Date _____ Site No. _____ Time _____ Recorder's Name _____

River Name _____ Location _____

Weather _____ Rain in last week? Y [ ] N [ ]

Photograph numbers and details _____

Latitude: deg [ ][ ] min [ ][ ] sec [ ][ ] Longitude: deg [ ][ ][ ] min [ ][ ] sec [ ][ ]

GPS Name and Datum _____

PLANFORM SKETCH OF SITE

Including bedform types, location of cross-sections, access points, landmarks and natural or artificial channel or floodplain features.
Left bank is facing downstream.

LENGTH OF SAMPLING SITE

Bankfull width _____ (m)

x 10

Length of sampling site _____ (m)

Notes

_____

_____

_____

_____

_____

_____

_____

BEFORE LEAVING THE SITE, CHECK DATA SHEETS TO ENSURE THAT ALL VARIABLES HAVE BEEN RECORDED [ ] **Y**

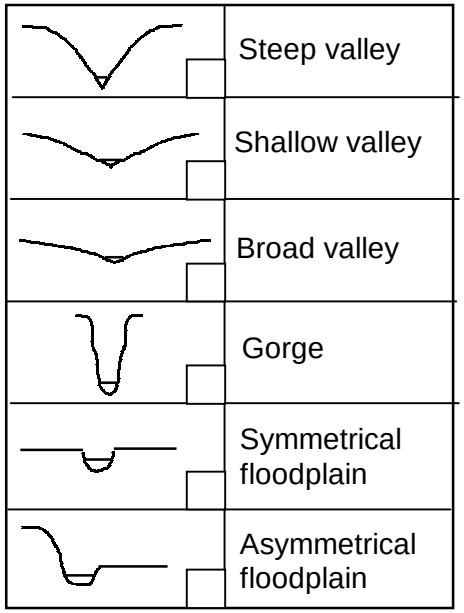
Acknowledgments - The content and layout of these data sheets are derived from the sheets used in the River Habitat Audit Procedure (Anderson, 1993a), AUSRIVAS, the Index of Stream Condition (Ladson and White, 1999 and DNRE Victoria) and the River Habitat Survey (Raven *et al.*, 1998).

BASIC WATER CHEMISTRY

		Units
Temperature	_____	°c
Conductivity	_____	_____
Dissolved Oxygen	_____	mg l^{-1}
Dissolved Oxygen Sat.	_____	%
pH	_____	
Turbidity	_____	_____
Total phosphorus ☐ Water sample taken?	_____	_____
Total nitrogen ☐ Water sample taken?	_____	_____
ALKALINITY		
Amount of water	_____	ml
Amount of H_2SO_4	_____	ml
Alkalinity	_____	mg l^{-1}

Valley shape

Choose one category only



Local impacts on streams

Choose one or more categories and describe the detail of each

- ☐ Sand or gravel mining
- ☐ Other mining
- ☐ Road
- ☐ Bridge / culvert / wharf
- ☐ Ford / ramp
- ☐ Discharge pipe
- ☐ Forestry activities
- ☐ Sugar mill
- ☐ Irrigation run-off or pipe outlet
- ☐ Sewage effluent
- ☐ Channel straightening
- ☐ River improvement works
- ☐ Water extraction
- ☐ Dredging
- ☐ Grazing
- ☐ Litter
- ☐ Recreation
- ☐ Other

Description _____

_____

_____

Floodplain width _____ _____ _____ Average _____ (m)

Floodplain features

Choose one or more features when present

- ☐ Sampling site has no distinct floodplain
- ☐ Oxbows / billabongs
  Body of water occupying a former river meander, isolated by a shift in the stream channel
- ☐ Remnant channels
  Formed during a previous hydrological regime. May be infilled with sediment
- ☐ Flood channels
  A channel that distributes water onto the floodplain and off the floodplain during floods
- ☐ Scroll systems
  Short, crescentic strips or patches formed along the inner bank of a stream meander
- ☐ Splays
  Small alluvial fan formed where an overloaded stream breaks through a levee and deposits material on the floodplain
- ☐ Floodplain scours
  Scour holes formed by the concentrated clearing and digging action of flowing water
- ☐ No floodplain features present
  Floodplain present at the sampling site but does not contain any of the above features

Local landuse

Choose one category for each bank

Left	Right	
☐	☐	Native forest
☐	☐	Native grassland (not grazed)
☐	☐	Grazing (native or non-native pasture)
☐	☐	Exotic grassland (lawns etc., no grazing)
☐	☐	Forestry Native [ ] [ ] Pine [ ] [ ]
☐	☐	Cropped Rainfed [ ] [ ] Irrigated [ ] [ ]
☐	☐	Urban residential
☐	☐	Commercial
☐	☐	Industrial or intensive agricultural
☐	☐	Recreation
☐	☐	Other _____

