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**Appendix 16.1**  
**Aquatic Field Survey Target**  
**Notes**

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## River Boyne

The proposed River Boyne crossing point, including the 500 m reach downstream, were surveyed on 19 March 2022. Field target notes are presented in **Table A16-1a**, corresponding to locations shown in **Figure A16.1a**, with accompanying images (**Image A16.1a**) from selected target points displayed below. **Table A16-1d** shows survey point co-ordinates.

**Table A16-1a: River Boyne Aquatic Survey Habitat Notes**

Survey Point	Habitat Notes - River Boyne (Figure A16.1a, Image A16.1a)
B1	Proposed crossing point ( <b>Image B1</b> ). Channel ~40 m wide with an area of low standing waves mid-channel. Substrates not visible owing to depth. Far bank, improved grassland; one low step followed by ~3 m high grassed embankment. RHS bank of damp meadow merging to river margin with 3-4 m wide sandy berm of <i>Glyceria maxima</i> (reed sweet grass), <i>Veronica</i> sp., <i>Phalaris</i> and yellow iris.
B2	Flood plain on the south bank of the crossing point is a damp meadow with low undulations running more or less parallel to the bank - possibly owing to the action of draining flood water. This area is the location of proposed central bridge pier foundations and is very waterlogged. One area ~6 m back from the bank ( <b>Image B2</b> ) forms a wet drain with <i>G. maxima</i> , creeping bent, <i>Phalaris</i> and <i>Ranunculus repens</i> . The LHS bank also has a fringe of <i>Iris</i> , <i>G. maxima</i> and <i>Phalaris</i> but is much narrower than the near (RHS) bank. The flood plain has a mix of grass, <i>Phalaris</i> , <i>R. repens</i> and <i>Iris</i> .
B3	Downstream end of survey reach ( <b>Image B3</b> ), opposite a linear island running parallel to the RHS bank. The south floodplain has <i>Veronica</i> sp., <i>G. maxima</i> and <i>Phalaris</i> at the river's edge. Fast, deep rippled water / standing waves present. Good salmonid water.
B4	Side channel with steep eroding banks, immediately below the weir close to the southern bank.
B5	Immediately d/s weir, RHS side ( <b>Image B5</b> ) Fast water between gaps in weir. Good salmonid water.
B6	Immediately u/s the weir, RHS bank, deep, almost laminar flow ( <b>Image B6</b> ). Good salmonid holding water in glide/pool u/s of weir.
B7	Narrow flood plain on RHS bank between main channel and towpath. Dominated by <i>Phalaris</i> , grass and <i>R. repens</i> . In-channel deep glide with occasional club-rush ( <i>Schoenoplectus lacustris</i> ).
B8	50m u/s crossing Some marginal <i>Phalaris</i> and <i>G. maxima</i> on sandy shoals close to bank, likely good lamprey nursery– similar on far bank. Fast glide in-channel.
B9	Upstream end of mid-channel island, dominated by <i>Phalaris</i> ( <b>Image B9</b> ).
B10	Beginning of standing waves in 'south' channel, very fast and turbulent.
B11	Fast glide ~1m+ deep on south channel inside mid-channel island ( <b>Image B11</b> ). RHS bank slightly undercut parallel to island. Less marginal vegetation and less nursery habitat for juvenile lamprey owing to scouring effect of faster flows.
B12	Downstream end of mid-channel island with <i>G. maxima</i> along water's edge. Fast glide. Good salmonid habitat. Willow on LHS banks.
B13	Downstream end of open bank walk (RHS), where the towpath comes close to the river. Diagonal weir has gaps; not presenting any barrier to fish or lamprey migration. Good salmonid holding water in glide/pool u/s weir. The back drain of the towpath in this area with <i>Veronica beccabunga</i> , <i>Phalaris</i> , Willow, <i>Myosotis scorpioides</i> and with <i>R. ficaria</i> , <i>Rumex</i> sp., and meadowsweet on drier ground closer to the towpath.
Canal	The canal is ~7-8 m wide at the proposed crossing point with no perceptible flow. In channel was dominated by <i>Phalaris</i> backed by <i>Iris</i> and <i>G. maxima</i> , with <i>Lemna minuta</i> (invasive) in open water. The immediate edge along the towpath is grassed and with woodland herbs. Ash and willow near crossing point centreline, with hedgerow of blackthorn, ash, willow and bramble along the northern edge of the towpath separating it from the back drain running along the riverside of the towpath.

**Key:** u/s: upstream; d/s: downstream; LHS: left-hand side; RHS: right-hand side.



**Figure A16.1a: River Boyne & Navigation Canal – Aquatic Survey Points**



**B1** – Proposed crossing point, River Boyne



**B2** – Wet floodplain / damp meadow adjacent proposed River Boyne crossing



**B9** – Mid-channel island, just d/s crossing



**B11** – view u/s across proposed crossing



**B13 – view upstream towards crossing**

**B5 – fast water around old weir**

**B6 -view u/s over old weir**

**B3 -view u/s from 500m d/s of crossing point**

**Canal back drain -view toward proposed crossing**

**Disused navigation canal – crossing point**

**Image A16.1a: River Boyne Survey Sites (19 March 2022)**

## Mattock (Mooretown) Stream

The proposed Mooretown Stream crossing point, including the 200m reach downstream and adjoining field drains, were surveyed on 19 March 2022. Field target notes are presented in **Table A16-1b**, corresponding to locations shown in **Figure A16.1b**, with accompanying images (**Image A16.1b**) from the Mooretown survey points below. **Table A16.1d** shows survey point co-ordinates.

