

McCormacks Bay, Avon Heathcote Estuary

Environmental Effects of Culvert Replacement

Submission for City Plan from Dr Kevin F O'Connor of 21 Tuawera Terrace, Clifton, Chch 8081, arising from McCormacks Bay Steering Group, appointed by Christchurch City Council to integrate remediation of McCormacks Bay environment with culvert replacement in Causeway

Background to this Submission

Deficiencies of existing provisions of Plan.

The draft LTCCP identifies one budget line for central culvert replacement referred to as **WBS 542/001312**, "Causeway culvert and walls", totalling \$502,020 over 2009-2011. It is understood that this project summary could include any related investigations or assessments needed for any consents involved, but may be insufficient in scope or funding for the needed remediation of McCormacks Bay.

No other provision appears in the plan for other possible engineering work affecting the causeway and McCormacks Bay, perhaps involving replacement or alteration to east and west culverts, or for any further environmental investigation or assessment of effects of culvert replacement of any kind in the causeway. This submission seeks to have provision made for overcoming such deficiencies.

Integration of remediation of McCormacks Bay with Causeway roadwork

The McCormacks Bay Steering Group was appointed in August 2006 to guide the integration of McCormacks Bay remediation with the renewal of culvert or culverts as part of maintaining road and other essential communications across the Causeway. The Group was

"established to ensure that a comprehensive planning view of the Bay that takes into account the wider environmental and social issues was integrated into the recommendations for development of scenarios for the replacement of the causeway culverts."

The Steering Group was then active for several months, identifying work that needed to be done for this integrated objective. It had not been convened since February 2007 while the Council commissioned and undertook further agreed on investigations. Neither the effective work of the Steering Group nor integration of McCormacks Bay remediation with replacement of causeway culverts can be assured without provision for additional financial support for expanded work. Hence, the need for this submission.

Summary of Progress to March 2009

Consulting Group meeting of 31.03.09

For its meeting of 31 March, 2009 members of the Steering Group received copies of three reports:

- ✚ EOS Ecology Survey of Benthic Invertebrate Fauna and Sediment of McCormacks Bay, presented by Trevor Partridge;
- ✚ NIWA Data Report of McCormacks Bay Hydraulics and Sediment Study, presented by John Walter;
- ✚ Will Doughty (Transport & Greenspace Unit CCC) "Project Steering Group Progress Report" on the McCormacks Bay Causeway Bridge Renewal.

In addition the Steering Group had oral reports presented by

- ✚ Lloyd Greenfield, CCC, on constraints and timeframes for central culvert replacement, with a possible bridge structure built outside the present central culvert;
- ✚ John Walter, CCC, commenting on NIWA hydraulics study and using these and other data for modelling the hydraulic tidal function of a central bridge structure with lower floor and greater width than present culvert. (This report has been supplemented by a written version e-mailed to participants 08.04.09)

This material has been summarily discussed in the Steering Group under Facilitator Joe McCarthy, with the emergence of several points, some but not all of which are listed below as premises for further investigation and assessment for the successful continuation of this integrated project. (Minutes of the Meeting have since been circulated by Eric Banks for CCC on 08.04.09). In compiling this submission I have also had access to earlier papers including

- ✚ the Reserve Management Plan of 1994;
- ✚ the McCormacks Bay Causeway: Maintenance and Development (Jennings) Report from City Solutions, October 2004;
- ✚ Derek Going's McCormacks Bay Tidal Hydraulics Report, May 2006

Because of the long delay in re-convening the Steering Group, members suffered from the time constraint of 16 April for further submissions to be made for inclusion of items in the LTCCP. Especially, there was a lack of time for organisations represented on the Steering Group to prepare submissions. As an independent citizen and not representing any organisation on the Steering Group, but familiar from long association with CEA and AHEIT with many issues dealing with the Estuary and its uses, I undertook to make a submission for the LTCCP based on the reports currently made to us. This submission could be distributed to the organisations represented or involved for their consideration and possible support to the Council.

This offer was put to the meeting of the Steering Group by the Facilitator and received the overwhelming support of the meeting.

