ENOUGH ABOUT THE BIRDS (AND MAMMALS),

What about the bees and the flowers and the trees?

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Present Standings on Barrier Impact Mitigation

• Linear infrastructure has been shown to have an adverse impact on biodiversity causing its fragmentation, degradation and the creation of barriers to movement (Andrews, 1990; Goosem, 2004; Spellerberg, 1998; and van der Ree et al, 2007).

•SMEC's Environmental team has a close working relationship with the SMEC designers to ensure that, as part of the detailed design process, environmental compliance requirements are met and best practice and innovative methodologies are utilised to ensure habitat and biodiversity connectivity on linear infrastructure projects.

•Focus of biodiversity connectivity and mitigating impacts through engineering solutions in the past has centred around vertebrates such as mammals, birds and amphibians. Such measures SMEC has designed include:

- **Fauna overpass and underpasses (including fauna furniture and funnelling structures such as fencing (Figure 1));**
- **Fauna movement structures and design considerations for arboreal mammals; and**
- **Fish, reptile and amphibian friendly culverts and crossing structures.**

• Such measures often neglect impacts to invertebrates, plants and the habitat these provide. SMEC believe that the maintenance of reproduction potential for flora species and hydrological regimes for flora communities are also important factors to mitigate. Measures to reduce such impacts are now being included in SMEC projects.

Figure 1: Fauna Overpass: Bonville Bypass NSW.

Figure 2: Hydrological Connection Measures including rock mattresses through the embankment and culverts for high flows and aquatic fauna: Bonville Bypass NSW.

Protecting Plant Reproduction

• Linear infrastructure acts as a barrier to the movement of seed and pollen through biotic and environmental mechanisms. In many cases, the implementation of measures to promote fauna crossing are sufficient to address these issues as plants often have edible fruits or visual attractants, and pollen and seed are spread by vertebrates.

• However, in some cases the attractant is smell and such species may have only a limited period for pollination. So it is essential that odours are not impacted, such as a result of car or train emissions, and that barriers to small insect pollinators are minimised.

• SMEC has been involved in the design for pollinator culverts in such situations, to ensure appropriate connectivity for the dispersal of chemical attractants and pollinators are available for the continued survival of threatened flora species.

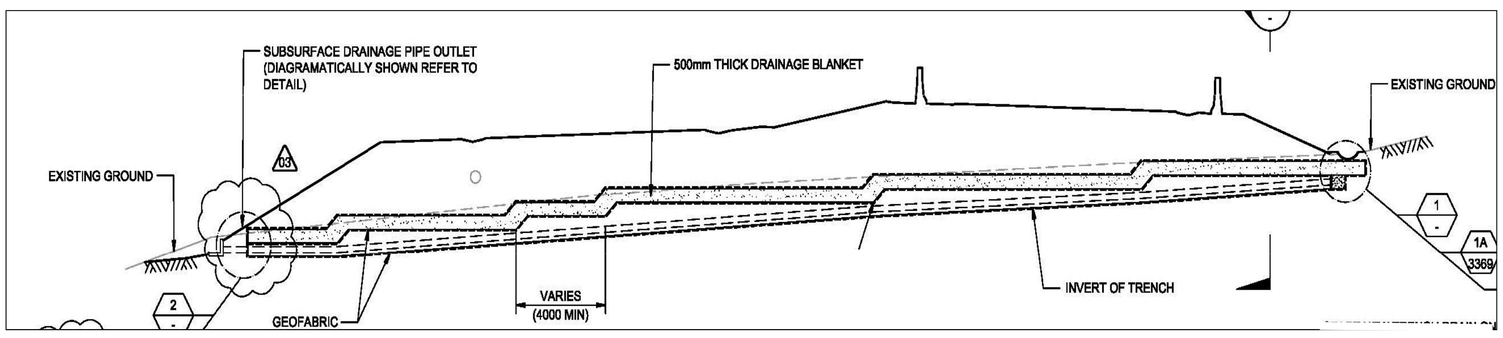

Figure 3: Design drawings showing hydrological connectivity system across an embankment.

