must be taken.
INTOLERABLE	Activities must cease immediately, or must not be allowed to start, until the risk has been reduced. If it is not possible to reduce the risk even with unlimited resources, the activities will remain prohibited.

4 Record the residual Risk Rating to demonstrate that the risk has been reduced to an acceptable level; record Likelihood and Severity rating.

5 Risk Assessments are to be reviewed:

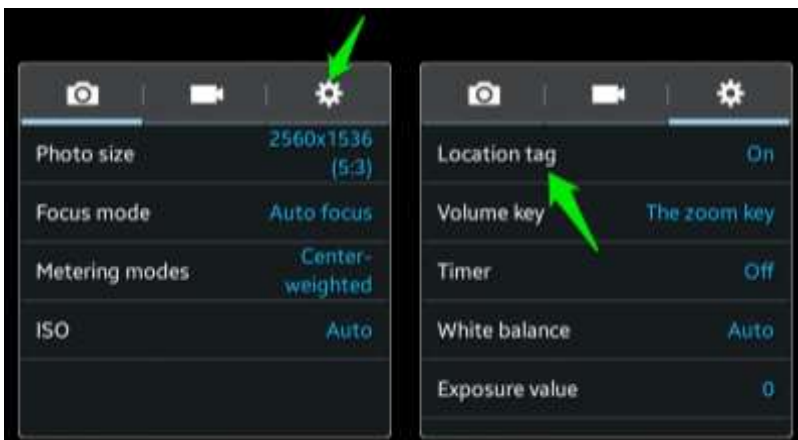
- Annually.
- If there is reason to doubt the effectiveness of the assessment.
- Following an accident or near miss.
- Following significant changes to the task, process, procedure or Line Management.
- Following the introduction of more vulnerable personnel.
- If "Generic" prior to use.

SWEPT Photo location setting guide

“A photo is worth a thousand words”. Photos are strongly encouraged because they give valuable information, provide a record, and can also (see below) provide precise location information too.

Geotagging photos on Android:

1. Go to your device’s settings app to access the settings menu
2. Scroll to the ‘Location’ or ‘Location and security’ option and select the option
3. Tap the option ‘Use GPS Satellites’ to place a green check mark next to it – this option must be enabled for the geotagging to work
4. If you’re using Android 8.1 or below – tap ‘mode’ within the location tab and then choose ‘high accuracy’ or ‘battery saving’
5. Open the camera app and then the camera settings within the app



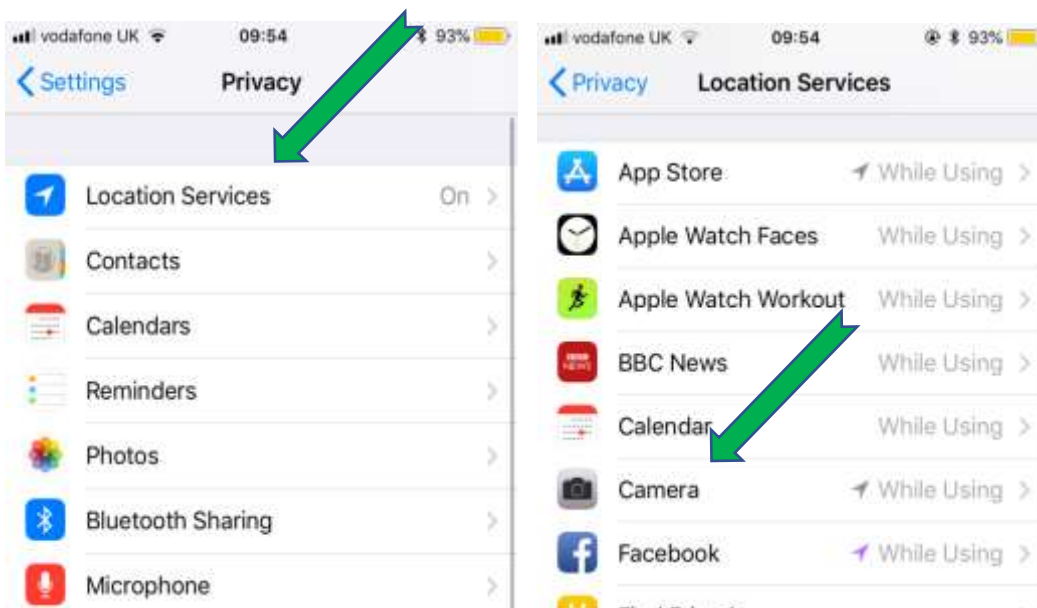
6. Ensure that one of the following options is on (dependent on phone and operating system) ‘store location’, ‘save location’, ‘geo-tag photos’ or any similar button.

7. The device will now record a location alongside every photo taken

Android: within the camera app ensuring geotagging is enabled

Geotagging photos on iPhone:

1. Go to your device settings app to access the settings menu (see screenshots)
2. Find and tap on privacy
3. Select location services
4. Tap on camera
5. Under ‘Allow Location Access’ ensure that ‘While Using The App’ is selected
6. The device will now record a location alongside every photo taken



Using a handheld GPS Device for Locations:

If you own a handheld GPS device – this can also be used for geotagging your photos, useful if you wish to use a camera or if your phone does not have geotagging capabilities:

1. At each point you take a photo, access your GPS co-ordinates on the device and make a note of them– the way to do this will be dependent on device, but most are pretty simple and easy to operate.
2. Make a note of the time the photo was taken next to the co-ordinates you have noted.
3. Later, back at home, the GPS co-ordinates can be matched with the photos taken on your phone/camera by matching up the time from the device that has been used to take the photo.

Using an OS Map for Locations:

If you find it easier, or do not have access to a phone with geotagging capabilities or a GPS device, then an OS Map can be used also:

- Alongside every photo taken make a note of the grid reference using an Ordnance Survey map
- If you need a refresher on how to take grid references on OS maps then there are online guides such as: <http://www.ordnancesurvey.co.uk/resources/map-reading/> or <https://www.ordnancesurvey.co.uk/blog/2015/11/map-reading-skills-how-to-read-a-grid-reference/> that can help.
- Make sure to also note the time you take the photo next to your grid reference to make it easier to match up grid references and photos later on.

Finding your GPS location:

- Some smartphones such as iPhones have a compass app built into the phone; this is usually found under utilities on your home screen and it automatically shows your position. (See image).
- Other smartphone operating systems such as Android allow you to download an app which will give your GPS location; this can be found in Google Maps or other GPS apps.




