

## Ouseburn - examples of data in the Ouseburn evidence pack

	Graph or chart description	Examples of “call-out box” conclusions that chart illustrates	Illustration
1.	<p>A local issues map - the reach in close-up with a lot more of the GIS layers printed. An example of the base map. The local sewer mapping was included at the workshops but it cannot be shared publicly, so has been removed here.</p> <p>Source of original data: Environment Agency, Northumbrian Water &amp; Natural England</p>	<p><i>No call out boxes on this map</i></p>	<p>1a Base Map</p> <p>Legend</p> <ul style="list-style-type: none"> <li>DischargeConsents_Sewage <ul style="list-style-type: none"> <li>CSO_WCo</li> <li>STW_WCo</li> <li>STW_Private</li> <li>PStation_WCo+Private</li> </ul> </li> <li>NIRS <ul style="list-style-type: none"> <li>NIRS_Prem2_Airport</li> <li>NIRS_Poll1_AgricMaterials</li> <li>Carcasses</li> <li>Slurry &amp; Dilute Slurry</li> <li>NIRS_Poll1_SewMaterials_reach</li> <li>Crude Sewage</li> <li>Final Effluent</li> <li>Grey Water</li> <li>Other Sewage Material</li> <li>Storm Sewage</li> </ul> </li> <li>Landfill Sites <ul style="list-style-type: none"> <li>Authorised</li> <li>Historic</li> </ul> </li> <li>Sewers <ul style="list-style-type: none"> <li>P sample points</li> <li>WQ Logger_2010_11</li> <li>Main_WIMS_WQ_MPs</li> </ul> </li> <li>Sewers <ul style="list-style-type: none"> <li>Polluted SW Outfalls</li> <li>CSOs_NWL</li> <li>SEWERS Ouseburn_CSOs</li> <li>CSO Overflow</li> </ul> </li> <li>Water Body &amp; Rivers <ul style="list-style-type: none"> <li>Ouseburn_WB_SplitByReach</li> <li>Main River</li> <li>DRN_v3</li> </ul> </li> </ul> <p>© Crown Copyright and database right 2016. Ordnance Survey WU298506</p>

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2.	<p>A land use map - based on information from Land Cover Mapping. An example of the land use map. The local sewer mapping was included at the workshops but it cannot be shared publicly, so has been removed here.</p> <p>Source of original data: Environment Agency, Northumbrian Water, Natural England &amp; CaBA GIS</p>	<p><i>“88% of the land in this reach is agricultural. This is the most rural out of all the reaches”</i></p> <p><i>“This reach has the following main land uses: 55% arable and horticultural; 25% improved grassland; 15% urban”</i></p>	<p><b>1b Land Use Map</b></p> <p>1:35,000</p> <p>© Crown Copyright and database right 2016. Ordnance Survey WU298506</p> <p><b>Legend</b></p> <p><b>DischargeConsents_Sewage</b></p> <ul style="list-style-type: none"> <li>CSO_WCo</li> <li>STW_WCo</li> <li>STW_Private</li> <li>PStation_WCo+Private</li> </ul> <p><b>NIRS</b></p> <ul style="list-style-type: none"> <li>NIRS_Prem2_Airport</li> <li>NIRS_Poll1_AgricMaterials</li> <li>Carcasses</li> <li>Slurry &amp; Dilute Slurry</li> <li>NIRS_Poll1_SewMaterials_reach</li> <li>Crude Sewage</li> <li>Final Effluent</li> <li>Grey Water</li> <li>Other Sewage Material</li> <li>Storm Sewage</li> </ul> <p><b>Landfill Sites</b></p> <ul style="list-style-type: none"> <li>Authorised</li> <li>Historic</li> <li>P sample points</li> <li>WQ Logger_2010_11</li> <li>Main_WIMS_WQ_MPs</li> </ul> <p><b>Sewers</b></p> <ul style="list-style-type: none"> <li>Polluted SW Outfalls</li> <li>CSOs_NWL</li> </ul> <p><b>SEWERS Ouseburn_CSOs</b></p> <ul style="list-style-type: none"> <li>CSO Overflow</li> </ul> <p><b>Land Cover Map_ByReach</b></p> <ul style="list-style-type: none"> <li>Arable and horticulture</li> <li>Broad leaved, mixed and yew woodland</li> <li>Coniferous woodland</li> <li>Dwarf shrub heath</li> <li>Freshwater</li> <li>Improved grassland</li> <li>Inland rock</li> <li>Neutral grassland</li> <li>Rough low-productivity grassland</li> </ul>



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3.	<p>A chart of concentrations of 4 pieces of water quality data: Dissolved Oxygen saturation, Biochemical Oxygen Demand, Ammonia and Annual Average Orthophosphate, plotted over time.</p> <p>This topic was actually split down into two graphs, the second one restricting itself to just the last 5 years which is likely to be of more interest to the stakeholders.</p> <p>Source of original data: Environment Agency</p>	<p><i>"There have been some improvements since the 1990s but this could be either improvements in agricultural inputs and / or urban or sewage sources" or, "Significant reduction in ammonia in the 1990s related to improvements at the airport mean the contribution from the airport to downstream reaches is no longer a threat."</i></p>	