**Table A16-1b: Mattock (Mooretown) Stream Aquatic Survey Habitat Notes**

Survey Point	Habitat Notes – Mooretown Stream (Figure A16.1b, Image A16.1b)
<b>M14</b>	Mooretown Stream main channel, ~200 m downstream from existing N2 crossing. Upstream reach from this point will be culverted/realigned. Very modified by drainage ( <b>Image M14</b> ) with tillage both banks.
<b>M15</b>	Upstream of existing N2 culvert ( <b>Image M15</b> ) - small stony stream (0.8-1 m wide, 5-10 cm deep) with silted berm along RHS side, dominated by <sup>1</sup> <i>Helosciadium nodiflorum</i> , <i>Glyceria maxima</i> and <i>Veronica beccabunga</i> . Substrate in riffles: 70% small cobble, 30% pebble. Silted margins. Moderate turbulent flow. LHS bank with blackthorn and bramble hedge, RHS bank open. Culvert/pipe underneath road with step down into culvert (probable fish barrier under low flow conditions).
<b>M16</b>	Macroinvertebrate kick sample site downstream from existing N2 culvert ( <b>Image M16</b> ). Macroinvertebrate fauna indicative of Q3 – ‘poor’ status. LHS bank steep, ~3 m high with ash, ivy, hawthorn, bramble and occasional elder. This continues along both banks in the first field east of the road and on RHS bank in the second field. Where the bank is open, Lesser celandine ( <i>Ranunculus ficaria</i> ) and nettle were noted along the channel edge. No in-stream vegetation. Flows comprise riffle, run and glide over silted substrates of cobble (60%), pebble (30%) and sand (10%). Small trout stream, suitable for spawning and nursery, although very tunnelled especially along the first field. Overall riffle and riffle/run covers 66% of stretch and shallow glide the remainder. A few small trout were observed in the channel. Some spawning substrates and silt deposits suitable for brook lamprey. Poor water quality, sedimentation and obvious signs of dredging reduces fisheries habitat quality.
<b>M17</b>	Moderate slope toward the stream from the south at this point, with tillage fields.
<b>M18</b>	Field drains adjoining Mooretown Stream ( <b>Image M18</b> ) - Southern hedge bank 2-3 m high with ash, ivy and bramble. Drain base with slick of standing water in places. No fisheries value, standing pools may support amphibians at times. A drain turns at right angles to the east-west drain here and ‘flows’ south toward the stream. <i>Ranunculus repens</i> and willowherb grow in the base.
<b>M19</b>	Same drain as at M18 but at the western end of the same field. Base of drain damp ( <b>Image M19</b> ). No fisheries value and low ecological significance overall.
<b>M20</b>	Dry field boundary drain running south from M19 to the Mooretown Stream ( <b>Image M20</b> ). No aquatic ecological value.

**Key:** u/s: upstream; d/s: downstream; LHS: left-hand side; RHS: right-hand side.

<sup>1</sup> Syn. *Apium nodiflorum*



**Figure A16.1b: Mattock (Mooretown) Stream – Aquatic Survey Points**



**M14** – Mooretown Stream view upstream from ~200m downstream of existing N2



**M15** – upstream of existing N2 crossing, leading down to existing N2 crossing



**M16** – macroinvertebrate kick sample site downstream of existing N2 crossing



**M18** – view west along drain crossed by proposed bypass. No fisheries value, low ecological value.



**M19** – base of drain that “flows” between N19-N18; damp, slick mud with no fisheries value.



**M20** – view north along dry field boundary drain towards Mooretown Stream

**Image A16.1b: Mattock (Mooretown) Stream Survey Sites (19 March 2022)**

## Thurstianstown Stream

Thurstianstown Stream was surveyed on 19 March 2022. This stream has a small headwater drain just west of the southern end of the proposed scheme, which may temporarily receive drainage during the construction phase. Field target notes are presented in **Table A16-1c**, corresponding to locations shown in **Figure A16.1c**, with accompanying images from the Thurstianstown study reaches below (**Image A16.1c**). **Table A16-1d** shows survey point co-ordinates.

