

Author	Drawing number	Description	Revision	Tick if Applicable to this package
DMR	1305	Ends to Pipe Culverts – General Arrangement and Installation of Wingwalls, Headwalls and Aprons	Rev C 9/96	<input checked="" type="checkbox"/>
DMR	1306	Ends to Pipe Culverts – Construction of Unreinforced Wingwalls, Headwalls and Aprons	Rev C 9/97	<input checked="" type="checkbox"/>
DMR	1307	Access Chamber – Details 1050 to 2100 Dia.	Rev B 3/07	<input checked="" type="checkbox"/>
DMR	1308	Access Chamber – Roof Slabs 1050 to 2100 Dia.	Rev B 3/07	<input checked="" type="checkbox"/>
DMR	1309	Concrete Gully – Field Inlet Type 1	Rev A 9/99	<input checked="" type="checkbox"/>
DMR	1310	Concrete Gully – Field Inlet Type 2	Rev A 9/99	<input checked="" type="checkbox"/>
DMR	1311	Concrete Gully – Roadway Type Channel Lip in Line	Rev B 1/04	<input checked="" type="checkbox"/>
DMR	1312	Concrete Gully – Roadway Type Kerb in Line	Rev B 1/04	<input checked="" type="checkbox"/>
DMR	1313	Concrete Gully – Precast Lintel Details	Rev A 5/99	<input checked="" type="checkbox"/>
DMR	1314	Traffic Signals/Road Lighting – Pit – Drainage Details	Rev D 2/00	<input type="checkbox"/>
DMR	1315	Road Lighting Pole – Lighting Design parameters	Rev F 2/00	<input type="checkbox"/>
DMR	1316	R C Box Culverts & Slab Link Box Culverts – General Arrangement and Installation of Precast Units	Rev H 5/06	<input checked="" type="checkbox"/>
DMR	1317	R C Box Culverts & Slab Link Box Culverts – Construction of Bases with Nibs and Aprons	Rev H 3/07	<input checked="" type="checkbox"/>
DMR	1318	R C Box Culverts & Slab Link Box Culverts – Construction of Bases with Recesses and Aprons	Rev G 3/07	<input checked="" type="checkbox"/>
DMR	1319	R C Box Culverts & Slab Link Box Culverts – Construction of Unreinforced Wingwalls and RC Headwalls H = 750 – 2400	Rev I 5/06	<input checked="" type="checkbox"/>
DMR	1320	R C Box Culverts & Slab Link Box Culverts – Crown Unit Holding Down Anchors	Rev B 10/96	<input checked="" type="checkbox"/>
DMR	1321	Concrete Gully – Precast Concrete Side Inlet Gilley with Precast Shaft	Rev D 10/99	<input checked="" type="checkbox"/>
DMR	1322	Concrete Gully – Precast Concrete Side Inlet Gilley with Cast In Situ Pit	Rev D 5/99	<input checked="" type="checkbox"/>
DMR	1323	Road Lighting Pole – Luminaire Terminal Panel for Fixed Base Poles and Bridge Balustrade	Rev F 7/97	<input type="checkbox"/>
DMR	1327	Traffic Signals/Road Lighting – Mains Connection	Rev D 5/99	<input type="checkbox"/>
DMR	1328	Road Lighting Pole – Anchor Cage fabrication Details	Rev H 9/03	<input type="checkbox"/>
DMR	1329	Road Lighting Pole and Pit – Typical Physical Arrangement	Rev F 1/04	<input type="checkbox"/>
DMR	1330	Underbridge Road Lighting Bracket – General Arrangement	Rev D 1/04	<input type="checkbox"/>
DMR	1331	Wall Mounted Road Lighting Bracket – 1500mm – Fabrication Detail	Rev D 1/04	<input type="checkbox"/>
DMR	1332	Road Lighting Switchboard Pole Mounted – Typical Layout Circuit Diagram and Parts List Men System	Rev E 1/07	<input type="checkbox"/>
DMR	1333	Traffic Signals/Road Lighting – Minimum Clearance Overhead Electric Lines from Ground and Structures	Rev E 11/06	<input type="checkbox"/>
DMR	1334	Pedestrian Crossing Lighting – GEC Solarflood Flood Light Installation and Aiming	Rev C 1/04	<input type="checkbox"/>
DMR	1335	Pedestrian Crossing Lighting – Floodlight Mounting Bracket for Use with a Street Light Luminaire	Rev C 1/04	<input type="checkbox"/>
DMR	1336	Pedestrian Crossing Lighting – Floodlight Mounting Bracket	Rev E 8/99	<input type="checkbox"/>

Author	Drawing number	Description	Revision	Tick if Applicable to this package
DMR	1351	Road Furniture – Motor Grid	Rev D 2/04	<input type="checkbox"/>
DMR	1352	Road Furniture – Motor Grid with Vermin & Road Fencing	Rev C 2/04	<input type="checkbox"/>
DMR	1353	Road Furniture – Vermin & Dog Fencing at Motor Grid	Rev B 8/99	<input type="checkbox"/>
DMR	1353	Road Furniture – Vermin & Dog Fencing at Motor Grid	Rev B 8/99	<input type="checkbox"/>
DMR	1354	Standard Bicycle Safe Fitting to Existing Motor Grid	Rev C 9/99	<input type="checkbox"/>
DMR	1356	Road Edge guide Posts – Timber and Tubular Steel Post and Installation Details	Rev D 1/02	<input type="checkbox"/>
DMR	1358	Maintenance Marker Posts – Post and installation Details	Rev A 9/92	<input type="checkbox"/>
DMR	1359	Culverts – Installation, Bedding and Filling/Backfilling Against/Over Culverts	Rev E 10/03	<input checked="" type="checkbox"/>
DMR	1363	Traffic Sign – Multiple traffic Sign Support	Rev F 7/02	<input type="checkbox"/>
DMR	1364	Traffic Sign – Connection Strap and Erection Cleat Details	Rev C 7/02	<input type="checkbox"/>
DMR	1365	Traffic Sign – Traffic Sign Support Breakaway Post details (two or more supports)	Rev D 9/95	<input type="checkbox"/>
DMR	1366	Traffic Sign – Traffic Sign Support Detail Truss Type Breakaway	Rev F 9/95	<input type="checkbox"/>
DMR	1367	Traffic Sign – Traffic Sign Support Detail Truss Type Breakaway Bracing Details	Rev E 7/02	<input type="checkbox"/>
DMR	1368	Traffic Sign – Single Traffic Sign Support	Rev C 7/02	<input type="checkbox"/>
DMR	1369	Traffic Sign – Details of Sign Stiffening Extrusion	Rev A 7/02	<input type="checkbox"/>
DMR	1370	Road Lighting Pole – General Arrangements	Rev C 7/97	<input type="checkbox"/>
DMR	1371	Road Lighting Pole – Fixed Base	Rev C 7/97	<input type="checkbox"/>
DMR	1372	Road Lighting Pole – Slip Base	Rev C 7/97	<input type="checkbox"/>
DMR	1373	Road Lighting Pole – Fixed base in Concrete Median Barrier	Rev C 7/97	<input type="checkbox"/>
DMR	1374	Road Lighting Pole – Impact Absorbent	Rev C 7/97	<input type="checkbox"/>
DMR	1375	Road Lighting Pole – High Mast	Rev C 7/97	<input type="checkbox"/>
DMR	1376	Road Lighting Pole – Fixed Base with Pedestrian Crossing Floodlight	Rev C 7/97	<input type="checkbox"/>
DMR	1377	Road Lighting Pole – Joint Use Traffic Signal and Road Lighting Pole	Rev C 7/97	<input type="checkbox"/>
DMR	1378	Road Lighting Pole – Combination Traffic Signals Mast Arm and Road Lighting Pole	Rev C 7/97	<input type="checkbox"/>
DMR	1379	Road Lighting Pole – Pole Mounted Road Lighting Luminaire	Rev C 7/97	<input type="checkbox"/>
DMR	1380	Road Lighting Pole – Slip base Pole Installation Details for no Crossfall	Rev D 2/04	<input type="checkbox"/>
DMR	1381	Road Lighting Pole – Slip base Pole Installation Details for Crossfalls Not Exceeding 1:6	Rev D 2/04	<input type="checkbox"/>
DMR	1382	Road Lighting Pole – Slip base Pole Installation Details for Crossfalls of Between 1:6 and 1:3	Rev D 2/04	<input type="checkbox"/>
DMR	1386	Road Lighting Pole – Slip Base Pole Remedial Ramping treatment	Rev D 2/04	<input type="checkbox"/>
DMR	1389	Road Lighting Pole – Slip base Pole Male/Female Connectors Installation Details	Rev C 3/04	<input type="checkbox"/>
DMR	1390	Road Lighting Pole – Fixed Base Pole Aerial Connection Wiring Details	Rev B 7/97	<input type="checkbox"/>
DMR	1392	Road Lighting Pole – Fixed Base Pole Installation Details for Crossfalls Up to 1:2	Rev D 2/04	<input type="checkbox"/>
DMR	1393	Road Lighting Pole – Fixed Base Pole Installation Details for Crossfalls Up to 1:2	Rev D 2/04	<input type="checkbox"/>
DMR	1394	Road Lighting Pole – Impact Absorbent Pole Installation Details for	Rev D 2/04	<input type="checkbox"/>

Author	Drawing number	Description	Revision	Tick if Applicable to this package
DMR	1395	Crossfalls Up to 1:3 Road Lighting Pole – Fixed Base in Concrete Median Barrier Installation Details	Rev D 3/04	<input type="checkbox"/>
DMR	1396	Road Lighting Pole – Joint Use Traffic Signal and Road Lighting Pole Installation Details	Rev F 10/06	<input type="checkbox"/>
DMR	1397	Road Lighting Pole – Impact Absorbent Pole Internal Cabling Installation Details	Rev F 1/04	<input type="checkbox"/>
DMR	1398	Road Lighting Pole – Impact Absorbent Pole Wiring Details	Rev D 5/99	<input type="checkbox"/>
DMR	1399	Road Lighting Pole – Fixed Base Pole Wiring Details	Rev D 5/99	<input type="checkbox"/>
DMR	1400	Road Lighting Pole – Slip Base Pole Wiring Details	Rev C 7/97	<input type="checkbox"/>
DMR	1401	Road Lighting Pole – Fixed Base Pole Single Phase Junction Box Wiring Details No Protection	Rev B 7/97	<input type="checkbox"/>
DMR	1402	Road Lighting Pole – Slip Base Pole and Impact Absorbent Pole Single Phase Junction Box Wiring Details Fuse-Switch protection	Rev C 7/97	<input type="checkbox"/>
DMR	1403	Traffic Signals – Mast Arm Footing Installation Details	Rev F 10/06	<input type="checkbox"/>
DMR	1404	Traffic Signals – Mast Arm Anchor Cage fabrication Details	Rev E 9/02	<input type="checkbox"/>
DMR	1406	Pedestrian Crossing Lighting -- GEC Sentry PX Flood Light Installation And Aiming	Rev B 1/04	<input type="checkbox"/>
DMR	1407	Road Lighting Pole – Traffic Signal Terminal Panel for Joint Use Poles	Rev C 2/07	<input type="checkbox"/>
DMR	1408	Road Lighting Pole – Traffic Signal Terminal Panel for Joint Use Poles Wiring Details	Rev C 7/03	<input type="checkbox"/>
DMR	1409	Road Lighting Pole – Luminaire Headframes Wiring Details for Fixed Base Poles	Rev C 1/04	<input type="checkbox"/>
DMR	1410	Road Lighting Pole – Luminaire Headframes Wiring Details for Slip Base and Impact Absorbent Poles	Rev B 1/04	<input type="checkbox"/>
DMR	1411	Traffic Signals – Mast Arm Terminal Panel Road Lighting Junction Box (Type B)	Rev B 7/97	<input type="checkbox"/>
DMR	1412	Traffic Signals – Road Lighting Junction Box (Type B) Wiring Details	Rev C 5/99	<input type="checkbox"/>
DMR	1413	Traffic Signals – Terminal Panel Traffic Signal Junction Box (Type A)	Rev D 1/07	<input type="checkbox"/>
DMR	1414	Traffic Signals – Traffic Signal Junction Box (Type A) Wiring Details	Rev D 2/07	<input type="checkbox"/>
DMR	1415	Traffic Signals/Road Lighting – Circular Cable Joining Pit 600 Diameter	Rev B 3/04	<input type="checkbox"/>
DMR	1416	Traffic Signals/Road Lighting – Collar for 600 Diameter Circular Cable Joining Pit	Rev B 11/03	<input type="checkbox"/>
DMR	1417	Traffic Signals/Road Lighting – Collar for 600 Diameter Circular Cable Joining Pit Drawing 1 of 2 and Drawing 2 of 2	Rev B 11/03	<input type="checkbox"/>
DMR	1418	Traffic Signals/Road Lighting – Cable Junction Box Supporting Strap	Rev B 12/03	<input type="checkbox"/>
DMR	1420	Traffic Signals – Traffic Signals Components	Rev C 5/99	<input type="checkbox"/>
DMR	1421	Traffic Signals – Traffic Signals Post Footing Installation Details	Rev D 11/06	<input type="checkbox"/>
DMR	1422	Traffic Signals – Ragbolt Sub-Assembly Fabrication Details	Rev D 6/02	<input type="checkbox"/>
DMR	1423	Traffic Signals – Controller Base Installation Details	Rev D 8/02	<input type="checkbox"/>
DMR	1424	Traffic Signals – Detector Loops Installation Details in Asphalt Pavement	Rev D 11/06	<input type="checkbox"/>
DMR	1425	Traffic Signals – Detector Loops Placement Details	Rev D 7/016	<input type="checkbox"/>
DMR	1426	Traffic Signals – Standard Loop Configurations	Rev B 7/97	<input type="checkbox"/>
DMR	1427	Traffic Signals – 'U' Series Mast Arm Installation Details	Rev C 5/99	<input type="checkbox"/>
DMR	1428	Traffic Signals – Base Mounted Signals Post Installation Details	Rev C 5/99	<input type="checkbox"/>

Author	Drawing number	Description	Revision	Tick if Applicable to this package
DMR	1429	Road Lighting Pole – Slip Base Pole Installation Details for Crossfalls of Between 1:6 and 1:3 Using Concrete Step Thread	Rev B 2/04	<input type="checkbox"/>
DMR	1430	Road Lighting Switchboard Pillar Mounted – Typical Layout Circuit Diagram and Parts List Men System	Rev C 1/07	<input type="checkbox"/>
DMR	1431	Road Lighting Pole – Fixed Base Pole Loop In/Loop Out Wiring Details	Rev A 7/97	<input type="checkbox"/>
DMR	1432	Road Lighting Pole – Fixed Base Pole Three Phase Junction Box Wiring Details No Protection	Rev A 7/97	<input type="checkbox"/>
DMR	1433	Road Lighting Pole – Slip Base Pole and Impact Absorbent Pole Three Phase Junction Box Wiring Details Fuse – Switch Protection	Rev A 7/97	<input type="checkbox"/>
DMR	1434	Traffic Signals/Road Lighting – Cable Guard Manufacturing Details	Rev A 5/99	<input type="checkbox"/>
DMR	1436	Traffic Signals – Symbols	Rev C 5/06	<input type="checkbox"/>
DMR	1437	Traffic Signals – Hinged Base Plate for Traffic Signal Post Fabrication Details	Rev B 5/99	<input type="checkbox"/>
DMR	1438	Traffic Signals – Hinged Base Plate for Traffic Signal Post Installation Details	Rev B 5/99	<input type="checkbox"/>
DMR	1439	Traffic Signals – Lantern Designations, Functions and Aiming	Rev C 11/06	<input type="checkbox"/>
DMR	1440	Traffic Signals/Road Lighting – Pit-Concrete Surround	Rev B 1/00	<input type="checkbox"/>
DMR	1441	Access Chamber – Step Irons	Rev A 5/99	<input checked="" type="checkbox"/>
DMR	1442	Concrete Gullies – Roadway Type at Concrete Barriers	Rev A 5/99	<input checked="" type="checkbox"/>
DMR	1443	Concrete Gully – Roadway Type Precast Inlet Units on Grade	Rev A 5/99	<input checked="" type="checkbox"/>
DMR	1444	Concrete Gully – Roadway Type Precast Inlet Units in Sag	Rev A 5/99	<input checked="" type="checkbox"/>
DMR	1445	Concrete Gully – Roadway Type for Type 28 Channel	Rev A 6/02	<input checked="" type="checkbox"/>
DMR	1446	Kerb ramp – Ramped Pedestrian Crossing	Rev A 10/00	<input type="checkbox"/>
DMR	1447	Median and Island Crossings – Ramped and Cut Through Pedestrian Crossings	Rev A 10/00	<input type="checkbox"/>
DMR	1448	Road Furniture – Motor Grid (RHS Rails)	Rev D 7/06	<input type="checkbox"/>
DMR	1449	Road Furniture – Motor Grid (RHS Rails) with Vermin & Dog Fencing	Rev C 2/04	<input type="checkbox"/>
DMR	1450	Traffic Sign – Traffic Sign Support Timber Posts	Rev B 9/95	<input type="checkbox"/>
DMR	1451	Traffic Sign – Timber Support Details	Rev D 9/95	<input type="checkbox"/>
DMR	1459	Concrete Gully – Roadway Type Channel Lip in Line Anti-Ponding in Sag	Rev A 6/02	<input checked="" type="checkbox"/>
DMR	1460	Type F Concrete Barrier – Extruded Median Barrier – Barrier, Reinforcing and Expansion Joint Details	Rev E 3/04	<input type="checkbox"/>
DMR	1461	Type F Concrete Barrier – Extruded Median Barrier – Details of Road Lighting Pole Cover Plates	Rev D 3/04	<input type="checkbox"/>
DMR	1462	Type F Concrete Barrier – Transition between Median Barrier and W Beam Guardrail	Rev E 3/04	<input type="checkbox"/>
DMR	1463	Type F Concrete Barrier – Reinforcing Details for Median Barrier Terminal with Lighting	Rev C 7/02	<input type="checkbox"/>
DMR	1464	Type F Concrete Barrier – Reinforcing Details for Median Barrier Terminal without Lighting	Rev B 1/00	<input type="checkbox"/>
DMR	1465	Type F Concrete Barrier – Fabrication Details for W Beam Guardrail Connection Brackets	Rev B 12/99	<input type="checkbox"/>
DMR	1466	Concrete Barriers – Delineator Bracket Details	Rev C 7/02	<input type="checkbox"/>

Author	Drawing number	Description	Revision	Tick if Applicable to this package
DMR	1467	Concrete Barrier/Bridge Parapet – Cast-In Anchor Assembly for W and Thrie Beam Guardrail Connection	Rev C 3/02	<input type="checkbox"/>
DMR	1468	Single Slope Concrete Barrier – Extruded Median Barrier – Barrier, Reinforcing and Expansion Joint Details	Rev D 3/04	<input type="checkbox"/>
DMR	1469	Single Slope Concrete Barrier – Extruded Median Barrier – Details of Road Lighting Pole Cover Plates	Rev C 3/04	<input type="checkbox"/>
DMR	1470	Single Slope Concrete Barrier – Transition between Median Barrier and Thrie Beam Guardrail	Rev D 3/04	<input type="checkbox"/>
DMR	1471	Single Slope Concrete Barrier – Reinforcing Details for Median Barrier Terminal with Lighting	Rev B 2/02	<input type="checkbox"/>
DMR	1472	Single Slope Concrete Barrier – Reinforcing Details for Median Barrier Terminal without Lighting	Rev B 2/02	<input type="checkbox"/>
DMR	1473	Single Slope Concrete Barrier – Precast Concrete Barrier	Rev C 8/02	<input type="checkbox"/>
DMR	1474	Steel Beam Guardrail – Installation and Set out	Rev E 6/06	<input type="checkbox"/>
DMR	1475	Steel Beam Guardrail – Installation on Bridge and Barrier Approaches	Rev D 11/01	<input type="checkbox"/>
DMR	1476	Steel Beam Guardrail – Terminal Components	Rev E 8/06	<input type="checkbox"/>
DMR	1477	Steel Beam Guardrail – Posts and Block outs, Soil and Bearing Plates, Slip Base Plate	Rev E 4/06	<input type="checkbox"/>
DMR	1478	Steel Beam Guardrail – W Beam Anchor Bracket Delineation Unit Post on Base Plate Abraham Blockout	Rev D 3/04	<input type="checkbox"/>
DMR	1479	Steel Beam Guardrail – Bolts, nuts, Screws and Washers Cable Assembly with Fasteners	Rev C 12/01	<input type="checkbox"/>
DMR	1480	Steel Beam Guardrail – fabrication Details for W Beam Rails and Rail Components	Rev B 1/04	<input type="checkbox"/>
DMR	1481	Steel Beam Guardrail – fabrication Details for Thrie Beam Rails and Rail Components	Rev B 1/04	<input type="checkbox"/>
DMR	1482	Steel Beam Guardrail – W Beam and Thrie Beam Assemblies	Rev B 7/02	<input type="checkbox"/>
DMR	1483	Steel Beam Guardrail – Thrie Beam Layouts	Rev B 4/01	<input type="checkbox"/>
DMR	1484	Steel Beam Guardrail – Batter Slope Terminals (1 on 1 and Steeper)	Rev A 8/02	<input type="checkbox"/>
DMR	1485	Steel Beam Guardrail – Reinforcing Details for Concrete Terminal Block	Rev A 2/02	<input type="checkbox"/>
DMR	1486	Single Slope Concrete Barrier – Concrete Terminal with Thrie Beam Guardrail Connection General Details	Rev A 6/02	<input type="checkbox"/>
DMR	1487	Single Slope Concrete Barrier – Concrete Terminal with Thrie Beam Guardrail Connection Reinforcement Details	Rev A 2/02	<input type="checkbox"/>
DMR	1488	Steel Beam Guardrail – Thrie Beam Bullnose Installation and Setout	Rev A 10/03	<input type="checkbox"/>
DMR	1489	Steel Beam Guardrail – Thrie beam Bullnose Components	Rev A 3/04	<input type="checkbox"/>
DMR	1490	Steel Beam Guardrail – Installation and Setout Footing Details	Rev A 12/06	<input type="checkbox"/>
DMR	1491	Steel Beam Guardrail – Standard Guardrail Attachments to Culverts, Fabrication and Assembly Details	Rev A 1/07	<input type="checkbox"/>
DMR	1493	Steel Beam Guardrail – W Beam Connections for Concrete End Posts	Rev B 6/02	<input type="checkbox"/>
DMR	1494	Steel Beam Guardrail – Thrie Beam Connections for Concrete End Posts	Rev B 6/02	<input type="checkbox"/>
DMR	1495	Wire Rope Barrier – Transition Between Steel Beam Guardrail and Brifen Wire Rope Barrier on One Way Road	Rev A 8/02	<input type="checkbox"/>

