

# Contents

<b>Acknowledgements</b>	<b>v</b>	
<b>Preface</b>	<b>vii</b>	
<b>Section 1</b>	<b>Background</b>	<b>1</b>
<b>Chapter 1.</b>	<b>Introduction</b>	<b>3</b>
<b>Section 2</b>	<b>Methods</b>	<b>11</b>
<b>Chapter 2.</b>	<b>Experimental Protocols</b>	<b>13</b>
	2.1. Background . . . . .	13
	2.2. Phase I and II Lysimeter Experiments .	14
	2.3. Soil Column Experiments . . . . .	29
	2.4. Mini-column Experiments . . . . .	35
<b>Chapter 3.</b>	<b>Modelling Radionuclide Transport and Uptake in Vegetated Soils</b>	<b>41</b>
	3.1. Introduction . . . . .	41
	3.2. Lysimeter System Model . . . . .	42
	3.3. Physically-Based Modelling . . . . .	57
	3.4. Hydrological Model Applications . . . .	64
	3.5. Discussion . . . . .	84

<b>Section 3</b>	<b>Results</b>	87
<b>Chapter 4.</b>	<b>Radiochlorine</b>	89
	4.1. Background . . . . .	89
	4.2. Experimental Overview . . . . .	90
	4.3. Results . . . . .	93
	4.4. General Discussion . . . . .	184
<b>Chapter 5.</b>	<b>Radioiodine</b>	188
	5.1. Background . . . . .	188
	5.2. Experimental Overview . . . . .	192
	5.3. Results . . . . .	194
	5.4. General Discussion . . . . .	226
<b>Chapter 6.</b>	<b>Technetium</b>	230
	6.1. Background . . . . .	230
	6.2. Experimental Overview . . . . .	237
	6.3. Results . . . . .	238
	6.4. General Discussion . . . . .	263
<b>Chapter 7.</b>	<b>Radioselenium</b>	266
	7.1. Background . . . . .	266
	7.2. Experimental Overview . . . . .	269
	7.3. Results . . . . .	269
	7.4. General Discussion . . . . .	294
<b>Chapter 8.</b>	<b>Radiocations</b>	300
	8.1. Background . . . . .	300
	8.2. Experimental Overview . . . . .	304
	8.3. Results . . . . .	305
	8.4. General Discussion . . . . .	338

<b>Section 4</b>	<b>Conclusions and Recommendations</b>	<b>343</b>
<b>Chapter 9.</b>	<b>Conclusions</b>	<b>345</b>
	9.1. Overview . . . . .	345
	9.2. Summary of Results . . . . .	346
	9.3. Experimental Design . . . . .	361
	9.4. Modelling . . . . .	363
	9.5. Conclusions and Future Directions . . .	365
<b>Colour Section</b>		<b>367</b>
<b>Appendix</b>		<b>379</b>
<b>Data Archive</b>		<b>381</b>
<b>Reference</b>		<b>383</b>
<b>Index</b>		<b>397</b>