**Table A16-2c: Thurstianstown Stream Aquatic Survey Habitat Notes**

Survey Point	Thurstianstown Stream (Figure A16.1c, Image A16.1c)
<b>T21</b>	~180 m upstream of road crossing, the stream forms a uniform glide with heavily silted substrate, ~2 m wide ( <b>Image T21</b> ). Heavily drained, deepened and widened. The habitat is unsuitable for trout, owing to predominantly slack flows and heavy siltation, with no suitable gravelly riffles. If trout were present, they would be in low numbers and foraging from other breeding sites (not this stream section). Good lamprey ammocoete habitat the species were able to spawn in the system, which is very unlikely owing to lack of suitable gravels and poor water quality.
<b>T22</b>	A heavily silted side drain ~1.5 m wide and 15 cm deep, joins the ‘main’ channel at this point ( <b>Image T22</b> ).
<b>T23</b>	‘Main’ channel of stream, forming a uniform silty glide. Both banks heavily shaded by sycamore, hawthorn and ivy. The stream lacks flow diversity and has no hard substrates. Very poor fisheries habitat, other than 3-spined stickleback perhaps, and eel. The land is flat to the east towards the receiving drain with the same silted glide persisting into its upper reaches.
<b>T24</b>	~200m downstream of the local road, where the first riffle occurs ( <b>Image T24</b> ). The stream had coarse substrates for a very short stretch (10m). ~1.5 m wide, 15-25 cm deep. Cascade/riffle over a substrate of angular cobble 60% and pebble 40%. No instream vegetation. Heavily shaded from banks with ivy, fern and sycamore. Macroinvertebrate fauna indicative of Q3 – ‘poor’ status.
<b>T25</b>	Straightened and deepened field boundary drain near existing N2, at location where proposed attenuation pond would discharge ( <b>Image T25</b> ). Trickle base-flow in drain, RHS hedge with ash, hawthorn, ivy and bramble; LHS grassed with herb species.

**Key:** u/s: upstream; d/s: downstream; LHS: left-hand side; RHS: right-hand side.



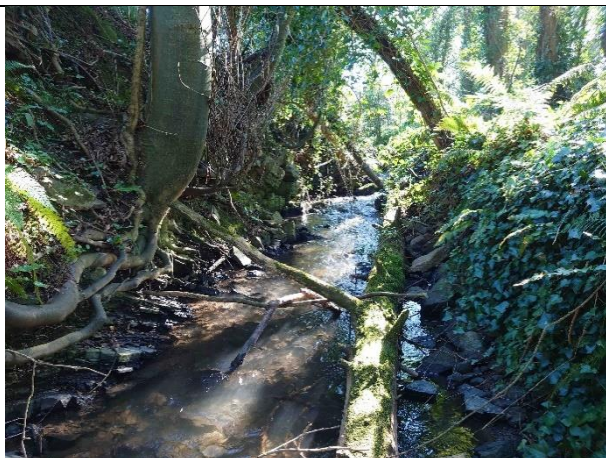
**Figure A16.1c: Thurstianstown Stream – Aquatic Survey Points**



**T21 – Thurstianstown Stream, typical silty glide habitat**



**T22 – heavily silted side drain adjoining Thurstianstown Stream**



**T24 – Thurstianstown Stream, view upstream over macroinvertebrate kick sample site**



**T25 – view west from proposed attenuation pond discharge point near existing N2; trickle flow in drain**

**Image A16.1c: Thurstianstown Stream Survey Sites (19 March 2022)**



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Table A16-1d: Aquatic Survey Site Co-ordinates

Watercourse	Survey Point	X (ITM)	Y (ITM)	Latitude	Longitude
Boyne	B1	696863	773323	53.700612	-6.533076
Boyne	B2	696861	773320	53.700585	-6.533107
Boyne	Canal	696852	773221	53.699701	-6.53327
Boyne	B3	697331	773096	53.698485	-6.526062
Boyne	B4	697251	773111	53.698635	-6.527268
Boyne	B5	697229	773118	53.698702	-6.527599
Boyne	B6	697194	773135	53.698861	-6.528124
Boyne	B7	697131	773166	53.699152	-6.529068
Boyne	B8	696831	773343	53.700797	-6.533554
Boyne	B9	696907	773291	53.700316	-6.53242
Boyne	B10	696929	773273	53.70015	-6.532092
Boyne	B11	696979	773244	53.69988	-6.531344
Boyne	B12	697050	773210	53.699562	-6.53028
Boyne	B13	697111	773179	53.699272	-6.529366
Mattock (Mooretown)	M14	697384	775266	53.71797	-6.524578
Mattock (Mooretown)	M15	697159	775343	53.718703	-6.527961
Mattock (Mooretown)	M16	697237	775302	53.71832	-6.526793
Mattock (Mooretown)	M17	697293	775221	53.717582	-6.52597
Mattock (Mooretown)	M18	697404	775095	53.71643	-6.524329
Mattock (Mooretown)	M19	697311	775087	53.716375	-6.525739
Mattock (Mooretown)	M20	697297	775091	53.716414	-6.52595
Thurstianstown	T21	695243	772438	53.692959	-6.557873
Thurstianstown	T22	695392	772401	53.6926	-6.555629
Thurstianstown	T23	695401	772402	53.692607	-6.555492
Thurstianstown	T24	694991	772653	53.694936	-6.561621
Thurstianstown	T25	696320	772126	53.689959	-6.541668