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4.	<p>The same 4 pieces of water quality data, but this time expressed as either</p> <ul style="list-style-type: none"> <li>- A percentile of the previous 12 months or</li> <li>- A rolling annual average</li> </ul> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p><i>“Significant reduction in ammonia in the 1990s related to improvements at the airport. This means that the contribution from the airport to the downstream reaches is no longer a threat”, or, “orthophosphate has decreased slightly in concentration since ~2010”</i></p>	<p><b>Ouseburn at &lt;place name&gt;</b></p> <p>Legend:</p> <ul style="list-style-type: none"> <li>10%ile DO %Sat</li> <li>90%ile BOD (5ATU)</li> <li>90%ile NH4-N</li> <li>Ann Av PO4</li> </ul> <p>Y-axes:</p> <ul style="list-style-type: none"> <li>Left: DO Saturation (%), BOD 5ATU &amp; No of Taxa</li> <li>Right: <math>\text{NH}_4\text{-N}</math> (mg/l) &amp; Ortho-<math>\text{PO}_4</math> (mg/l P)</li> </ul> <p>X-axis: Date (01/01/1970 to 01/01/2010)</p>

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5.	Three data sources matched to WFD status over time. The data sources are: Dissolved Oxygen, Ammoniacal Nitrogen and Orthophosphate. Some reaches also included a fourth data source: number of taxa (invertebrates). Levels were scored 1-5 according to WFD status (1=bad, 5=high). A fourth line on the graph is the combined score of the 3 water quality parameters.	<i>There has been an improvement but orthophosphate status is currently moderate and ammoniacal nitrogen has been moderate or poor" or, "Since the airport improvements, the main problem is poor-moderate status orthophosphate."</i>	<div><p><b>Ouseburn at &lt;insert location&gt;</b></p><p>There has been an improvement but orthophosphate status is currently moderate and ammoniacal nitrogen has been moderate or poor.</p></div> <table border="1"><thead><tr><th>Date</th><th>DO WFD Score</th><th>NH4-N WFD Score</th><th>oPO4 WFD Score</th><th>Combined Score</th></tr></thead><tbody><tr><td>01/01/2010</td><td>1</td><td>4</td><td>2</td><td>7</td></tr><tr><td>01/01/2011</td><td>1</td><td>4</td><td>2</td><td>7</td></tr><tr><td>01/01/2012</td><td>1</td><td>4</td><td>2</td><td>7</td></tr><tr><td>01/01/2013</td><td>5</td><td>4</td><td>3</td><td>12</td></tr><tr><td>01/01/2014</td><td>5</td><td>4</td><td>3</td><td>12</td></tr><tr><td>01/01/2015</td><td>5</td><td>4</td><td>3</td><td>12</td></tr></tbody></table>	Date	DO WFD Score	NH4-N WFD Score	oPO4 WFD Score	Combined Score	01/01/2010	1	4	2	7	01/01/2011	1	4	2	7	01/01/2012	1	4	2	7	01/01/2013	5	4	3	12	01/01/2014	5	4	3	12	01/01/2015	5	4	3	12
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6.	<p>A SAGIS 'stacked' chart, for all the reaches. SAGIS annual loads were converted into concentrations by dividing by estimated mean flow for that reach / location. The graph also includes average measured phosphate at mean flows, and other WIMS data at two different flow conditions.</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p><i>“There is a large shortfall between measured orthophosphate and the SAGIS predictions.”</i></p> <p><i>Also, “SAGIS suggests that rural inputs alone would only lead to borderline ‘good’ WFD status in the upper reaches”.</i></p>	<p><b>Ouseburn   SAGIS Diffuse Orthophosphate Predictions</b></p> <p>Annual Average Orthophosphate (0180) (mg/l)</p> <p>Legend:</p> <ul style="list-style-type: none"> <li>Urban Runoff</li> <li>STWs (Not SAGIS)</li> <li>Septic Tanks</li> <li>Livestock</li> <li>Arable</li> <li>WIMS 2010-2014 Average</li> <li>WIMS 2010-2014 (Av. at 50%ile to Mean Flows)</li> <li>Av. Measured Rural P at Mean Flows</li> <li>WIMS UJS Walbottle PS</li> <li>Moderate WFD Status</li> <li>Good WFD Status</li> </ul> <p>Note: SAGIS annual loads have been converted into concentrations by dividing by estimated mean flow per km<sup>2</sup></p> <p>Compared to at &lt;place names&gt;, there is a smaller shortfall between measured orthophosphate and that predicted by SAGIS for rural (agricultural and septic tanks). Rural STWs are part but not all of the difference.</p> <p>[+] SAGIS suggests “rural” inputs alone would lead to only borderline “Good” WFD Status in upper 3 reaches.</p> <p>[-] WQ (oPO<sub>4</sub>) improves between &lt;place names&gt; suggests sewage (non rural, non STW) input is relatively small in this reach.</p>



