TABLE OF CONTENTS

Page

TABLE OF CONTENTS i

EXECUTIVE SUMMARY iii

APPENDIX xiv

A) Conference Presentations xv

B) Workshop Participation xvi

C) Peer reviewed scientific manuscripts xvi

D) Capacity building outcomes xvii

ARCHIVING DATA xviii

ACKNOWLEDGEMENTS xix

1. INTRODUCTION AND OBJECTIVES 1

2. REVIEW OF RESEARCH ACHIEVEMENTS 13

2.1. PROJECT WRC 926 :
AN ASSESSMENT OF THE EXTENT OF ESTROGENIC ACTIVITY IN WESTERN CAPE WATER RESOURCES 13

2.1.1. The vitellogenin response in the frog, *Xenopus laevis* 15

2.1.2. Vitellogenin as biomarker for xenopbiotic estrogens 15

2.1.3. Development and validation of a sensitive *Xenopus laevis* bioassay bioassay for detecting environmental estrogenicity 16

2.1.4. Potential use of *Xenopus laevis* male breeding glands as biomarker for anti-androgenic effects 18

2.1.5. Study of normal reproductive cycles of *Xenopus laevis* and the fresh-water turtle, *Pelomedusa subrufa* to gain baseline information 19

2.1.6. Use of caged frogs to determine the estrogenic activity in water in selected areas in the Western Cape 22

2.1.7. *In vitro* screening of drinking water for evidence of estrogenic activity in selected study areas 24

2.2. **PROJECT WRC 1253:**

ENDOCRINE DISRUPTING CONTAMINANTS (EDCS) IN SOUTH AFRICAN WATER RESOURCES: DEVELOPMENT AND VALIDATION OF *IN VITRO* AND *IN VIVO* BIOASSAYS TO DETECT ENDOCRINE INTERACTION AND CHARACTERIZE PHYSIOLOGICAL DISRUPTION IN NON-MAMMALIAN ANIMALS 26

2.2 Objectives 26

2.2.1. Literature review 27

2.2.2. Development and validation of additional bioassays to detect EDC in water resources 27

2.2.2.1. Frog and avian estrogen sensitive lipids and lipoproteins

(a) Plasma lipoprotein profiles as biomarker for estrogenicity

(b) Development of a Chicken APOII ELISA 28

2.2.2.2. Development of *Xenopus laevis* monoclonal anti-Vtg anti-bodies and Vtg ELISA 29

2.2.2.3. Development and validation of universal vitellogenin (UniVtg) Bioassay 30

2.2.2.4. Hormonal control of *Xenopus laevis* male breeding glands: Biomarker for androgenicity 32

2.2.2.5. Preliiminary investigation into gender determination, during *Xenopus laevis* tadpole metamorphosis as biomarkers for estrogenicity and thyroid function 34

2.2.3. Screening of selected water resources for EDC activity

2.2.3.1. Screening of selected water samples using *Xenopus laevis* liver slice assay with Vtg ELISA 36

2.2.3.2. Screening water samples by *in vivo* exposure using frogs and tilapia fish as bio-indicators 37

2.2.3.3. Indigenous fish species as bio-indicators for estrogenic activity in three Western Cape rivers 39

3. **CONCLUSIONS** 41

4. **RECOMMENDATIONS** 47

5. **REFERENCES** 51