Riparian zone composition

Assess for whole sampling site

	% Cover	Vegetation Description
Trees (>10m in height)		
Trees (<10m in height)		
Shrubs		
Grasses / ferns / sedges		

May total more than 100%

Shading of channel

☐ < 5% ☐ 6 – 25% ☐ 26 – 50% ☐ 51 – 75% ☐ > 76%

Extent of trailing bank vegetation

☐ nil ☐ moderate

☐ slight ☐ extensive

Native and exotic riparian vegetation

% Native _____

% Exotic _____

Total 100%

Longitudinal extent of riparian vegetation

Choose one category for each bank. Do not include ground layer except where site is in native grassland.

	Left bank	Right bank
None	☐	☐
Isolated / scattered	☐	☐
Regularly spaced	☐	☐
Occasional clumps	☐	☐
Semi-continuous	☐	☐
Continuous	☐	☐

Regeneration of native woody vegetation

Is the sampling site in undisturbed forest?

Y [ ] N [ ]

If no, record regeneration category

☐ Abundant (>5% cover) and healthy

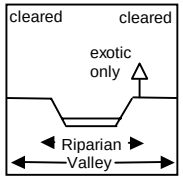
☐ Present

☐ Very limited (<1% cover)

Overall vegetation disturbance rating

Choose one category only. Sites with valley vegetation cleared on BOTH sides, but with riparian vegetation in good condition should be scored in the high disturbance category. Words within the drawings summarise the detailed text about the state of the riparian and valley vegetation for each category.

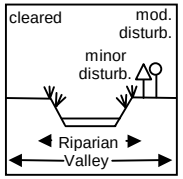
Extreme disturbance ☐



Riparian vegetation – absent or severely reduced. Vegetation is extremely disturbed (ie. dominated by exotic species with native species rare or completely absent)

Valley vegetation – agriculture and/or cleared land BOTH sides. Plants present are virtually all exotic species (willows, pines etc.)

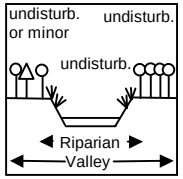
High disturbance ☐



Riparian vegetation – moderately disturbed by stock or through the intrusion of exotic species, although some native species remain

Valley vegetation – agriculture and/or cleared land ONE side, native vegetation on the other side clearly disturbed or with a high percentage of introduced species present

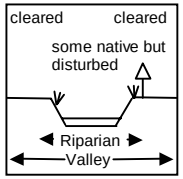
Low disturbance ☐



Riparian vegetation – native vegetation present on BOTH sides of the river and in relatively good condition with few exotic species present. Any disturbance present is relatively minor.

Valley vegetation – native vegetation present on BOTH sides of the river, with a virtually intact canopy and few exotic species

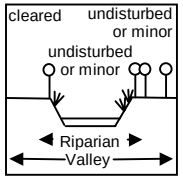
Very high disturbance ☐



Riparian vegetation – some native vegetation present, but it is severely modified BOTH sides by grazing or the intrusion of exotic species. Native species severely reduced in number and cover.

Valley vegetation – agriculture and/or cleared land BOTH sides. Plants present are virtually all exotic species (willows, pines etc.)

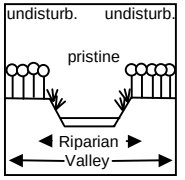
Moderate disturbance ☐



Riparian vegetation – native vegetation on BOTH sides with canopy intact or with native species widespread and common in the riparian zone. The intrusion of exotic species is minor and of moderate

Valley vegetation – agriculture and/or cleared land on ONE side, native vegetation on the other in reasonably undisturbed state

Very low disturbance ☐

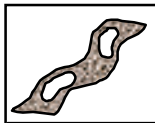


Riparian vegetation – native vegetation present on BOTH sides of the river and in an undisturbed state. Exotic species are absent or rare. Representative of natural vegetation in excellent condition

Valley vegetation – native vegetation present on BOTH sides of the river with an intact canopy. Exotic species are absent or rare. Representative of natural vegetation in excellent condition

Physical barriers to local fish passage

Choose one category for each flow condition

	Base flow	Low flow	High flow
 No passage	☐	☐	☐
 Very restricted passage	☐	☐	☐
 Moderately restricted passage	☐	☐	☐
 Partly restricted passage	☐	☐	☐
 Good passage	☐	☐	☐
 Unrestricted passage	☐	☐	☐

