
Protection of natural streams/rivers from adverse impacts arising from construction works

Background

Many of the natural streams/rivers¹ in Hong Kong are good habitats supporting a variety of wildlife and with important ecological functions, and carry high aesthetic and landscape value. There have been calls for increased protection to natural streams/rivers.

2. A natural stream/river refers to a natural channel with natural water fed from upper terrains, which covers both perennial stream/river with water flowing throughout the year as well as intermittent ones with water-flow only during the wet season. The streambed is natural and not man-made, which could consist of mixtures of bedrocks, boulders, cobbles, gravels, sand, silt or clay. The banks are also largely natural and defined, covered with bank-side and riparian vegetations. Ecologically Important Streams/ Rivers (EIS) are natural streams/rivers with important ecological functions such as providing habitats for diverse or rare animal or plant communities. The updated list of EIS can be found in the website of Agriculture, Fisheries and Conservation Department (http://www.afcd.gov.hk/conservation/eng/eis_1.htm).

Construction Activities

3. The Environment, Transport and Works Bureau (ETWB) has issued a Technical Circular (Works) No. 5/2005 on protection of natural streams and rivers. Details of the circular are available on the website at the address of <http://www.etwb.gov.hk>. ETWB has advised that construction works in or affecting natural streams/rivers should be restrained where possible to minimise possible disturbance to these streams/rivers. In case that construction works in or affecting natural streams/rivers are unavoidable, they should be carried out in an environmentally responsible manner and with appropriate mitigation measures to minimise any adverse impact so caused.

4. Construction works arising from projects and developments may have direct and/or indirect impacts on natural streams/rivers. Direct impacts are those resulted from physical changes directly disturbing the natural habitats of the

/streams/rivers.

¹ For the purpose of this practice note, natural streams and rivers exclude flood retention ponds, fishponds and engineered stormwater drainage systems which include drainage channels, nullahs, and ditches. Examples of engineered drainage channels are Tin Shui Wai Main Nullah, Yuen Long Nullah, Tuen Mun Nullah, engineered sections of Shing Mun River, or concrete U-channels for collection of surface runoff.

streams/ivers. Examples of such construction works causing direct impacts are training, filling, culverting, narrowing, widening, damming, realignment and diversion of streams/ivers, as well as bank stabilisation works such as shotcreting on riverbanks. Indirect impacts are those resulted from construction works that may cause pollution to or affect water-flow of streams/ivers. Examples of such construction works causing indirect impacts are site formation, landfilling discharge of silt and polluted water, dumping of debris into an area nearby, or foundation works involving dewatering, geotechnical and demolition works in the proximity of streams/ivers.

Measures for Protection

5. Most of the natural streams/ivers in the territory are subject to the control of a number of ordinances to various extents. These may include Land (Miscellaneous Provisions) Ordinance (Cap 28), Waterworks Ordinance (Cap 102), Town Planning Ordinance (Cap 131), Public Cleansing and Prevention of Nuisances Regulation (Cap 132BK), Country Parks Ordinance (Cap 208), Waste Disposal Ordinance (Cap 354) and Water Pollution Control Ordinance (Cap 358). Authorized persons, registered structural engineers and registered contractors are advised to pay attention to the requirements of the relevant ordinance(s) which are applicable to their projects.

6. During the planning stage, designers should avoid any potential impact on natural streams/ivers, particularly EIS. If this is unavoidable, it is strongly recommended that appropriate measures be adopted to minimise or compensate such impacts, taking into account the advice from all relevant authorities and the recommendations of any environmental review/study that may be required. Appendix A contains a set of broad guidelines (extracted from ETWB's Technical Circular (Works) No. 5/2005) on planning for construction works in natural stream/ivers and in EIS.

7. During the detailed design stage, designers are strongly recommended to adopt environmental friendly design in order to maintain the naturalness, landscape as well as ecological value of natural streams/ivers. To facilitate smooth implementation during construction, requirements for the proposed mitigation measures covering temporary works and construction activities should be fully incorporated in the contract documents for the project. Guidelines (extracted from ETWB's Technical Circular (Works) No. 5/2005) on developing precautionary measures during the construction stage are given in Appendix B.

8. For projects with only potential indirect impacts on natural streams/ivers other than EIS, authorized persons, registered structural engineers and registered contractors are strongly advised to carry out good site practice and establish appropriate pollution control measures during construction to minimise impacts.

9. A similar practice note has been issued to authorized persons and registered structural engineers.

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**Guidelines on Planning for Construction Works in Natural Stream/Rivers
and in Ecologically Important Streams/Rivers (EIS)**

(A) Planning for Construction Works in Natural Rivers and Streams

In planning for construction works in natural rivers and streams, the following considerations are relevant: -

- a. When determining the method and type of construction works, the project proponent should ascertain the potential environmental impact associated with such works. The method and type of works should be so chosen to avoid or minimise the possible environmental impact on streams/rivers. Construction of a new channel using artificial non-vegetative smooth lining (e.g. concrete lining) should be avoided as far as possible and should only be applied as the last resort when other more environmentally friendly designs are proved impracticable. In general, the various engineering options that can be adopted for river and stream modification works, in ascending order of impact on the environment and ecology, are as follows: -
 - (i) protection/stabilisation of river bank at locations prone to erosion by use of natural materials such as rock;
 - (ii) removal of fallen objects/obstruction and clearing of vegetation in a selective manner;
 - (iii) enlargement of channel by modifying one bank only;
 - (iv) enlargement of channel by modifying/widening both banks;
 - (v) enlargement of channel by deepening;
 - (vi) realigning by creating a new channel;
 - (vii) construction of a new channel using artificial non-vegetative smooth lining such as concrete.
- b. The proposed works should preferably be carried out during the dry season where flow in the stream/river is low. Rapid flow in a stream/river during the wet season together with the on-going construction works will have a higher potential of inducing collapse of the riverbanks and resulting in highly turbid water.
- c. Temporary access to the works site should be carefully planned and located to minimise disturbance caused to the substrates of streams/rivers and riparian vegetation by construction plant.