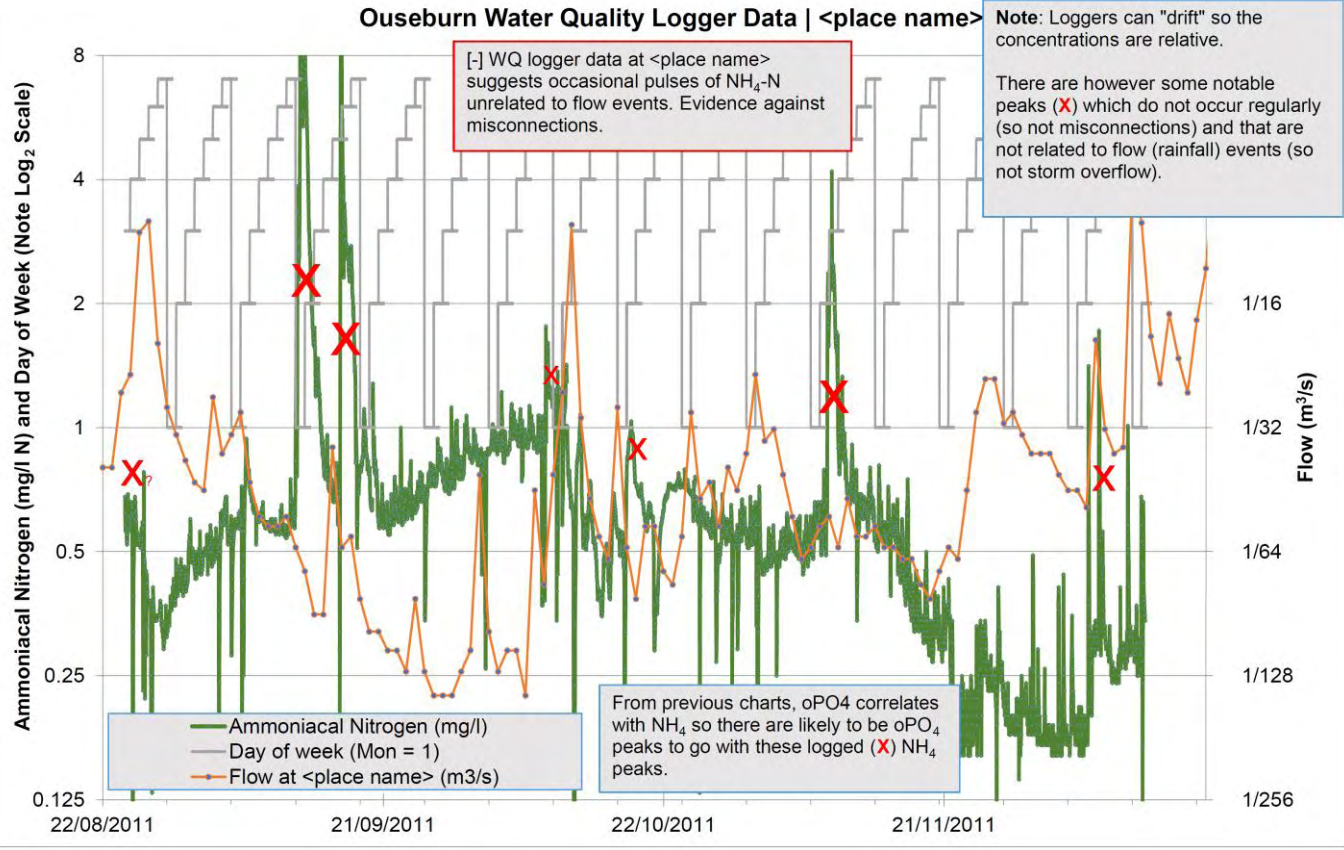
	Graph or chart description	Examples of “call-out box” conclusions that chart illustrates	Illustration
7.	<p>Another SAGIS 'stacked' chart for all the reaches, but this one cumulative load instead of annual average orthophosphate concentration. The 'measured' orthophosphate load is the product of the measured concentration and the estimated flow for that location when sampling took place</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p><i>The shortfall between predicted and 'measured' orthophosphate is 70-90kg/yr. The most likely other source is sewage. This equates to sewage from approx 75 properties" or, "in terms of loading, the data at this location point towards extra sewage loading in this reach."</i></p>	<p><b>Ouseburn   SAGIS Diffuse Orthophosphate Predictions</b></p> <p>Legend:</p> <ul style="list-style-type: none"> <li>Urban Runoff</li> <li>STWs</li> <li>Septic Tanks</li> <li>Livestock</li> <li>Arable</li> <li>WIMS 2010-2014 Average</li> <li>WIMS 2010-2014 (Av. at 50%ile to Mean Flows)</li> </ul> <p>Note: Measured concentrations have been converted into loads by multiplying by measured or estimated mean flows.</p> <p>There is a shortfall between measured orthophosphate and that predicted by SAGIS for rural (agricultural and septic tanks) and our estimates for STWs. The shortfall is smaller than at &lt;place name&gt;. The SAGIS "Urban Runoff" has lots of uncertainty.</p> <p>[...] The shortfall in oPO<sub>4</sub> cumulative load at &lt;place name&gt; is smaller than at &lt;place name&gt;. As the shortfall at &lt;place name&gt; must be preserved (conservation of mass), this suggests rural inputs in this reach are less than predicted by SAGIS, and sewage inputs are minor. (Note there is 9% woodland in this reach).</p> <p>Cumulative Orthophosphate Load (kg/year)</p> <p>Upstream of top monitoring point    As far as place name    As far as another place name    As far as another place name    As far as another place name    As far as another place name</p>