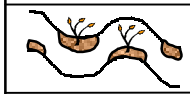
Type and height of barrier(s) _____

_____

_____

Type of bars

Choose one or more categories

	Bars absent ☐
	Side/point bars VEGETATED ☐
	Side/point bars UNVEGETATED ☐
	Mid-channel bars VEGETATED ☐
	Mid-channel bars UNVEGETATED ☐
	Bars around obstructions ☐
	Braided channel ☐
	Infilled channel ☐
	High flow deposits ☐

Extent of bars

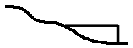
% of streambed forming a bar of any type _____ %

Dominant sediment particle size on bars

Boulder/cobble [ ] Pebble [ ] Gravel [ ]
Sand [ ] Silt/clay [ ] or _____mm

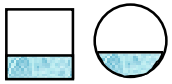
Channel modifications

Choose one or more categories

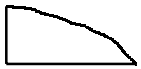
	No modifications ☐		Reinforced ☐
	Desnagged ☐		Revegetated ☐
	Dams and diversions ☐		Infilled ☐
	Resectioned ☐		Berms or embankments ☐
	Straightened ☐	Signs of work still	Recently channelised ☐
	Realigned ☐	Works old and revegetated	Channelised in the past ☐

Channel shape

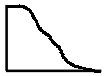
Choose one category only

 U shaped ☐	 Flat U shaped ☐	 Deepened U shape ☐	 Widened or infilled ☐	 Two stage ☐	 Multi stage ☐
 Box ☐	 Wide box ☐	 V shaped ☐	 Trapezoid ☐	 Concrete V ☐	 Pipe or culvert ☐

Bank shape
Choose one category for each bank

		Left bank	Right bank
	Concave	☐	☐
	Convex	☐	☐
	Stepped	☐	☐
	Wide lower bench	☐	☐
	Undercut	☐	☐

Bank slope
Choose one category for each bank

		Left bank	Right bank
	Vertical 80 - 90°	☐	☐
	Steep 60 - 80°	☐	☐
	Moderate 30 - 60°	☐	☐
	Low 10 - 30°	☐	☐
	Flat <10°	☐	☐

Factors affecting bank stability
Choose one or more categories

- ☐ None
- ☐ Mining
- ☐ Runoff
- ☐ Stock access
- ☐ Human access
- ☐ Ford, culvert or bridge
- ☐ Feral animals
- ☐ Other
- ☐ Cleared vegetation
- ☐ Irrigation draw-down
- ☐ Reservoir releases
- ☐ Seepage
- ☐ Flow and waves
- ☐ Drainpipes

Description _____

_____

_____

_____

Bedrock outcrops
Assess % of each bank covered by bedrock outcrops

% bedrock outcrops Left bank _____

Right Bank _____

Artificial bank protection measures
Choose one or more categories

- ☐ None
- ☐ Fence structures
- ☐ Levee banks
- ☐ Rock or wall layer
- ☐ Rip rap
- ☐ Fenced human access
- ☐ Other _____
- ☐ Fenced stock watering points
- ☐ Vegetation plantings
- ☐ Logs strapped to bank
- ☐ Concrete channel lining

_____

_____

Sediment oils
☐ absent ☐ light ☐ moderate ☐ profuse

Water oils
☐ none ☐ flecks ☐ globs ☐ sheen ☐ slick

Sediment odours
☐ normal/none ☐ sewage ☐ petroleum ☐ chemical

☐ anaerobic ☐ other _____

Water odours
☐ normal/none ☐ sewage ☐ petroleum ☐ chemical

☐ other _____

Turbidity (visual assessment)
☐ Clear ☐ Slight ☐ Turbid ☐ Opaque

Is water clarity reduced by:

☐ Suspended material (e.g mud, clay, organics) ☐ Dissolved material (e.g plant leachates)

Water level at the time of sampling
☐ Dry ☐ No flow ☐ Low ☐ Baseflow or near baseflow

☐ High ☐ Flood (don't sample)

Artificial features at the sampling site
Choose one or more categories

☐ Major ☐ Minor weir ☐ Ford ☐ Bridge ☐ Culvert ☐ Other

Description _____

_____

_____

Large woody debris
Overall % cover of logs and branches greater than 10cm in diameter

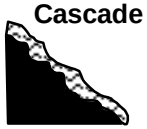
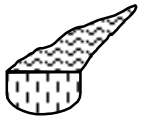
_____% Notes on visibility _____