Surveying the Waterway Environment for Pollution Threats Volunteer Project 2018-19 is a collaborative project led by the Pembrokeshire Marine SAC Officer and co-delivered with the West Wales Rivers Trust, Pembrokeshire Coastal Forum and the Darwin Centre. It is being funded by Natural Resources Wales.

Some content reproduced with kind permission of the Freshwater Habitat's Trust's *Clean Water for Wildlife* project.

Appendix 7: Survey form

Forms were created in excel and provided in hard copy to participants for use during field work.

		Volunteer Project		Site Survey Sheet		Report ID:	
		Survey section name		Survey sheet completed by			
Date dd/mm/yy				Others present			
Section start lat/long				Walking u/s or d/s			
Section start access point name:				Access issues			
Section finish lat/long				ENSURE YOU ARE ACTING AS PER RISK ASSESSMENT & GUIDANCE. IN PARTICULAR, DO NOT GET CUT OFF BY THE TIDE & DO NOT TAKE SHORT CUTS OVER CREEKS.			
Section finish access point name:							
Weather now				Weather last 24hrs			
Time at start of survey					Time at end of survey		
Observations - use codes (in orange) to describe your survey section. Include; in lists. DO NOT HANDLE OR MOVE ANY WASTE MATERIAL OR DEAD ANIMALS							
Adjacent land use							
(agri crops agric /grazing agrig ; urban urb ; semi-urban urbs ; wooded/natural nat)							
Livestock shore access?				Any structures/building on the shore?			
Description of foreshore (saltmarsh salt ; bedrock roc ; shingle							
shingle shi ; cobble cob ; mud mud ; seaweed (attached) sea ; algal mats mat ; drift algae drift)							
If algal mats are present indicate quantity (%)							
Flytipped waste *						Photo Y/N	
(Describe)						Include in photo log	
Marine "litter"						Photo Y/N	
(Indicate none/rare, occasional or lots. Plastics? Sanitary items?)						Include in photo log	
Non-native species						Photo Y/N	
(e.g. Japanese knotweed, Himalayan balsam)						Include in photo log	
Human activity						Photo Y/N	
(Note any - e.g. angling/fishing/gathering of any kind/shooting...)						Include in photo log	

Possible pollutants * (e.g. slurry, sewage, chemical/oil)		Photo Y/N Include in photo log
* FOR ALL OBSERVATIONS MARKED WITH ASTERIX TAKE A PHOTO & IMMEDIATELY RING NRW ON 03000 653000. Say you are a SWEPT survey volunteer when you make your report.		
If exploring the shore (especially lower) on your survey walk, please note whether you see any:		
live native oysters		live Pacific oysters
signs of otters		dead animals
		Photos?
		Photos?

The survey form consisted of a site survey sheet (above) which participants were encouraged to fill in online after fieldwork in order to ease data consolidation and analysis.

The link to the online google form is <https://goo.gl/forms/vLJ63SA9R7Uyv7E11>

This could then be interrogated, and summaries produced (see results section of main report).

The water testing spreadsheet was provided as an excel sheet which participants were encouraged to return electronically. After survey 1, this was modified to contain drop-down choices for nitrate and phosphate results to standardise data entry.

44 out of the 46 stretches were returned electronically, with around half of participants having also filled in geo-tag location information from their photos.

SWEPT Site Survey Results Recording Form

Report ID (office use only)
Your answer _____

Survey Section Name
Your answer _____

Survey Section completed by
Your answer _____

Others present
Your answer _____

DATE OF SURVEY (DDMMYY):		SURVEYOR NAME:								
Photo log. (Send all photos along with your survey sheet. Extract location info only if you can. Make sure your photo location can										
Number		Description (What were you taking the photo of? Water source (number it)? General view? Wildlife? Algal mat or pollution?	Photo location Latitude Longitude							
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
Water inputs description - note you have limited sample kits so may not be able to test all inputs. All water inputs must be photographed and logged.										
Note the drop-down box choices. These are designed to make life easier and to improve data consistency. Once on the correct cell, click on the arrow and make your choice. If N/A leave blank.										
Number	Description (e.g. pipe, stream, ditch)	Water clarity	Any smell?	Flow estimate	Depth (cm) estimate	Width (cm) estimate	Samples taken y/n	Nitrates result ppm	Phosphate result ppm	Photo location Latitude Longitude
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
Water sample testing - refer to separate sheet for instructions on how to take a water sample and record your corresponding results in the table above.										



Surveying the Waterway Environment for Pollution Threats Volunteer Project 2018-19

Survey Guidance Notes

Whilst the primary aim of the surveys is to look out for freshwater inputs to the marine environment of the Milford Haven waterway, and to test these sources for levels of nitrate and phosphate, surveyors are also able to gather other valuable information.

The survey form details some data that would be useful to collect but it is not exhaustive. Surveyors are encouraged to make use of the additional comments boxes to give whatever detail they find of interest. Your data is vital information!

The survey form is available in hard copy for annotation whilst out on survey. It is also available for completion electronically. If you can do this it saves us a lot of time! **It is important that survey results are submitted quickly.**

If you have any immediate pollution concerns then you should call NRW on 03000 653000 and they can then follow up in order to minimise any pollution risk. Tell them that you are a SWEPT volunteer.

Identifying Water Pollution.

If it doesn't look as you expect a healthy stream or natural clean water run-off to look, then please record this, especially if it smells. Particular types of pollution you might be able to record (see image sheet for examples) include:

Slurry – thick greeny-brown colour, turbid, can't see the bottom, strong smell of manure.

Silage – more of a strong compost smell, like rotting grass. This is visually less obvious than slurry and often accompanied by sewage fungus if there is chronic pollution.

Sewage fungus – off white/grey fluffy 'cotton wool' texture.

Soil – no strong odour, chocolate/coffee colour.

Algal bloom – pea green soup but no smell.

Iron ochre mine waste – orange/reddish brown. E.g. "Red Stream" at Little Milford.

Oil/bacteria – sheen on water surface. Prod it with a stick. If it breaks up into little "platelets" and the little bits stay broken it is bacteria. If it coalesces it is oil. Bacterial films are likely to be more prevalent when there are increased levels of nutrients but can be natural.

Algal mats.