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8.	<p>A graph of downstream changes in orthophosphate concentration under different flows, for all the reaches. The orthophosphate readings at 6 different flow rate percentiles are plotted, concentrating on the last 5-6 years.</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p><i>"Orthophosphate concentrations increase between these two locations at a range of flows" or, "concentrations increase at mid/low at very high flows at this location, but this does not indicate the source of those inputs."</i></p>	<p><b>Ouseburn   Downstream Changes in Orthophosphate under Different Flows</b></p> <p>Average Orthophosphate (mg/l P) in Flow Range</p> <p>Flow at &lt;place name&gt; (m<sup>3</sup>/s)</p> <ul style="list-style-type: none"> <li>≤95%ile (0.029)</li> <li>95%ile to 70%ile (0.029 to 0.07)</li> <li>70%ile to 50%ile (0.07 to 0.128)</li> <li>50%ile to Mean (0.128 to 0.324)</li> <li>Mean to 10%ile (0.324 to 0.713)</li> <li>&gt;10%ile (0.713)</li> </ul> <p>oPO<sub>4</sub> concentrations increase between the upstream of &lt;place name&gt; to &lt;place name&gt; sites at a range of different flows.</p> <p>Start Date: 17/07/2009 End Date: 16/07/2014</p> <p>Upstream of top monitoring point    As far as place name    As far as another place name    As far as another place name    As far as another place name    As far as another place name    As far as another place name</p>
<p>This kind of chart tells us whether water quality at different places is better or worse at low flows or high flows. It helps us work out the possible source e.g. misconnections (a low flow problem), storm sewer overflow capacity or agricultural runoff (a high flow problem)</p>			



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9.	<p>The same graph, but this time for ammoniacal nitrogen.</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p><i>"Ammoniacal nitrogen concentrations increase upstream from this location at a range of different flows apart from at low flows."</i></p>	

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10.	<p>A logarithmic scattergram plotting all the orthophosphate data against type of nitrogen (ammoniacal nitrogen as N and nitrate as N and calculated total inorganic nitrogen).</p> <p>Note - not all the reaches had this scattergram.</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p><i>"Orthophosphate has a visually strong correlation with ammoniacal nitrogen but little if any correlation with nitrate. This suggests a sewage or livestock / slurry source."</i></p>	

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11.	<p>Water quality logger data (for 3-4 months in 2011 when one was in place) for ammoniacal nitrogen. This chart also included days of the week (looking for a possible 'wrong connections' pattern linked to weekday / weekends differences) and flow.</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p><i>“There are some notable peaks marked with a red cross which do not occur regularly (so not misconnections) and that are not related to flow (rainfall) events (so are not storm overflow)”</i></p> <p><i>or, “notable peaks do not occur regularly and are not linked to rainfall events / storm overflow.”</i></p>	 <p><b>Ouseburn Water Quality Logger Data   &lt;place name&gt;</b></p> <p>[-] WQ logger data at &lt;place name&gt; suggests occasional pulses of <math>\text{NH}_4\text{-N}</math> unrelated to flow events. Evidence against misconnections.</p> <p>Note: Loggers can “drift” so the concentrations are relative.</p> <p>There are however some notable peaks (X) which do not occur regularly (so not misconnections) and that are not related to flow (rainfall) events (so not storm overflow).</p> <p>Ammoniacal Nitrogen (mg/l N) and Day of Week (Note Log<sub>2</sub> Scale)</p> <p>Ammoniacal Nitrogen (mg/l) Day of week (Mon = 1) Flow at &lt;place name&gt; (m<sup>3</sup>/s)</p> <p>From previous charts, oPO<sub>4</sub> correlates with <math>\text{NH}_4</math> so there are likely to be oPO<sub>4</sub> peaks to go with these logged (X) <math>\text{NH}_4</math> peaks.</p>
<p>Note – some reaches had an additional graph to follow this one, to zoom into a time period if relevant, to investigate frequent spikes.</p>			



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12.	<p>A scattergram to look at concentrations of orthophosphate compared with a change in Total Inorganic Nitrogen between two locations.</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p><i>“Concentrations generally decrease implying if there is an additional sewage source it has less of an effect than at &lt;other place&gt;”</i></p>	