_____

_____

Extent of bedform features

Total % composition for all features must equal 100%

Height >1m Gradient >60°	**Waterfall** 	_____ **% of site** _____ Est. Av. Length (m) _____ Est. Av. Height (m) _____ Est. Av. Gradient (°)
Step Height <1m Gradient 5-60° Strong currents	**Cascade** 	_____ **% of site** _____ Est. Av. Length (m) _____ Est. Av. Height (m) _____ Est. Av. Gradient (°)
Gradient 3-5° Strong currents Rocks break surface	**Rapid** 	_____ **% of site** _____ Est. Av. Length (m) _____ Est. Av. Depth (m) _____ Est. Av. Width (m)
Gradient 1-3° Moderate currents Surface unbroken but unsmooth	**Riffle** 	_____ **% of site** _____ Est. Av. Length (m) _____ Est. Av. Depth (m) _____ Est. Av. Width (m)
Gradient 1-3° Small currents Surface unbroken and smooth	**Glide** 	_____ **% of site** _____ Est. Av. Length (m) _____ Est. Av. Depth (m) _____ Est. Av. Width (m)
Gradient 1-3° Small but distinct & uniform current Surface unbroken	**Run** 	_____ **% of site** _____ Est. Av. Length (m) _____ Est. Av. Depth (m) _____ Est. Av. Width (m)
Area where stream widens or deepens and current declines	**Pool** 	_____ **% of site** _____ Est. Av. Length (m) _____ Est. Av. Depth (m) _____ Est. Av. Width (m)
A reasonable sized (>20% of channel width) cut-off section away from	**Backwater** 	_____ **% of site** _____ Est. Av. Length (m) _____ Est. Av. Depth (m) _____ Est. Av. Width (m)

Note: An additional response variable planform channel pattern is measured in the office

Macrophyte cover

Assess % cover of the sampling site by each category.

Overall % cover of macrophytes _____

% cover of emergent macrophytes _____

% cover of floating macrophytes _____

% cover of submerged macrophytes _____

} Total should equal overall % cover of macrophytes

Macrophyte composition

Use a macrophyte field guide (i.e. Sainty and Jacobs, 1994) to aid identification.
Listed macrophytes can be changed to reflect the common taxa present in each State or Territory.
N denotes a native taxa and I denotes an introduced taxa.

Emergent macrophytes

	Present	% cover
Brachiaria (Para Grass) I	☐	_____
Crassula (Crassula) N	☐	_____
Cyperus (Sedge) I/N	☐	_____
Eleocharis (Spikerush) N	☐	_____
Juncus (Rush) I/N	☐	_____
Paspalum (Water Couch) N	☐	_____
Phragmites (Common Reed) N	☐	_____
Ranunculus (Buttercup) I	☐	_____
Scirpus (Clubrush) N	☐	_____
Triglochin (Water Ribbon) N	☐	_____
Typha (Cumbungi) N	☐	_____
Other _____	☐	_____
Other _____	☐	_____
Other _____	☐	_____

Submerged macrophytes

	Present	% cover
Ceratophyllum (Hornwort) N	☐	_____
Chara (Stonewart) N	☐	_____
Elodea (Canadian Pondweed) I	☐	_____
Myriophyllum (Water Milfoil) I/N	☐	_____
Nitella (Stonewart) N	☐	_____
Potamogeton (Pondweed) N	☐	_____
Triglochin (Water Ribbon) N	☐	_____
Vallisneria (Ribbonweed) N	☐	_____
Other _____	☐	_____
Other _____	☐	_____
Other _____	☐	_____

Floating macrophytes

	Present	%
Azolla (Azolla) N	☐	_____
Callitriche (Starwart) I	☐	_____
Other _____	☐	_____
Other _____	☐	_____
Other _____	☐	_____

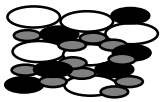
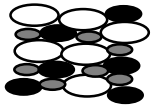
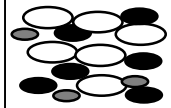
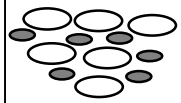
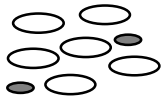
Overall % cover of native macrophyte taxa _____

Overall % cover of native macrophyte taxa _____

} Total should equal overall % cover of macrophytes from above

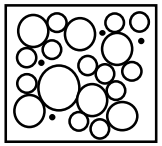
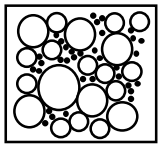
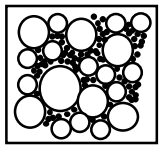
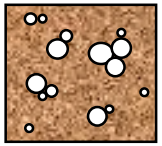
Bed compaction