Author	Drawing number	Description	Revision	Tick If Applicable to this package
DMR	1496	Wire Rope Barrier – Transition Between Steel Beam Guardrail and Flexfence Wire Rope Barrier on One Way Road	Rev A 8/02	<input type="checkbox"/>
DMR	1497	Wire Rope Barrier – Transition Between Concrete Barrier and Brifen/Flexfence Wire Rope Barrier on One Way Road	Rev A 8/02	<input type="checkbox"/>
DMR	1500	Bridges – Octagonal PSC Pile	Rev B 9/03	<input type="checkbox"/>
DMR	1508	Bridge Barriers – Steel Bridge Traffic Rail Intermediate Post and Rails	Rev D 3/07	<input type="checkbox"/>
DMR	1509	Bridge Barriers – Steel Bridge Traffic Rail End Post W Beam Connection	Rev C 3/07	<input type="checkbox"/>
DMR	1510	Bridge Barriers – Steel Bridge Traffic Rail End Post Thrie Beam Connection	Rev C 3/07	<input type="checkbox"/>
DMR	1511	Bridge Barriers – Bridge Safety Rail	Rev B 9/03	<input type="checkbox"/>
DMR	1512	Bridge Barriers – Bridge Balustrade	Rev A 9/03	<input type="checkbox"/>
DMR	1600	Fencing – Rural Fence and Gates Timber Posts and Stays	Rev A 12/00	<input type="checkbox"/>
DMR	1601	Fencing – Rural Fence and Gates CHS Posts and Stays	Rev B 7/03	<input type="checkbox"/>
DMR	1602	Fencing – Chainwire Fence and Gates	Rev B 6/02	<input type="checkbox"/>
DMR	1603	Fencing – Koala Proof Fence and Gate	Rev A 6/02	<input type="checkbox"/>
DMR	1604	Fencing – Galvanized Welded Mesh Fencing	Rev A 6/02	<input type="checkbox"/>
DMR	1608	Noise Barriers – Structural Detail Universal Beam Posts Concrete Panels Steel Panels	Rev A 4/04	<input type="checkbox"/>
DMR	1700	Traffic Signals – VID Detector Loops Installation Details	Rev A 10/06	<input type="checkbox"/>
DMR	1701	Traffic Signals – Detector Loops Details Counting Loops and Diode Connection	Rev A 1/07	<input type="checkbox"/>
DMR	1702	Traffic Signals – Detector Loops Motorways and Ramp Placement, and Installation Details	Rev A 1/07	<input type="checkbox"/>
DMR	1703	Traffic Signals – Red Light Camera Cable and Loop Details	Rev A 1/07	<input type="checkbox"/>
DMR	1704	Traffic Signals – Red Light Camera Wiring Details	Rev A 1/07	<input type="checkbox"/>
DMR	1707	Road Lighting Pole – Fixed Base Poles Mounted on Bridges Wiring Details	Rev A 3/07	<input type="checkbox"/>
DMR	1519	Pre-cast Units – Design assumptions for standard deck and kerb units	Rev A 03/08	<input type="checkbox"/>
QR	2567	Track Formation	Passed 29.5.04	<input type="checkbox"/>
ICC	SR.02	Typical Cross Sections – Residential Streets	Rev C	<input type="checkbox"/>
ICC	SR.03	Typical Cross Sections – Industrial Streets	Rev C	<input type="checkbox"/>
ICC	SR.04	Typical Cross Sections – Sub-Arterial and Arterial Roads with Kerbs and Channel	Rev C	<input type="checkbox"/>
ICC	SR.05	Typical Cross Sections – Sub-Arterial and Arterial Roads without Kerbs and Channel	Rev C	<input type="checkbox"/>
ICC	SR.06	Standard Verge and Access Profiles – Access Streets, Collector Streets and Industrial Streets	Rev B	<input type="checkbox"/>
ICC	SR.07	Standard Verge Profiles – Trunk Collector Streets, Sub-Arterial and Arterial Roads with Kerb and Channel	Rev B	<input type="checkbox"/>
ICC	SR.08	Standard Verge Profiles – Sub-Arterial and Arterial Roads without Kerb and Channel	Rev A	<input type="checkbox"/>

Author	Drawing number	Description	Revision	Tick if Applicable to this package
ICC	SR.09	Typical Cross Sections – Rural Roads	Rev B	<input type="checkbox"/>
ICC	SR.10	Standard Verge Profiles – Rural Roads	Rev B	<input type="checkbox"/>
ICC	SR.11	Standard Kerb and Channel Profiles Including Edge Restraints, Median and Inverts	Rev C	<input type="checkbox"/>
ICC	SR.12	Standard Residential Driveway – Driveway Invert and Slab or Tracks	Rev B	<input type="checkbox"/>
ICC	SR.13	Standard Commercial Driveway Invert and Slab Type A – Two Way Access	Rev A	<input type="checkbox"/>
ICC	SR.14	Standard Commercial Driveway Invert and Slab Type B – Two Way Access	Rev A	<input type="checkbox"/>
ICC	SR.15	Standard Invert Crossing for Areas without Kerb and Channel	Rev A	<input type="checkbox"/>
ICC	SR.16	Standard Rural Road Driveway Pipe Crossing	Rev A	<input type="checkbox"/>
ICC	SR.17	Standard Kerb and Channel Roofwater Drainage Connections	Rev B	<input type="checkbox"/>
ICC	SR.18	Standard Kerb Ramp	Rev C	<input type="checkbox"/>
ICC	SR.19	Standard Concrete Strip Pathways	Rev C	<input type="checkbox"/>
ICC	SR.20	Subsurface Drainage	Rev B	<input checked="" type="checkbox"/>
ICC	SR.21	Subsurface Drainage Flushing Points	Rev B	<input checked="" type="checkbox"/>
ICC	SR.22	Public Utilities in Subdivisions – Typical Service Corridors and Alignments	Rev C	<input type="checkbox"/>
ICC	SR.23	Public Utilities in Subdivisions – Typical Service Conduit Sections	Rev C	<input type="checkbox"/>
ICC	SR.24	Standard Brass Indicator Djsc for Service Crossings	Rev A	<input type="checkbox"/>
ICC	SR.25	Typical Single Post Traffic Sign	Rev B	<input type="checkbox"/>
ICC	SR.26	Standard Street Name Sign	Rev B	<input type="checkbox"/>
ICC	SR.28	Typical Concrete Threshold Treatment	Rev B	<input type="checkbox"/>
ICC	SR.29	Standard Roundabout Details	Rev B	<input type="checkbox"/>
ICC	SR.30	Overland Flow Path	Rev A	<input type="checkbox"/>
ICC	SR.31	Stone Work at Floodways – Rural Roads	Rev A	<input type="checkbox"/>
ICC	SR.32	Weld Mesh Fencing and Control Fence	Rev B	<input type="checkbox"/>
ICC	SR.33	Tubular Steel Fence with and without Chain Wire	Rev B	<input type="checkbox"/>
ICC	SR.34	Chain Wire Security Fencing	Rev A	<input type="checkbox"/>
ICC	SR.35	Log Barrier Fencing	Rev A	<input type="checkbox"/>
ICC	SR.36	Fencing – Locking Rail	Rev A	<input type="checkbox"/>
ICC	SR.37	4 & 6 Strand Barbed Wire Fence	Rev A	<input type="checkbox"/>
ICC	SR.38	Installation of Field Gate and Posts	Rev A	<input type="checkbox"/>
ICC	SR.39	Typical Bus Bay Indent	Rev A	<input type="checkbox"/>

## Appendix D – Reference Documents

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Released under RTI - DTMR



List of Reference Documents applying to this design lot.

Number	Description	Revision
	Queensland Urban Drainage Manual	2nd Ed 2007
	Road Drainage Design Manual	June 2002
	Australian Rainfall and Runoff	2001
D2G-BASD-DGRODR101-R-1000	Design Criteria Report	1
D2G-DP-SM-R-001	Safety in Design CHAIR 1 Report	1
D2G-BASD-DGFHKS100-R-1000	Regional flood model	1
D2G-BASD-REFHKS100-R-1000	Goodna Creek local flood model	1
DGGOKS100	Geotechnical Investigation Plans	1

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## Appendix E – Environmental Requirements Checklist

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Environmental Requirements Checklist (Version 7)

	Zone 2	Drainage	Design Response	Status (Compliant/ Partially compliant/ Non-compliant/ Not applicable)	Date Closed
All permanent water quality treatment structures should be designed for the adequate control of pollution and sediment in the one year Average Recurrence Interval (ARI) peak flow as a minimum, and also designed for stability for at least the 20 year ARI peak storm event.	Y	Y	Not applicable to this design lot. Refer to water quality design package (RERODR202).	Not applicable	24.11.09
Implement WSUD measures in accordance with design objectives in the Healthy Waterways' WSUD Action Plan (Section 3.3.1).	Y	Y	Not applicable to this design lot. Refer to water quality design package (RERODR202).	Not applicable	24.11.09
Design sedimentation ponds with sufficient holding times to reduce suspended solids to at or less than the suspended solid concentration of the receiving watercourse before release or use on site.	Y	Y	Not applicable to this design lot. Refer to water quality design package (RERODR202).	Not applicable	24.11.09
Any dewatering of trenches containing exposed acid sulphate soils shall be discharged to a holding pond and not directly into local waterways. Water testing and treatment, if necessary, is to be performed prior to water reuse or release.	Y	Y	Addressed during construction in accordance with the Construction Environmental Management Plan (D2C-MPL-V-017).	Compliant	24.11.09
Carry out weekly inspections of water quality treatment devices and implement regular maintenance regimes through operational phase.	Y	Y	Weekly inspections will be carried out during construction and a maintenance plan for the operational phase of the devices are contained within the design report. Applicable to the water quality package only (RERODR202)	Not applicable	24.11.09
Outfalls should meet the requirements of QUDM Chapter 3.02 – Lawful points of discharge.	Y	Y	New outlets are generally located where existing outlets discharge to established watercourses and drainage systems, or to park, drainage or road reserve and stormwater easements. Designs for individual outlets ensure that they do not cause actionable nuisance. The assessment of actionable nuisance includes potential changes to the quantum of flow and the concentration of flow at the point of discharge.	Compliant	22.12.09
Surface flows that are concentrated by an open channel or conduit should be controlled prior to discharge on a downstream system or owner. Concentrated flows should be dissipated by the use of detention and energy dissipators.	Y	Y	Addressed. All flow are discharged in a controlled manner refer to the detailed design drawings.	Compliant	24.11.09
Summary of the Water Quality Objectives applicable to the IMU. • Frequent Flow Management: Capture the first 15min/d of Runoff. • Waterway Stability Management: Limit post development 1-year ARI to pre-development (undeveloped) 1-Year ARI; Limit post development 100-year ARI to pre-development (undeveloped) 100-Year ARI. • Stormwater Quality Management: Achieve the following reductions in total pollutant load: 90% reduction in gross pollutants; 80% reduction in TSS; 60% reduction in Total Phosphorus; 45% reduction in Total Nitrogen.	Y	Y	Not applicable to this design lot. Refer to water quality design package (RERODR202).	Not applicable	24.11.09
It is recommended that, where feasible, all permanent water quality treatment structures should be designed for the adequate control of discharge, pollution, and sediment in the 1-year Average Recurrence Interval (ARI) event and 100 year ARI event.	Y	Y	Not applicable to this design lot. Refer to water quality design package (RERODR202).	Not applicable	24.11.09
All water quality works designed for the IMU should be developed with an operation and maintenance plan for the construction and operational phases of the project. These plans should be provided to ICC's maintenance department to ensure the long term operation of constructed water quality facilities.	Y	Y	Not applicable to this design lot. Refer to water quality design package (RERODR202).	Not applicable	24.11.09

Environmental Requirements Checklist (Version 7)

	Zone 2	Drainage	Design Response	Status (Compliant/ Partially compliant/ Non-compliant/ Not applicable)	Date Closed
<p>Waterway habitat degradation:</p> <ul style="list-style-type: none"> <li>Incorporate a filtration system into the drainage design in order to minimise pollutants entering Goodna and Six Mile Creeks. (Change 15000 to 16300 and 17700 to 18200)</li> <li>Revegetate creek banks with local provenance</li> </ul>	Y	Y	Not applicable to this design lot. Refer to water quality design package (RERODR202).	Not applicable	24.11.09
<p>Incorporate fauna underpass into road design at Goodna Creek (Change 15000 to 16300)</p>	Y	Y	Not applicable to this design lot. Refer to Smiths Road transverse design package (RERODD207).	Not applicable	24.11.09
<p>Establish fauna friendly culverts catering for a variety of faunal groups (Change 15000 to 16300)</p>	Y	Y	Not applicable to this design lot. Refer to Smiths Road transverse design package (RERODD207).	Not applicable	24.11.09
<p>Capture of road runoff in sedimentation/retention basins reducing the likelihood of seeds passing into nearby riparian areas (assuming adequate weed monitoring and control is carried out at each basin)</p>	Y	Y	Not applicable to this design lot. Refer to water quality design package (RERODR202).	Not applicable	24.11.09
<p>Swales and drainage channels longitudinal alignments to gently meander reflecting natural landform and to be of a more naturalised appearance with maximum side slope of 1:3. Investigate the use of rock lined wet, macrophyte planted and grass swale types.</p>	Y	Y	Not applicable to this design lot. No swales are incorporated into the design. For longitudinal drainage details refer to RERODR201.	Not applicable	24.11.09
<p>In the event of a spill, Emergency Services to be contacted immediately. Construction of settling ponds along the road corridor for the capture of any dangerous goods or hazardous substances. Contaminated water to be disposed of at a licensed waste transfer station.</p>	Y	Y	Spill containment basins have been designed in accordance to spill capture requirements and risk based approach where there are no space constraints. Not applicable to this design lot. Refer to water quality design package (RERODR202).	Not applicable	24.11.09
<p>DMR shall insist on the use of recycled material, where they are available and cost-competitive, by all contractors. Furthermore, recycling shall be utilised where available and cost-competitive for the disposal of all waste materials.</p>	Y	Y	Opportunities to minimise waste and use recycled materials have been considered as part of the design process, such as incorporation of existing culverts during temporary construction staging.	Compliant	24.11.09
<p>Contractors are to develop and implement a Stormwater Management Plan (SWMP) that clearly identifies potential flood sections along the upgrade corridor. The SWMP must include emergency procedures, contact numbers and an action plan outlining what to do in the event of a flood.</p>	Y	Y	To be addressed by construction team. To be addressed during the construction phase of the project in accordance with the Construction Environmental Management Plan (DZG-MPPL-V-017).	Compliant	24.11.09
<p>All contractors must, where possible, provide sandbag and/or bunding protection at the points of intersections of the construction site and the Six Mile and Goodna Creeks. Use of additional ITS in notifying vehicles travelling along the corridor and adjoining motorways of the delays in traffic movement and the location of the flooding.</p>	Y	Y	To be addressed by construction team. Control measures (during construction) will be in accordance with the Construction Environmental Management Plan (DZG-MPPL-V-017) and Incident Response Management Plan (DZG-MPPL-V-16).	Compliant	24.11.09

Environmental Requirements Checklist (Version 7)

	Zone 2	Drainage	Design Response	Status (Compliant/ Partially compliant/ Non-compliant/ Not applicable)	Date Closed
<p>The durability portions of the Project Plans and the Maintenance Manual must demonstrate how the selected design, materials, construction, operation and maintenance will achieve the durability objectives of each Asset, in conjunction with the specified Design Life for that Asset in section 5.2 of this Scope of Works and Technical Criteria. For each Asset which comprises part of the Upgrade, the Project Plans must:</p> <ul style="list-style-type: none"> <li>(i) define the characteristics of the environment;</li> <li>(ii) identify the potential deterioration mechanisms in that environment;</li> <li>(iii) determine the likely rate of deterioration;</li> <li>(iv) assess the material life;</li> <li>(v) define the required material performance;</li> <li>(vi) assess the need for further protection;</li> <li>(vii) if appropriate, develop procedures for replacement of Asset Items and Asset Sub-Items at intervals consistent with the Design Life specified in section 5.2 of this Scope of Works and Technical Criteria;</li> <li>(viii) determine inspection and monitoring requirements for both critical and non-critical Assets; and</li> <li>(ix) if appropriate, outline possible remedial measures.</li> </ul>	Y	Y	<p>The durability assessment has been carried out (refer to D2G-BASD-DGD/JS100-R-1000) and the recommendations incorporated into the design of culverts.</p>	Compliant	24.11.09
<p>The results of the Condition Surveys must be taken into account during design, construction and operation of the Upgrade.</p> <p>Except as specified in Appendix 36, the various Assets must have the following minimum Design Life: Drainage elements that are accessible for refurbishment, including building drainage, sedimentation and detention ponds, 20 years;</p>	Y	Y	<p>To be addressed by construction team.</p> <p>Addressed during design process. Refer to Design Criteria Report - Drainage (D2G-BASD-DGRDR000-R-001-R10).</p> <p>In developing the design, a durability assessment has been undertaken and all transverse drainage crossings have been designed for 100yr design life.</p>	Partially compliant	24.11.09
<p>The Contractor must develop, maintain and operate a drainage system and develop design solutions which avoid or minimise any potential damage or loss that may result from, or may be contributed to by water discharge from the Project Works and Temporary Works.</p>	Y	Y	<p>Not applicable to this package. Addressed as part of the TTM works as temporary construction staging drainage design has been shown on these drawings.</p>	Not applicable	24.11.09
<p>The Contractor must provide a water management system that requires a minimum of maintenance consistent with the need to ensure appropriate water quality discharge from the Project Works and Temporary Works.</p>	Y	Y	<p>Not applicable to this design lot. Refer to water quality design package (RERODR202).</p>	Not applicable	24.11.09
<p>The drainage system must:</p> <ul style="list-style-type: none"> <li>(i) preserve the existing elements such as natural channels, wetland and riparian vegetation;</li> <li>(ii) manage both the quality and quantity of runoff such that it is as close to the sources as possible and include the installation of devices which treat the stormwater and retain the run-off so that the system changes the existing water regime to the smallest amount practicable;</li> <li>(iii) be integrated with the construction process so that the total investment in drainage infrastructure is minimised and access is available to all devices which need on-going maintenance during both the construction phase, operation phase and the maintenance phase;</li> <li>(iv) be capable of being partitioned to contain spillage from incidents;</li> <li>(v) be designed for ease of maintenance; and</li> <li>(vi) be structurally safe in any storm.</li> </ul>	Y	Y	<ul style="list-style-type: none"> <li>(i) Addressed.</li> <li>(ii) for water quality management refer to RERODR202. Flow regime has been impacted to the smallest amount practicable, while ensuring that afflux is mitigated both upstream and downstream of the local roads.</li> <li>(iii) Access to drainage elements has considered in the design process.</li> <li>(iv) Not applicable to this design lot, refer water quality design package RERODR202.</li> <li>(v) see (iii)</li> <li>(vi) Addressed.</li> </ul>	Partially compliant	24.11.09
<p>Bridge drainage, bridge scrapers and underpass drainage must be connected to the road drainage system.</p>	Y	Y	<p>Not applicable to this design package.</p>	Not applicable	24.11.09

Environmental Requirements Checklist (Version 7)

	Zone 2	Drainage	Design Response	Status (Compliant/ Partially compliant/ Non-compliant/ Not applicable)	Date Closed
The drainage system must prevent any flooding inside underpasses for a 10 year ARI. The Upgrade must be designed so that the motorway carriageways are protected by physical means to prevent flooding of the Upgrade such that the lowest point of each carriageway's pavement surface is 100mm above the 100 year ARI flood level for cross drainage.	Y	Y	Not applicable to this design package.	Not applicable	24.11.09
The Upgrade must be designed so that the above requirement of sub-section (a) is maintained for the design life of the Assets. Flood levels must be measured during representative storm events immediately following completion of construction of relevant sections of the Project Works to verify the likely compliance of the Project Works with the predicted inundation limits and inundation times. In the event that the measurements required in sub-section (b) demonstrate flood levels and/or inundation times greater than those predicted, the Contractor must immediately commence a process to modify the Project Works to the meet the required limits, unless otherwise agreed by Main Roads.	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (D2G-BASD-DGRDR000-R-001-A0). This level of protection achieved from this design.	Compliant	24.11.09
A high standard environmental design must be developed for the Project Works, including provision for: (i) erosion, sedimentation and water quality infrastructure (ii) groundwater movements (iii) fauna underpasses and fauna fencing (iv) fish-friendly structures, including watery design (v) management and mitigation measures for environmentally sensitive areas, including marine environments, and (vi) construction and operational noise and vibration measures.	Y	Y	Fish friendly structures are not required at this location. Refer to Zone 2 Water Quality design lot RERODR202.	Not applicable	24.11.09
Concrete safety barriers must not be used in areas where fauna habitat is adjacent to the Project Site and fauna has not been effectively prevented from crossing the Project Site, or where a concrete safety barrier could adversely impact the effects of floods.	Y	Y	Not applicable to this design package. Addressed as part of the road design and fencing and accommodation works. It should be noted that fauna exclosure fencing is proposed in all areas of significant fauna habitat.	Not applicable	24.11.09
Bridge drainage over streams shall satisfy the requirements of the Environmental Management Plan (EMF). In general, collection and treatment of drainage water is not required unless specified in the EMF. Where drainage pipes are required, they must be able to be cleaned effectively, and placed between beams or behind an edge skirt to maintain clean lines on the bridge profile. Drainage system shall be hot dip galvanized steel. PVC drains are not permitted.	Y	Y	Not applicable to this design package.	Not applicable	24.11.09
The drainage design must comply with the following requirements: (a) The drainage design must be in accordance with Reference Documents, the Main Roads Road Drainage Design Manual, Australian Rainfall and Runoff (ARRR) 2001 and the requirements of all relevant Authorities.	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (D2G-BASD-DGRDR000-R-001-A0)	Compliant	24.11.09
The drainage design must comply with the following requirements: (b) The Contractor must obtain approval for the drainage design from all relevant Authorities.	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (D2G-BASD-DGRDR000-R-001-A0). Consultation with the relevant Authorities is ongoing.	Compliant	24.11.09
The drainage design must comply with the following requirements: (c) The drainage design must hydraulically model watercourses which are crossed by the Project Works for flooding and impact of the PMF, and must provide flood mitigation measures where required.	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (D2G-BASD-DGRDR000-R-001-A0)	Compliant	24.11.09
The drainage design must comply with the following requirements: (d) For all drainage design, the storm modelled must be the one producing the largest peak discharge for the required storm event.	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (D2G-BASD-DGRDR000-R-001-A0)	Compliant	24.11.09