Green algal mats comprise a layer of living green seaweed (not washed up/ on the strandline) that are found across the shore (see image). Assess the amount of green algal cover as a percentage of the **available habitat** of mud/gravel surface (i.e. don't include rock) using 4 categories:

None, < 25% cover, 25 – 50% cover, >50% cover. Look at an area in front of you and estimate cover. Take a wider look around. If it looks like there is generally a bit more in the area that you can see from where you are standing, go for the higher category. Do this at several locations if it varies (a photo will help location tagging).



Algal mats on the shore.

Taking water samples and recording test results.

Don't forget to photograph each water source input that you find and describe it. Ensure your photos are geo-tagged, otherwise manually record each position.

The number of sample tests per survey is limited so you will not be able to test every water input. Choose any inputs that appear polluted and try to spread samples.

Recording the level of nutrients.

- Once the development time is up, compare your N or P tube (one each per site) with the corresponding chart (right).
- The chart is based on ranges. e.g. My colour falls between 1 and 2, choose 2.
- If the tube hasn't changed colour at all choose the lowest range category <0.2 N or <0.02 P.
- If your tube matches one colour exactly, choose the higher range. e.g. If recording 0.5 choose the range 0.5-1.

P: Categories intended to match 'High' (blue) and 'Good' (green) Water Framework Directive status. N: categories reflect literature values for High status

USING YOUR PACKTEST SAMPLE KITS

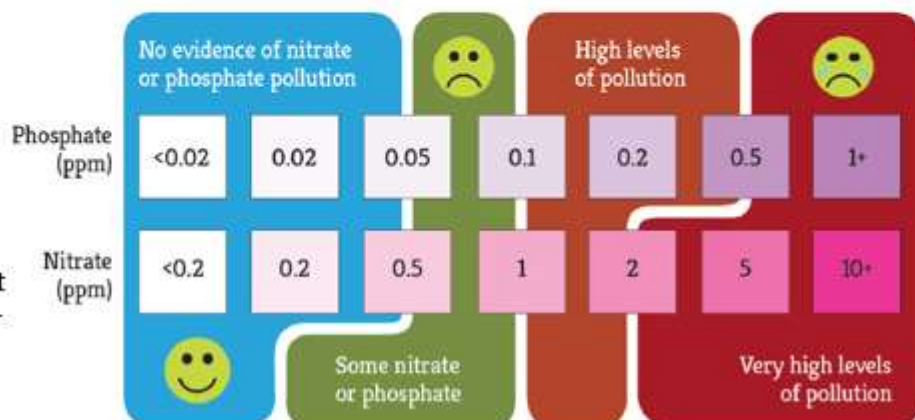
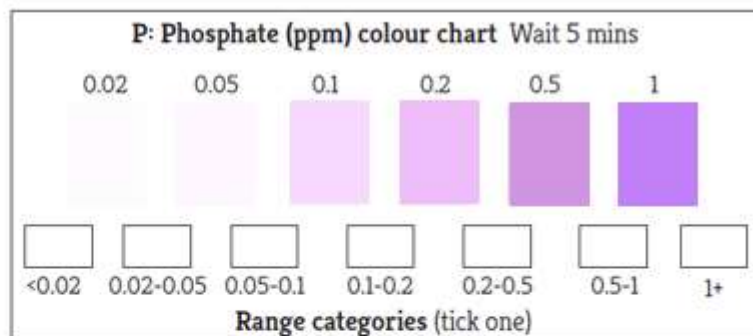
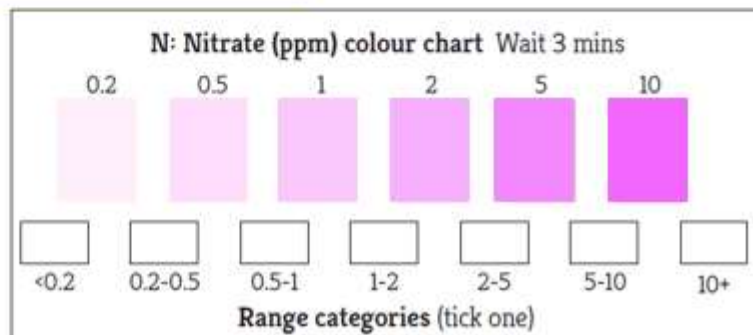
You use one phosphate and one nitrate tube for each water sample (marked N for nitrate or P for phosphate on the tab at the base of the tube)

- Pull out and discard the yellow pin leaving a small air hole
- With the air hole pointing upwards, use your finger and thumb to squeeze out the air
- Keeping the air squeezed out, turn the tube upside down and insert below the water
- Gently release the pressure and suck up enough water to fill the tube just over half way

- If you need to, turn the tube upright again, squeeze out a bit more air to suck up more water to just over half way
- Gently shake the tube to mix the water and powder inside
- Make a note of the time and wait for the colour reaction

Nitrate: 3 mins
Phosphate: 5 mins

- Compare the tube with the colour chart immediately when the time is up, as the colour will continue to develop.
- Record the results and enter them online or via email



Some content reproduced with kind permission of the Freshwater Habitat's Trust's Clean Water for Wildlife project.

Essential to note here is that due to a small budget, all forms were produced and printed in house. Much effort went in to modifying the colour chart in order for the printed output to best match the master copy colour chart provided with the tests. Should budget allow, a professional colour matched output would be preferable.



**Surveying the Waterway Environment for
Pollution Threats Volunteer Project 2018-19**

If this car is parked inappropriately,
please contact the owner:

Mobile:

For more information about the
SWEPT project

please see: www.wwrt.or.uk/sweptproject

Or contact the SWEPT project manager on
01646 696108 / 07881334047.

SWEPT is a collaborative project led by the Pembrokeshire Marine SAC Officer and co-delivered with the West Wales Rivers Trust, Pembrokeshire Coastal Forum and the Darwin Centre. It is being funded by Natural Resources Wales.

Appendix 10: Kyoritsu PackTest nitrate and phosphate test information.

This information is taken from Biggs, J., McGoff, E., Ewald, N., Williams, P., Dunn, F. and Nicolet, P. (2016). Clean Water for Wildlife technical manual. Evaluating PackTest nitrate and phosphate test kits to find clean water and assess the extent of pollution. Freshwater Habitats Trust, Oxford.

Additional technical background information for the PackTest phosphate low range test kit

This summarises information provided by the PackTest kit manufacturers Kyoritsu. For SWEPT Kyoritsu's low range phosphate PackTest was used which is based on an enzymatic method and does not use strong acid. The manufacturers note that low phosphate concentrations can be measured from samples containing relatively few coexisting substances, such as river water, underground water and drinking water. The low range PackTest kit is not suitable for the analysis of samples collected from water purifier tanks, sewage, industrial wastewater or other samples which contain high concentrations of coexisting substances. For more contaminated waters, in which the phosphate level is higher, Kyoritsu recommends the use of the high range Pack Test kit which spans: 0.2-10 mg PO₄³⁻ L⁻¹.