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13.	<p>A logarithmic scattergram comparing orthophosphate and flow.</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p><i>“Orthophosphate concentrations increase with decreasing flow (dilution of background source) – but – there is also a component at higher flows (storm source).” - these two trends are highlighted on the graph with blue arrows</i></p>	<p><b>&lt;place name&gt; Orthophosphate</b></p> <p>At ~Mean Flows P = 0.05 to 0.11 mg/l (average ~0.08 to 0.09 mg/l)</p> <p>Legend:</p> <ul style="list-style-type: none"> <li>Field Survey Site 4 (trib name)</li> <li>Field Survey Site 5 (trib name)*</li> <li>Field Survey Site 6 (trib name)*</li> <li>Field Survey Site 26 (trib name)</li> <li>&lt;place name&gt; (2010-2014)</li> <li>&lt;place name&gt; (Av. for Flow Range)</li> <li>&lt;place name&gt; Flow Stats</li> </ul> <p>*Field Survey (EA) in Nov 2011 and May 2012 (see map for locations)</p> <p>[0] Trib from &lt;location&gt;, with its 4 surface water outfalls has high P at low flows. But possible sewage signature cannot be separated from agricultural and golf course signal.</p> <p>Orthophosphate concentrations increase with decreasing flow (dilution of background source), but there is also a component at higher flows (storm source). This appears to be a more dilute signal of the &lt;place x&gt; source - see next slide.</p> <p>Flow at &lt;place name&gt; (m³/s) (Log<sub>10</sub> scale)</p> <p>Orthophosphate (0180 or "Lab P") (mg/l P)</p> <p>95%ile 70%ile 50%ile Mean 10%ile</p>
<p>Note – some reaches followed this with a similar logarithmic scattergram for Ammoniacal Nitrogen against flow – which could illustrate evidence for partially blocked sewers which don’t discharge under very low flows and are flushed at high flows</p>			

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14.	<p>A logarithmic scattergram to compare Total Oxidised Nitrogen with flow.</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p><i>“There is an increase in total oxidised nitrogen with increasing flow. This suggests a runoff source for nitrate. It appears the orthophosphate is a background source (present at higher concentrations at low flows) which is being diluted by higher nitrate flows” and, “as orthophosphate decreases in concentration with increasing nitrogen concentration increase with flow, this suggests agricultural runoff is causing dilution of upstream orthophosphate in this reach”</i></p>	<p><b>Ouseburn   &lt;place name&gt; TON v Flow</b></p> <p>• &lt;place name&gt; logger location (2010-2014) ◇ &lt;place name&gt; Flow Stats</p> <p>This increase in total oxidised nitrogen (mainly nitrate) with increasing flow suggests a runoff source for nitrate and helps to explain the orthophosphate / nitrate relationship on chart 3a. That is, it appears the orthophosphate is a background source (so present at higher concentrations at low flows) which is diluted by higher nitrate higher flows.</p> <p>[–] As oPO<sub>4</sub> decreases in concentration with increasing NO<sub>3</sub>, and NO<sub>2</sub> concentrations increase with flow, this suggests agricultural runoff is causing dilution of upstream oPO<sub>4</sub> in this reach.</p>



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15.	<p>NIRS data - by category and number of water impact incidents - for each reach.</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p>“8 sewage NIRS events, half were category 3 and half were category 4.”</p>	<table border="1"><caption>Ouseburn NIRS (June 2001- July 2014)   by Pollutant Type   Reach &lt;insert number&gt;</caption><thead><tr><th>Pollutant Type</th><th>Category 1s</th><th>Category 2s</th><th>Category 3s</th><th>Category 4s</th><th>Total</th></tr></thead><tbody><tr><td>Agricultural Materials &amp; Wastes</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Contaminated Water</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>Gen. Biodegr. Materials &amp; Wastes</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Inert Materials &amp; Wastes</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>Inorganic Chemicals/Products</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>Oils and Fuel</td><td>0</td><td>0</td><td>1</td><td>4</td><td>5</td></tr><tr><td>Organic Chemicals/Products</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>Other Pollutant</td><td>0</td><td>0</td><td>0</td><td>2</td><td>2</td></tr><tr><td>Pollutant Not Identified</td><td>0</td><td>0</td><td>5</td><td>0</td><td>5</td></tr><tr><td>Sewage Materials</td><td>0</td><td>0</td><td>4</td><td>4</td><td>8</td></tr><tr><td>Specific Waste Materials</td><td>0</td><td>0</td><td>0</td><td>3</td><td>3</td></tr></tbody></table>	Pollutant Type	Category 1s	Category 2s	Category 3s	Category 4s	Total	Agricultural Materials & Wastes	0	0	0	0	0	Contaminated Water	0	0	1	0	1	Gen. Biodegr. Materials & Wastes	0	0	0	0	0	Inert Materials & Wastes	0	0	0	1	1	Inorganic Chemicals/Products	0	0	0	1	1	Oils and Fuel	0	0	1	4	5	Organic Chemicals/Products	0	0	1	0	1	Other Pollutant	0	0	0	2	2	Pollutant Not Identified	0	0	5	0	5	Sewage Materials	0	0	4	4	8	Specific Waste Materials	0	0	0	3	3
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Organic Chemicals/Products	0	0	1	0	1																																																																						
Other Pollutant	0	0	0	2	2																																																																						
Pollutant Not Identified	0	0	5	0	5																																																																						
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Specific Waste Materials	0	0	0	3	3																																																																						