Environmental Requirements Checklist (Version 7)

	Zone 2	Drainage	Design Response	Status (Compliant/ Partially compliant/ Non-compliant/ Not applicable)	Date Closed
The drainage design must comply with the following requirements: (e) The Project Works must not increase inundation levels more than those contained in section 5.13 of this Scope of Works and Technical Criteria or the Environmental Documents.  The drainage design must comply with the following requirements: (f) Runoff from along ramps or turning roadways must not flow beyond noses and across the main carriageway for a 2 year ARI storm event.	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (DZG-BASD-DGRDR000-R-001-A0). Inundation levels are not increased as a result of this design.  Not applicable to this design lot, refer longitudinal drainage RERODR201.	Compliant	24.11.09
The drainage design must comply with the following requirements: (g) Where the pipe system is not self-cleaning, the drainage design must make provision for acceptable alternative cleaning strategies.	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (DZG-BASD-DGRDR000-R-001-A0).  Minimum velocities have been achieved for all culverts to allow for self cleaning.	Compliant	24.11.09
The drainage design must comply with the following requirements: (h) If embankment or formation settlement occurs, the required waterway areas must be maintained.	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (DZG-BASD-DGRDR000-R-001-A0)	Compliant	24.11.09
The drainage design must comply with the following requirements: (i) The design of waterway areas must accommodate any embankment or formation settlement.	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (DZG-BASD-DGRDR000-R-001-A0), and Geotechnical Investigation included in this report.	Compliant	24.11.09
The drainage design must comply with the following requirements: (j) The part(s) of the drainage system that deal(s) with general pavement drainage must incorporate methods for retention of 40,000 litres of polluted run-off (including oil and chemical pollutants, and oil and chemical spills) at each point of discharge from the Project Site and the Local Road Works, including discharges into existing wetlands or tidal channels.	Y	Y	Not applicable to this design lot. Refer to water quality design package (RERODR202).	Not applicable	24.11.09
The drainage design must comply with the following requirements: (k) The drainage system must separate cross-drainage systems from pavement drainage systems and from longitudinal drainage systems.	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (DZG-BASD-DGRDR000-R-001-A0).	Compliant	24.11.09
The drainage design must comply with the following requirements: (l) Oil and chemical spill collection and treatment must be provided at water crossings nominated by Main Roads.	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (DZG-BASD-DGRDR000-R-001-A0) and the water quality design lot RERODR202	Not applicable	24.11.09
Drainage of surface run-off from pavement wearing surfaces must be designed for a 1 in 10 year ARI. A 1 in 100 year ARI must be modelled and a check made of flow levels to ensure that nuisance flooding is avoided. A drainage system must be provided to pick up all pavement water, including any drainage layers.	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (DZG-BASD-DGRDR000-R-001-A0)	Compliant	24.11.09
Watercourses must be modelled and have impacts assessed for 50 year and 100 year ARIs and the PMF	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (DZG-BASD-DGRDR000-R-001-A0)	Compliant	24.11.09
The following minimum ARI must be applied to the drainage design: (i) cross highway drainage - 100 year ARI (ii) channels and open drains - 10 year ARI (iii) gutter flow spread limited to width of shoulder - 10 year ARI (iv) piped system (including pits) - 10 year ARI (v) major storm event check for no property damage - 100 year ARI (vi) major storm event check for no structure damage - 200 year ARI (vii) surface run-off from pavement - as per Clause 7.12.1.2 and Clause 7.12.1.5.	Y	Y	(i) refer transverse drainage package RERODR205 - It should be noted that transverse drainage for the local roads has been designed for 20 year ARI. (ii) refer longitudinal drainage package RERODR201 (iii) refer longitudinal drainage package RERODR201 (iv) refer longitudinal drainage package RERODR201 (v) refer longitudinal drainage package RERODR201 (vi) Addressed, major storm 100year floods were checked. (vii) Addressed PMF floods for C-FSS950. (viii) refer longitudinal drainage package RERODR201	Partially compliant	24.11.09

5.13

Environmental Requirements Checklist (Version 7)

	Zone 2	Drainage	Design Response	Status (Compliant/ Partially compliant/ Non-compliant/ Not applicable)	Date Closed
A catchment drawing must be provided within the design report and must show: (a) existing and design contours, gullies/slots, manholes, culverts, bridges and pipes (b) catchment areas (c) pervious and impervious percentages (d) coefficients of runoff (e) overland flow times, including times of concentration, and (f) extent of proposed work.	Y	Y	Catchments plans are included in this design package, refer to Appendix A.	Compliant	24.11.09
Continuity of ground water flow from one side of tunnel or underpass structures (including approach structures) to the other side of tunnel or underpass structures must be provided. The infrastructure to accommodate the groundwater flow across the tunnel or underpass and its approach must be designed to address the chemical properties of the groundwater and the potential for iron compound precipitation from the groundwater to block pipe work, making any provisions necessary to facilitate maintenance activities and removal of blockages from the pipes.	Y	Y	Not applicable to this design lot as no tunnels are present in this design lot.	Compliant	24.11.09
All outlets of the surface drainage system must incorporate energy dissipation, erosion and sediment control.	Y	Y	All outlets have energy dissipation, erosion and sediment controls.	Compliant	24.11.09
Construction of the drainage system must be consistent with the acid sulphate soils management plan.	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (DGRDR101-R-1000). Also refer to the Construction Environmental Management Plan (D2G-MPEL-V-017).	Compliant	24.11.09
The Contractor must design scour protection for all areas susceptible to scouring, including barriers and bridge abutments. Scour protection must be designed for a minimum maintenance-free life of 50 years. Scour protection for waterway areas must be designed in consultation with the relevant Authorities, address fauna access requirements, and comply with the requirements of Appendix 21 (if used) of this Scope of Works and Technical Criteria.	Y	Y	Scour protection incorporated into the culvert design.	Compliant	24.11.09
Water to be discharged from the Project Site must meet EPA requirements.	Y	Y	Not applicable to this design lot. Refer to the water quality package: RERODR202 and the Design Criteria Report - Drainage (D2G-BASD-DGRDR000-R-001-A0)	Not applicable	24.11.09
Further to the requirements of sections 5.5 and 5.13 of the SWTC, service roads must be designed so that the lowest point of each carriageway's pavement surface is above the 20-year ARI flood level (target) or the 10-year ARI flood level (minimum).	Y	Y	Addressed during design process. Refer to Design Criteria Report - Drainage (DGRDR101-R-1000).	Compliant	24.11.09
Consideration shall be given to the following: (i) identification of potentially affected water bodies or sensitive receiving areas (ii) construction activities and their potential impact on water quality (iii) monitoring location(s), triggers and frequency (iv) water quality objectives (performance criteria).	Y	Y	Not applicable to this design lot. Refer to the water quality package RERODR202.	Not applicable	24.11.09
All permanent and temporary water quality treatment measures shall be removed from the scenario presented within the Inform EAR in Exhibit C. This review shall consider the purpose, design, placement and size of these measures.	Y	Y	Not applicable to this design lot. Refer to the water quality package RERODR202.	Not applicable	24.11.09
Consideration shall be given to the need for temporary or permanent water treatment devices to treat first flush events and the collection of runoff from bridges.	Y	Y	Not applicable to this design lot. Refer to the water quality package RERODR202.	Not applicable	24.11.09
Water discharged from site or from any water treatment devices must comply with water quality provisions of the Environmental Protection (Water) Policy 1997, as well as ANZECC and/or locally relevant water quality guidelines.	Y	Y	Not applicable to this design lot. Refer to the water quality package RERODR202, and the Design Criteria Report - Drainage (D2G-BASD-DGRDR000-R-001-A0)	Not applicable	24.11.09



Environmental Requirements Checklist (Version 7)

	Zone 2	Drainage	Design Response	Status (Compliant/ Partially compliant/ Non-compliant/ Not applicable)	Date Closed
<p>Consideration shall be given to the following information in all relevant documentation:</p> <ul style="list-style-type: none"> <li>(i) identification of significant habitat areas</li> <li>(ii) identification of fauna known or likely to occur within the area</li> <li>(iii) identification of significant habitat features such as hollows, nests</li> <li>(iv) methods available to minimise impacts, such as:                             <ul style="list-style-type: none"> <li>A. preserving areas by prohibiting disturbance or construction activities</li> <li>B. preserving habitat logs, rock, other structures and subsequent re-installment</li> <li>C. minimising clearing within the construction zone</li> <li>D. implementation of two-stage clearing procedures</li> <li>E. procedures to treat fauna injured by the construction activities.</li> <li>(v) use of an EPA-authorized "fauna spotter-catcher" during works</li> <li>(vi) inclusion of contact details for emergency wildlife care on the project's emergency contact list</li> <li>(vii) detail of procedures implemented to treat fauna injured by construction activities</li> <li>(viii) immediate reporting of any fauna injured or dead, which are known as rare, endangered or vulnerable, to Main Roads and the EPA.</li> <li>(ix) implementation of fauna mitigation measures such as underpasses and exclusion fencing.</li> </ul> </li> </ul>	Y	Y	<p>Significant habitat areas in the vicinity of this design include Goodna Creek and surrounding riparian vegetation, and the Pan Pacific Peace Gardens. These habitat areas have been avoided where possible.</p> <p>Any clearing and fauna handling (if required) will be in accordance with the Construction Environmental Management Plan (D2G-MPL-V-017).</p>	Compliant	24.11.09
<p>The design of the motorway bridges [over Goodna Creek] considers the Brisbane River floodplain; with the motorway bridges designed to provide Q100 immunity (Brisbane River).</p>	Y	Y	Not applicable to this design package.	Not applicable	24.11.09
<p>Local roads and/or service roads are designed to provide Q20 immunity (Brisbane River) (Goodna Creek).</p>	Y	Y	Addressed in this package. All design achieves 20 year ASI.	Compliant	24.11.09
<p>All clearing of native vegetation within the approved clearing limit.</p>	Y	Y	Clearing will be in accordance with the construction Environmental Management Plan (D2G-MPL-V-017)	Compliant	24.11.09
<p>Construction of a permanent five (5) cell box culvert crossing over Goodna Creek that is part of the extension of Smiths Road, to be constructed in accordance with the attached Origin Alliance drawing D2G-BASD-RRDR203-D-2470 Ipswich Motorway Upgrade - Dimmore to Goodna ch13200 to ch20770, Transverse Drainage Zone 2 Fish Culvert Typical Section dated 11/06/2009.</p>	Y	Y	Not applicable to this design package.	Not applicable	24.11.09
<p>The realignment of Goodna Creek as per proposal detail 4 is to be constructed such that the realignment provides for upstream and downstream fish passage and fish habitat including riparian vegetation.</p>	Y	Y	Not applicable to this design package. Refer to Smiths Road transverse drainage package RERODR207	Not applicable	24.11.09
<p>The site [Goodna Creek] (including all disturbed areas such as slopes, borrow pits, stockpile and screening areas) must be rehabilitated in a manner such that:</p> <ul style="list-style-type: none"> <li>(a) the quality of stormwater, other water and seepage released from the site will not cause environmental harm.</li> </ul>	Y	Y	Not applicable to this design package. Refer to Smiths Road transverse drainage package RERODR207	Not applicable	24.11.09
<p>The site [Goodna Creek] (including all disturbed areas such as slopes, borrow pits, stockpile and screening areas) must be rehabilitated in a manner such that:</p> <ul style="list-style-type: none"> <li>(b) the final landform is stable and not subject to slumping; and</li> <li>(c) the final landform is stable and not subject to slumping; and</li> </ul>	Y	Y	Not applicable to this design package. Refer to Smiths Road transverse drainage package RERODR207	Not applicable	24.11.09
<p>All clearing of native vegetation within the approved clearing limit.</p>	Y	Y	[S1] To be addressed by construction team in accordance with the Construction Environmental Management Plan (D2G-MPL-V-017).	Compliant	24.11.09

Final

What impact

## Appendix F – Independent Verification Comments and Closeout

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Released under RTI - DTMR

[Redacted]

**From:** [Not Relevant]@hyderconsulting.com]  
**Sent:** Friday, May 21, 2010 3:36 PM  
**To:** [Redacted]  
**Cc:** AA001719; d2g@projectcentre.net; [Redacted] NR D2G Document  
 Control; [Redacted]; [Redacted]; [Redacted]  
**Subject:** RERODR206: Transverse Drainage Other Culverts - Zone 2 (Draft IFC-hold removal)

[Redacted]

The above package has been discussed with the designer today and we have been made aware of the following changes:

1. Culvert CS1250 (north Brisbane Terrace) has been removed from the scope of works due to the finalisation of the limit of works.
2. The removal of aforementioned culvert has no impact on existing culverts.
3. No other changes have been made since IFC.

Based on these information we don't have any further comments on this package.

Note: The verification is to the current SWTC Version F - December 2009.

Kind Regards

[Redacted]  
 Deputy Design Verification Manager  
 Ipswich Motorway Upgrade D2G  
 Hyder Consulting Pty Ltd  
 199 Grey St South Brisbane QLD 4101 Australia  
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**International advisory and design consultancy**

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Released Under RTI - DMR



# Ipswich Motorway Upgrade Dinmore to Goodna Alliance Verification

**Package:** RERODR200  
**Title:** Redbank - Drainage - Transverse Drainage  
**Stage:** Zone 2  
**Issue:** 15% design

**Alliance Verifier:**  
**Date Distributed:**  
**Date Compiled:**  
**Date of Comments:**

Ref No	Item	Reviewer	Reference	Reviewer Comment	Designer Comment
101	Report	Hyder AV	D2G-BASD- RERODR200-R-1000 Appendix	Some of the page numbers appear inconsistent or incorrect within the appendix of the report. Example: Appendix G is numbered as "page F-73" and for consistency should be "page G-73". Appendix H also appears incorrect.	This has been corrected in the 85% design report.
102	Report	Hyder AV	General Comment	Design Criteria Report (Appendix L) is not provided. Please provide. This review does not include verification in respect to the design criteria.	It is submitted as a separate report.
103	Report	Hyder AV	General Comment	Concept design is to be mindful of requirements for maintenance access such as turning movements, hard stand areas and space for these configurations at all water treatment/retention locations as per 5.8 of SWTC.	This has been considered and is included in water quality packages.
104	Vertical	Hyder AV	General Comment	No vertical geometry/critical/vertical sections have been provided and as such no detailed review of vertical clashes such as with services, culverts and drainage lines have been made.	This has been corrected in the 85% design report.
105	Report	Hyder AV	D2G-BASD- RERODR200-R-1000 Cl 3.2	Non-compliances are noted in Cl 3.2. Changes to the SWTC will require Main Roads approval/sign-off.	Non-compliances have been identified and discussed with DMR and CC. Issues have been closed-out. This is discussed within the report in 3.2
105A				Has there been a response to RFI 446	RFI 446 has been closed. Reported in the 100% design report.
106	Report	Hyder AV	Cl 4.4	Items for resolution are noted in Cl 4.4. These items should be addressed appropriately. Items for resolution are still open.	This have been resolved
106A					1. New tail water levels from the latest Goodna Creek flood studies, have been used to update the SWMM models. This have been reported in the 100% design report. 2. Fences have been proposed along channels with steep slopes e.g channel south of Smiths Rd
106b				No fence has been shown on the drawings.	Fences are not shown on the drainage drawings. Please refer to design package DGRORF101-Fencing and Accomodation Works for fence location and details.
107	Report	Hyder AV	Cl 3.2.2	The report identifies at Lower Cross Street an afflux non-compliance at Ch300. Transverse Drainage Sheet 8 and the Road long section for control line M2X0 appears to show the location would be better described as circa Ch380 as it appears to be the location where the overland flow path funnels and the location of the 750mm diameter cross culvert	Noted. The Lower Street has been removed from the scope of works in 85% design.



# Ipswich Motorway Upgrade Dinmore to Goodna Alliance Verification

Package: RERODR200  
 Title: Redbank - Drainage - Transverse Drainage  
 Stage: Zone 2  
 Issue: 15% design

Alliance Verifier:  
 Date Distributed:  
 Date Compiled:  
 Date of Comments:

Ref No	Item	Reviewer	Reference	Reviewer Comment	Designer Comment
108	Report	Hyder AV	CI 3.2.2	The afflux at "Lower Cross Street Ch 300" is identified as a non compliance within the report. The afflux is identified as being 1.50m at the design 750mm diameter culvert after construction which is located where the existing conditions are that of an unconstructed natural flow path. This afflux level appears very high. Should greater capacity be provided for the culvert crossing?	Noted. The Lower Street has been removed from the scope of works in 85% design.
109	Report	viewed in the 85% design	CI 3.2.4	Table 4-10 indicates that the water level is reduced upstream of the basin inlet (C14800A) and down stream of the QR culverts (C14800E), however a large increase in the water level appears at the points in between. In particular a large increase in water level of 0.8m occurs at the pit at the basin outlet (C14800B). Is this considered to be consistent with the requirements?	The water levels were compared at two different points. This has been updated in the 85% design.
110	Report	Hyder AV	CI 3.2.5	The afflux at "Lower Cross Street Ch 200" is identified as a non compliance within the report. The actual afflux is not identified in either CI 3.2.5 or CI 4.2.7 of the discussion. It is noted that the maximum pond depth would be 0.9m. Please provide this in CI 3.2.5 if the afflux cannot be provided.	Noted. The Lower Street has been removed from the scope of works in 85% design.
111	Report	Hyder AV	Table 4.1	Table 4.1 indicates that culvert lengths, grades and levels vary. Please provide the range of the values and indicate how these varying values were used in the design.	The SWMM model generates the slopes from the IL, OL and the length of the culverts.
112	Report	Hyder AV	Table 4-4	Table 4-4 indicates the initial losses. Please clarify the selection of 1.5mm.	Reference: XP RAFTS reference and ARR Vol 2, 1988.
113	Report	Hyder AV	CI 4.2.3	Table 4-3 states Manning's n for road as 0.02 however directly below the table it is stated "Manning coefficient for impervious sub catchments such as roads and concrete driveways is taken to be 0.015." Please explain why the values stated differ.	Noted. Manning's n for roads have been changed to 0.015.
114	Report	Hyder AV	Section 4.2.3	Section 4.2.3 indicates that levels must not exceed more than 10mm. Please clarify the source from where this value was obtained.	This issue was resolved under RF1-281. 10mm is the target maximum increase in afflux with a 20mm tolerance in areas of state and council controlled land.
115	Report	Hyder AV	Section 4.2.3	Please indicate if the culvert hydraulics will be tested.	Please provide more detail on this.



# Ipswich Motorway Upgrade Dinmore to Goodna Alliance Verification

Package: RERODR200  
 Title: Redbank - Drainage - Transverse Drainage  
 Stage: Zone 2  
 Issue: 15% design

Alliance Verifier:  
 Date Distributed:  
 Date Compiled:  
 Date of Comments:

Ref No	Item	Reviewer	Reference	Reviewer Comment	Designer Comment
116	Report	Hyder AV	Section 4.2.3	Page 10 indicates that culverts were modelled without blockage and then in the later section it is indicated as modelled with blockage. Please clarify application of blockage.	Typing error. All culverts have been designed with blockage.
117	Report	Hyder AV	Various tables	Tables 4-5, 4-7, 4-11, 4-13, 4-19, 4-21, 4-27, 4-29, 4-32, 4-34, 4-41, 4-43, 4-47 and 4-49 indicates only a 0 and 100% value in the last column. Please clarify how these values were derived.	Each catchment was divided into Sub-catchments 1 and 2 in XP-Rafis. Sub-catchment 1 represents the pervious area, thus 0% impervious. Sub-catchment 2 represents the impervious area, thus 100% impervious.
118	Report	Hyder AV	Cl 4.2.4	Table 4-5 & 4-7 states various Manning's values with corresponding %impervious values of 0% and 100%, but in general states Manning's as 0.025 for 0% impervious and 0.015 for 100% impervious. These values stated do not match up with the values stated in table 4-3, which indicate Manning's as 0.04 for 0% impervious and 0.02 for 100% impervious. Please explain why the values stated differ or amend.	Sub-catchment 1 represents the pervious area, thus 0% impervious. To estimate the average pervious area 'n', the value of 0.02 have been used for roads. Sub-catchment 2 represents all 100% impervious area, thus a manning 'n' of 0.015 have been used.
119	Report	Hyder AV	Cl 4.2.5	Table 4-11 & 4-13 states various Manning's values with corresponding %impervious values of 0% and 100%, but in general states Manning's as 0.025 for 0% impervious and 0.015 for 100% impervious. These values stated do not match up with the values stated in table 4-3, which indicate Manning's as 0.04 for 0% impervious and 0.02 for 100% impervious. Please explain why the values stated differ or amend.	Same as above
120	Report	Hyder AV	Cl 4.2.6	Table 4-19 & 4-21 states various Manning's values with corresponding %impervious values of 0% and 100%. These values stated do not match up with the values stated in table 4-3, which indicate Manning's as 0.04 for 0% impervious and 0.02 for 100% impervious. Please explain why the values stated differ or amend.	Same as above



# Ipswich Motorway Upgrade Dinmore to Goodna Alliance Verification

Package: RERODR200  
Title: Redbank - Drainage - Transverse Drainage  
Stage: Zone 2  
Issue: 15% design

Alliance Verifier:  
Date Distributed:  
Date Compiled:  
Date of Comments:

Ref No	Item	Reviewer	Reference	Reviewer Comment	Designer Comment
121	Report	Hyder AV	CI 4.2.7	Table 4-27 & 4-29 states Manning's as 0.03 for 0% impervious and 0.015 for 100% impervious. These values stated do not match up with the values stated in table 4-3, which indicate Manning's as 0.04 for 0% impervious and 0.02 for 100% impervious. Please explain why the values stated differ or amend.	Same as above
122	Report	Hyder AV	CI 4.2.8	Table 4-32 & 4-34 states various Manning's values with corresponding %impervious values of 0% and 100%. These values stated do not match up with the values stated in table 4-3, which indicate Manning's as 0.04 for 0% impervious and 0.02 for 100% impervious. Please explain why the values stated differ or amend.	Same as above
123	Report	Hyder AV	CI 4.2.9	Table 4-41 & 4-43 states various Manning's values with corresponding %impervious values of 0% and 100%. These values stated do not match up with the values stated in table 4-3, which indicate Manning's as 0.04 for 0% impervious and 0.02 for 100% impervious. Please explain why the values stated differ or amend.	Same as above
124	Report	Hyder AV	CI 4.2.11	Why is Manning's stated as 0.0 for a number of the catchment areas in table 4-47? Also table 4-47 & 4-49 states various Manning's values with corresponding %impervious values of 0% and 100%. These values stated do not match up with the values stated in table 4-3, which indicate Manning's as 0.04 for 0% impervious and 0.02 for 100% impervious. Please explain why the values stated differ or amend appropriately.	Same as above
125	Report	Hyder AV	CI 4.2.4	Table 4-5 refers to sub catchment numbers. This is not shown on the Catchment Plan Base plans, hence unable to check if areas and percentage pervious appear correct.	This has been incorporated in the 85% design drawings
126	Report	Hyder AV	Table 4-26	Table 4-26 indicates an increase in discharge velocity of 2.46m/s with a decreased flow of 1.42m <sup>3</sup> /s. Please confirm that this higher velocity could not be mitigated and clarify the decreased flow.	This has been addressed in the 85% design report.