Manufacturers information about the method

The phosphate (low range) PackTest kits measures only the dissolved phosphate ion. Hydrolytic phosphorus or Total Phosphorus cannot be measured directly and requires a pre-treatment. The PackTest measures both the phosphate ion (PO₄³⁻) and phosphate-phosphorus (PO₄³⁻-P). Samples should be read in daylight or under a daylight corrected lamp. Kyoritsu note that partially undissolved reagent in the sample tube will not affect the measurement.

Temperature effects

Importantly, the manufacturers suggest that sample temperature should be kept in the range 20-40° C. Lower temperature necessitates longer reaction time. For example: at 10°C, the response time for phosphate is 20 minutes rather than the normal 5 minutes. An alternative approach in cold weather, or if the water itself is cold, is to collect the water sample in a small bottle and warm it in your hands, or a pocket before testing.

Interferences with the PackTest phosphate kit

The phosphate kit is recommended for use if the pH range is 6 - 9. The manufacturers suggest that, if necessary, the pH should be adjusted with diluted sulfuric acid or sodium hydroxide solution, although there is no detailed information on how to do this.

Coexisting ions can modify reaction colour. The list below, which is provided by Kyoritsu, shows ion concentrations *above* which interference can be significant:

- 1000 mg/L: Ba²⁺, Ca²⁺, Cl⁻, F⁻, I⁻, K⁺, Na⁺, NH₄⁺, NO₂⁻, NO₃⁻
- 500 mg/L: B³⁺, Phenol
- 200 mg/L: Zn²⁺
- 50 mg/L: Cu²⁺, Mg²⁺, Ni²⁺, SO₄²⁻
- 10 mg/L: Al³⁺, Cr³⁺, Cr⁶⁺, Mn²⁺
- ≤ 5 mg/L: Fe³⁺.

In most freshwaters which are not experiencing gross pollution from industrial or sewage sources such concentrations would be unusual, but surveyors should be aware that unexpected results might be caused by chemical interferences.

Additional technical background information for the PackTest nitrate test kit

This summarises information provided by the PackTest kit manufacturers Kyoritsu. For SWEPT Kyoritsu's standard nitrate PackTest (not the high range) was used which is based on a reduction by zinc and the naphthylethylenediamine enzymatic colour comparison method

Manufacturers information about the method

Samples should be read in daylight or under a daylight corrected lamp. Kyoritsu note that partially undissolved reagent in the sample tube will not affect the measurement.

Temperature effects

Importantly, the manufacturers suggest that sample temperature should be kept in the range 15-40°C. Lower temperature necessitates longer reaction time though no details are given. An alternative approach in cold weather, or if the water itself is cold, is to collect the water sample in a small bottle and warm it in your hands or in a pocket before testing.

Interferences with the PackTest nitrate kit

The nitrate kit is recommended for use in the pH range is 2 – 9, and is described by Kyoritsu as best between 6 and 7. The manufacturers suggests that, if necessary, the pH should be adjusted with diluted sulfuric acid or sodium hydroxide solution, although there is no detailed information on how to do this. We have not evaluated the effect of low or high pH on the results.

According to the information provide by Kyoritsu a range of coexisting ions can modify the nitrate test reaction colour. The list below indicates the concentrations at which interferences become significant:

≥ 1000 mg/L: Al³⁺, B³⁺, Ba²⁺, Ca²⁺, Cl⁻, CN⁻, F⁻, Mg²⁺, Mn²⁺, Na⁺, NH₄⁺, PO₄³⁻, SO₄²⁻, Zn²⁺, Phenol

≥ 250 mg/L: K⁺

≥ 100 mg/L: Co²⁺, Cr³⁺

≥ 50 mg/L: Fe²⁺, Ni²⁺

≤ 20 mg/L: Fe³⁺

≤ 5 mg/L: I⁻

≥ 2 mg/L: Cd²⁺, Residual Chlorine

≥ 1 mg/L: Cr⁶⁺

Sub-ppm level: Cu²⁺, Hg²⁺, NO₂⁻, Sn²⁺, Protein, Surfactant

Within Kyoritsu's 'sub-ppm6' group it is potentially possible that Cu²⁺ and NO₂⁻ could be present in the waters tested. 'NO₂⁻ is most likely to be present in sites receiving treated sewage effluents. It seems possible that 'proteins' could be present in samples at sub-ppm levels however this is not a routinely monitored variable.

Avoiding methodological errors

PackTest kits are simple but there are ways in which errors can creep in. Being aware of these errors, and reducing them through practice or training, is important for consistent results to be achieved. The main errors to take care avoiding are:

Using old kits

Kyoritsu recommend that PackTest kits should be used within 12 months after purchase. They should be stored in a cool, dry and dark place. The age of the kits can be determined from the batch numbers on the outside of the package. In practice, Biggs *et al* (2016) found that some become less sensitive with age even before the 12-month due date and recommended using all kits within 6 months.

Colour

The colour charts show a change in the intensity of colour, rather than a colour change, so people who are colour-blind are still able to use the kits. However, colour intensity may look different in different light, so the tubes should be viewed in reasonably bright daylight, but not direct sunlight. If samples are analysed indoors, they can be viewed at a window or, as the manufacturer recommends, using a daylight type lamp. It is useful to do the first few trials together with one or two other people to provide confidence that there is agreement on the correct colour category.

Temperature

Care needs to be taken to ensure that the water sample is warm enough when it is tested. **The manufacturers specify a range between 20-40°C for phosphate and 15-40°C for nitrate.** As the temperature drops the colour change is slower. At 10°C the manufacturers recommend that a phosphate test would take 20 minutes, rather than 5 minutes for the correct colour to develop.

Timing

As well as getting the right temperature, it is important to time the reactions correctly (3 minutes for nitrate, 5 minutes for phosphate) because the kits will continue to darken in colour after this time.

COST:

Further nitrate and phosphate tests were purchased from the PackTest manufacturer Kyoritsu's primary distributor in Japan (Hosoda Ltd.) in March 2020.