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16.	<p>More NIRS data – this time by pollutant and by reach. This is for the number NIRS category 1-3 incidents. Not every reach had this graph printed in the pack</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p><i>“The incident here relates to crude sewage rather than grey water”, or “compared to other reaches there have been a moderate number of sewage events in this reach”, or “category 1-3 incidents are few in number compared to many other reaches”</i></p>	<div><p><b>Ouseburn Sewage NIRS (2001-14)   by Pollutant and by Reach</b></p><p>The chart displays the number of NIRS Category 1-3 Water Pollution Incidents (No) for various pollutants across different reaches. The pollutants are Storm Sewage (blue), Other Sewage Material (yellow), Grey Water (light grey), Final Effluent (dark grey), and Crude Sewage (green). The reaches are listed on the x-axis with their respective areas in km2. The y-axis represents the number of incidents, ranging from 0 to 25.</p><table><thead><tr><th>Reach</th><th>Area (km2)</th><th>Crude Sewage</th><th>Final Effluent</th><th>Grey Water</th><th>Other Sewage Material</th><th>Storm Sewage</th><th>Total</th></tr></thead><tbody><tr><td>Upstream of top monitoring point</td><td>2.75</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>As far as place name</td><td>8.35</td><td>5</td><td>0</td><td>0</td><td>0</td><td>1</td><td>6</td></tr><tr><td>As far as another place name</td><td>6.6</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>2</td></tr><tr><td>As far as another place name</td><td>12.16</td><td>6</td><td>2</td><td>1</td><td>1</td><td>1</td><td>11</td></tr><tr><td>As far as another place name</td><td>26.76</td><td>10</td><td>2</td><td>5</td><td>4</td><td>2</td><td>23</td></tr><tr><td>As far as another place name</td><td>4.3</td><td>3</td><td>0</td><td>0</td><td>0</td><td>1</td><td>4</td></tr><tr><td>As far as another place name</td><td>0.66</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>2</td></tr></tbody></table><p>[-] Category 1 to 3 sewage pollution incidents are few in number compared to many other reaches.</p></div>	Reach	Area (km2)	Crude Sewage	Final Effluent	Grey Water	Other Sewage Material	Storm Sewage	Total	Upstream of top monitoring point	2.75	1	0	0	0	0	1	As far as place name	8.35	5	0	0	0	1	6	As far as another place name	6.6	1	0	1	0	0	2	As far as another place name	12.16	6	2	1	1	1	11	As far as another place name	26.76	10	2	5	4	2	23	As far as another place name	4.3	3	0	0	0	1	4	As far as another place name	0.66	1	0	0	1	0	2
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17.	<p>More NIRS data but this time by year instead of by category.</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p><i>“Crude sewage pollution is an intermittent but ongoing problem” or, “Grey water pollution has been recorded here in 2002, 2003 and 2007.”</i></p>	<div><h3>Ouseburn Sewage NIRS   by Pollutant and by Year   Reach &lt;number&gt;</h3><p>The chart displays the number of water pollution incidents (Category 1-4) by year from 2001 to 2014. The y-axis represents the number of incidents (0 to 10), and the x-axis represents the year. The legend identifies five categories: Storm Sewage (blue), Other Sewage Material (yellow), Grey Water (light grey), Final Effluent (dark grey), and Crude Sewage (green). The data is as follows:</p><table><thead><tr><th>Year</th><th>Crude Sewage</th><th>Final Effluent</th><th>Grey Water</th><th>Other Sewage Material</th><th>Storm Sewage</th><th>Total</th></tr></thead><tbody><tr><td>2001</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>2</td></tr><tr><td>2002</td><td>0</td><td>0</td><td>2</td><td>0</td><td>0</td><td>2</td></tr><tr><td>2003</td><td>4</td><td>0</td><td>1</td><td>1</td><td>0</td><td>6</td></tr><tr><td>2004</td><td>2</td><td>1</td><td>0</td><td>0</td><td>1</td><td>4</td></tr><tr><td>2005</td><td>2</td><td>1</td><td>0</td><td>0</td><td>1</td><td>4</td></tr><tr><td>2006</td><td>2</td><td>1</td><td>0</td><td>1</td><td>1</td><td>5</td></tr><tr><td>2007</td><td>3</td><td>0</td><td>1</td><td>0</td><td>0</td><td>4</td></tr><tr><td>2008</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>2009</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>2</td></tr><tr><td>2010</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>2011</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>2012</td><td>3</td><td>0</td><td>0</td><td>0</td><td>0</td><td>3</td></tr><tr><td>2013</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>2014</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr></tbody></table><p>Callout boxes:</p><ul style="list-style-type: none"><li>[+] Crude sewage pollution has been recorded most years between 2001 and 2014.