# Ipswich Motorway Upgrade Dimmore to Goodna Alliance Verification

**Package:** RERODR206  
**Title:** Detailed Design Report – Transverse Drainage Zone 2 (Other Culverts)  
**Stage:** Zone 2  
**Issue:** 85%

**Alliance Verifier:** Hyder  
**Date Distributed:** 21/1/2009  
**Date Completed:** 16/1/2009  
**Hyder AV & Contact Details:** Not Relevant  
**OA Designer & Contact Details:**

Ref No	Reviewer	Reference	Verifier's Reviewer Comment	Alliance Designer Comment	Status - Originator Comments Internal Use Only
145	Hyder AV	Report - Section 4.2.4	The report identifies that C-SR100 is included in the zone 3 transverse drainage report. No details have been found in this report. There appears no reference to this culvert within the reference noted in this report. Please include the full details in section 4.2.4.	Zone 3 Transverse Drainage Report D2G-3A3D-RRDR300-R-1000 Section 4.2.4 Culvert C16500 describes the hydraulic model used for the entire catchment with SR 100 outlet culvert crossing Mine St/ Collingwood Drive.	Closed 17/1/2009
146	Hyder AV	Report - Section 4.2.4 and Appendix L	There are no SWMM details for this culvert provided in the Appendix including inlet capacities, system head losses, pipe losses and other details associated with the hydraulic capacity of the system. Please provide full hydraulic details for the culvert C-SR100 system.	Refer above report for the whole hydraulic model. All losses were determined in accordance with QUD1. Refer Appendix L for inlet capacities and pit head losses used in C-SR 100 RCBC culvert.	Closed 22/1/2009
146a			Refer to comments 100%, 160 and 100% 166.	The flows for this culvert passes through Zones 2 and 3. The upper portion is in Zone 3 and the lower portion C-SR100 is in Zone 2. Refer to the zone 3 transverse package RRDR300-R-1000 for full details of the Zone 3 portion. Full hydraulic details are provided for C-SR100 in Appendix L.	Closed 17/1/2009
147	Hyder AV	Report - Section 4.2.5	There are no details regarding the PMF flows for the culvert. Please clarify why no flow assessment were completed for this event.	Design brief does not require PMF flows quantitatively. But, the escape route for higher flows were analysed and discussed in the report.	Closed 17/1/2009
148	Hyder AV	Report - Section 4.2.6	The report compares the upgrade to a base case. However, the new road layout and drainage significantly alters the existing flow regime. Please confirm the level of the cul-de-sac head.	The ground elevation at the head of cul-de-sag is 14.60m, and the water level elevation at the culvert inlet for Q20 and Q100 are 12.74m and 12.95m respectively.	Closed 17/1/2009
149	Hyder AV	Report - Section 4.2.6	There are no details regarding the PMF flows for the culvert. Please clarify why no flow assessment were completed for this event.	Design brief does not require PMF flows quantitatively. But, the escape route for higher flows were analysed and discussed in the report.	Closed 22/1/2009
149a			It appears no discussion details are per response added in report	Discussion on flows above Q100 has been added. Please refer to the discussion section of the Upgrade Culvert C-FS750.	Closed 17/1/2009
150	Hyder AV	Report - Section 4.2.7	For inlet FS950A in both the 20 yr and 100 yr scenarios, the water level for the base case is higher than the upgrade despite greater inflows for the upgrade. Please clarify how the base scenario calculations were determined.	The invert level at the culvert inlet location has been lowered in the upgrade scenario in order to drop the water level elevations for both Q20 and Q100 events. The original ground elevation is EL 10.50m and the upgrade ground elevation is EL 9.40m.	Closed 17/1/2009
151	Hyder AV	Drawing - D-1034	There are no details of the swale/channel flowing into inlet FS750A. Please provide details.	The grassed channel has been designed with 1m deep, 1m wide and 1:2.5 and 1:4 batters at the right bank and left bank respectively.	Closed 22/1/2009
151a			This does not match the details on the drawing.	The details given in ref. no 151 are for the outlet channel. The inlet channel has been designed as a grassed channel with 1m deep, 0.5m wide and 1:2 batter, and it is shown on the drawing D-1034.	Closed 22/1/2009
152	Hyder AV	Drawing - D-1035	There are no details of the swale/channel flowing from outlet FS1250B. Please provide details.	The grassed channel has been designed with 1m deep, 1m wide and 1:3 and 1:2 batters at the right bank and left bank respectively.	Closed 22/1/2009
152a			The drawing indicates both batters as 1:3. Please indicate both side slopes on the drawing.	The minimum batter of 1:2 is shown on the drawing D-1035. The batter slopes of the channel are specified in the design terrain model, which will be used for channel set outs.	Closed 22/1/2009
153	Hyder AV	Appendix G	DNMR comments. Comments have not been closed out. Please clarify the status of the comments.	Closed out	Closed out





# Ipswich Motorway Upgrade Dinmore to Goodna Alliance Verification

Package: RERODR206  
 Title: Detailed Design Report – Transverse Drainage Zone 2 (Other Culverts)  
 Stage: Zone 2  
 Issue: 85%

Alliance Verifier: Hyder  
 Date Distributed: 21/1/2009  
 Date Corrigited: 16/1/2009  
 Hyder AV & Contact Details:   
 Not Relevant  
 OA Designer & Contact Details:

Ref No	Reviewer	Reference	Verifier's Reviewer Comment	Alliance Designer Comment	Status - Originator Comments Internal Use Only
153a			Appendix G does not show that the comments have been closed out.	Closed out on 15/12/2005. A copy is attached in Appendix G.	Closed 22/1/2009
154	Hyder AV	Appendix L	Results from XR-SWMM have been provided. Please provide details of the inputs (i.e. inlet capacities, pipe losses, pit head losses)	The XR-SWMM input details are included in the 100% design report. All losses were determined in accordance with QUDM. Refer Appendix L for inlet capacities and pit losses etc. General inputs have been discussed within the design report and the transverse drainage design note (appendix to design criteria report). Where non-typical inputs have been adopted they have been included in Appendix L. Inlet capacities are based on a typical entrance loss of 0.5 unless noted otherwise and field inlets are modelled as inlet weirs and are based on the pit dimensions with an allowance for 50% blockage. Please refer to comments 161.	Closed 22/1/2009 - It is strongly recommended that all INPUTS are provided in Appendix L as has been requested on a number of occasions
154a			Appendix L shows the XR-SWMM model outputs and not the inputs. Please supply the inputs.		
155	Hyder AV	D2G-BASD-RERODR203-D-1029	See comment 160.	Due to environmental reasons (adjacent Indigenous Heritage Site), the road side batter has been designed at 1:2. This limits the land used for the drainage path.	Closed 17/1/2009
156	Hyder AV	Section 8.3	It is noted that the outlet structure for C-SK130 is on hold, please clarify the status of the longitudinal drainage package.	Longitudinal drainage has been finalised now. A special outlet structure has been designed which incorporates the 2x 1800Wx900H RCBC's and 2x 900 dia. RCP longitudinal outlet pipes.	Open 22/1/2009
156a			Drawing 1023 & Section 8.3 identify that this is still on hold. Longitudinal drainage is identified as 35%. Please clarify the status.	85% detailed design report for the longitudinal drainage package has been issued now. Longitudinal drainage is on hold in this transverse package. All drainage elements outside this package (Other Culverts) are on hold. The drawing 2121 has been included in the design package now. The headwall is not on hold but the longitudinal system is as this is an IFC package and any items that are not IFC must be on hold.	CLOSED 23/1/2009
156b			Updated report/drawings 2121 not provided	Drawing no. 2121 has been forwarded on 22/1/2009	Closed 17/1/2009
157	Hyder AV	Section 3	Non-compliance has been noted and is subject to DMR's approval	Non-compliance RFI 446 has been closed out.	
<p><b>Opportunities for Improvement</b></p> <p>1 Reviewer's initials <input type="text"/></p>					



# Ipswich Motorway Upgrade Dimmore to Goodna Alliance Verification

Package: **RERODR206**  
 Title: **Draft Final Design Report – Transverse Drainage Zone 2 (Other Culverts)**  
 Stage: **Zone 2**  
 Issue: **100% (Draft IFC) Design**

Alliance Verifier: **Hyder**  
 Date Distributed: **11/12/2009**  
 Date Completed: **17/12/2009**  
 Hyder AV & Contact Details: **Not Relevant**  
 updated: **22/12/2009**  
 updated: **22/12/2009**  
 OA Designer & Contact Details: **[Redacted]**

Ref No	Reviewer	Reference	Verifier's Reviewer Comment	Alliance Designer Comment	Status - Originator Comments Internal Use Only
158	Hyder AV	D2G-BASD-RERODR203-D-2353 / 2354	It is noted that written agreement from service authorities is required for clearances for construction (i.e. adjacent to pit 4/210A) - Has these agreements been provided on each basis noted on the plans?	The services providers sign-off is dealt with the construction team during construction. Any clearances have been avoided by designing the drainage around the service or reducing the service. The services have been designed and approved in accordance with the relevant service authorities drawings and specifications. The Alliance PUP team have been engaged to review the design package and confirm they are satisfied with the integration of the drainage design. Please note that pit 4/210A is part of the longitudinal system and is not part of this package. This comment should be provided in the relevant package.	Closed 21/12/2009. The pit was a general description and the comment is relevant to all such notes on the plans
159a			Channels have been included in the site plan. Please include the corresponding detail on the longsection.	The formation slopes of the inlets and outlets are specified in the design terrain model, which will be used for channel set outs. Construction team will get the finished ground levels from the design terrain model, therefore they are not indicated on the longitudinal section. They are not provided in any drainage design drawings.	CLOSED
160	Hyder AV	Section 2	Please note that SWTC has been updated in version D (Dec 2009). Please confirm that IFC will comply with the latest version of the SWTC.	Project centre does not have an updated SWTC version. D dated Dec 09. The SWTC is Rev E dated Oct 09. The other culverts transverse drainage design has been designed in accordance with the latest version of the SWTC except where detailed in the non compliance section of the report.	Closed 21/12/2009
161	Hyder AV	Report - Section 4.2.4 to 4.2.8 and Appendix L	The details provided in Appendix L do not include any headloss calculations for any drainage friction losses. Consequently, please confirm the appropriate hydraulic headlosses have been applied to all drainage structures for the design calculations/outputs documented in these sections and appendix L.	The standard inlet and outlet head loss factors of 0.5 and 1.0 were applied to all open culverts. The headloss details for the special structures such as field gully pits (C-F5750 and C-F51250) and closed inlet pits (C-SR100) were provided in Appendix L. Added descriptions and additional sheets for inlet loss calculations at C16500A7 and C-SR100A have now been attached.	Closed 22/12/2009
162	Hyder AV	Section 5.2.1	We are not aware of RSA Zone 2 has been undertaken. Please submit RSA Zone 2 for verification prior to issue this package at IFC.	An RSA for the 85% road alignment package has been completed.	Closed 22/12/2009
162a			Post note by [Redacted] I can inform you that the Road Safety Audit has been undertaken, responded to and closed out by the Auditor. The report is currently with Trevor for final sign off prior to project centre issue. For information the report number is 2108200A-PP7015-B.		



# Ipswich Motorway Upgrade Dinmore to Goodna Alliance Verification

**Package:** RERODR206  
**Title:** Draft Final Design Report – Transverse Drainage Zone 2 (Other Culverts)  
**Stage:** Zone 2  
**Issue:** 100% (Draft FIC) Design

**Alliance Verifier:** [Redacted]  
**Date Distributed:** 11/12/2009  
**Date Completed:** 17/12/2009  
**Hyder AV & Contact Details:** [Redacted]  
**updated:** 22/12/2009  
**updated:** 23/12/2009  
**OA Designer & Contact Details:** [Redacted]

Ref No	Reviewer	Reference	Verifier's Reviewer Comment	Alliance Designer Comment	Status - Originator Comments Internal Use Only
163	Hyder AV	Section 6.9	Please clarify the sewerage pipes in conflict with C-SR100. Has the relocation request been updated to the design presented in this package? As far as we are aware Telstra services have already been relocated based on previous design - please clarify. We are also concerned that there will be Energex relocations required to lift the power lines to allow for necessary clearance for Smiths Road traffic - please clarify.	The invert levels of the outlet drain channel from C-SR100 have been designed to pass over the existing sewer pipe with a cover of 600mm. A concrete slab was designed to protect the pipe as shown on the drawing D-1028 in the design package RERODR207-Smiths Road Culverts. Telstra cables were relocated and layed around 2m below the base of the RCBCs, making construction possible. The location of the nearest proposed Energex powerline pole was checked and found that the nearest post is around 15 m south of the 9m wide outlet channel, which confirms that it is out of the construction boundary. Options were considered in TOC and 15% design stage. Design brief requires 170 year design life and durability (SWTC 5.2) for culverts. We can not keep any existing culverts unless we prove long term durability.	Closed 21/12/09
164	Hyder AV	General	Please confirm that options have been investigated in terms of maintaining the existing culvert (including upgrade if required) and the proposed solution from constructability's and cost point of view.	Hold 3-Construction of safety screens is on hold to confirm ICC is happy to include safety screens.	Closed 21/12/09
165	Hyder AV	Report - Section 8.3	Holds No. 3 and 4 are noted. Please note that re-verification will be required to remove holds in relation to Hold 3 & 4, please clarify what the impact will be on this design package as it was not identified in the previous submission.	Hold 4- Construction of culvert C-FS1250 is on hold due to the expected revision of the Monash Street alignment. Re-verification is required to remove these holds.	Open 21/12/09 - Hold 3 & 4 to be removed prior to FIC.
165a			We do understand that technically it is on hold, however, we do have concerns about the potential impact on this design once holds are removed. Please clarify if holds will be removed prior to FIC	Hold 4 will not be removed prior to FIC as it is expected that the Monash Road alignment may change. There is therefore no point in asking Hyder to verify this component and hence it is on hold.	CLOSED
166	Hyder AV	Drawings - D-1029, D-2121, D-2462	Rock Protection is shown for outlet C-SR1005 on D-1029 along the channel base and up the sides. The apron width on D-2121 is 9.04m while the schedule has the apron width as 8.00m. Please review and confirm the details for the scour protection at the outlet. Further the width nominated on D2462 is in mm (i.e. 8mm), also the plans (D-1029) scale the length of beaching at approx 22m which does not reflect the schedule in D2462	Hold 3 is for an inlet screen. The screen has been designed and an appropriate screen loss has been determined based on a blockage factor of 50%. The screen is on hold until ICC can confirm if they want the screen or not. Some people believe that the screen is more of a safety issue if it is included rather than leaving it out of the design. If the screen is removed it will not change the culvert size as the loss has been included in the modeling and the hydraulics will only be improved if the screen is removed. Removal of the screen will result in more flow going through the culvert. This is acceptable as flow drains directly to Goodna Creek and will not cause any afflux issues.	Closed 22/12/2009
167	Hyder AV	Drawing - D-1034, D-2462	Rock Protection is shown for outlet C-FS6205, but not detailed in the schedule on D-2462. Please clarify where the scour protection details will be shown.	Apron widths shown in D-2462 are in meters instead of mm. This has been corrected on the drawing 4-2462. Generally the scour widths should cover the channel base width and approximately 1m height on the sides. The revised length is 22m, and the starting width is 13m and ending width is 9m.	Closed 22/12/09



# Ipswich Motorway Upgrade Dinmore to Goodna Alliance Verification

Package: RERODR206  
 Title: Draft Final Design Report – Transverse Drainage Zone 2 (Other Culverts)  
 Stage: Zone 2  
 Issue: 100% (Draft IFC) Design

Alliance Verifier: Hyder  
 Date Distributed: 11/12/2009  
 Date Completed: 17/12/2009  
 Hyder AV & Contact Details:   
 NOT REVIEWED

update: 22/12/2009  
 updated: 23/12/2009  
 OA Designer & Contact Details:

Ref No	Reviewer	Reference	Verifier's Reviewer Comment	Alliance Designer Comment	Status - Originator Comments Internal Use Only
168	Hyder AV	D2G-BASD-RERODR203-D-1034 & D2G-BASD-RERODR203-D-2353	Pit 4/208A is on top of C-FSS2D. There does not appear to be a cross connection. Please clarify the clearance between the pit & pipe and include the location on the appropriate longsections	There is no cross connection. It is a longitudinal drainage passes over the top of the transverse drainage system. The cover from the covert of the transverse line to the invert of the longitudinal line is 1.3m.	Open 21/12/09

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# Ipswich Motorway Upgrade Dinmore to Goodna Alliance Verification

**Package:** RERODR206  
**Title:** Final Design Report - Drainage – Transverse Drainage Zone 2 (Other Culverts)  
**Stage:** Zone 2  
**Issue:** 100% - Draft IFC - Submission 02

**Alliance Verifier:** Hyder  
**Date Distributed:** 18/03/2010  
**Date Completed:** 30/02/2010  
**IV Designer Contact Details:** [Redacted]  
**OA Designer Contact Details:** [Redacted]

Ref No	Reviewer	Reference	Verifier's Reviewer Comment	Category (Minor/ Moderate/ Major)	Alliance Designer Comment	Status - Originator Comments Internal Use Only
173	Hyder AV	D-2462, D-1034 & D-1035	The "culvert dimensions and inlet screen details" lists C-FSS620 as a 750 mm diameter pipe & C-FSS950 as 2100 mm diameter pipe. However D-1034 & D-1035 shows this pipes as multiple pipes (i.e. C-FSS620 is a 2x750 mm diameter pipe). Further, the global drawing for inlet screen details (DGRDDR100-D-0084) includes a reference to "P", the culvert inlet width. However, this is not included in the inlet screens table. Please include the culvert inlet width dimension.	Moderate	The Table in drg. No RERODR206-D-2462 has been updated with the following figures: For the culvert C-FSS620, P=2208mm. For the culvert C-FSS950, P=8686mm.	[OB] Closed 30/03/10
174	Hyder AV	D-2354	The culvert length for SR 100 is shown as 42.054 m on the longitudinal section. This does not match the length nominated in Table 4-52 (46m). Please clarify the correct length for the culvert.	Minor	Typing error. The correct culvert length is 42.0m. It has been corrected from 48.0m to 42.0m in the Table 4.2.	[OB] Closed 30/03/10
175		Section 5.1	Section outdated. Please amend	Minor	Section 5.1 revised and updated.	[OB] Closed 30/03/10
176		Section 8.3	It is noted that still two holds are present. Re-verification will be required to remove. Minor holds	Minor	Hold 1: Longitudinal drainage - not part of this package. It will be removed after the long. drainage package RERODR201 submitted for IFC. Hold 4: Culvert C-SR1250. Recent discussions with road designers indicated	[OB] Closed 30/03/10

### Opportunities for Improvement

1	Reviewers Initials	General comment				
2	Reviewers Initials	General comment				

Released Under



# Ipswich Motorway Upgrade Dimmore to Goodna Alliance Verification

Package: RERODR206  
 Title: Final Design Report - Drainage – Transverse Drainage Zone 2 (Other Culverts)  
 Stage: Zone 2  
 Issue: 100% - Draft IFC - Submission 03 - Hold Removal

Alliance Verifier: Hyder  
 Date Distributed: 18/05/2010  
 Date Compiled: 21/05/2010  
 IV Designer Name & Contact Details:   
 OA Designer Name & Contact Details:

Ref No	Reviewer	Reference	Reviewer Comment	Category (Minor / Moderate / Major)	Designer Comment	Status - Originator Comments Internal Use Only
	Hyder AV		As discussed with the Alliance designer today and we have been made aware of the following changes: 1. Culvert CS1250 (north Brisbane Terrace) has been removed from the scope of works due to the finalisation of the limit of works. 2. The removal of aforementioned culvert has no impact on existing culverts. 3. No other changes have been made since IFC.  Based on these information we don't have any further comments on this package.		n/a	Closed - OB - 21/05/2010

**Opportunities for Improvement**

	Reviewers Initials	General comment
1		
2	Reviewers Initials	General comment

Released Dimmore



# Ipswich Motorway Upgrade Dinmore to Goodna Alliance Verification

**Package:** RERODR206  
**Title:** Final Design Report - Drainage – Transverse Drainage Zone 2 (Other Culverts)  
**Stage:** Zone 2  
**Issue:** 100% - Draft IFC - Submission 04 - Design change

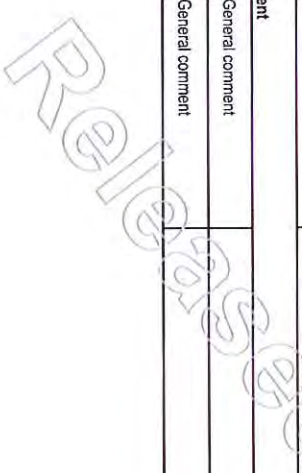
**Alliance Verifier:** Hyder  
**Date Distributed:** 8/09/2010  
**Date Corrupted:** 14/09/2010  
**Updated:** 29/09/2010  
**IV Designer Name & Contact Details:**  
**OA Designer Name & Contact Details:**

Name:	
Not Relevant:	

Ref No	Reviewer	Reference	Reviewer Comment	Category (Minor / Moderate / Major)	Designer Comment	Status - Originator Comments Internal Use Only
177	Hyder AV	Table 3-1	It is noted that RFI-674 has been raised with DMR in regards to the afflux & modelling at C-FSS950. Closure of this comment will be subject to TMRs approval of this RFI.	Moderate	The RFI has been closed out.	Closed - we recommend to liaise with TMR to obtain their acceptance on the afflux values.
178	Hyder AV	Appendix G	It is noted that DMR has not provided any comments on the resubmission. Please clarify DMR's comments on the increased afflux.	Major	DTMR have no further comments on the package	Closed - SE - 28/09/10
179	Hyder AV	Sec. 4.2.7 & Appendix H	It is noted that ICC requested the 50% blockage factor for C-FSS950. No minutes have been provided. Further, please clarify if ICC has provided any comments on the updated upstream afflux.	Major	ICC has been sent the package and no further comments have been received.	Closed - SE - 28/09/10
180	Hyder AV	Table 4-28 & Appendix L	It is noted that the peak Q20 flow in Table 4-28 is 6.6 cumecs. Whilst Appendix L does not clearly identify the flow in the conduit C-FSS950. Please clarify the flow in this link.	Moderate	This comment is under clear. Please confirm information you are requesting to be clarified or changed. It should be noted that the flows have not changed for the 20 year ARI, between this submission and the IFC submission. This revision is based on the assumptions made regarding the PMF event only.	Closed - SE - 28/09/10

**Opportunities for Improvement**

	Reviewers Initials	General comment
1	Reviewers Initials	General comment
2	Reviewers Initials	General comment



## Appendix G – DMR Comments and Closeout

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Released under RTI - DTMR



[Redacted]

**From:** [Redacted]  
**Sent:** Thursday, May 20, 2010 4:33 PM  
**To:** [Redacted]  
**Cc:** [Redacted]  
**Subject:** FW: DIFC No Comments - Various packages  
**Follow Up Flag:** Follow up  
**Flag Status:** Red

FYI

[Redacted]  
Assistant Project Manager  
P 07 [Redacted]  
F 07 3280 9111  
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PO BOX 505, Booval Business Centre Q 4304

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.....