Pack Test WAK-NO₃ comes in boxes of 50 testing tubes (in packets of 5) US\$45 per box

Pack Test WAK-PO₄(D) low-range comes in boxes of 40 testing tubes (in packets of 5) US\$45 per box

Import, customs, VAT and delivery to the UK is approximately an additional £500 for a consignment of 10 boxes of nitrate tests and 12 boxes of phosphate tests.

Therefore, March 2020 test cost (total) = £3 for each nitrate/phosphate testing sample pair.

Contact: Mr. Akio Takata a.takata@hosoda-jp.co.jp or sales2@hosoda-jp.co.jp

Ms. Quin Kato Kyoritsu Chemical-Check Lab., Corp. kato-k@kyoritsu-lab.co.jp

Appendix 11: Survey stretches and surveys completed

	Stretch code	Survey stretch	Survey 1 (Nov)		Survey 2 (Dec)		Survey 3 (Jan)		Survey 4 (Feb)		Surveys completed
			Inputs recorded	P+N water tests	Inputs recorded	P+N water tests	Inputs recorded	P+N water tests	Inputs recorded	P+N water tests	
North section (West and East Cleddau)											
1	N1	Sprinkle Pill to Lower Hook Quay	5	5	5	5	5	5	5	5	4/4
2	N2	Lower Hook to Little Milford	9	4	4	4	6	6	4	4	4/4
3	N3	Little Milford to Cunnigar (Tittlemouse Cottage)	5	5	5	5	5	5	5	5	4/4
4	N4	Tittlemouse Cottage (Cunnigar) to Haroldston Bridge	6	5	6	5	6	7	7	6	4/4
5	N5	Higgons Well to Hanton Bridge	5	5	6	6	6	6	6	6	4/4
6	N6	Boulston Point to Millin Cross	5	5	7	5	7	6	7	6	4/4
7	N7	Millin Cross to Slebech	5	5	5	5	13	5	15	9	4/4
8	N8	Slebech Park to Blackpool Mill	8	5	2	2	4	4	-	-	3/4
9	N9	Blackpool Mill to Canaston Bridge	5	5	4	4	4	4	4	4	4/4
10	N10	Blackpool Mill to Beggarsland Pill	5	5	5	5	5	5	5	5	4/4
11	N11	Beggarsland Pill to Rigan Pill	5	5	5	5	-	-	-	-	2/4
Carew and Cresswell rivers											
12	CC1	Four Ashes to Pill Susan	5	5	5	5	5	5	5	5	4/4
13	CC2	Pill Susan to Upton Pill and opposite bank north of quarries	Didn't manage to get out in the end (proposed 'bonus' stretch by private boat).								0
14	CC3	Upton Pill to Ford Pill	3	3	5	5	4	4	4	4	4/4
15	CC4	Radford Pill (Ford Farm to Radford Point)	11	5	15	6	-	-	5	5	3/4
16	CC5	Mill pond to ford	4	3	-	-	-	-	-	-	1/3
17	CC6	West Williamston	5	4	-	-	5	4	-	-	2/4
18	CC7	Cresswell south side	9	5	7	7	6	6	7	7	4/4
19	CC8	Cresswell north	14	4	51	7	16	6	33	4	4/4
20	CC9	Lawrenny to Lawrenny Newton	7	5	7	7	6	6	9	7	4/4
Pembroke-side section (Landshipping to Angle)											
21	P1	Rigan Pill to Sam's wood	5	3	14	10	12	11	-	-	3/4
22	P2	Sam's wood to Garron Bridge	10	3	12	10	12	10	12	6	4/4
23	P3	Lawrenny to Garron Bridge	8	5	7	7	6	5	5	5	4/4
24	P4	Mill Bay to Four Ashes	5	5	5	5	5	5	5	4	4/4
25	P5	Cosheston Point to Mill Bay	3	3	4	4	3	3	3	3	4/4
26	P6	Cosheston Pill North	3	3	5	5	5	5	5	5	4/4
27	P7	Cosheston Pill South	11	5	5	4	6	5	12	5	4/4
extra	P7.5	Hobbs Point to the bridge	-	-	-	-	-	-	6	3	1/4
28	P8	Pennar point to Carr Rocks	9	3	13	10	13	7	-	-	3/4
29	P9	Pembroke river 1	7	4	8	6	8	7	8	7	4/4
30	P10	Pembroke river 2	5	5	5	5	5	5	5	5	4/4
31	P11	Pembroke river 3	5	5	5	5	5	5	5	5	4/4
32	P12	Bentlass stretch	5	5	5	5	4	4	5	5	4/4
33	P13	Angle Bay	5	5	6	6	8	8	8	8	4/4
Milford-side section (Sprinkle Pill to Dale)											
34	M1	Black Tar to Sprinkle Pill	3	3	6	5	4	4	3	3	4/4
35	M2	Port Lion to Black Tar	6	5	10	10	9	9	6	6	4/4
36	M3	Benton Point to Port Lion	4	4	4	3	4	3	4	3	4/4
37	M4	Rudders to Roose Ferry	4	4	1	1	4	4	4	4	4/4
38	M5	Burton Ferry to Rudders	7	5	7	6	8	4	8	6	4/4
39	M6	Westfield Pill to Burton Ferry	3	3	-	-	-	-	-	-	1/4
40	M7	Church lake to Westfield Pill	3	3	5	5	5	5	5	5	4/4
41	M8	Wear Point to Church Lake	13	4	15	4	10	4	10	4	4/4
42	M9	Gelliswick	5	5	5	5	5	5	5	5	4/4
43	M10	East of Sandy Haven (Stepping stones to South Hook)	-	-	7	5	9	5	8	5	3/4
44	M11	Sandy Haven Inlet (upstream of stepping stones)	10	5	10	10	-	-	10	10	3/4
45	M12	Sandy Haven West (stepping stones to Great Castle Head)	7	5	5	5	5	5	5	5	4/4
46	M13	Great Castle Head to Monk Haven	1	1	2	2	-	-	2	2	3/4
47	M14	The Gann (Musselwick Point to Jubille Beach)	5	1	5	5	6	6	6	6	4/4
			273	190	320	236	264	218	276	207	

Appendix 12: NRW water testing comparison results

Sampling in February 2019 was carried out by SWEPT volunteers. Water samples were taken and sent in to NRW for lab analysis.