Choose one category only

	Tightly packed, armoured Array of sediment sizes, overlapping, tightly packed and very hard to dislodge
	Packed, unarmoured Array of sediment sizes, overlapping, tightly packed but can be dislodged with moderate
	Moderate compaction Array of sediment sizes, little overlapping, some packing but can be dislodged with moderate
	Low compaction (1) Limited range of sediment sizes, little overlapping, some packing and structure but can be dislodged very easily
	Low compaction (2) Loose array of fine sediments, no overlapping, no packing and structure and can be dislodged very easily

Sediment matrix

Choose one category only

	Bedrock
	Open framework 0-5% fine sediment, high availability of interstitial spaces
	Matrix filled contact framework 5-32% fine sediment, moderate availability of interstitial spaces
	Framework dilated 32-60% fine sediment, low availability of interstitial spaces
	Matrix dominated >60% fine sediment, interstitial spaces virtually absent

Sediment angularity

Choose one category only

Assess cobble, pebble and gravel fractions only

	Very angular
	Angular
	Sub-angular
	Rounded
	Well rounded
	Cobble, pebble and gravel fractions not present

In the USEPA Habitat Assessment on the following pages, be sure to use the correct form for high or low gradient streams

Bed stability rating

Choose one category only

Unstable - eroding ← **Stable** → **Unstable - depositing**

Severe erosion	Moderate erosion	Bed stable	Moderate deposition	Severe deposition
Streambed scoured of fine sediments. Signs of channel deepening. Bare, severely eroded banks. Erosion heads. Steep streambed caused by erosion.	Little fine sediment present. Signs of channel deepening. Eroded banks. Streambed deep and narrow. Steep streambed comprised of unconsolidated (loosely arranged and unpacked) material	A range of sediment sizes present in the streambed. Channel is in a 'relatively natural' state (not deepened or infilled). Bed and bar sediments are roughly the same size. Banks stable. Streambed comprised of consolidated (tightly arranged and packed) material.	Moderate build-up of fine sediments at obstructions and bars. Streambed flat and uniform. Channel wide and shallow.	Extensive build up of fine sediments to form a flat bed. Channel blocked, but wide and shallow. Bars large and covering most of the bed or banks. Streambed comprised of unconsolidated (loosely arranged and unpacked) material.

Site No. _____ **Date** _____

USEPA Habitat Assessment
Circle a score for each parameter

HIGH GRADIENT STREAMS

Habitat parameter	Condition category																					
	Excellent					**Good**					**Fair**					**Poor**					
1. Epifaunal substrate / available cover	Greater than 70% of substrate favourable for epifaunal colonisation and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonisation potential (i.e. logs/snags that are not new fall and not transient).					40-70% mix of stable habitat; well-suited for full colonisation potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonisation (may rate at high end of scale).					20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
2. Embeddedness	Gravel, cobble and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.					Gravel, cobble and boulder particles are 25-50% surrounded by fine sediment.					Gravel, cobble and boulder particles are 50-75% surrounded by fine sediment.					Gravel, cobble and boulder particles are more than 75% surrounded by fine sediment.					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
3. Velocity / depth regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). Slow is <0.3m/s, deep is >0.5m).					Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).					Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).					Dominated by 1 velocity/depth regime (usually slow-deep).					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
4. Sediment deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions and bends; moderate deposition in pools prevalent.					Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
5. Channel flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills >75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
6. Channel alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging (greater than 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**