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**From:** [Redacted]  
**Sent:** Thursday, 20 May 2010 4:20 PM  
**To:** [Redacted]  
**Subject:** DIFC No Comments - Various packages

Hi [Redacted]

Please be advised TMR have not reviewed and/or have no comments on the following DIFC

packages:

- GOSTBR142
- RIRORF300
- DIRORF400
- DISTRW042
- DGPUKS100
- RISTRW037
- RIRORF303
- RERODR206

Kind regards,


[Redacted]  
 Project Officer | Project Delivery - MR Projects  
 Major Infrastructure Projects Division | Department of Transport and Main Roads

---

Floor 1 | Redbank Origin Alliance Project Office | Lot 1 Chalk Street | Redbank Qld 4301  
 PO Box 70 | Spring Hill Qld 4004

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Maritime Safety Queensland or endorsed organisations utilising the same infrastructure.

.....

[Redacted]

**From:** [Redacted]  
**Sent:** Monday, September 27, 2010 5:26 PM  
**To:** [Redacted]  
**Cc:** [Redacted]  
**Subject:** FW: Draft IFC - RERODR206 - Design Change  
**Importance:** High  
**Attachments:** pic30382.gif

[Redacted]

No DTMR comments on this package. We need to obtain closure to Hyder comments then we can issue as IFC.

Regards

[Redacted]

Area Design Manager (East)



@d2g.com.au

Chalk Street, Redbank, Qld, 4301  
P.O. Box 505, Booval Business Centre, Qld, 4304  
Safe Work, Safe Travel, Safely Home

**From:** [Redacted]  
**Sent:** Monday, September 27, 2010 11:13 AM  
**To:** [Redacted]  
**Cc:** [Redacted]  
**Subject:** Re: Draft IFC - RERODR206 - Design Change  
**Importance:** High

Please be advised TMR have no comment on this package.

Kind regards,

[Redacted]

Project Officer | Project Delivery - MR Projects  
Major Infrastructure Projects Division | Department of Transport and Main Roads

Floor 1 | Redbank Origin Alliance Project Office | Lot 1 Chalk Street | Redbank Qld 4301  
PO Box 70 | Spring Hill Qld 4004

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**MAIN ROADS COMMENT & RESPONSE FORM**

This form is used for Checks and Reviews. It is NOT used for Internal Verification

Design Lot No.	GEN:MR-MR#260	Zone	2	Design Stage	Detailed Design	Review Level:	Overall Compliance with PAA and SWTC
Description: Detailed Design Report, Transverse Drainage – Zone 2, Other Culverts - Nimal							

Issue Reference No.	Notes by Reviewer			Notes by Designer in response		Close out Reviewer Acceptance (initial)
	Document No. (list specific drawing or page number)	Issues or observations (list adequate details to enable review)	Category (Major/minor observation)	Designer's response (ensure adequate details to enable acceptance)	Designer's response (ensure adequate details to enable acceptance)	
1.	D2G-BASED-RERODR206-R-1000	Section 4.2.7 Upgrade Culvert C-FSS950 Agreement with ICC needs at this location	Minor	ICC has agreed to the complete culvert design at this location		15/12/2009
2.						
3.						
4.						
5.						

Categories:  
 Major Issues: Develop Design Further – correction mandatory before completion of Stage (Close-out required)  
 Minor Issues: Correct and Close-out – correction mandatory before completion of Stage  
 Observations: are noted and work should be revised

15/12/09

**MAIN ROADS COMMENT & RESPONSE FORM**

This form is used for Checks and Reviews. It is NOT used for Internal Verification

Design Lot No.	D2G-BASD-RERODR206-R-1000	Zone	2	Design Stage	85%	Review Level:	Overall Compliance with PAA and SWTC
Description: Detailed Design Report – Transverse Drainage – Zone 2 - Other Culverts_DCW							

Issue Reference	Document No. (list specific drawing or page number)	Issues or observations (list adequate details to enable review)	Category (Major/minor observation)	Notes by Reviewer		Reviewer Acceptance (initial)
				Notes by Designer in response	Close out	
1.	D2G-MP13-5-4080 Designers correspondence	Page 1. Zones should be 'Zone 2' not 'Zone 3'		Designer's response (ensure adequate details to enable acceptance)	Typing error. Corrected in 100% design report.	
2.	DDR Page 51	Clause 6.3.1. 'proposed' to be changed to 'proposed'.		Designer's response (ensure adequate details to enable acceptance)	Typing error. Corrected in 100% design report.	
3.	Drng 1029	<p>1. Concerned that 2 x 750 dia pipes inlet at structure 11/212A yet outlet is only 1 x 750 dia.</p> <p>2. Confirm that inlet pipes from structures 1/212D and 1/212E do not drain to larger outlet pipe at structure 15/212A.</p>		<p>1. The drainage lines of concern have been revised and there is one pie into and out of the gully, this will be updated in future longitudinal design submissions. As this comment is not applicable to this design lot.</p> <p>2. The lines 212D and 212E and 212A have been hydraulically modelled an are correct, please refer to the latest longitudinal design submission for information as this comment is not applicable to this design lot.</p>		
4.	Drng 0142	Layout of Expected Levels of Mine Workings. More details and/or titles required on inset drawing following Drng 0142.		Designer's response (ensure adequate details to enable acceptance)	This drawing was attached in Appendix C as a reference drawing to indicate that culvert C-SR100 is not affected by the Mine Workings. Refer to Report D2G-BASD-DGMSIR102-R-1001 for further details.	
5.	Appendix L - XRP-SWMM Outputs	1 in 20 year ARI Ultimate Scenario SWMM Results. Maximum velocity at catchment p C16500F1 is 8.74 m/s which has increased from base scenario velocity of 5.26 m/s. Ultimate velocity appears very excessive. Explanation required for increase. Have noted		Designer's response (ensure adequate details to enable acceptance)	Revised in the final (100%) report. The max. velocity in p C16500F1 is 3.06m/s in the base model and 2.92 m/s in the ultimate model. The max. velocity in pC16500C1 is 3.83m/s in the base model and 2.69 m/s in the ultimate model.	

P:\110-DESIGN MANAGEMENT\110-01-Submission Control\DCDCs To Issue\RERODR206 - Transverse Drainage - Other Culverts - IFC\Draft Part\Appendix G - DMR Comments\COMMENTS\_RERODR206\_DCV.doc

Revision 01  
Date: 01/12/08

15/12/09

Released under RTI - D11111

Issue Reference No.	Notes by Reviewer		Category (Major/minor observation)	Notes by Designer in response		Close out Reviewer Acceptance (Initial)
	Document No. (list specific drawing or page number)	Issues or observations (list adequate details to enable review)		Designer's response (ensure adequate details to enable acceptance)		
		that others such as PC16500C1 have also increased from base scenario. Concerned with scouring with extreme velocities.				

Categories: Major issues: Develop Design Further – correction mandatory before completion of Stage (Close-out: required)  
 Minor issues: Correct and Close-out – correction mandatory before completion of Stage  
 Observations: are noted and work should be revised

## Appendix H – Third Party Reviews and Closeouts

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Released under RTI - DTMR

**DESIGN COMMENT AND RESPONSE (DCR)**

D2G-MP13-F-4033

This form is used for Checks and Reviews. It is NOT used for Internal Verification

DRR No.	xxx	Section:	Zone 2	Design Lot No.	D2G-BASD-RERODR206-R-206	Review Level:	ICC REVIEW
Description: Transverse Drainage Zone 2- Other Culverts							

Issue Reference No.	Notes by Reviewer		Category (Major/minor observation)	Notes by Designer in response		Reviewer Acceptance (initial)
	Document No. (list specific drawing or page number)	Issues or observations (list adequate details to enable review)		Designer's response (ensure adequate details to enable acceptance)	Close out	
1.		Upstream/downstream adverse effects should be advised. Modelling should be undertaken to determine whether there are substantive adverse effects and/or whether the adverse effects are from motorway or pre-existing, where adverse effects from motorway are expected, ICC would expect to be advised of adverse effects and reasons why they cannot be attenuated/remediated.		Our models take into account upstream and downstream water levels, flows and velocities in order to zero-in and minimise any adverse effect that the motorway upgrade has. The report contains this information.		
2.		Road surface flows designed in accordance with brief. The lateral cross/longitudinal drainage must be able to remove enough water to meet the 100 year requirements.		All motorway culverts have been designed to fully convey Q100 flows. Road surface flows are dealt with in longitudinal drainage design. All local roads were designed to 20yr ARI immunity (i.e. Q20 flows).		
3.		Alignment of drainage at corner Collingwood Drive/Smiths Road questioned, under consideration of change.		Transverse culvert design (C-SR100) and the outlet drainage have been discussed in the report D2G-BASD-RERODR206-R-1000.		
4.		The two separate and adjacent Water Quality ponds on Goodna Creek culvert under review.		Not dealt with in this design lot.		
5.		Noted that blockage factor of only 20% was used; DiviR based requirement. Consequences/ sensitivity of blockage should be analysed and advice included in the design report.		There is no guidance in RDDM as to required level of blockage. We have adopted 20% based on similar projects. 20% blockage is applied in base and upgrade scenarios therefore afflux issues should be consistent regardless of what blockage is applied. A blockage factor of 50% was adapted to the C-FSS950 culvert as requested by ICC.		

21/12/20



Issue Reference No.	Notes by Reviewer		Notes by Designer in response	Close out
	Document No. (list specific drawing or page number)	Issues or observations (list adequate details to enable review)		
6.		<p>"Culverts" typically drw 3003326-DD-TD-0056/2 &amp; 62/2</p> <ul style="list-style-type: none"> <li>• See comment above re. dispersive soils</li> <li>• Culverts with low head of culvert depth - provide a suction relief point at/near entry</li> <li>• Nov 2008 storms showed that even very large culvert configurations blocked - many cases 50% - appropriate blockage factor needs to be applied along with suitable management of overflows.</li> <li>• Risk assessment required for exit control structure/behaviour</li> <li>• Placement of grates inlet /outlet subject to risk assessment (see QUDM 2007)</li> </ul>	<p>Designer's response (ensure adequate details to enable acceptance)</p> <ul style="list-style-type: none"> <li>• Dispersive soils have been identified on site and where the proposed design has a potential detrimental effect to the existing conditions, appropriate geotechnical investigations and landscaping treatments will be applied to rectify the problem.</li> <li>• Noted but not applicable.</li> <li>• A blockage factor of 50% was adapted to the C-FS950 culvert. Please refer the report for details.</li> <li>• During the modelling process, an assessment of the outlet flows was performed and no conditions warranted any risk assessment or additional mitigation measures.</li> <li>• A QUDM analysis has been performed for culvert inlet screens. Details in report.</li> </ul>	<p>Reviewer Acceptance (initial)</p> <p>[Redacted]</p>

**Categories:**

**Major issues:** Develop Design Further – correction mandatory before completion of Stage (Close-out required)

**Minor issues:** Correct and Close-out – correction mandatory before completion of Stage

**Observations:** are noted and work should be revised

21/12/09

## Appendix I – Community Requirements Checklist

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Community issues and concerns

Zone	Area/Street/Issue	Stakeholder	Impact/ weighting	Issues	Mitigation measures
2	Traffic Impacts on safety and amenity of Smiths Rd	Goodna residents who currently use Stuart Street on and off ramps	H	<p>1. Concerned that Smiths Road extension will not be opened before Stuart Street on and off ramps are permanently closed - this will severely limit their travel movements if an alternative is not in place.</p> <p>2. Residents are concerned about the speed of motorists travelling along Smiths Road and are constantly asking if there will be traffic lights connecting between the old section and into the new extension of the road.</p>	<p>Intention is that Williams St ramp intersection is open before Stuart St connection is closed.</p> <p>ICC suggested at meeting held 10 June 09 that Stuart/Smith intersection signalisation may not now be funded by them, and that they are considering signalisation of Smith/William and /or Smith/Albert in lieu. Issue will need to be clarified following receipt of pending letter from ICC re their funding contribution.</p> <p>Signalisation of Smith/Stuart Street intersection is confirmed, subject to resolution of Smith Road funding. Ongoing community engagement.</p>
2	Traffic Impacts on safety and amenity of Smiths Rd	Local resident	L	Increased traffic, accidents & vehicle speed on Smiths Road.	Signalisation of Smith/Stuart Street intersection will contribute to traffic management in Smith Road.
2	Access to Sport Complex	ICC officers	L	Access arrangements of Mine Street	Meeting held with ICC 10 June 09 included discussion on access to Sports complex from Smiths Road. Ongoing consultation with ICC and sporting complex.
3&4	Traffic Impacts on safety and amenity of Southern Service Road	Local resident	M	Noise barriers along the Service Road in Riverview be increased to match increased elevation of bridges.	Confirm strategy for advising the community of the final placement of noise barriers.
3	Proximity of Construction Works	Local resident (x2)	L	Traffic volumes on Brisbane Road	Concerns will be addressed by ongoing community engagement. No need for specific response.
2	Alignment of Monash Road	QR	M	Alignment of Monash Road and associated property impacts	Design being developed to confirm extent of splay required at SE corner of QR land.
2	Alignment of Monash Road	Units	M	Alignment of Monash Road and associated property impacts	Design options being considered for the affected tennis court which will either be re-oriented N-S or a retaining wall constructed. Ongoing consultation.
1	Staging of Pedestrian Access to Goodna Station	Pedestrians / local elected reps	H	Concerned about the demolition of BR140 before the completion of the new pedestrian bridge - potentially utilising bus service during construction could be drawn out because of length of time between operational bridges	Construction team current position is to closely match the programs for demolition of old and opening of new. Any gap will be addressed by temporary use of buses.
1	Safe access to the motorway	Local Goodna residents	L	Local Goodna residents do not believe closing Stuart Street (which is considered a safe and long ramp) to be a good idea. However most are appeased with the Smiths Road extension alternative	Concern is addressed by program decision to open Williams st connection before Stuart St is closed. The situation would be further improved by opening of Smiths Rd but timing/funding is uncertain.
1	Traffic Congestion at Williams Street	Goodna local residents	L	<p>Are concerned that by opening William Street access to the motorway, the on ramp will not be able to cope with increased traffic and are concerned it will cause congestion in front of the Caltex service station and McDonalds.</p> <p>Residents believe there will be an increased traffic volume at the Church Street / Queen Street roundabout intersection that is already very congested after the closure of Stuart Street, as more local residents will be forced to use this access point to get onto the motorway</p>	<p>Based on the traffic modelling and analysis completed for the William Street/Southern Service Road left-in/left-out type priority intersection, the traffic operations based on the predicted traffic volumes at "day of opening" are adequate and indicate that the predicted delay and queue for the traffic accessing the westbound entry ramp will be minimal.</p> <p>Although there will be an overall increase in traffic volumes at Church Street (at year of opening compared to current volumes), traffic wishing to access the motorway in the westbound direction can utilise the William Street connection to the Church Street westbound entry ramp (i.e. do not need to access the motorway in the westbound direction via the roundabout). Traffic exiting the motorway in the westbound direction will need to exit back at the Ipswich/ Logan Motorway Interchange and use the Southern Service Road for accessing Church Street roundabout. However, there are also alternative routes available if they do not wish to travel through the roundabout.</p>

**Community issues and concerns**

Zone	Area/Street/Issue	Stakeholder	Impact/ weighting	Issues	Mitigation measures
2	Traffic congestion due to ramp closures	Local resident	L	Riverview resident believes there will be an increased traffic volume at the Mine Street intersection and it will become similar to Church Street / Queen Street roundabout intersection at Goodna that is already very congested, as more local residents will be forced to use this access point to get onto the motorway	Based on the traffic modelling and analysis completed for the two ramp junctions at Mine street, the intersections will operate with a suitable level of service at "day of opening". The key traffic signals along the Mine Street corridor will be coordinated to minimise the delay and queue lengths for the key movements along this corridor.
3	Dust concern at Redbank School	Redbank School	H	Concern over dust impacts from construction	Ongoing consultation with the school has resulted in installation of air conditioning units, increased use of water carts, and applying additives to water used for dust suppression. Letter sent to school about mitigation of dust impacts. Not a design issue.
3	Vehicle access to Riverview	Mayor Paul Pisasale	L	Very supportive of project. Wants a design Entry Statement into Ipswich	Consultation ongoing with ICC re use of BR450 and adjacent retaining walls as entry statement.
2	Vehicle Access from Smiths Road	Not Relevant	L	Smiths Road - concerns about residents needing to do a left turn into the Christian College.	A left turn from Smith's Road onto Bellevue Road has been provided.
3	Vehicle access to Riverview		L	1. Traffic impacts where Southern Service Road goes into Law Street. 2. Traffic impacts at intersection of Law Street and Collingwood Drive due to connection of Southern Service Road to Law Street 3. Issues with residents access to Southern Service Road.	Ongoing community engagement
3	Traffic Congestion at Mine St		M	1. Limited Riverview access 2. Concerned that Northern Service Road does not extend to River Road. Council would like this for commercial access. Have suggested a 1-way ramp off Brisbane Road	Ongoing community engagement. Inclusion of a service road access from River Road would require demolition of existing Warrego Highway bridge which is planned to be retained and would result in substandard geometric design. Follow up with briefings for local member(s) and councillors.
4	Monuments at Dinmore Park		M	Concerned about the existing monument stone, loss of green space. Removal of remaining monuments at Dinmore Primary School and placement at Dinmore Park with the monument stone.	Meeting held with ICC and [redacted] Meeting needs to be organised for consultation with immediate stakeholders.
3	Design of school oval	Redbank School	H	Concern by the school that the existing alignment of the school oval is encouraging children to kick the ball onto the motorway.	Meeting to be held with Redbank Primary School on Monday 5 October. At this meeting will be discussed the finalisation of the oval, mitigation for stopping balls entering the motorway. Letter to be sent to Queensland Education on the agreed outcome of meeting.
4	Numerous		L	1. Pedestrian overpass at St Peter Claver College 2. Would like old motorway to remain four lanes from site office area east. 3. Wants ramp to remain into Brisbane Road (north side) going east.	Ongoing community engagement
	Noise barrier extents	Redbank School	L	Need to consider where the Law Street ped bridge will land and how students enter the school	Ongoing consultation with school with development of design to accommodate agreed outcomes.
All	Location of noise walls with respect to property boundaries.	Community DMR ICC	M	Where noise walls are to be constructed on the boundary of an existing property there is an issue regarding location of the wall. Whilst the posts and panels may be located close to the boundary the footings are larger and also need to be considered. A noise fence on the actual boundary alignment would mean that part of the footings encroach into private property, whereas if the footings are placed outside the boundary then the wall impinges on the road reserve (very narrow in places) and also creates a remnant portion of crown land excised by the wall. Maintenance access to the rear of the wall (for inspection or repairs) must also be considered.	Generally noise walls are located clear of a property boundary and where required, a Type 28 open channel for surface drainage will be installed between the noise wall and property fence.
2	Concerned about visibility during construction		L	Business owner is concerned about visibility of his business being obstructed during construction. Also concerned that new noise walls will be constructed as part of the project that are not currently there. [redacted]	Community engagement team currently preparing for initial consultation with property owners potentially impacted by noise walls proposed on existing boundaries.
1	Noise wall provision during construction	Businesses and Goodna State School	L	1. Demolition and construction of replacement noise wall (parallel to Barram Street and up to Goodna State School 2. Noise issues during construction during school hours, but main issue will be the timing of the removal of the old noise wall and the period prior to construction of replacement	Being followed up by Construction team in conjunction with Comms team. No concerns - business as usual.
2	Noise wall provision during construction	Residents and properties that back along Enfield Street that back onto Francis Street on ramp		1. Relocation of noise wall along Francis Street - may be an issue during the removal of old noise wall and construction of its replacement. 2. Relocation of "mural" noise wall is of personal interest to [redacted] there is the expectation this will be temporarily removed and replaced in same condition	Community engagement team currently preparing for initial consultation with property owners potentially impacted by noise walls proposed on existing boundaries.