Sampling remark	Parameter type	Parameter method	Sign	Value	Unit
SWEPT PORT LION TO BENTON CASTLE INPUT 1 DITCH	3683 / N Inorganic	wqValue(0111)+wqValue(0116	<	6.71	mg/l
SWEPT PORT LION TO BENTON CASTLE INPUT 1 DITCH	0180 / Orthophosphat	Low	<	0.02	mg/l
SWEPT PORT LION TO BENTON CASTLE INPUT 1 DITCH	0116 / N Oxidised	Low	---	6.68	mg/l
SWEPT PORT LION TO BENTON CASTLE INPUT 1 DITCH	0172 / Chloride Ion	Low	---	26	mg/l
SWEPT PORT LION TO BENTON CASTLE INPUT 1 DITCH	0111 / Ammonia(N)	Low	<	0.03	mg/l
SWEPT PackTest PORT LION TO BENTON CASTLE INPUT 1 DITCH	NO3		<	1-2	ppm
SWEPT PackTest PORT LION TO BENTON CASTLE INPUT 1 DITCH	PO4		<	0.02	ppm
SWEPT PORT LION TO BENTON CASTLE INPUT 2 STREAM	0116 / N Oxidised	Low	---	6.02	mg/l
SWEPT PORT LION TO BENTON CASTLE INPUT 2 STREAM	0172 / Chloride Ion	Low	---	49	mg/l
SWEPT PORT LION TO BENTON CASTLE INPUT 2 STREAM	0111 / Ammonia(N)	Low	<	0.03	mg/l
SWEPT PORT LION TO BENTON CASTLE INPUT 2 STREAM	0180 / Orthophosphat	Low	<	0.02	mg/l
SWEPT PORT LION TO BENTON CASTLE INPUT 2 STREAM	3683 / N Inorganic	wqValue(0111)+wqValue(0116	<	6.05	mg/l
SWEPT PackTest PORT LION TO BENTON CASTLE INPUT 2 STREAM	NO3		<	5-10	ppm
SWEPT PackTest PORT LION TO BENTON CASTLE INPUT 2 STREAM	PO4		<	0.02	ppm
SWEPT PORT LION TO BENTON CASTLE INPUT 4 STREAM ONTO SHORE	0116 / N Oxidised	Low	---	5.87	mg/l
SWEPT PORT LION TO BENTON CASTLE INPUT 4 STREAM ONTO SHORE	3683 / N Inorganic	wqValue(0111)+wqValue(0116	<	5.9	mg/l
SWEPT PORT LION TO BENTON CASTLE INPUT 4 STREAM ONTO SHORE	0172 / Chloride Ion	Low	---	35.3	mg/l
SWEPT PORT LION TO BENTON CASTLE INPUT 4 STREAM ONTO SHORE	0111 / Ammonia(N)	Low	<	0.03	mg/l
SWEPT PORT LION TO BENTON CASTLE INPUT 4 STREAM ONTO SHORE	0180 / Orthophosphat	Low	<	0.02	mg/l
SWEPT PackTest PORT LION TO BENTON CASTLE INPUT 4 STREAM ONTO SHORE	NO3		<	0.2-0.5	ppm
SWEPT PackTest PORT LION TO BENTON CASTLE INPUT 4 STREAM ONTO SHORE	PO4		<	0.02	ppm
SWEPT DAVE AND JOHN STREAM 1 SAMPLE DRY SUNNY NO SMELL N LESS THAN 0.2 P LESS THAN 0.02	3683 / N Inorganic	wqValue(0111)+wqValue(0116	<	0.28	mg/l
SWEPT DAVE AND JOHN STREAM 1 SAMPLE DRY SUNNY NO SMELL N LESS THAN 0.2 P LESS THAN 0.02	0111 / Ammonia(N)	Low	<	0.03	mg/l
SWEPT DAVE AND JOHN STREAM 1 SAMPLE DRY SUNNY NO SMELL N LESS THAN 0.2 P LESS THAN 0.02	0172 / Chloride Ion	Low	---	11.7	mg/l
SWEPT DAVE AND JOHN STREAM 1 SAMPLE DRY SUNNY NO SMELL N LESS THAN 0.2 P LESS THAN 0.02	0116 / N Oxidised	Low	---	0.25	mg/l
SWEPT DAVE AND JOHN STREAM 1 SAMPLE DRY SUNNY NO SMELL N LESS THAN 0.2 P LESS THAN 0.02	0180 / Orthophosphat	Low	<	0.02	mg/l
SWEPT PackTest DAVE AND JOHN SAMPLE 1	NO3		<	0.2	ppm
SWEPT PackTest DAVE AND JOHN SAMPLE 1	PO4		<	0.02	ppm
SWEPT DAVE AND JOHN STREAM 2 SAMPLE 2 DRY AND SUNNY NO SMELL N 0.2-0.5 P LESS THAN 0.02	3683 / N Inorganic	wqValue(0111)+wqValue(0116	<	1.43	mg/l
SWEPT DAVE AND JOHN STREAM 2 SAMPLE 2 DRY AND SUNNY NO SMELL N 0.2-0.5 P LESS THAN 0.02	0111 / Ammonia(N)	Low	<	0.03	mg/l
SWEPT DAVE AND JOHN STREAM 2 SAMPLE 2 DRY AND SUNNY NO SMELL N 0.2-0.5 P LESS THAN 0.02	0172 / Chloride Ion	Low	---	25.5	mg/l
SWEPT DAVE AND JOHN STREAM 2 SAMPLE 2 DRY AND SUNNY NO SMELL N 0.2-0.5 P LESS THAN 0.02	0116 / N Oxidised	Low	---	1.4	mg/l
SWEPT DAVE AND JOHN STREAM 2 SAMPLE 2 DRY AND SUNNY NO SMELL N 0.2-0.5 P LESS THAN 0.02	0180 / Orthophosphat	Low	<	0.02	mg/l
SWEPT PackTest DAVE AND JOHN SAMPLE 2	NO3		<	0.2-0.5	ppm
SWEPT PackTest DAVE AND JOHN SAMPLE 2	PO4		<	0.02	ppm
SWEPT DAVE AND JOHN SAMPLE 3 DRY SUNNY WATER CLEAR NO SMELL N 1-2 P MORE THAN 0.2	0111 / Ammonia(N)	Low	<	0.03	mg/l
SWEPT DAVE AND JOHN SAMPLE 3 DRY SUNNY WATER CLEAR NO SMELL N 1-2 P MORE THAN 0.2	3683 / N Inorganic	wqValue(0111)+wqValue(0116	<	5.03	mg/l