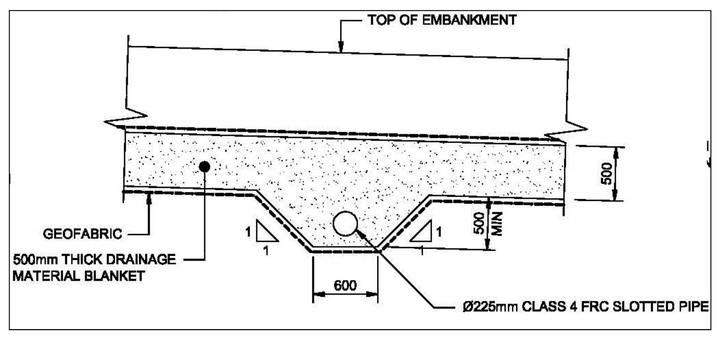

Figure 4: Design drawings showing hydrological connectivity through an embankment and pipe for intraflow.

The Importance of Maintaining Hydrological Regimes

• SMEC believe that breaking the barriers caused by linear infrastructure is not limited to ensuring fauna connectivity. It is also important to consider mitigating impacts on habitat and ecosystem connectivity and health. After all, what is the point in connecting fauna between habitats if the value of the habitat is degraded?

• Cuttings and embankments associated with linear infrastructure have the potential to impact on surface and subsurface hydrological flows through compaction and the use of inappropriate fill materials.

• To ensure that hydrological regimes are maintained, SMEC have designed a number of systems that ensure overland flow and intraflow are maintained and mimicked as much as possible as the pre-infastructure state (Figures 2, 3 & 4). This has been particularly important in ensuring the health of a number of threatened wetland and floodplain communities and the habitat these provide for threatened fauna species.

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References:

Andrews, A. (1990) Fragmentation of habitat by roads and utility corridors: A review. Australian Zoologist 26 (3&4): 130-141.

Goosem, M. (2004) Linear infrastructure in the tropical rainforests of far north Queensland: mitigating impacts on fauna of roads and powerline clearings. In 'Conservation of Australia's Forest Fauna (Second edition) '. (Ed. D Lunney) pp. 418-434. (Royal Zoological Society of New South Wales: Mosman, NSW).

Spellerberg, I. F. (1998) Ecological effects of roads and traffic: a literature review. Global Ecology & Biogeography Letters 7, 317-333.

van der Ree, R., Clarkson, D.T., Holland, K., Gulle, N., Budden M. (2007) Review of Mitigation Measures used to deal with the Issue of Habitat Fragmentation by Major Linear Infrastructure, Report for Department of Environment and Water Resources (DEWR), Contract No. 025/2006, SMEC Australia Pty Ltd and Australian Research Centre for Urban Ecology.

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A poster by Ian Irwin and Cassandra Thompson, SMEC Australia Pty Ltd

SMEC has been involved in a range of infrastructure projects both nationally and internationally. SMEC have recently completed a review of mitigation measures to deal with the issue of habitat fragmentation by major linear infrastructure in conjunction with the Australian Research Centre for Urban Ecology for DEWHA.

SMEC has designed a number of innovative movement structures for vertebrate fauna as part of large infrastructure projects, for example:

- Fauna overpass and underpasses on road upgrades projects (specifically Hume and Pacific Highway);
- Fauna movement structures and design considerations for Gliders on road upgrades projects (specifically Hume and Pacific Highway);
- Fish friendly and amphibian friendly culverts on road upgrades projects (specifically Hume and Pacific Highway);
- However, SMEC considers that one of the major impacts of large infrastructure projects, the alteration of flora species and communities from the creation of barriers to reproduction and alterations to hydrological regimes, is equally important as the measures being instated for charismatic animals.

The SMEC design and environmental team is currently working on the implementation of a number of innovative initiatives for the mitigation of impacts to these often overlooked impacts. This involves constructing pollinator (wasp) movement structures for threatened flora species, and ensuring water flow patterns are optimised and hydrological regime changes minimised for low-lying, water dependent endangered ecological communities. This also includes the installation of low flow channels within culverts to ensure the health of river and creek systems and innovative design to ensure continual flow of natural springs to wetland areas.

The poster aims to look beyond previous methods of mitigating habitat fragmentation and focus on environmental design that maximises the retention of ecological communities as a whole.

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