</li><li>[+] Grey water (misconnections) pollution has been recorded in 2002, 2003, 2007 and 2009.</li><li>[-] NIRS: Four storm sewage incidents but all between 2001 and 2006 and none since.</li></ul><p>Water Impact Categories 1 to 4</p></div>	Year	Crude Sewage	Final Effluent	Grey Water	Other Sewage Material	Storm Sewage	Total	2001	1	0	0	0	1	2	2002	0	0	2	0	0	2	2003	4	0	1	1	0	6	2004	2	1	0	0	1	4	2005	2	1	0	0	1	4	2006	2	1	0	1	1	5	2007	3	0	1	0	0	4	2008	0	0	0	0	0	0	2009	1	0	1	0	0	2	2010	0	0	0	0	0	0	2011	1	0	0	0	0	1	2012	3	0	0	0	0	3	2013	0	0	0	1	0	1	2014	0	0	0	1	0	1
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18.	<p>A closer look at sewage NIRS - compared to flow conditions.</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p>“Two sewage incidents are at CSOs, but at lower flows, implying misconnections or a blocked sewer or failed infrastructure” and “Four sewage incidents relate to foul sewer and rising main at a range of flows, implying blocked sewer or failed infrastructure”</p>	<p>The chart is a combined bar and line graph titled "Ouseburn Sewage NIRS   by Premises and by Flow   Reach &lt;number&gt;". The x-axis represents "Flow on the Ouseburn at &lt;place name&gt; (m³/s)" with categories: 1/64 to 1/32, 1/32 to 1/16, 1/16 to 1/8, 1/8 to 1/4, 1/4 to 1/2, 1/2 to 1, 1 to 2, 2 to 4, and 4 to 8. The left y-axis is "Number of Pollution Events June 2001 to July 2014" (0 to 7). The right y-axis is "Flow at &lt;place name&gt; as % of 1990-2013 record" (0 to 0.28). The legend includes: Unspecified Source (grey), Domestic &amp; Residential (yellow), Construction &amp; Demolition (light blue), Commercial &amp; Service Sector (green), Sewage Treatment Works (dark blue), Other Water Industry Premises (dark blue), Rising Main (grey), Foul Sewer (grey), PSOs (orange), CSOs (orange), Surface Water Outfalls (blue), and Flow at &lt;place name&gt; (yellow line). The bars show pollution events: 1 CSO event in the 1/32 to 1/16 range, 1 CSO and 1 Foul Sewer event in the 1/16 to 1/8 range, 1 Foul Sewer event in the 1/8 to 1/4 range, and 1 Foul Sewer event in the 1/2 to 1 range. The line shows flow percentage, peaking at ~0.24 in the 1/16 to 1/8 range. Two call-out boxes provide conclusions: one for CSOs at lower flows and one for Foul Sewer and Rising Main incidents across a range of flows.</p> <table border="1"><caption>Data extracted from the chart</caption><thead><tr><th>Flow Range (m³/s)</th><th>CSOs (Orange)</th><th>Foul Sewer (Grey)</th><th>Rising Main (Blue)</th><th>Flow at &lt;place name&gt; (%)</th></tr></thead><tbody><tr><td>1/64 to 1/32</td><td>0</td><td>0</td><td>0</td><td>~0.04</td></tr><tr><td>1/32 to 1/16</td><td>1</td><td>1</td><td>0</td><td>~0.20</td></tr><tr><td>1/16 to 1/8</td><td>1</td><td>1</td><td>1</td><td>~0.24</td></tr><tr><td>1/8 to 1/4</td><td>0</td><td>1</td><td>0</td><td>~0.23</td></tr><tr><td>1/4 to 1/2</td><td>0</td><td>0</td><td>0</td><td>~0.12</td></tr><tr><td>1/2 to 1</td><td>0</td><td>1</td><td>0</td><td>~0.08</td></tr><tr><td>1 to 2</td><td>0</td><td>0</td><td>0</td><td>~0.04</td></tr><tr><td>2 to 4</td><td>0</td><td>0</td><td>0</td><td>~0.02</td></tr><tr><td>4 to 8</td><td>0</td><td>0</td><td>0</td><td>~0.01</td></tr></tbody></table>	Flow Range (m³/s)	CSOs (Orange)	Foul Sewer (Grey)	Rising Main (Blue)	Flow at <place name> (%)	1/64 to 1/32	0	0	0	~0.04	1/32 to 1/16	1	1	0	~0.20	1/16 to 1/8	1	1	1	~0.24	1/8 to 1/4	0	1	0	~0.23	1/4 to 1/2	0	0	0	~0.12	1/2 to 1	0	1	0	~0.08	1 to 2	0	0	0	~0.04	2 to 4	0	0	0	~0.02	4 to 8	0	0	0	~0.01