SWEPT DAVE AND JOHN SAMPLE 3 DRY SUNNY WATER CLEAR NO SMELL N 1-2 P MORE THAN 0.2	0180 / Orthophosphat	Low	---	0.023	mg/l
SWEPT DAVE AND JOHN SAMPLE 3 DRY SUNNY WATER CLEAR NO SMELL N 1-2 P MORE THAN 0.2	0116 / N Oxidised	Low	---	5	mg/l
SWEPT DAVE AND JOHN SAMPLE 3 DRY SUNNY WATER CLEAR NO SMELL N 1-2 P MORE THAN 0.2	0172 / Chloride Ion	Low	---	21.8	mg/l
SWEPT PackTest DAVE AND JOHN SAMPLE 3	NO3		<	1-2	ppm
SWEPT PackTest DAVE AND JOHN SAMPLE 3	PO4		<	0.02-0.05	ppm
SWEPT DAVE AND JOHN STREAM 4 SAMPLE 4 DRY SUNNY NO SMELL N 0.2-0.5 P LESS THAN 0.02	3683 / N Inorganic	wqValue(0111)+wqValue(0116	<	1.04	mg/l
SWEPT DAVE AND JOHN STREAM 4 SAMPLE 4 DRY SUNNY NO SMELL N 0.2-0.5 P LESS THAN 0.02	0180 / Orthophosphat	Low	<	0.02	mg/l
SWEPT DAVE AND JOHN STREAM 4 SAMPLE 4 DRY SUNNY NO SMELL N 0.2-0.5 P LESS THAN 0.02	0116 / N Oxidised	Low	---	1.01	mg/l
SWEPT DAVE AND JOHN STREAM 4 SAMPLE 4 DRY SUNNY NO SMELL N 0.2-0.5 P LESS THAN 0.02	0172 / Chloride Ion	Low	---	26.6	mg/l
SWEPT DAVE AND JOHN STREAM 4 SAMPLE 4 DRY SUNNY NO SMELL N 0.2-0.5 P LESS THAN 0.02	0111 / Ammonia(N)	Low	<	0.03	mg/l
SWEPT PackTest DAVE AND JOHN SAMPLE 4	NO3		<	0.2-0.5	ppm
SWEPT PackTest DAVE AND JOHN SAMPLE 4	PO4		<	0.02	ppm
SWEPT DAVE AND JOHN SAMPLES 5 DRY SUNNY WATER CLEAR NO SMELL N LESS THAN 0.2 P LESS THAN 0.02	3683 / N Inorganic	wqValue(0111)+wqValue(0116	---	2.377	mg/l
SWEPT DAVE AND JOHN SAMPLES 5 DRY SUNNY WATER CLEAR NO SMELL N LESS THAN 0.2 P LESS THAN 0.02	0180 / Orthophosphat	Low	---	0.026	mg/l
SWEPT DAVE AND JOHN SAMPLES 5 DRY SUNNY WATER CLEAR NO SMELL N LESS THAN 0.2 P LESS THAN 0.02	0116 / N Oxidised	Low	---	1.9	mg/l
SWEPT DAVE AND JOHN SAMPLES 5 DRY SUNNY WATER CLEAR NO SMELL N LESS THAN 0.2 P LESS THAN 0.02	0172 / Chloride Ion	Low	---	6330	mg/l
SWEPT DAVE AND JOHN SAMPLES 5 DRY SUNNY WATER CLEAR NO SMELL N LESS THAN 0.2 P LESS THAN 0.02	0111 / Ammonia(N)	Low	---	0.477	mg/l
SWEPT PackTest DAVE AND JOHN SAMPLES 5	NO3		<	0.2	ppm
SWEPT PackTest DAVE AND JOHN SAMPLES 5	PO4		<	0.02	ppm
SWEPT P6 POINT FARM 1	3683 / N Inorganic	wqValue(0111)+wqValue(0116	<	9.19	mg/l
SWEPT P6 POINT FARM 1	0111 / Ammonia(N)	Low	<	0.03	mg/l
SWEPT P6 POINT FARM 1	0116 / N Oxidised	Low	---	9.16	mg/l
SWEPT P6 POINT FARM 1	0180 / Orthophosphat	Low	<	0.02	mg/l
SWEPT P6 POINT FARM 1	0172 / Chloride Ion	Low	---	85.6	mg/l
SWEPT P6 PackTest POINT FARM 1	NO3		<	10 +	ppm
SWEPT P6 PackTest POINT FARM 1	PO4		<	0.02	ppm
SWEPT P6 POINT FARM 2	0111 / Ammonia(N)	Low	---	0.361	mg/l
SWEPT P6 POINT FARM 2	3683 / N Inorganic	wqValue(0111)+wqValue(0116	---	7.521	mg/l
SWEPT P6 POINT FARM 2	0180 / Orthophosphat	Low	<	0.02	mg/l
SWEPT P6 POINT FARM 2	0116 / N Oxidised	Low	---	7.16	mg/l
SWEPT P6 POINT FARM 2	0172 / Chloride Ion	Low	---	4690	mg/l
SWEPT P6 PackTest POINT FARM 2	NO3		<	2-5	ppm
SWEPT P6 PackTest POINT FARM 2	PO4		<	0.02-0.05	ppm
SWEPT P6 COSHESTON PILL NW	3683 / N Inorganic	wqValue(0111)+wqValue(0116	<	4.07	mg/l
SWEPT P6 COSHESTON PILL NW	0111 / Ammonia(N)	Low	<	0.03	mg/l
SWEPT P6 COSHESTON PILL NW	0172 / Chloride Ion	Low	---	30.9	mg/l
SWEPT P6 COSHESTON PILL NW	0116 / N Oxidised	Low	---	4.04	mg/l
SWEPT P6 COSHESTON PILL NW	0180 / Orthophosphat	Low	---	0.139	mg/l
SWEPT P6 PackTest COSHESTON PILL NW	NO3		<	5-10	ppm
SWEPT P6 PackTest COSHESTON PILL NW	PO4		<	0.05-0.1	ppm
SWEPT P6 COSHESTON PILL MAIN INPUT	3683 / N Inorganic	wqValue(0111)+wqValue(0116	<	3.61	mg/l
SWEPT P6 COSHESTON PILL MAIN INPUT	0180 / Orthophosphat	Low	<	0.02	mg/l
SWEPT P6 COSHESTON PILL MAIN INPUT	0116 / N Oxidised	Low	---	3.58	mg/l
SWEPT P6 COSHESTON PILL MAIN INPUT	0172 / Chloride Ion	Low	---	74.1	mg/l
SWEPT P6 COSHESTON PILL MAIN INPUT	0111 / Ammonia(N)	Low	<	0.03	mg/l
SWEPT P6 PackTest COSHESTON PILL MAIN INPUT	NO3		<	2-5	ppm
SWEPT P6 PackTest COSHESTON PILL MAIN INPUT	PO4		<	0.02	ppm