- d. The use of less or smaller construction plant may be specified to reduce disturbance to the riverbed where aquatic inhabitants are located.
- e. Temporary sewerage system should be designed and installed to collect wastewater and prevent it from entering rivers and streams.
- f. Proper locations well away from rivers/streams for temporary storage of materials (e.g. equipment, filling materials, chemicals and fuel) and temporary stockpile of construction debris and spoil should be identified before commencement of the works.
- g. Landscape and visual impact assessment should be conducted early to identify, assess and minimise any adverse landscape or visual impact.

(B) Planning for Construction Works in the EIS

In planning for construction works in the EIS, in addition to the considerations mentioned in (A) above, the following considerations are also relevant: -

- a. Environmentally friendly features, such as diversified planting of trees, shrubs, herbaceous and wetland plants and grass on the river embankments to form an ecological riparian zone, should be incorporated into the works. The bottom of a natural stream/river should be left intact where practicable, and only bank stabilisation or bank widening works using soft but adequately robust engineering techniques or bank widening works should be carried out.
- b. The use of concrete or the like should be avoided or minimised. Unless there are severe site constraints, more environmentally friendly alternatives such as geotextile-reinforced grassed lining, bio-engineering methods, natural stonewall, gabions etc. should be used on the embankment and random rubble or stones on the bottom.
- c. Wherever a natural habitat of special flora and fauna is identified, alternative design and construction methods should be considered to avoid the disturbance. If disturbance is unavoidable, proper mitigation measures such as translocation, temporary migratory pathways, recolonisation or compensation plan should be devised. After construction works, placement of substrates (e.g. gravels, crushed stones or boulders) of similar size and composition to those of the original riverbed should be considered to encourage recolonisation.
- d. Phasing of the works should be considered to better control and minimise any impact caused, and to provide refuge for aquatic animals. Works should not be carried out for the whole width of the stream at the same time, if the stream is wide enough. Adequate width of the stream should be left intact with the flow maintained as far as practicable so that disturbance to the aquatic ecosystem is kept to the minimum. A free passage along the stream is

necessary to avoid forming stagnant water in any phase of the works and to maintain the integrity of aquatic communities.

- e. If the upper reaches are breeding grounds for fish and the works would involve construction of dam structures, installation of specially designed fish ladder should be provided for fish migration.
- f. Before commencement of works, Agriculture, Fisheries and Conservation Department (AFCD) should be consulted for the presence of rare species within the works site. Mitigation measures such as relocation of the rare species outside the site should be discussed with AFCD where necessary.
- g. Before commencement of works, an inspection of stream should be carried out to check the presence of any pools of considerable size. If found, they should be preserved with care as far as possible, as they are usually favourite habitats of aquatic inhabitants and removal of pools can be detrimental to aquatic communities.

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**Guidelines on Developing Precautionary Measures
during the Construction Stage**

Depending on the extent of the proposed works and particulars of relevant rivers and streams, different precautionary measures may have to be devised and implemented. Some of the measures generally recommended for adoption to the construction works in the vicinity of natural rivers and streams are listed below:-

- a. The proposed works site inside or in the proximity of natural rivers and streams should be temporarily isolated, such as by placing of sandbags or silt curtains with lead edge at bottom and properly supported props, to prevent adverse impacts on the stream water qualities. Other protective measures should also be taken to ensure that no pollution or siltation occurs to the water gathering grounds of the work site.
- b. The natural bottom and existing flow in the river should be preserved as much as possible to avoid disturbance to the river habitats. If temporary access track on riverbed is unavoidable, this should be kept to the minimum width and length. Temporary river crossings should be supported on stilts above the riverbed.
- c. Stockpiling of construction materials, if necessary, should be properly covered and located away from any natural stream/river.
- d. Construction debris and spoil should be covered up and/or properly disposed of as soon as possible to avoid being washed into nearby rivers/streams by rain.
- e. Construction effluent, site run-off and sewage should be properly collected and/or treated. Wastewater from a construction site should be managed with the following approach in descending order:
 - (i) minimisation of wastewater generation;
 - (ii) reuse and recycle;
 - (iii) treatment.

Proper locations for discharge outlets of wastewater treatment facilities well away from the natural streams/rivers should be identified.

- f. Removal of existing vegetation alongside the riverbanks should be avoided or minimised. When disturbance to vegetation is unavoidable, all disturbed areas should be hydroseeded or planted with suitable vegetation to blend in with the natural environment upon completion of works.

- g. Adequate lateral support may need to be erected in order to prevent soil/mud from slipping into the stream/river, but without unduly impeding the flow during heavy rain
- h. Supervisory staff should be assigned to station on site to closely supervise and monitor the works.

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