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19.	<p>Consents.</p> <p>Number of consented discharges by type, combining data from the Environment Agency and the Water Company.</p> <p>Source of original data: Environment Agency (but processed by project team)</p>		<div><p><b>Ouseburn Consented Discharges   Reach &lt;insert place name&gt;</b></p><p>Number of Consented Discharges</p><p>Legend: One data source (orange), Another data source (blue)</p><p>Callout boxes:</p><ul style="list-style-type: none"><li>[+] There is one septic tank / package treatment plant and one small sewage treatment works.</li><li>[0] There are between 2 and 4 CSOs.</li></ul><table><thead><tr><th>Discharge Type</th><th>Number of Consented Discharges</th><th>Data Source</th></tr></thead><tbody><tr><td>Air Transport</td><td>0</td><td>Another data source</td></tr><tr><td>Domestic Property (Multiple)</td><td>1</td><td>Another data source</td></tr><tr><td>STWs (non NWL)</td><td>1</td><td>Another data source</td></tr><tr><td>STWs (NWL)</td><td>0</td><td>Another data source</td></tr><tr><td>PSOs (non NWL)</td><td>0</td><td>Another data source</td></tr><tr><td>PSOs (NWL)</td><td>0</td><td>Another data source</td></tr><tr><td>CSOs (NWL)</td><td>2</td><td>Another data source</td></tr><tr><td>Trade (Unknown/Other)</td><td>0</td><td>Another data source</td></tr><tr><td>NWL CSOs</td><td>4</td><td>One data source</td></tr></tbody></table></div>	Discharge Type	Number of Consented Discharges	Data Source	Air Transport	0	Another data source	Domestic Property (Multiple)	1	Another data source	STWs (non NWL)	1	Another data source	STWs (NWL)	0	Another data source	PSOs (non NWL)	0	Another data source	PSOs (NWL)	0	Another data source	CSOs (NWL)	2	Another data source	Trade (Unknown/Other)	0	Another data source	NWL CSOs	4	One data source
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20.	<p>Estimated phosphate loading from small Sewage Treatment Works - again combining data - for all the reaches. This graph also had a line indicating cumulative loading.</p> <p>Source of original data: Environment Agency (but processed by project team)</p>	<p><i>“The sewage treatment works add a reasonably significant orthophosphate load, but this is already accounted for in the shortfall noted on the SAGIS plots”</i></p>	<p><b>Ouseburn Consented Discharges - Estimated P Loading from STWs</b></p> <p>P Loading calculated from average daily STW flow x 9 mg/l P in treated sewage effluent. (STW flow reported occasionally as dry weather flow [DWF], but mainly as maximum daily flow). Following formulae use for conversion: Average daily flow = 3xDWF/2.4 Average daily flow = maximum daily flow / 2.4.</p> <table border="1"> <thead> <tr> <th>Reach</th> <th>STWs (NWL) (kg/year)</th> <th>STWs (non NWL) (kg/year)</th> <th>Cumulative Loading (kg/year)</th> </tr> </thead> <tbody> <tr> <td>Upstream of top monitoring point (2.75 km<sup>2</sup>)</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>As far as place name (8.35 km<sup>2</sup>)</td> <td>6.8</td> <td>25.75</td> <td>32.55</td> </tr> <tr> <td>As far as another place name (6.6 km<sup>2</sup>)</td> <td>15.75</td> <td>0</td> <td>48.3</td> </tr> <tr> <td>As far as another place name (12.16 km<sup>2</sup>)</td> <td>2.05</td> <td>0</td> <td>50.35</td> </tr> <tr> <td>As far as another place name (26.76 km<sup>2</sup>)</td> <td>61.63</td> <td>6.16</td> <td>118.11</td> </tr> <tr> <td>As far as another place name (4.3 km<sup>2</sup>)</td> <td>0</td> <td>0</td> <td>118.11</td> </tr> <tr> <td>As far as another place name (0.66 km<sup>2</sup>)</td> <td>0</td> <td>0</td> <td>118.11</td> </tr> </tbody> </table> <p>[...] No STWs loading in this reach</p>	Reach	STWs (NWL) (kg/year)	STWs (non NWL) (kg/year)	Cumulative Loading (kg/year)	Upstream of top monitoring point (2.75 km <sup>2</sup> )	0	0	0	As far as place name (8.35 km <sup>2</sup> )	6.8	25.75	32.55	As far as another place name (6.6 km <sup>2</sup> )	15.75	0	48.3	As far as another place name (12.16 km <sup>2</sup> )	2.05	0	50.35	As far as another place name (26.76 km <sup>2</sup> )	61.63	6.16	118.11	As far as another place name (4.3 km <sup>2</sup> )	0	0	118.11	As far as another place name (0.66 km <sup>2</sup> )	0	0	118.11
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