Substance of Submission to Council

What I wish the Council to consider from the reports to the Steering Group:

- ✚ McCormacks Bay is a disgrace to the City, aesthetically and biologically;
- ✚ The causeway itself is suffering in different sectors from aging and decay and would probably require reconstruction of the seawall on the seaward side before roadway could be widened to carry a bus lane or greater traffic;
- ✚ Present urgent renewal of central culvert is warranted but should be occasion for beginning remediation of McCormacks Bay as part of the Estuary;
- ✚ Remediation of the Bay cannot achieve restoration to pristine estuarine condition but ecologically it must aim to restore estuarine function, instead of lagoon function to which it is evolving;
- ✚ Remediation must achieve as full tidal integration with the Estuary as feasible;
- ✚ Full tidal drainage from all parts of McCormacks Bay depends on **ALL** culverts functioning with the same floor level, and lower than at present;
- ✚ The eastern basin of the Bay, beside the Causeway, has deteriorated most seriously towards lagoon status from continuous inundation, and requires integration with the main body by **deep** multiple breaching of the artificial gravel bar opposite the central culvert, as well as a functional east culvert;

- ✚ Some designs of new central culvert or bridge could reduce water velocity in and/or out of the Bay, thereby greatly detracting from its unique value for instructive experience in turbulent flow kayaking;
- ✚ Simplistic maximisation of tidal inflows could heighten flooding risk to some properties in McCormacks Bay Road, calling for integrated sediment trapping and flood protection for local areas;
- ✚ Establishment of salt marsh communities in high water zone may warrant designed addition of coarse sediments.

What specific action I think the Council should take:

- ✚ Expand the brief of WBS 542/001312 to include lowering of all three culverts to uniform low floor level, as well as breaching present artificial gravel bar at central culvert, and if warranted modifying artificial islands, to ensure regular complete tidal drainage of the whole Bay;
- ✚ Increase provision of funds to carry out all necessary culvert work, making professional assessments of hydrological, ecological, recreational and other social and economic effects in the environment of the Bay as part of the project, and monitoring the effects in practice, say a further \$400,000.

Why this should be done:

- ✚ McCormacks Bay has already been subject to proposals (1) from the early 1930s for controls to form a “marine lake” by closing or part-closing sea outlets, (2) from 1960s especially, for “reclamation” by infilling with dredgings from the Estuary and with rock and clay from hillside developments and (3) from the 1970s, for various combinations of dredging, channelling, island-building and beach-making to make dryland, lake and estuarine areas within the Bay for different recreational and wildlife purposes. None of these proposals has worked out satisfactorily. A sincere and comprehensive attempt to manage McCormacks Bay as Estuary is overdue.
- ✚ Attempts at making a marine lake or lagoon out of the continuously inundated area (as in the north-eastern portion of the Bay, Zone C of earlier CCC Reserve Management Plan) have failed ecologically because success depends on (a) thorough water exchange to maintain water quality at least to estuary quality (b) having or acquiring local flora, benthic fauna and avifauna suited to such habitat. Neither set of conditions has been fulfilled. Ecological outcome is semi-stagnant water, *Ulva* growing and decomposing through the water column, lowest numbers of taxa and individuals of estuarine benthic fauna and poorest use suitability for recreation or for birds.
- ✚ At the present time McCormacks Bay does not integrate tidally with the Estuary, high tide in the Bay being 100mm below that in the Estuary. Lowest water level in the Bay is 9.2 m, while in the Estuary outside it is 8.45m. The reason for this condition is **high IL** values for culverts, namely 9.49m and 9.52m for two pipes of western culvert, 9.05m for present central culvert, and 8.90m for eastern culvert (effectively higher as pipe floor is covered in rocks).
- ✚ **All culverts need to be lowered down to at least 8.55m** to achieve tidal drainage of the maximum area of the Bay. Only with maximum tidal drainage can **growth of macro-algae be limited** and opportunity created for **restoration of characteristically estuarine benthic fauna and wading birds**. With long inundation, cockles, favoured food of waders, disappear and *Zeacumanthus* spp., worthless snails, dominate the benthic fauna.
- ✚ Engineering priorities for roading and other communications are important but the ways in which they are achieved govern their environmental effects as outlined here. Choices among such ways should also take account of effects of design on tidal water velocity affecting suitability for kayaking instruction and of tidal flows and levels on spring tide flooding.