Continued over

Site No. _____ Date _____

USEPA Habitat Assessment
Circle a score for each parameter

HIGH GRADIENT STREAMS

Habitat parameter	Condition category																					
	Excellent					**Good**					**Fair**					**Poor**					
7. Frequency of riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
8. Bank stability **(score each bank)**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; 'raw' areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
SCORE	Left bank	**10**	**9**			**8**	**7**	**6**			**5**	**4**	**3**			**2**	**1**	**0**			
SCORE	Right bank	**10**	**9**			**8**	**7**	**6**			**5**	**4**	**3**			**2**	**1**	**0**			
9. Vegetative protection **(score each bank)**	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understorey shrubs, or non woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimetres or less in average stubble height.					
SCORE	Left bank	**10**	**9**			**8**	**7**	**6**			**5**	**4**	**3**			**2**	**1**	**0**			
SCORE	Right bank	**10**	**9**			**8**	**7**	**6**			**5**	**4**	**3**			**2**	**1**	**0**			
10. Riparian zone score **(score each bank)**	Width of riparian zone >18 metres; human activities (i.e. roads, lawns, crops etc.) have not impacted the riparian zone.					Width of riparian zone 12-18 metres; human activities have impacted the riparian zone only minimally.					Width of riparian zone 6-12 metres; human activities have impacted the riparian zone a great deal.					Width of riparian zone <6 metres; little or no riparian vegetation is present because of human activities.					
SCORE	Left bank	**10**	**9**			**8**	**7**	**6**			**5**	**4**	**3**			**2**	**1**	**0**			
SCORE	Right bank	**10**	**9**			**8**	**7**	**6**			**5**	**4**	**3**			**2**	**1**	**0**			

TOTAL HIGH GRADIENT HABITAT SCORE ☐

Site No. _____ Date _____

USEPA Habitat Assessment
Circle a score for each parameter

LOW GRADIENT STREAMS

Habitat parameter	Condition category																					
	Excellent					**Good**					**Fair**					**Poor**					
1. Epifaunal substrate / available cover	Greater than 50% of substrate favourable for epifaunal colonisation and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonisation potential (i.e. logs/snags that are not new fall and not transient).					30-50% mix of stable habitat; well-suited for full colonisation potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonisation (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
2. Pool substrate characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
3. Pool variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow or pools absent.					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
4. Sediment deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions and bends; moderate deposition in pools prevalent.					Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
5. Channel flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills >75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
6. Channel alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging (greater than 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**

Continued over

Site No. _____ Date _____

USEPA Habitat Assessment
Circle a score for each parameter

LOW GRADIENT STREAMS

Habitat parameter	Condition category																					
	Excellent					**Good**					**Fair**					**Poor**					
7. Channel sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas).					The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.					The bends in the stream increase the stream 1 to 2 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.					
SCORE	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
8. Bank stability **(score each bank)**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; 'raw' areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
SCORE	Left bank	**10**	**9**			**8**	**7**	**6**			**5**	**4**	**3**			**2**	**1**	**0**			
SCORE	Right bank	**10**	**9**			**8**	**7**	**6**			**5**	**4**	**3**			**2**	**1**	**0**			
9. Vegetative protection **(score each bank)**	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understorey shrubs, or non woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimetres or less in average stubble height.					
SCORE	Left bank	**10**	**9**			**8**	**7**	**6**			**5**	**4**	**3**			**2**	**1**	**0**			
SCORE	Right bank	**10**	**9**			**8**	**7**	**6**			**5**	**4**	**3**			**2**	**1**	**0**			
10. Riparian zone score **(score each bank)**	Width of riparian zone >18 metres; human activities (i.e. roads, lawns, crops etc.) have not impacted the riparian zone.					Width of riparian zone 12-18 metres; human activities have impacted the riparian zone only minimally.					Width of riparian zone 6-12 metres; human activities have impacted the riparian zone a great deal.					Width of riparian zone <6 metres; little or no riparian vegetation is present because of human activities.					
SCORE	Left bank	**10**	**9**			**8**	**7**	**6**			**5**	**4**	**3**			**2**	**1**	**0**			
SCORE	Right bank	**10**	**9**			**8**	**7**	**6**			**5**	**4**	**3**			**2**	**1**	**0**			

TOTAL LOW GRADIENT HABITAT SCORE ☐

 Site No. _____ Date _____

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding.
Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams).
Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

Cross-section sketch

The channel sketch should show in cross-section the shape of the channel and include the location of the water surface, watermark and bankfull points. Also show other features such as bars, rocky outcrops and snags encountered at the cross section.