**Community issues and concerns**

Zone	Area/Street/Issue	Stakeholder	Impact/ weighting	Issues	Mitigation measures
1	Parking provisions & street arrangements Permanent noise walls	Hinton Street residents	L	<ol style="list-style-type: none"> <li>1. Have been promised by former DMR Minister that there will be no impact to their properties as a result of the project.</li> <li>2. Are aware that local road will be upgraded with access not being affected.</li> <li>3. There may also be issues during the removal of the old noise wall and construction of its replacement.</li> <li>4. Is any parking being removed?</li> <li>5. They need to be consulted re the proposed noise walls</li> </ol>	<p>Following up drainage design to quantify impacts on private property (afflux). Will require signoff to any non-conformance with the brief (ICC via DMR). Alternatively, the two affected properties could be resumed. To be followed up.</p> <p>Parking and access to properties has been assessed. It has been proven that vehicles can access driveways from Hinton St. Whilst there is no designated on-street parking it is possible for residents to access their properties even if vehicles are parked in the street provided that at least one lane remains clear.</p> <p>Comms team currently preparing for initial consultation with property owners potentially impacted by noise walls proposed on existing boundaries.</p>
1	Noise wall provision during construction	Hinton Street residents	L	<ol style="list-style-type: none"> <li>1. Have been promised by former Main Roads Minister that there will be no impact to their properties as a result of the project.</li> <li>2. Are aware that local road will be upgraded with access not being affected.</li> <li>3. There may also be issues during the removal of the old noise wall and construction of its replacement.</li> <li>4. Is any parking being removed?</li> <li>5. They need to be consulted re the proposed noise walls</li> </ol>	<p>Comms team currently preparing for initial consultation with property owners potentially impacted by noise walls proposed on existing boundaries.</p>

	Impact of Mway construction on construction of stadium	Goodna State School	L	<p>Goodna State School will be receiving <span style="border: 1px solid black; padding: 0 2px;">Not Relevant</span> from Dept of Education to construct an indoor stadium. They are concerned about the construction of this facility at the same time as the motorway upgrade and the uncertainty of the impact to the school from the project over the coming years.</p>	<p>Construction team request that Comms team ask the school to nominate their construction access location so that it can be built into TCPs. Comms team to follow up.</p>
All	ICC liaison	ICC	M	<ol style="list-style-type: none"> <li>1. Establishing ongoing point of contact</li> <li>2. Selection of design standards (can't should local government standards be adopted in lieu of DMR?)</li> <li>3. Identification of assets to be transferred to ICC on completion ("Limit of Responsibility" map, usually produced by DMR) Need to identify reliable and appropriately authorised ICC point of contact for ongoing liaison.</li> </ol>	<p>Identified issues being followed up. ICC is sharing funding for Smiths Rd extension and will also be adopting significant assets delivered by the project overall. ICC typical details and standards to be used where appropriate. ICC to appoint Liaison Officer as primary point of contact for project.</p> <p><span style="border: 1px solid black; padding: 0 2px;">[Redacted]</span> to be approached re identification of assets for handover.</p>
1	Vehicle access during construction	Caltex / Hungry Jack's / Mc Donald's / Car Wash	L	<ol style="list-style-type: none"> <li>1. Concerned about access to these businesses during completion of Brisbane Rd on ramp at Goodna.</li> <li>2. There may be a need to place a pit / storage facility on Caltex land which could be costly, either through a lease or partial resumption</li> <li>3. Potential connection of motorway transverse drainage into existing water quality pond within private property</li> </ol>	<p>Options for motorway transverse drain being considered with intention of avoiding works within private property (associated with connecting to existing water quality/detention pond). Designers considering upgrading motorway footprint section only, or justification for leaving existing culverts untouched (cf 100yr design life requirement). Case to be developed for submission to DMR (Derek Millar).</p>
4	Entry statement	Acini	M	<p>Concerned about impacts of construction on their lab testing work. Need at least 8 weeks notice of works. Additional concerns regarding access and car parking.</p>	<p>Main concerns addressed.</p> <p><span style="border: 1px solid black; padding: 0 2px;">[Redacted]</span> to follow up compensation aspect.</p>
4	Reduced access	Local resident	L	<p>Access from Riverview to Warrego Highway</p>	<p>Ongoing community engagement. Designers to advise Comms team of outcome of design considerations. Follow up with briefings for local member(s) and councillors.</p>
4		QR	L	<p>Very long lead times for approvals. Currently re-designing Dinmore carpark - need to engage with community. Need to finalise Woogaroo St funding from DMR</p>	<p>Details of future Dinmore carpark to be inserted into drawings to avoid clash with future carpark formations and roads. Community Team to discuss with QR regarding community engagement requirements</p>
3	Construction impacts	Redbank School	H	<p>Concerned about construction staging, noise, disruption.</p>	<p>Ongoing community engagement.</p>

## Appendix J – Value Engineering Outputs

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Released under RTI - DTMR

**IPSWICH MOTORWAY UPGRADE  
DINMORE TO GOODNA**

**Drainage  
Action List**

HH
SG
BJ
BL
GR
AG
JB

KN
BH
JW
CG
DB
AZ

NOT KNOWN

**Givens**

No.	Description	Evaluation	Action By	Due Date	Comment
1	Standard precast components (maximum use) and standard types	Yes			
2	Q100 on the motorway, Q20 service roads (largest and Q10 minimum)	Yes			
3	Q2 for temporary surface drainage (government)	CH*	AZ	21/11/2008	
4	Cross drainage during construction is no worse than existing	Yes			
5	40,000 l spill capture at every discharge point	CH	BJ	21/11/2008	Water Quality report under discussion
6	Zero efflux at boundaries	CH	AG	28/11/2008	Discussed with ICC. Some allowance for efflux acceptable
7	Main roads drainage specifications	Yes			
8	EPA water requirements for discharge	CH	BJ	21/11/2008	Water Quality report under discussion
9	Can't increase flows for downstream systems	CH	BJ	28/11/2008	
10	Q100 for CR embankments.	Yes			

**Assumptions**

No.	Description	Evaluation	Action By	Due Date	Comment
1	Predominantly gravity except where least cost outcome is pumping system	OK			
2	Staging is fully considered and cross and longitudinal drainage can be maintained during construction	OK			
3	Goodna CK will be rehabilitated	CH	AG	28/11/2008	Goodna Creek will be re-instated
4	Can't reuse existing culverts	CH	BJ	21/11/2008	RPI returned to confirm this
5	New culverts will be in same location (assumes 4)	CH	BJ	21/11/2008	New culverts will be at or close to existing location, depending on conflicts
6	During construction water will be treated to normal temporary processes (ERSC)	CH	JB	21/11/2008	Staging to be considered
7	All roads need runoff treatment	OK			
8	DMR standards apply to both local and services roads	CH	BJ	21/11/2008	Motorway drainage requires treatment. Local roads do not
9	Flooded width to accommodate slurry eight	CH	AZ	28/11/2008	
10	Extent of flooded width into traffic lane in ultimate configuration (1.2m assumed to date)	OK			
11	All future works is included in hydraulic analysis	CH	AZ	28/11/2008	Road drainage undertaken for ultimate lane configuration
12	Model the PMF for cross drainage structures (RPI submitted)	CH	BJ	21/11/2008	Road drainage undertaken for ultimate lane configuration
13	Use existing hydrology from ICC and BCC	OK			
14	Bridge drainage will be Q20	CH	AG	28/11/2008	RPI returned. PMF will be modelled
15	Capture shared path off the bridges	CH	BJ	28/11/2008	
16	Flows will increase with development upstream (effects some areas)	OK			
17	Permanent transverse drainage has to be installed to allow earthworks	CH	BJ	28/11/2008	
18	Modelling is based on adequate and accurate survey (continuing updates happening)	OK	FJ	28/11/2008	15% transverse concept design report due Xmas 08
19		OK			

**Zone 1 and 2**

No.	Description	Evaluation	Action By	Due Date	Comment
14	Can we .....(by).....				
15	Zone 2				
16	Use existing C4 culverts (check vertical of motorway)	P1	BJ/JB	28/11/2008	
17	Remove humeceptors at northern services road because it comes from local roads (DMR) (Check ICC objectives)	P1	BJ	28/11/2008	
18	Adopt swales where gundralls used on local roads (footpath will have kerb and channel)	P1	AG	28/11/2008	
19	Use scuppers to break the concrete barrier and capture in swales to treat water? (need to check brief)	P1	AG	28/11/2008	
20	Remove the need for pipes across the structure by adding additional need for treatment	P2	BJ	5/12/2008	
21	Use the area between west off ramps & motorway to locate with treatment to prevent pipes over bridge	P2	AG	5/12/2008	
22	Increase the flow width capability on local roads	P1	AG	28/11/2008	
23	Use Acco drains where longitudinal levels suit for construction staging	P1	AG	28/11/2008	
24	Use Acco drains where longitudinal levels suit for permanent	P1	AG	28/11/2008	
25	Reuse culvert C3 and C10	P1	BJ/JB	28/11/2008	

## Appendix K – SIDR Outputs

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Released under RTI - DTMR



Note: Parts of the SIDR highlighted in grey have been added after the original workshop date

Design Package: Zone 2 Transverse Drainage - Other Culverts Project Name: Ipswich Motonway Upgrade – Dinmore to Goodna

Date: 21 May 2009 / 09 July 2009 / 21 July 2009 S.I.D. Report No: SIDR#16

Zone 1 – 21/07/2009	Zone 2/3 – 21/05/2009	Zone 4 – 21/07/2009	Zone 4 Basin – 09/07/2009
- Drainage Design Lead (M)	- Project Engineer	- Senior Project Engineer	
- Urban Designer	- Project Engineer	- Rail Interface Manager	- QR
- Drainage Designer	- Project Engineer	- Designer	- QR
- Drainage Designer	- Project Engineer	- Project Engineer	- Drainage Design Lead
- Rail Interface Manager	- Area Manager	- Site Engineer	
- Senior Project Engineer	- Drainage Lead	- Designer	- Rail Interface Manager
- Design Interface Manager	- SID, R&O Eng	- Drainage Design Lead	Pat Dennehy – DMR Project Manager
	- Construction Manager	- Urban Designer	- Project Engineer
	- Drainage Designer	- Design Area Manager (West)	- Project Engineer
	- Drainage Designer	- Design Interface Manager	- SID, R&O Eng
	- Construction Manager		
	- Design Mngr (Const.)		
	- DIM		

Rating	Consequence				How Likely is it to Occur?				
	Safety	Environment	Quality	Community	Almost Certain (A) Expected in most circumstances	Likely (L) Will probably occur in most circumstances	Possible (P) Might occur at some time	Unlikely (U) Could occur at any time	Rare (R) May occur, only in exceptional circumstances
5	Catastrophic (Death/Permanent Injury)	Environmental Disaster	High financial loss (> \$100k)	Adverse national media or public attention	9 A	6 A	7 A	6 H	5 H
4	Major (Extensive Injuries) (Major Plant Damage)	Environmental Harm (Loss of Protection)	Major financial loss (\$50k - \$100k)	Attention from media or heightened concern from the community	8 A	7 A	6 H	5 H	4 M
3	Moderate (Medical Treatment) (Minor Plant Damage)	Environmental Nuisance (Spill contained with outside help)	Moderate financial loss (\$5k - \$50k)	Local public or media attention and complaints	7 A	6 H	5 H	4 M	3 L
2	Minor (First Aid Treatment)	Insignificant Event (Spill contained by site)	Minor financial loss (< \$5k)	Public concern limited to complaints	6 H	5 H	4 M	3 L	2 L
1	Insignificant (No Injuries)	No environmental impact	No financial loss	No complaints or concerns	5 H	4 M	3 L	2 L	1 N

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Design Package: Zone 2 Transverse Drainage - Other Culverts Project Name: Ipswich Motorway Upgrade – Dinmore to Goodna

Date: 21 May 2009 / 09 July 2009 / 21 July 2009 S.I.D. Report No: SIDR#16

No	Job Step	What are the Hazards	Risk Score	Controls Required	Target Risk Score	Responsible Group
<b>Construction and Demolition – Risk Assessment (CHAIR 2)</b>						
1.0	ZONE 3					
1.1	Construction of drainage crossing of IM East of Endeavour Rd	<ul style="list-style-type: none"> <li>• Damage to existing buried 1050mm dia. drain                             <ul style="list-style-type: none"> <li>◦ Struck by plant</li> <li>◦ Struck by jacking pipes</li> </ul> </li> </ul>	5H	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statement (includes Permit To Excavate)</li> </ul>	3L	Construction
1.2	Retaining Wall / Drainage interface	<ul style="list-style-type: none"> <li>• Introduction of constant water-path to retaining structure                             <ul style="list-style-type: none"> <li>◦ Potential for retaining wall failure due to erosion</li> </ul> </li> </ul>	6H	<ul style="list-style-type: none"> <li>• Retaining wall solution to link to drainage requirements</li> </ul>	4M	Design, Construction
1.3	Construction of drainage crossing IM West of Mine St underpass (BR280/285)	<ul style="list-style-type: none"> <li>• Proximity to traffic                             <ul style="list-style-type: none"> <li>◦ Struck by vehicle</li> <li>◦ Struck by object</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statement</li> <li>• Investigate alternative option to dual 1050mm dia., e.g. single 1650mm dia. to reduce boring length and construction time (hence exposure)</li> </ul>	3L	Design, Construction
		<ul style="list-style-type: none"> <li>• Location of cast-in-place chamber on service road ramp (proximity to traffic)                             <ul style="list-style-type: none"> <li>◦ Struck by vehicle</li> <li>◦ Struck by object</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statement</li> <li>• Investigate relocating chamber out of road way (South side)</li> </ul>	3L	Design, Construction

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Design Package: Zone 2 Transverse Drainage - Other Culverts Project Name: Ipswich Motorway Upgrade – Dinmore to Goodna

Date: 21 May 2009 / 09 July 2009 / 21 July 2009 S.I.D. Report No: SIDR#16

No	Job Step	What are the Hazards	Risk Score	Controls Required	Target Risk Score	Responsible Group
1.4	Construction of channel drain over buried gas pipe	<ul style="list-style-type: none"> <li>• Proximity of manhole to northern IM retaining wall and traffic                             <ul style="list-style-type: none"> <li>○ Struck by vehicle</li> <li>○ Struck by object</li> </ul> </li> <li>• Working in/adjacent gas pipe exclusion zone                             <ul style="list-style-type: none"> <li>○ Struck by plant</li> <li>○ Damage to infrastructure</li> <li>○ Explosion / ignition</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Investigate manhole configuration to north of motorway – from 3 no. to 2 no.</li> <li>• Investigate options to remove the need for manhole against retaining wall</li> <li>• Develop Integrated Work Method Statement</li> </ul>	3L	Design, Construction
1.5	Cross drain along Endeavour Rd to cross QR	<ul style="list-style-type: none"> <li>• Proximity to traffic                             <ul style="list-style-type: none"> <li>○ Struck by vehicle</li> <li>○ Struck by object</li> </ul> </li> <li>• Cranage and lifting underneath QR bridge                             <ul style="list-style-type: none"> <li>○ Struck by vehicle</li> <li>○ Struck by object</li> <li>○ Electrification</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statement</li> <li>• Install protection slab over gas main incorporated into works</li> <li>• Confirm that channel works consistent with protection slab</li> </ul>	3L	Design, Construction
			7A	<ul style="list-style-type: none"> <li>• Investigate alternative route for crossing rail corridor:                             <ul style="list-style-type: none"> <li>○ Thrust/jack from council land on south through to Moggill Ferry Rd (Eastern side of Endeavour Rd)</li> </ul> </li> <li>• Develop Integrated Work Method Statement</li> <li>• Carry out under a QR SCA (Safety Clarification Advice)</li> </ul>	4M	Construction

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Design Package: Zone 2 Transverse Drainage - Other Culverts Project Name: Ipswich Motorway Upgrade – Dinmore to Goodna

Date: 21 May 2009 / 09 July 2009 / 21 July 2009 S.I.D. Report No: SIDR#16

No	Job Step	What are the Hazards	Risk Score	Controls Required	Target Risk Score	Responsible Group
1.6	Construction of Longitudinal Drainage	<ul style="list-style-type: none"> <li>• Excavation under QR bridge                             <ul style="list-style-type: none"> <li>○ Potential for undermining of bridge abutments</li> <li>○ Conflict with existing buried services under bridge</li> </ul> </li> <li>• Working adjacent traffic:                             <ul style="list-style-type: none"> <li>○ Construction of pipe work and pits</li> <li>○ Installation of water quality devices</li> <li>○ Public entering open excavations</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statement (includes Permit To Excavate)</li> </ul>	4M	Construction
		<ul style="list-style-type: none"> <li>• Working adjacent/within rail corridor:                             <ul style="list-style-type: none"> <li>○ Damage to rail equipment or infrastructure</li> <li>○ Damage to plant, equipment or work force</li> <li>○ Electrocutation</li> <li>○ Open excavations within/adjacent the rail corridor</li> <li>○ Public access to rail corridor</li> <li>○ Personnel safety</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statements</li> <li>• Develop and implement Traffic Control Plans as required</li> <li>• Review construction of permanent exclusion fencing prior to drainage works where practical</li> <li>• Fence off construction works securely</li> </ul>	3L	Construction
				<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statements</li> <li>• Carry out work under a QR SCA (Safety Clarification Advice) or closure if required</li> <li>• Securely fence work areas to prevent public accessing rail corridor from worksite, and to protect rail workers from accessing worksite</li> </ul>	3L	Construction

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Design Package: Zone 2 Transverse Drainage - Other Culverts      Project Name: Ipswich Motorway Upgrade – Dinmore to Goodna  
Date: 21 May 2009 / 09 July 2009 / 21 July 2009      S.I.D. Report No: SIDR#16

2.0	ZONE 2					
2.1	Construction of Monash Rd	<ul style="list-style-type: none"> <li>Potential dam effect between Monash Rd and adjacent housing estate during significant rain event                             <ul style="list-style-type: none"> <li>Damage to property</li> <li>Drowning</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>Investigate drainage capacity / high flow culverts</li> </ul>	3L	Design
2.2	Construction of culverts adjacent housing and motorway	<ul style="list-style-type: none"> <li>Localised flooding at upstream side of key culverts                             <ul style="list-style-type: none"> <li>Damage to property</li> <li>Drowning</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>Consider over-sizing of key culverts to provide additional flood protection to residents</li> </ul>	3L	Design
2.3	Construction of Smiths Rd	<ul style="list-style-type: none"> <li>Working within power easement                             <ul style="list-style-type: none"> <li>Electrification</li> </ul> </li> <li>Working in UXO clearance area                             <ul style="list-style-type: none"> <li>Explosion</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>Compliance with asset owner requirements regarding encroachment and exclusion zones</li> <li>Develop Integrated Work Method Statement</li> </ul>	3L	Construction
			6H	<ul style="list-style-type: none"> <li>Develop Integrated Work Method Statement (incorporate UXO precautions)</li> </ul>	3L	Construction

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Date: 21 May 2009 / 09 July 2009 / 21 July 2009 S.I.D. Report No: SIDR#16

2.4	Construction of drainage adjacent the rail corridor	<ul style="list-style-type: none"> <li>Working adjacent/within rail corridor:                             <ul style="list-style-type: none"> <li>Damage to rail equipment or infrastructure</li> <li>Damage to plant, equipment or work force</li> <li>Construction of chamber at tie in to existing QR culvert and potential undermining of rail embankment, tracks and other infrastructure</li> <li>Electrocution</li> <li>Public access to rail corridor</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>Develop Integrated work Method Statements</li> <li>Carry out under a QR SCA Safety Clarification Advice) or closure if required</li> <li>Review design to utilise the existing upstream headwall as part of the new tie in chamber, or join the existing to new to minimise risk of undermining the rail formation</li> <li>Securely fence work areas to prevent public accessing rail corridor from worksite, and to protect rail workers from accessing worksite</li> </ul>	3L	Design, Construction
2.5	Retaining Wall / Drainage interface	<ul style="list-style-type: none"> <li>Introduction of constant water path to retaining structure                             <ul style="list-style-type: none"> <li>Potential for retaining wall failure due to erosion</li> </ul> </li> </ul>	6H	<ul style="list-style-type: none"> <li>Retaining wall solution to link to drainage requirements</li> </ul>	4M	Design, Construction
2.6	Construction of Longitudinal Drainage	<ul style="list-style-type: none"> <li>Working adjacent traffic:                             <ul style="list-style-type: none"> <li>Construction of pipe work and pits</li> <li>Installation of water quality devices</li> <li>Public entering open excavations</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>Develop Integrated Work Method Statements</li> <li>Develop and implement Traffic Control Plans as required</li> <li>Review construction of permanent exclusion fencing prior to drainage works where practical</li> <li>Fence off construction works securely</li> </ul>	3L	Construction

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		<ul style="list-style-type: none"> <li>• Working adjacent/within rail corridor:                             <ul style="list-style-type: none"> <li>○ Damage to rail equipment or infrastructure</li> <li>○ Damage to plant, equipment or work force</li> <li>○ Electrocutation</li> <li>○ Open excavations within/adjacent the rail corridor</li> <li>○ Public access to rail corridor</li> <li>○ Personnel safety</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statements</li> <li>• Carry out work under a QR-SCA (Safety Clarification Advice) or closure if required</li> <li>• Securely fence work areas to prevent public accessing rail corridor from worksite, and to protect rail workers from accessing worksite</li> </ul>	3L	Construction
3.0	ZONE 1					
3.1	Construct culverts around Church St	<ul style="list-style-type: none"> <li>• Damage to existing services:                             <ul style="list-style-type: none"> <li>○ Telstra, power, sewer, signalling</li> </ul> </li> <li>• Working adjacent traffic:                             <ul style="list-style-type: none"> <li>○ Construction of pipe work and pits (large in size)</li> <li>○ Installation of water quality devices</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Develop an Integrated Work Method Statement</li> <li>• Undertake potholing to prove service locations to incorporate during design, and construction</li> </ul>	3L	Design, Construction
			7A	<ul style="list-style-type: none"> <li>• Develop and implement a Traffic Control Plan</li> <li>• Develop an Integrated Work Method Statement</li> <li>• Use precast structures to minimise time excavations are open as much as practical</li> </ul>	3L	Design, Construction