This comparison utilised the standard NRW “NUTS” suite (default nutrients suite for ad hoc sampling) that contains the following:

NUTS 25 Nutrients Low mg/l GEN 111 21 mg/l Ammoniacal N 0.03 mg/l
 NUTS 25 Nutrients Low mg/l GEN 116 21 mg/l N Total Ox as N 0.2 mg/l
 NUTS 25 Nutrients Low mg/l GEN 180 21 mg/l oPhosphate rv as P 0.02 mg/l
 NUTS 25 Nutrients Low mg/l GEN 172 21 mg/l Chloride 2 mg/l

It did not specifically test for nitrate or nitrite (to directly compare with PackTest results for nitrate). However, given that “N Total Ox as N” (or TON for short) is the same as the sum of nitrate and nitrite, and that nitrite concentrations are generally negligible compare with nitrate in freshwater, TON and nitrate concentrations should be virtually identical.

Sampling in May-July 2019 was carried out by NRW monitoring staff.

Sample Point (NRW)	Sample location name	Kyoritsu PackTest	PackTest Results	Lab test	Lab results mg/l
Testing on 24 May 2019					
32475	River Carew at road bridge	NO3	<0.2	Nitrate-N	1.074
32475	River Carew at road bridge	PO4	<0.02	Orthophosphpt	0.033
32691	Cosheston Pill	NO3	0.2-0.5	Nitrate-N	2.246
32691	Cosheston Pill	PO4	<0.02	Orthophosphpt	0.024
33230	Cresswell Bridge	NO3	0.5-1	Nitrate-N	1.496
33230	Cresswell Bridge	PO4	<0.02	Orthophosphpt	0.095
33231	Cresswell Bridge			Phosphorus-P	0.153
33231	Llangwm Pill	NO3	0.5-1	Nitrate-N	6.076
33231	Llangwm Pill	PO4	<0.02	Orthophosphpt	0.054
33232	Llangwm Pill			Phosphorus-P	0.181
33232	Castle Pill	NO3	<0.2	Nitrate-N	0.556
33232	Castle Pill	PO4	<0.002	Orthophosphpt	0.027
33233	Castle Pill			Phosphorus-P	0.117
33233	Sandy Haven Pill	NO3	0.5-1	Nitrate-N	4.392
33233	Sandy Haven Pill	PO4	0.02-0.05	Orthophosphpt	0.118
33234	Sandy Haven Pill			Phosphorus-P	0.162
34547	Middle Pembroke Millpond (bottom at road bridge)	NO3	1.0-2.0	Nitrate-N	5.219
34547	Middle Pembroke Millpond (bottom at road bridge)			Nitrate-N	4.4075
34547	Middle Pembroke Millpond (bottom at road bridge)	PO4	<0.02	Orthophosphpt	0.028
34547	Middle Pembroke Millpond (bottom at road bridge)			Orthophosphpt	0.02
Testing on 3 June 2019					
33218	Penglyn Brook	NO3	1	Nitrate-N	3.786
33218	Penglyn Brook	PO4	<0.02	Orthophosphpt	0.608
33219	Canaston Bridge	NO3	1	Nitrate-N	2.426
33219	Canaston Bridge	PO4	<0.02	Orthophosphpt	0.032
33244	Westfield Pill (Water Lane footbridge)	NO3	1	Nitrate-N	4.757
33244	Westfield Pill (Water Lane footbridge)	PO4	<0.02	Orthophosphpt	0.074
39430	Monkton Bridge (Commons stream)	NO3	5	Nitrate-N	4.587
39430	Monkton Bridge (Commons stream)	PO4	0.05	Orthophosphpt	0.042
81246	Hubberston Pill (Priory Road bridge)	NO3	1	Nitrate-N	2.468

81246	Hubberston Pill (Priory Road bridge)	PO4	<0.02	Orthophosphat	0.038
84240	Winterton Marsh stream at roadbridge	NO3	2	Nitrate-N	7.025
84240	Winterton Marsh stream at roadbridge	PO4	0.05	Orthophosphat	0.087
85001	Merlins Brook below Kraft Food	NO3	1	Nitrate-N	1.976
85001	Merlins Brook below Kraft Food	PO4	<0.02	Orthophosphat	0.079
86505	Milton Brook at lower bridge	NO3	5	Nitrate-N	3.366
86505	Milton Brook at lower bridge	PO4	0.05	Orthophosphat	0.029
120660	Milton raw water	NO3	0.5	Nitrate-N	2.146
120660	Milton raw water	PO4	0.05	Orthophosphat	0.028
Testing on 1 July 2019					
33218	Penglyn Brook	no3	5.00	Nitrate-N	3.554
33218	Penglyn Brook	po4	0.10	Orthophosphat	0.545
33219	Canaston Bridge	no3	1.00	Nitrate-N	3.206
33219	Canaston Bridge	po4	0.05	Orthophosphat	0.061
33244	Westfield Pill (Water Lane footbridge)	no3	0.50	Nitrate-N	5.176
33244	Westfield Pill (Water Lane footbridge)	po4	0.05	Orthophosphat	0.095
39430	Monkton Bridge (Commons stream)	no3	5.00	Nitrate-N	3.292
39430	Monkton Bridge (Commons stream)	po4	0.05	Orthophosphat	0.058
81246	Hubberston Pill (Priory Road bridge)	no3	1.00	Nitrate-N	2.066
81246	Hubberston Pill (Priory Road bridge)	po4	0.05	Orthophosphat	0.054
84240	Winterton Marsh stream at roadbridge	no3	5.00	Nitrate-N	6.72
84240	Winterton Marsh stream at roadbridge	po4	0.10	Orthophosphat	0.118
85001	Merlins Brook below Kraft Food	no3	1.00	Nitrate-N	1.966
85001	Merlins Brook below Kraft Food	po4	0.05	Orthophosphat	0.084
86505	Milton Brook at lower bridge	no3	2	Nitrate-N	3.346
86505	Milton Brook at lower bridge	po4	0.02	Orthophosphat	0.026
120660	Milton raw water	no3	0.5	Nitrate-N	1.966
120660	Milton raw water	po4	0.02	Orthophosphat	0.031