Concept Plan SP 2024-006

Southern River Catchment Nutrient Export Modelling

BCS Rivers and Estuaries Science

Project Core Team

X X **Supervising Scientist** Kerry Trayler
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Project status as of April 12, 2024, 3:02 p.m.

X X New project, pending concept plan approval

Document endorsements and approvals as of April 12, 2024, 3:02 p.m.

X X
Project Team granted
Program Leader required
Directorate required

Southern River Catchment Nutrient Export Modelling

Program

BCS Rivers and Estuaries Science

Departmental Service

Service 7: Research and Conservation Partnerships

Background

Southern River Catchment (150km2) is the second largest nutrient (TN and TP) contributor to the Swan Canning Estuary (Kelsey, *et al*. 2010 & Paraska, *et al*. 2022). About 66% of the catchment is cleared for residential (27%), grazing (25%) and other uses (14%). The topography of the catchment and proximity to groundwater mean that there is a high groundwater contribution to overall discharge from the catchment.

In order to reduce nutrient export from the catchment, land managers need to make decisions about the location, scale and type of interventions that are required on-ground, and these require an adequate hydrological and nutrient model. Unfortunately, the existing Swan Canning catchment model (Paraska, *et al*. 2022) lacks capability to estimate local groundwater contribution to the overall nutrient export and is therefore not fit for purpose in this catchment. The role of groundwater in transporting nutrient off the catchment needs to be further investigated and a new, refined model that accounts from groundwater and landuse needs to be built.

Aims

[variant=australian]This project aims to generate a new catchment model for Southern River to address gaps in the understanding of the catchment spatiotemporal variability in hydrological regimes and water quality, as well as to improve modelled estimates of the catchment nutrient export based on: (1) sources (surface runoff and groundwater-derived), (2) land use activity, and (3) likely pathways from the catchment to the estuary.

Models to be used:

- Distributed (2D) and processed-based mesoscale Hydrologic Model (mHM) developed by Helmholtz Centre for Environmental Research (Kumar, *et al*., 2013) to perform the sub-catchment scale hydrological simulations.

- Calibrated PRAMS (Perth region aquifer modelling system) developed by Department of Water and Environmental Regulation (DWER).

Approach:

Historical dataset of groundwater and surface water levels at existing monitoring sites will be used to calibrate and validate the hydrological model. Additional 5 sites will be added for surface water flow and quality for 2 years monitoring period.

Softwares to be used:

- Programming and numeric computing MATLAB® and programming languages Python and R will be used for the project for data acquisition, processing and extraction throughout the project.

- Open-source geographic information system QGIS will be used to process all spatial dataset and perform spatial analysis.

Expected outcome

[variant=australian]A tool for engagement with local government and land managers to make informed decisions about land use and management interventions to reduce nutrient export loading and improve water quality of the Swan Canning Estuary.

Strategic context

Strategic Direction: Discover - Develop adaptive management tools to promote ecosystem resilience to the impacts of climate change and other threats

Science Strategic Goal: Mitigation of pressures and threats to ecosystems and associated values is evidence based and effective.

BCS Approach: Undertake research to understand and mitigate the pressure and threats acting on terrestrial, aquatic, estuarine and marine ecosystems.

REScience Program objective: Providing information and science support for management action aimed at reducing nutrients, organic material, sediment and non-nutrient contaminants entering the Swan and Canning Rivers.

Swan Canning River Protection Strategy: Reduce nutrients, organic material and sediment entering the Swan Canning Rivers

Expected collaborations

Local Government Authority within Southern River: City of Gosnells and City of Armadale

[variant=australian]Department of Water and Environmental Regulation (DWER) Groundwater Modellers

Proposed period of the project

April 1, 2024 – Dec. 31, 2026

Staff time allocation

to | X | X | X | X |

Role	Year 1	Year 2	Year 3
Scientist	0.2	0.8	
Technical	0.2	0.4	0.2
Volunteer			
Collaborator			

Indicative operating budget

to | X | X | X | X |

Source	Year 1	Year 2	Year 3
Consolidated Funds (DBCA)	24741	23294	24741
External Funding	90295	104334	156389