**“SAFETY IN DESIGN” RISK SCHEDULE**

Applicable Design Lot: RERODR206

D2G-MP13-F-4100

Rev Num: B  
Rev Date 02/12/2009  
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Note: Parts of the SIDR highlighted in grey have been added after the original workshop date

Project Name: Ipswich Motorway Upgrade – Dinmore to Goodna

Design Package: Zone 2 Transverse Drainage - Other Culverts

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	<ul style="list-style-type: none"> <li>Working adjacent/within rail corridor:                             <ul style="list-style-type: none"> <li>Damage to rail equipment or infrastructure</li> <li>Damage to plant, equipment or work force</li> <li>Electrocution</li> <li>Public access to rail corridor</li> <li>Personnel safety</li> </ul> </li> </ul>	<p>7A</p>	<ul style="list-style-type: none"> <li>Develop Integrated work Method Statements</li> <li>Carry out work under a QR-SCA (Safety Clarification Advice) or closure if required</li> <li>Review design to utilise the existing upstream headwall as part of the new tie-in chamber, or join the existing to new to minimise risk of undermining the rail formation</li> <li>Securely fence work areas to prevent public accessing rail corridor from worksite, and to protect rail workers from accessing worksite</li> </ul>	<p>3L</p> <p>Design, Construction</p>
	<ul style="list-style-type: none"> <li>Access to pipes after construction:                             <ul style="list-style-type: none"> <li>Public safety around outlets (CPTED)</li> <li>Public safety during storm events</li> </ul> </li> </ul>	<p>6H</p>	<ul style="list-style-type: none"> <li>Investigate the use of screw or lock down grates</li> <li>Review use of personnel exclusion fencing around inlets/outlets verses screens to structures</li> </ul>	<p>4M</p> <p>Design, Construction</p>
<p>3.2</p> <p>Construct culverts around William St</p>	<ul style="list-style-type: none"> <li>Working adjacent traffic:                             <ul style="list-style-type: none"> <li>Construction of pipe work and pits (large in size)</li> <li>Potential flooding issues during construction due to closure of existing open channel</li> <li>Public access to open excavations</li> </ul> </li> </ul>	<p>7A</p>	<ul style="list-style-type: none"> <li>Use precast pits to minimise time excavations are open as much as practical</li> <li>Develop Integrated Work Method Statements</li> <li>Develop and implement Traffic Control Plans as required</li> <li>Review construction of permanent exclusion fencing prior to drainage works where practical</li> <li>Fence off construction works securely</li> </ul>	<p>3L</p> <p>Design, Construction</p>



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	<ul style="list-style-type: none"> <li>Working adjacent/within rail corridor:                             <ul style="list-style-type: none"> <li>Damage to rail equipment or infrastructure</li> <li>Damage to plant, equipment or work force</li> <li>Construction of chamber at tie in to existing QR culvert and potential undermining of rail embankment, tracks and other infrastructure</li> <li>Electrocution</li> <li>Public access to rail corridor</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>Develop Integrated work Method Statements</li> <li>Carry out under a QR SCA (Safety Clarification Advice) or closure if required</li> <li>Review design to utilise the existing upstream headwall as part of the new tie-in chamber, or join the existing to new to minimise risk of undermining the rail formation</li> <li>Securely fence work areas to prevent public accessing rail corridor from worksite, and to protect rail workers from accessing worksite</li> </ul>	3L	Design, Construction
	<ul style="list-style-type: none"> <li>Damage to culverts during installation of subsequent works:                             <ul style="list-style-type: none"> <li>Construction of TL5 pile foundation could clash with and damage new culvert</li> </ul> </li> </ul>	6H	<ul style="list-style-type: none"> <li>Review as built information as part of Integrated Work Method Statement</li> </ul>	3L	Construction
	<ul style="list-style-type: none"> <li>Access to pipes after construction                             <ul style="list-style-type: none"> <li>Public safety around outlets (CPTED)</li> <li>Public safety during storm events</li> </ul> </li> </ul>	6H	<ul style="list-style-type: none"> <li>Investigate the use of screw or lock down grates</li> <li>Review use of personnel exclusion fencing around inlets/outlets verses screens to structures</li> </ul>	4M	Design, Construction

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3.3	Construct culvert 3 at the eastern end of Hinton St	<ul style="list-style-type: none"> <li>• Working adjacent traffic:                             <ul style="list-style-type: none"> <li>○ Construction of pipe work and pits (large in size)</li> <li>○ Installation of water quality devices</li> <li>○ Public access to open excavations</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Use precast pits to minimise time excavations are open</li> <li>• Develop Integrated Work Method Statements</li> <li>• Develop and implement Traffic Control Plans as required</li> <li>• Review construction of permanent exclusion fencing prior to drainage works where practical</li> <li>• Fence off construction works securely</li> </ul>	3L	Design, Construction
		<ul style="list-style-type: none"> <li>• Working adjacent/within rail corridor:                             <ul style="list-style-type: none"> <li>○ Damage to rail equipment or infrastructure</li> <li>○ Damage to plant, equipment or work force</li> <li>○ Construction of chamber at tie in to existing QR culvert and potential undermining of rail embankment, tracks and other infrastructure</li> <li>○ Electrocutation</li> <li>○ Public access to rail corridor</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statements</li> <li>• Carry out under a QR SCA (Safety Clarification Advice) or closure if required</li> <li>• Review design to utilise the existing upstream headwall as part of the new tie in chamber, or join the existing to new to minimise risk of undermining the rail formation</li> <li>• Securely fence work areas to prevent public accessing rail corridor from worksite, and to protect rail workers from accessing worksite</li> </ul>	3L	Design, Construction
	<ul style="list-style-type: none"> <li>• Working adjacent Goodna State School                             <ul style="list-style-type: none"> <li>○ Public entering open excavations</li> <li>○ Public entering culverts</li> </ul> </li> </ul>	6H	<ul style="list-style-type: none"> <li>• Securely fence work areas to prevent public accessing worksites</li> <li>• Review permanent protection to culverts to prevent public from accessing pipes</li> </ul>	4M	Design, Construction	

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		<ul style="list-style-type: none"> <li>• Damage to culverts during installation of subsequent works: <ul style="list-style-type: none"> <li>○ Construction of TL5 pile foundation could clash with and damage new culvert</li> </ul> </li> <li>• Access to pipes after construction <ul style="list-style-type: none"> <li>○ Public safety around outlets (CPTED)</li> <li>○ Public safety during storm events</li> </ul> </li> </ul>	5H	<ul style="list-style-type: none"> <li>• Review as built information as part of Integrated Work Method Statement</li> </ul>	3L	Construction
		<ul style="list-style-type: none"> <li>• Working adjacent traffic: <ul style="list-style-type: none"> <li>○ Construction of pipe work and pits</li> <li>○ Installation of water quality devices</li> <li>○ Public entering open excavations</li> </ul> </li> </ul>	6H	<ul style="list-style-type: none"> <li>• Investigate the use of screw or lock down grates</li> <li>• Review use of personnel exclusion fencing around inlets/outlets verses screens to structures</li> </ul>	3L	Design
3.4	Construction of Longitudinal Drainage	<ul style="list-style-type: none"> <li>• Working adjacent/within rail corridor: <ul style="list-style-type: none"> <li>○ Damage to rail equipment or infrastructure</li> <li>○ Damage to plant, equipment or work force</li> <li>○ Construction of chamber at tie in to existing QR culvert and potential undermining of rail embankment, tracks and other infrastructure</li> <li>○ Electrocutation</li> <li>○ Open excavations within/adjacent the rail corridor</li> <li>○ Public access to rail corridor</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statements</li> <li>• Develop and implement Traffic Control Plans as required</li> <li>• Review construction of permanent exclusion fencing prior to drainage works where practical</li> <li>• Fence off construction works securely</li> </ul>	3L	Design, Construction
		<ul style="list-style-type: none"> <li>• Working adjacent/within rail corridor: <ul style="list-style-type: none"> <li>○ Damage to rail equipment or infrastructure</li> <li>○ Damage to plant, equipment or work force</li> <li>○ Construction of chamber at tie in to existing QR culvert and potential undermining of rail embankment, tracks and other infrastructure</li> <li>○ Electrocutation</li> <li>○ Open excavations within/adjacent the rail corridor</li> <li>○ Public access to rail corridor</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statements</li> <li>• Carry out under a QR SCA (Safety Clarification Advice) or closure if required</li> <li>• Review design to utilise the existing upstream headwall as part of the new tie in chamber, or join the existing to new to minimise risk of undermining the rail formation</li> <li>• Securely fence work areas to prevent public accessing rail corridor from worksite, and to protect rail workers from accessing worksite</li> </ul>	3L	Design, Construction

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3.5	Retaining Wall / Drainage interface	<ul style="list-style-type: none"> <li>• Introduction of constant water path to retaining structure                             <ul style="list-style-type: none"> <li>○ Potential for retaining wall failure due to erosion</li> </ul> </li> </ul>	6H	<ul style="list-style-type: none"> <li>• Retaining wall solution to link to drainage requirements</li> </ul>	4M	Design, Construction
4.0	ZONE 4					
4.1	Construction of transverse drainage, including upgrading of McEwen and Verral St drainage	<ul style="list-style-type: none"> <li>• Working adjacent traffic:                             <ul style="list-style-type: none"> <li>○ Construction of pipe work and pits</li> <li>○ Installation of water quality devices</li> <li>○ Public entering open excavations</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statements</li> <li>• Develop and implement Traffic Control Plans as required</li> <li>• Review construction of permanent exclusion fencing prior to drainage works where practical</li> <li>• Fence off construction works securely</li> </ul>	3L	Design, Construction
		<ul style="list-style-type: none"> <li>• Working adjacent/within rail corridor:                             <ul style="list-style-type: none"> <li>○ Damage to rail equipment or infrastructure</li> <li>○ Damage to plant, equipment or work force</li> <li>○ Construction of chamber at tie in to existing QR culvert and potential undermining of rail embankment, tracks and other infrastructure</li> <li>○ Electrocutation</li> <li>○ Open excavations within/adjacent the rail corridor</li> <li>○ Public access to rail corridor</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statements</li> <li>• Carry out under a QR SCA (Safety Clarification Advice) or closure if required</li> <li>• Review design to utilise the existing upstream headwall as part of the new tie in chamber, or join the existing to new to minimise risk of undermining the rail formation</li> <li>• Securely fence work areas to prevent public accessing rail corridor from worksite, and to protect rail workers from accessing worksite</li> </ul>	3L	Design, Construction
		<ul style="list-style-type: none"> <li>• Access to pipes after construction                             <ul style="list-style-type: none"> <li>○ Public safety around outlets (CPTED)</li> <li>○ Public safety during storm events</li> </ul> </li> </ul>	6H	<ul style="list-style-type: none"> <li>• Investigate the use of screw or lock down grates</li> <li>• Review use of personnel exclusion fencing around inlets/outlets verses screens to structures</li> </ul>	3L	Design, Owner

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4.2	Construction of Longitudinal Drainage	<ul style="list-style-type: none"> <li>• Working adjacent traffic:                             <ul style="list-style-type: none"> <li>○ Construction of pipe work and pits</li> <li>○ Installation of water quality devices</li> <li>○ Public entering open excavations</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statements</li> <li>• Develop and implement Traffic Control Plans as required</li> <li>• Review construction of permanent exclusion fencing prior to drainage works where practical</li> <li>• Fence off construction works securely</li> </ul>	6H	3L	Construction
4.3	Retaining Wall / Drainage interface	<ul style="list-style-type: none"> <li>• Working adjacent/within rail corridor:                             <ul style="list-style-type: none"> <li>○ Damage to rail equipment or infrastructure</li> <li>○ Damage to plant, equipment or work force</li> <li>○ Electrocutation</li> <li>○ Open excavations within/adjacent the rail corridor</li> <li>○ Public access to rail corridor</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statements</li> <li>• Carry out under a QR SCA (Safety Clarification Advice) or closure if required</li> <li>• Securely fence work areas to prevent public accessing rail corridor from worksite, and to protect rail workers from accessing worksite</li> </ul>	7A	3L	Construction
5.0	ZONE 4 RETENTION BASIN	<ul style="list-style-type: none"> <li>• Introduction of constant water path to retaining structure                             <ul style="list-style-type: none"> <li>○ Potential for retaining wall failure due to erosion</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Retaining wall solution to link to drainage requirements</li> </ul>	6H	4M	Design, Construction

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5.1	Retention Basin Bulk Earthworks in proximity to Bridge construction, and existing rail formation	<ul style="list-style-type: none"> <li>• Space Constraints                             <ul style="list-style-type: none"> <li>◦ Proximity to large plant</li> <li>◦ Struck by plant</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Bridge and basin construction are programmed to minimise interference between construction activities. Bulk Earthworks for basin will occur prior to bridge construction.</li> <li>• Integrated V/ork Method Statement</li> <li>• Origin Alliance site access rules apply – permission from site supervisor, sign-on to IWMS, JHA and daily pre-start.</li> </ul>	4M	Construction
	<ul style="list-style-type: none"> <li>• Flooding in QR access track                             <ul style="list-style-type: none"> <li>◦ Localised ponding of water against rail formation</li> <li>◦ Overtopping of rail formation</li> </ul> </li> </ul>	5H	<ul style="list-style-type: none"> <li>• Basin designed to retain Q100 water levels, therefore expect ponding to be caused from rainfall within small catchment of access track</li> <li>• QR may consider an emergency response procedure in the case of ponding</li> </ul>	4M	Design, Construction
	<ul style="list-style-type: none"> <li>• Working adjacent within rail corridor:                             <ul style="list-style-type: none"> <li>◦ Damage to rail equipment or infrastructure</li> <li>◦ Damage to plant, equipment or work force</li> <li>◦ Electrocuton</li> <li>◦ Open excavations within/adjacent the rail corridor</li> <li>◦ Public access to rail corridor</li> </ul> </li> </ul>	7A	<ul style="list-style-type: none"> <li>• Develop Integrated Work Method Statements</li> <li>• Carry out under a QR SCA (Safety Clarification Advice) or closure if required</li> <li>• Securely fence work areas to prevent public accessing rail corridor from worksite, and to protect rail workers from accessing worksite</li> </ul>	3L	Construction
6.0	FLOODING				

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6.1	<p><b>Construction during flood events</b></p> <ul style="list-style-type: none"> <li>• Flooding of the work areas and traffic areas</li> <li>• Electrical hazards</li> <li>• Public/environmental health hazards due to waste products/pollution</li> <li>• Emergency vehicle access restrictions</li> <li>• Drowning</li> </ul>	7A (5P)	<ul style="list-style-type: none"> <li>• Flood modelling to be undertaken to assess flood extents</li> <li>• Drainage designs to consider flood impacts and design storm events</li> <li>• Construction to consider weather reports/BOM reports</li> <li>• Traffic control plans as required, Develop integrated work method statements.</li> <li>• Temporary bunding</li> </ul>	5H (3P)	Design Construction
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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
<b>Construction and Demolition – Mitigation (CHAIR 2)</b>						
1.0	Zone 3					
1.1	<p>Damage to existing buried 1050mm dia. Drain Alignment of the proposed transverse drainage system at Endeavour underpass has been moved to avoid the potential conflict during construction.</p> <p>Existing services have been potholed to locate the service prior to construction. Existing service locations are shown on design drawings.</p>	<ul style="list-style-type: none"> <li>Struck by plant</li> <li>Damage to existing culverts through construction activity</li> <li>Harm to people and/or equipment</li> </ul>	4M (3U)	Design – 12/2/10	Construction	
1.2	<p>Introduction of constant water path to retaining structure</p> <p>Catch drains and toe drains have been provided where required to control stormwater runoff.</p> <p>Local drainage requirements have been incorporated in the design of the retaining walls.</p> <p>Wall drainage is shown on the structural retaining wall drawings</p>	<ul style="list-style-type: none"> <li>Potential for retaining wall failure due to erosion</li> <li>Potential for overtopping drainage system due to abnormally large rainfall event</li> <li>Potential for erosion around wall following large rainfall event</li> <li>Harm to people and/or equipment</li> </ul>	4M (3U)	Design – 12/2/10	Construction	

Not Relevant

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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign. Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
1.3	<p><u>Proximity to traffic</u> Options for culvert crossing investigated and a single culvert has been designed to minimise the construction risk. The alignment of the drainage system has been offset to assist in construction staging.</p>	<ul style="list-style-type: none"> <li>Harm to people and/or equipment</li> <li>Struck by vehicle</li> <li>Struck by object</li> </ul>	5H (5R)	Design – 12/2/10	Construction	
	<p><u>Location of cast-in-place chamber on service road ramp (proximity to traffic)</u> Not able to be mitigated through design. Options for the manhole location were investigated and the manhole was required to be installed directly behind the kerb and channel to achieve cover and maintenance requirements, as well as provide connectivity to existing drainage system. Location of manhole off service road is limited by location of retaining wall.</p>	<ul style="list-style-type: none"> <li>Harm to people and/or equipment</li> <li>Struck by vehicle</li> <li>Struck by object</li> </ul>	7A (5P)	Design – 12/2/10	Construction	
	<p><u>Proximity of manhole to northern IM retaining wall and traffic</u> Options for the manhole location were investigated and the manhole was required to be installed directly behind the kerb and channel to achieve cover and maintenance requirements. The manhole C16500A and C16500B1 are located behind the kerbs of the ramp and out of the direct traffic path</p>	<ul style="list-style-type: none"> <li>Harm to people and/or equipment</li> <li>Struck by vehicle</li> <li>Struck by object</li> </ul>	5H (5R)	Design – 12/2/10	Construction	

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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
1.4	<p><u>Working in/adjacent gas pipe exclusion zone</u> The design has been optimised to limit the number of gas main crossings. The gas mains have been highlighted on the design drawings (layout plans). The gas main has been shown on the longitudinal drainage sections. A protection slab has also been designed for the gas main (refer PUP package).</p>	<ul style="list-style-type: none"> <li>Harm to people and/or equipment</li> <li>Struck by plant</li> <li>Damage to infrastructure</li> <li>Explosion / Ignition</li> </ul>	5H (4U)	Design – 12/2/10	Construction	
1.5	<p><u>Proximity to traffic</u> The alignment of the drainage system optimised to avoid crossing under the QR underpass. The design provides for a thrust bored crossing to the east of the underpass.</p> <p><u>Cranage and lifting underneath QR bridge</u> Design has eliminated the interaction with the existing QR bridge by optimising the design to avoid crossing under the QR bridge.</p> <p><u>Excavation under QR bridge</u> Design has eliminated the interaction with the existing QR bridge by optimising the design to avoid crossing under the QR bridge.</p>	<ul style="list-style-type: none"> <li>Damage to QR infrastructure due to thrust boring activities</li> <li>Harm to people and/or equipment</li> <li>Working adjacent to and within live rail corridor leading to personnel harm</li> <li>No residual risk due to removal of this specific hazard situation.</li> <li>No residual risk due to removal of this specific hazard situation.</li> </ul>	5H (5R)	Design – 12/2/10	Construction	
			N/A	Design – 12/2/10	Construction	
			N/A	Design – 12/2/10	Construction	

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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
1.6	<p><u>Working adjacent traffic</u> The longitudinal drainage has been designed in accordance with the appropriate guidelines.</p> <p>The longitudinal drainage design incorporates the requirements of the temporary traffic management plans.</p>	<ul style="list-style-type: none"> <li>Harm to people and/or equipment</li> <li>Public safety due to entering open excavations</li> </ul>	7A (5P)	Design – 12/2/10	Construction	
2.0	<p><u>Working adjacent/within rail corridor</u> The longitudinal drainage has been designed in accordance with the appropriate QR and Project standards</p>	<ul style="list-style-type: none"> <li>Damage to rail equipment or infrastructure</li> <li>Damage to plant, equipment or work force</li> <li>potential undermining of rail embankment, tracks and other infrastructure</li> <li>Electrocution</li> <li>Public access to rail corridor</li> </ul>	7A (5P)	Design – 12/2/10	Construction	
2.1	<p><u>Potential dam effect between Monash Rd and adjacent housing estate during significant rain event</u> Monash road culverts have been designed to an acceptable level of immunity (PMF) for the road.</p>	<ul style="list-style-type: none"> <li>Damage to property</li> <li>Drowning</li> <li>Harm to people and/or equipment</li> </ul>	5H (5R)	Design – 12/2/10	Construction	

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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
2.2	<p><u>Localised flooding at upstream side of key culverts</u></p> <p>Options for over-sizing key culverts were considered. Where it did not adversely impact on residents downstream, hydraulic regime, or maintenance, over-sizing was adopted. Culverts have been designed with the appropriate level of immunity as specified in the Design Brief.</p> <p>Desktop study undertaken for all the Transverse culverts detailing the expected impact of a full blockage or significant rain event.</p> <p>Safety screens to culvert inlets/outlets have been designed in accordance with QUDM section 12.04 where required.</p>	<ul style="list-style-type: none"> <li>• Damage to property</li> <li>• Drowning</li> <li>• Harm to people and/or equipment</li> </ul>	5H (5R)	Design – 12/2/10	Construction	
2.3	<p><u>Working within power easement</u></p> <p>Existing electricity and overhead power lines have been identified and shown on the design drawings.</p> <p><u>Working in UXO clearance area</u></p> <p>UXO clearance areas have been shown on the exclusion zone drawings and the drainage design has avoided this exclusion zone</p>	<ul style="list-style-type: none"> <li>• Harm to people and/or equipment</li> <li>• Electrocutation</li> <li>• Damage to power poles / power lines</li> <li>• Damage to plant</li> </ul>	6H (5U)	Design – 12/2/10	Construction	
		<ul style="list-style-type: none"> <li>• Harm to people and/or equipment</li> <li>• Explosion if UXO uncovered inside or outside of exclusion zone</li> </ul>	5H (4U)	Design – 12/2/10	Construction	