Cross-section number _____ of _____

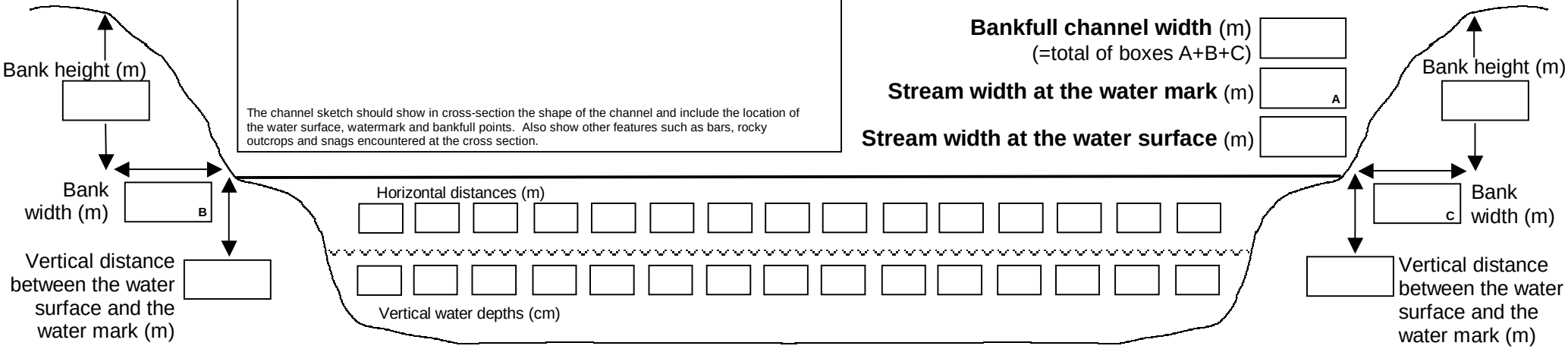
Type of bedform at the cross-section

☐ Riffle ☐ Run ☐ Pool ☐ Cascade ☐ Other _____

Bankfull channel width (m) (=total of boxes A+B+C) ☐

Stream width at the water mark (m) ☐ A

Stream width at the water surface (m) ☐



Notes on cross-section measurement

_____

_____

Riparian zone width

Left bank _____ (m) Right bank _____ (m)

Bank material

Assess % composition for each bank

	Left bank	Right bank
Bedrock	_____	_____
Boulder (>256mm)	_____	_____
Cobble (64-256mm)	_____	_____
Pebble (16-64mm)	_____	_____
Gravel (2-16mm)	_____	_____
Sand (0.06-2mm)	_____	_____
Fines (silt and clay, <0.06mm)	_____	_____

Total 100% each

Substrate composition

Assess % composition in the area of bed 5m either side of the cross-section.

Bedrock	_____
Boulder (>256mm)	_____
Cobble (64-256mm)	_____
Pebble (16-64mm)	_____
Gravel (2-16mm)	_____
Sand (0.06-2mm)	_____
Fines (silt and clay <0.06mm)	_____

Total 100%

Assess in the area 5m either side of the cross section

Filamentous algae cover

☐ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Periphyton cover

☐ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Moss cover

☐ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Detritus cover

☐ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

 Site No. _____ Date _____

Channel cross-sections and variables to be measured in the area around a cross section

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Cross-section sketch

The channel sketch should show in cross-section the shape of the channel and include the location of the water surface, watermark and bankfull points. Also show other features such as bars, rocky outcrops and snags encountered at the cross section.

Cross-section number _____ of _____

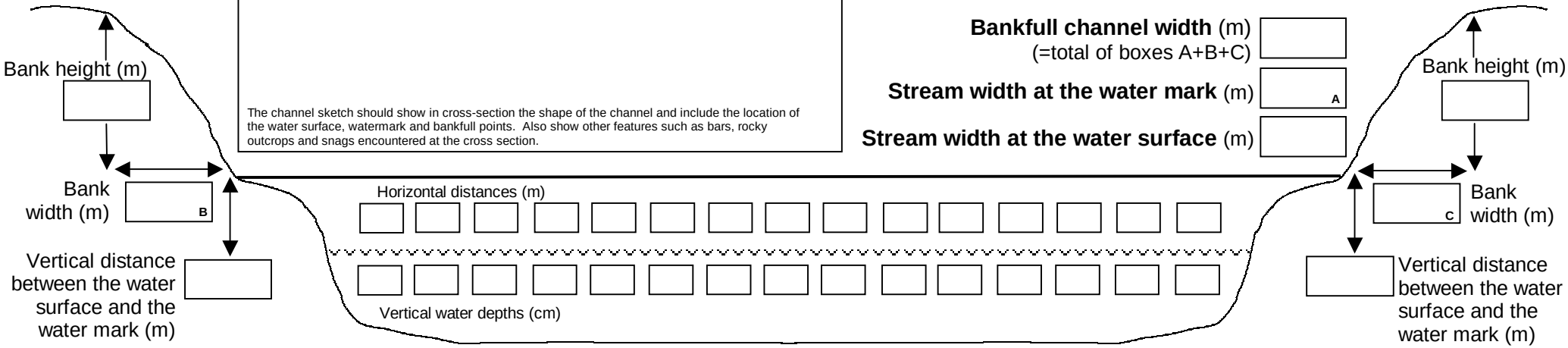
Type of bedform at the cross-section

☐ Riffle ☐ Run ☐ Pool ☐ Cascade ☐ Other _____

Bankfull channel width (m) (=total of boxes A+B+C) ☐

Stream width at the water mark (m) ☐ A

Stream width at the water surface (m) ☐



Notes on cross-section measurement

_____

_____

Riparian zone width

Left bank _____ (m) Right bank _____ (m)

Bank material

Assess % composition for each bank

	Left bank	Right bank
Bedrock	_____	_____
Boulder (>256mm)	_____	_____
Cobble (64-256mm)	_____	_____
Pebble (16-64mm)	_____	_____
Gravel (2-16mm)	_____	_____
Sand (0.06-2mm)	_____	_____
Fines (silt and clay, <0.06mm)	_____	_____

Total 100% each

Substrate composition

Assess % composition in the area of bed 5m either side of the cross-section.

Bedrock	_____
Boulder (>256mm)	_____
Cobble (64-256mm)	_____
Pebble (16-64mm)	_____
Gravel (2-16mm)	_____
Sand (0.06-2mm)	_____
Fines (silt and clay <0.06mm)	_____

Total 100%

Assess in the area 5m either side of the cross section

Filamentous algae cover

☐ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Periphyton cover

☐ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Moss cover

☐ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Detritus cover

☐ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Channel cross-sections and variables to be measured in the area around a cross section

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Cross-section number _____ of _____

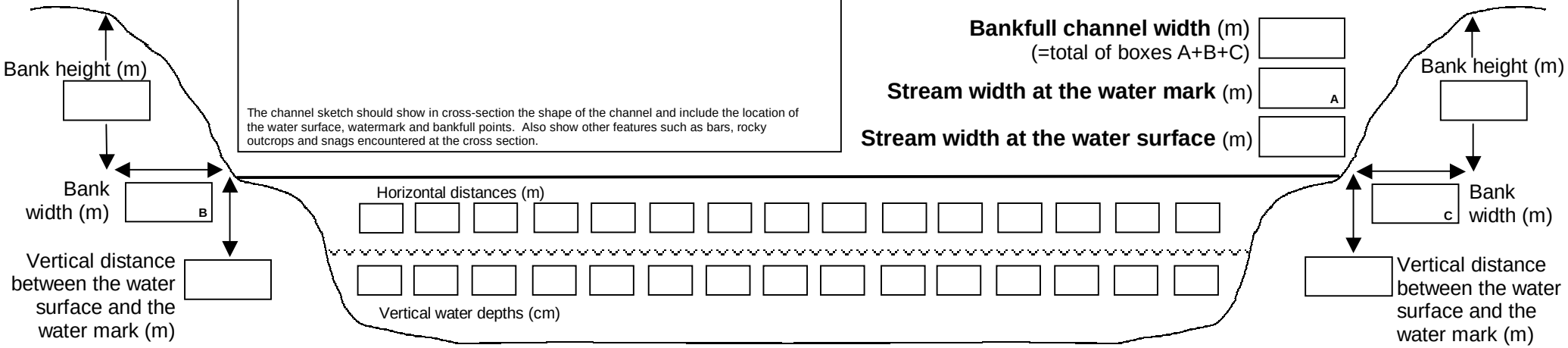
Type of bedform at the cross-section

☐ Riffle ☐ Run ☐ Pool ☐ Cascade ☐ Other _____

Bankfull channel width (m) (=total of boxes A+B+C) ____

Stream width at the water mark (m) ____ A

Stream width at the water surface (m) ____



Notes on cross-section measurement

_____

_____

Riparian zone width

Left bank _____ (m) Right bank _____ (m)

Bank material

Assess % composition for each bank

	Left bank	Right bank
Bedrock	_____	_____
Boulder (>256mm)	_____	_____
Cobble (64-256mm)	_____	_____
Pebble (16-64mm)	_____	_____
Gravel (2-16mm)	_____	_____
Sand (0.06-2mm)	_____	_____
Fines (silt and clay, <0.06mm)	_____	_____

Total 100% each

Substrate composition

Assess % composition in the area of bed 5m either side of the cross-section.

Bedrock	_____
Boulder (>256mm)	_____
Cobble (64-256mm)	_____
Pebble (16-64mm)	_____
Gravel (2-16mm)	_____
Sand (0.06-2mm)	_____
Fines (silt and clay <0.06mm)	_____

Total 100%

Assess in the area 5m either side of the cross section

Filamentous algae cover

☐ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Periphyton cover

☐ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Moss cover

☐ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Detritus cover

☐ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%