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2.4	<p><u>Working adjacent/within rail corridor</u> The design has located the proposed gully infrastructure outside of the QR boundary to allow for ease of construction and to minimise the risk of damage to QR assets.</p> <p>Permanent and temporary fencing locations and details developed to restrict access to the rail corridor. Fencing details are shown in another package (refer Fencing Package DGRORF101)</p> <p>Utilising existing QR infrastructure where possible to minimise risk of undermining/affecting rail formation.</p>	<ul style="list-style-type: none"> <li>Harm to people and/or equipment</li> <li>Damage to QR infrastructure</li> <li>Electrocution</li> <li>Public access to rail corridor</li> </ul>	4M (4P)	Design – 12/2/10	Construction	
2.5	<p><u>Introduction of constant water path to retaining structure</u> Catch drains and toe drains have been provided where required to control stormwater runoff. Local drainage requirements have been incorporated in the design of the retaining walls. Wall drainage is shown on the structural retaining wall drawings</p>	<ul style="list-style-type: none"> <li>Potential for retaining wall failure due to erosion</li> <li>Potential for overtopping drainage system due to abnormally large rainfall event</li> <li>Potential for erosion around wall following large rainfall event</li> <li>Harm to people and/or equipment</li> </ul>	4M (3U)	Design – 12/2/10	Construction	

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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
2.6	<p><u>Working adjacent traffic</u> The longitudinal drainage has been designed in accordance with the appropriate guidelines.</p> <p>The longitudinal drainage incorporates the requirements of the temporary traffic management plans.</p>	<ul style="list-style-type: none"> <li>Public safety due to entering open excavations</li> <li>Harm to people and/or equipment</li> </ul>	7A (5P)	Design – 12/2/10	Construction	
3.0	<p><u>Working adjacent/within rail corridor:</u> Permanent and temporary fencing locations and details developed to restrict access to the rail corridor. Fencing details are shown in another package (refer Fencing Package DGRORF101.)</p>	<ul style="list-style-type: none"> <li>Damage to rail equipment or infrastructure.</li> <li>Damage to plant, equipment or work force potential undermining of rail embankment, tracks and other infrastructure</li> <li>Electrocution</li> <li>Public access to rail corridor</li> <li>Personnel harm</li> </ul>	4M (4R)	Design – 12/2/10	Construction	
3.1	<p><u>Zone 1</u> <u>Damage to existing services</u> Potholing of the existing services has been undertaken and included in the survey model. Existing services information also included in services model. Applicable existing services have been shown on the design drawings</p>	<ul style="list-style-type: none"> <li>Damaging existing services requiring replacement</li> <li>Personnel/equipment harm due to contact with live services</li> </ul>	4M (4R)	Design – 12/2/10	Construction	

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Design Package: Zone 2 Transverse Drainage - Other Culverts Project Name: Ipswich Motorway Upgrade – Dinmore to Goodna

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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign. Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
	<p><u>Working adjacent traffic</u></p> <p>The longitudinal drainage design incorporates the requirements of the temporary traffic management plans.</p> <p>Precast pits have been specified as part of the design.</p>	<ul style="list-style-type: none"> <li>• Damage to people and/or equipment</li> <li>• Public safety due to entering open excavations</li> </ul>	7A (4P)	Design – 12/2/10 [Redacted]	Construction	[Redacted]
	<p><u>Working adjacent/within rail corridor</u></p> <p>The design has located the proposed culvert infrastructure outside of the QR boundary to and allow for ease of construction and to minimise the risk of damage to QR assets.</p> <p>Permanent and temporary fencing locations and details developed to restrict access to the rail corridor. Fencing details are shown in another package (refer Fencing Package DGRORF101.)</p> <p>The design has utilised as much of the existing upstream headwall as possible (subject to geometric positioning of the connecting culverts).</p>	<ul style="list-style-type: none"> <li>• Damage to rail equipment or infrastructure</li> <li>• Damage to plant, equipment or work force</li> <li>• potential undermining of rail embankment, tracks and other infrastructure</li> <li>• Electrocutation</li> <li>• Public access to rail corridor</li> <li>• Personnel harm</li> </ul>	4M (4R)	Design – 12/2/10 [Redacted]	Construction	[Redacted]

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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
	<p><u>Access to pipes after construction</u> Fencing has been provided to limit falls from stormwater culverts and some fencing provided to limit access as per fencing package. Safety grates and screens have been located in accordance with QUDM section 12.04, risk assessment. Stakeholders (ICC) have been included in the selection of locating inlet screens</p>	<ul style="list-style-type: none"> <li>Public safety around outlets (CPTED)</li> <li>Public safety during storm events</li> <li>Damage to public infrastructure</li> <li>Harm to people and/or equipment</li> </ul>	5H (4P)	Design – 12/2/10	Construction	
3.2	<p><u>Working adjacent traffic</u> Permanent fencing and temporary fencing locations and details developed to restrict access. Fencing details are shown in another package (refer Fencing Package DGRORF101.) Precast pits have been specified as part of the design.</p>	<ul style="list-style-type: none"> <li>Damage to people and/or equipment</li> <li>Public safety due to entering open excavations</li> </ul>	7A (5P)	Design – 12/2/10	Construction	



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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
	<p><u>Working adjacent/within rail corridor</u> The design has located the proposed gully infrastructure outside of the QR boundary and allow for ease of construction and to minimise the risk of damage to QR assets.</p> <p>Permanent and temporary fencing locations and details developed to restrict access to the rail corridor. Fencing details are shown in another package (refer Fencing Package DGRORF101)</p> <p>The design has utilised as much of the existing upstream headwall as possible (subject to geometric positioning of the connecting culverts).</p>	<ul style="list-style-type: none"> <li>• Damage to rail equipment or infrastructure</li> <li>• Damage to plant, equipment or work force potential undermining of rail embankment, tracks and other infrastructure.</li> <li>• Electrocutation</li> <li>• Public access to rail corridor</li> <li>• Personnel harm</li> </ul>	4M (4R)	Design – 12/2/10	Construction	
	<p><u>Damage to culverts during installation of subsequent works</u> Interdisciplinary reviews and checks have been undertaken as part of the design process. Clashes identified as part of the design process and services realigned or relocated as appropriate.</p> <p>Stormwater pipes are shown on structural drawings where the stormwater is integral with the structure.</p> <p>Pipe class and cover has been assessed for likely construction and permanent loads (refer to Design Report for details)</p>	<ul style="list-style-type: none"> <li>• Damage to culverts/pipes installed on site requiring replacement</li> </ul>	4M (3U)	Design – 12/2/10	Construction	

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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
	<p><u>Access to pipes after construction</u> Fencing has been provided to limit falls from stormwater culverts and some fencing provided to limit access as per fencing package. Safety grates and screens have been located in accordance with QUDM section 12.04, risk assessment. Stakeholders (ICC) have been included in the selection of locating inlet screens</p>	<ul style="list-style-type: none"> <li>Public safety around outlets (CPTED)</li> <li>Public safety during storm events</li> <li>Damage to public infrastructure</li> <li>Harm to people and/or equipment</li> </ul>	6H (4P)	Design – 12/2/10	Construction	
3.3	<p><u>Working adjacent traffic</u> The longitudinal drainage has been designed in accordance with the appropriate guidelines. Permanent and temporary fencing locations and details developed to restrict access. Fencing details are shown in another package (refer Fencing Package DGRORF-101-1). Precast pits have been specified as part of the design.</p>	<ul style="list-style-type: none"> <li>Damage to people and/or equipment</li> <li>Public safety due to entering open excavations</li> </ul>	7A (5P)	Design –	Construction	

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Design Package: **Zone 2 Transverse Drainage - Other Culverts** Project Name: **Ipswich Motorway Upgrade – Dinmore to Goodna**  
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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
	<p><u>Working adjacent/within rail corridor</u></p> <p>The design has located the proposed gully infrastructure outside of the QR boundary and allow for ease of construction to minimise the risk of damage to QR assets.</p> <p>The design has utilised as much of the existing upstream headwall as possible (subject to geometric positioning of the connecting culverts).</p> <p>Permanent and temporary fencing locations and details developed to restrict access to the rail corridor. Fencing details are shown in another package (refer Fencing Package DGRORF101)</p>	<ul style="list-style-type: none"> <li>• Damage to rail equipment or infrastructure</li> <li>• Damage to plant, equipment or work force</li> <li>• potential undermining of rail embankment, tracks and other infrastructure</li> <li>• Electrocutation</li> <li>• Public access to rail corridor</li> <li>• Personnel harm</li> </ul>	4M (4R)	Design – 12/2/10	Construction	
	<p><u>Working adjacent Goodna State School</u></p> <p>Permanent and temporary fencing locations developed to restrict access. Fencing details are shown in another package (refer Fencing Package DGRORF101)</p>	<ul style="list-style-type: none"> <li>• Public entering open excavations resulting in injury</li> <li>• Public entering culverts resulting in injury</li> <li>• Property damage/vandalism</li> </ul>	6H (4P)	Design – 12/2/10	Construction	

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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
	<p><u>Damage to culverts during installation of subsequent works</u></p> <p>Interdisciplinary reviews and checks have been undertaken as part of the design process. Clashes identified as part of the design process and services realigned or relocated as appropriate.</p> <p>Stormwater pipes are shown on structural drawings where the stormwater is integral with the structure.</p> <p>Pipe class and cover has been assessed for likely construction and permanent loads (refer to Design Report for details)</p>	<ul style="list-style-type: none"> <li>• Damage to services installed on site</li> <li>• Damage to culverts/pipes installed on site requiring replacement</li> </ul>	4M (3U)	Design – 12/2/10	Construction	
	<p><u>Access to pipes after construction</u></p> <p>Fencing has been provided to limit falls from stormwater culverts and some fencing provided to limit access as per fencing package. Safety grates and screens have been located in accordance with QUDM section 12.04 Risk assessment. Stakeholders (ICC) have been included in the selection of locating inlet screens</p>	<ul style="list-style-type: none"> <li>• Public safety around outlets (CPTED)</li> <li>• Public safety during storm events</li> <li>• Damage to public infrastructure</li> </ul>	6H (4P)	Design – 12/2/10	Construction	

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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
3.4	<p><u>Working adjacent traffic</u> The longitudinal drainage has been designed in accordance with the appropriate guidelines.</p> <p>The longitudinal drainage design incorporates the requirements of the temporary traffic management plans.</p>	<ul style="list-style-type: none"> <li>• Damage to people and/or equipment</li> <li>• Public safety due to entering open excavations</li> </ul>	7A (5P)	Design – 12/2/10	Construction	
	<p><u>Working adjacent/within rail corridor</u> The longitudinal drainage has been designed in accordance with the appropriate guidelines. (QR) Minimal length of longitudinal drainage has been proposed within the QR corridor to minimise the risk.</p>	<ul style="list-style-type: none"> <li>• Damage to rail equipment or infrastructure</li> <li>• Damage to plant, equipment or work force</li> <li>• potential undermining of rail embankment, tracks and other infrastructure</li> <li>• Electrocution</li> <li>• Open excavations within/adjacent the rail corridor</li> <li>• Public access to rail corridor</li> </ul>	7A (5P)	Design – 12/2/10	Construction	
3.5	<p><u>Introduction of constant water part to retaining structure</u> Catch drains and toe drains have been provided where required to control stormwater runoff. Local drainage requirements have been incorporated in the design of the retaining walls. Wall drainage is shown on the structural retaining wall drawings</p>	<ul style="list-style-type: none"> <li>• Potential for retaining wall failure due to erosion</li> <li>• Potential for overtopping drainage system due to abnormally large rainfall event</li> <li>• Potential for erosion around wall following large rainfall event</li> </ul>	4M (3U)	Design – 12/2/10	Construction	

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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
4.0	<b>ZONE 4</b>					
4.1	Working adjacent traffic Permanent fencing locations and details developed to restrict access to the Motorway. Fencing details are shown in another package (refer Fencing Package DGRORF101)  Location of proposed drainage designed to limit the extent of excavation required to reduce the risk	<ul style="list-style-type: none"> <li>Damage to people and/or equipment</li> <li>Public safety due to entering open excavations</li> </ul>	7A (5P)	Design – 12/2/10	Construction	
	Working adjacent/within rail corridor The design has located the proposed gully infrastructure outside of the QR boundary to allow for ease of construction and to minimise the risk of damage to QR assets. Stakeholder approval has been sought to agree on the proposed crossing alignments. Crossings are significantly below track level and located away from all masts, signals and sidings, and are in accordance with the QR standards. Permanent fencing locations and details developed to restrict access to the rail corridor. Fencing details are shown in another package (refer Fencing Package DGRORF101)	<ul style="list-style-type: none"> <li>Damage to rail equipment or infrastructure</li> <li>Damage to plant, equipment or work force</li> <li>potential undermining of rail embankment, tracks and other infrastructure</li> <li>Electrocution</li> <li>Open excavations within/adjacent the rail corridor</li> <li>Public access to rail corridor</li> </ul>	4M (4R)	Design – 12/2/10	Construction	

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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign. Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
	<p>Access to pipes after construction</p> <p>Fencing has been provided to limit falls from stormwater culverts and some fencing provided to limit access as per fencing package. Safety grates and screens have been located in accordance with QUDM section 12.04, risk assessment. Stakeholders (ICC) have been included in the selection of locating inlet screens</p> <p>All stormwater infrastructure has been design in accordance with relevant standard drawings.</p>	<ul style="list-style-type: none"> <li>Public safety around outlets (CPTED)</li> <li>Public safety during storm events</li> <li>Damage to public infrastructure</li> <li>Harm to people and/or equipment</li> </ul>	6H (4P)	Design – [Redacted]	Construction	[Redacted]
4.2	<p>Working adjacent traffic</p> <p>Permanent fencing locations and details developed to restrict access to the Motorway. Fencing details are shown in another package (refer to DGPCAL101).</p> <p>The stormwater has been design in accordance with the relevant design documentation.</p> <p>The longitudinal drainage design incorporates the requirements of the temporary traffic management plans.</p>	<ul style="list-style-type: none"> <li>Damage to people and/or equipment</li> <li>Public safety due to entering open excavations</li> </ul>	6H (5U)	Design – [Redacted]	Construction	[Redacted]

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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
	<p><u>Working adjacent/within rail corridor:</u> No longitudinal drainage proposed within rail corridor. Permanent fencing locations and details developed to restrict access to the rail corridor. Fencing details are shown in relevant fencing package (refer DGRORF101)</p>	<ul style="list-style-type: none"> <li>• Damage to rail equipment or infrastructure</li> <li>• Damage to plant, equipment or work force</li> <li>• Electrocuton</li> <li>• Public access to rail corridor</li> </ul>	4M (4R)	Design – 12/2/10	Construction	
4.3	<p><u>Introduction of constant water path to retaining structure</u> Catch drains and toe drains have been provided where required to control stormwater runoff. Local drainage requirements have been incorporated in the design of the retaining walls. Wall drainage is shown on the structural retaining wall drawings</p>	<ul style="list-style-type: none"> <li>• Potential for retaining wall failure due to erosion</li> <li>• Potential for overtopping drainage system due to abnormally large rainfall event</li> <li>• Potential for erosion around wall following large rainfall event</li> </ul>	4M (3U)	Design – 12/2/10	Construction	
5.0	<b>ZONE 4 RETENTION BASIN</b>					
5.1	<p><u>Space Constraints:</u> Design of basin completed to ensure that all earthworks are within Project Boundary and no works cross into QR corridor.</p>	<ul style="list-style-type: none"> <li>• Damage to people or plant</li> </ul>	4M (3U)	Design – 12/2/10	Construction	



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No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Residual Risk Transferred to Group	Recipient Group Acceptance Initial
	<p><u>Flooding in QR access track</u> Design of basins included emergency overflow provisions to contain runoff in large rainfall events within designated drainage corridors. Design checked to confirm Q100 flood levels are contained within the basin. Geotechnical team has been consulted over embankment stability issues</p>	<ul style="list-style-type: none"> <li>Flooding into QR</li> <li>Overtopping of rail formation</li> <li>Harm to people and/or equipment</li> </ul>	5H (4U)	Design – [REDACTED]	Construction	[REDACTED]
	<p><u>Working adjacent/within rail corridor</u> Permanent fencing locations and details developed to restrict access to the rail corridor. Fencing details are shown in relevant fencing package. Design footprint reduced to be contained fully with DTMR land Included relevant stakeholders (QR) in design solutions and have received signoff</p>	<ul style="list-style-type: none"> <li>Unintentional damage to infrastructure due to works in and around the QR rail corridor</li> <li>Damage to plant, equipment or work force</li> <li>Electrocution</li> <li>Public access to rail corridor resulting in property damage or public harm</li> </ul>	4M (4R)	Design – 12/2/10 [REDACTED]	Construction	[REDACTED]
<b>6.0</b>	<b>FLOODING</b>					
<b>6.1</b>	<p><u>Construction during flood events</u> Advice on expected design event inundation areas Local flooding impacts of IMU designs have been assessed by flood models/drainage assessment</p>	<ul style="list-style-type: none"> <li>Local flooding causing dangerous work site/traffic accidents</li> <li>Harm to people and or equipment</li> <li>Drowning</li> </ul>	6H (4P)	Design – 22/2/10 [REDACTED]	Construction	[REDACTED]

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No	Job Step	What are the Hazards	Risk Score	Controls Required	Target Risk Score	Responsible Group
<b>Operation and Maintenance – Risk Assessment (CHAIR 3)</b>						
1	Access to manholes	<ul style="list-style-type: none"> <li>• Proximity to traffic                             <ul style="list-style-type: none"> <li>◦ Struck by vehicle</li> </ul> </li> </ul>	6H	<ul style="list-style-type: none"> <li>• Traffic control required in advance of and around manhole where access is directly adjacent to or in roadway</li> <li>• Design manhole locations so that they are offset from highly trafficked areas</li> <li>• Develop and implement IWMS/JSA/HESP for maintenance activities, including Traffic Control Plan as required.</li> </ul>	3L (3R)	Owner, Design
2	Capture and treatment of flammable spills around Church St	<ul style="list-style-type: none"> <li>• Drainage discharges to an open drain that runs adjacent houses and public space</li> </ul>	5H	<ul style="list-style-type: none"> <li>• Provide spill containment basin at the end of each longitudinal drainage wherever possible</li> <li>• Develop and implement an emergency response procedure in the case of spillage</li> </ul>	3L (3R)	Owner, Design
3	Maintenance of pits under kerb lines or within roadway	<ul style="list-style-type: none"> <li>• Proximity to traffic                             <ul style="list-style-type: none"> <li>◦ Struck by vehicle</li> <li>◦ Closure of local roads or the motorway during maintenance</li> </ul> </li> </ul>	6H	<ul style="list-style-type: none"> <li>• Traffic control required in advance of and around manhole where access is directly adjacent to or in roadway</li> <li>• Design drainage pit to provide easy access to the gully invert</li> <li>• Develop and implement IWMS/JSA/HESP for maintenance activities, including Traffic Control Plan as required.</li> </ul>	3L (2U)	Owner, Design

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No	Job Step	What are the Hazards	Risk Score	Controls Required	Target Risk Score	Responsible Group
4	Maintenance of inlet/outlet safety structures required to prevent public access.	<ul style="list-style-type: none"> <li>Objects/people caught in inlet/outlet structures with no means of escape</li> <li>Access to structure for maintenance (potential confined space depending upon the structure)</li> </ul>	6H	<ul style="list-style-type: none"> <li>Maintenance to be completed in dry conditions</li> <li>Design of inlet/outlet structure to consider removal of cage for maintenance purposes</li> <li>Apply controls and safety systems for access as per Australian Standard where drainage pit is deemed to be a confined space</li> <li>Review design and apply sloped face of grate to inlet/outlet</li> <li>Develop and implement IWMS/JSA/HESP for maintenance activities, including Traffic Control Plan as required.</li> </ul>	4M (4R)	Owner, Design
5	> Q100 Rain Event	<ul style="list-style-type: none"> <li>Overtopping of basin spillway                             <ul style="list-style-type: none"> <li>Refer to Item 1.2</li> <li>Flooding</li> <li>Scour and erosion</li> <li>High depths and velocities in pedestrian/road areas</li> </ul> </li> <li>Catastrophic failure of basin embankment                             <ul style="list-style-type: none"> <li>Refer to Item 1.2</li> <li>Flooding</li> <li>Scour and erosion</li> <li>High depths and velocities in pedestrian/road areas</li> </ul> </li> </ul>	5H	<ul style="list-style-type: none"> <li>Develop an emergency response procedure in the case of basin spillway overtopping</li> <li>Design emergency overflow systems to allow drainage of extremely large rainfall events</li> <li>Develop an emergency response procedure in the case of basin embankment failure</li> <li>Design emergency overflow systems to allow drainage of extremely large rainfall events</li> </ul>	4M (4R)	Owner, Design

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No	Job Step	What are the Hazards	Risk Score	Controls Required	Target Risk Score	Responsible Group
6	Significant Rain Event	<ul style="list-style-type: none"> <li>○ Rainfall greater than design storm</li> <li>○ Flooding</li> <li>○ Scour and erosion</li> <li>○ High depths and velocities in pedestrian/road areas</li> </ul>	5H	<ul style="list-style-type: none"> <li>• regular inspection and maintenance regime to stormwater infrastructure</li> <li>• Review design to assess impacts due to large rainfall events</li> </ul>	4M (4R)	Owner, Design
7	Basin sediment removal activities	<ul style="list-style-type: none"> <li>• Significant build-up of silt / sediment raising level of basin                             <ul style="list-style-type: none"> <li>○ Reduction of basin's storage capacity</li> <li>○ Contaminants/chemical</li> </ul> </li> </ul>	3L	<ul style="list-style-type: none"> <li>• regular inspection and maintenance regime to check sediment levels in basin</li> <li>• provide depth gauge markers in basin as reference for water depth/sediment depth</li> <li>• Develop and implement IWMS/JSA/HESP for maintenance activities, including Traffic Control Plan as required</li> </ul>	3L (3R)	Owner, Design
		<ul style="list-style-type: none"> <li>• Access to basin                             <ul style="list-style-type: none"> <li>○ Slip / trip / fall</li> </ul> </li> </ul>	3L	<ul style="list-style-type: none"> <li>• Design to allow for designated maintenance access ramp into basins</li> <li>• Dewater dam prior to maintenance (silt removal) activities</li> <li>• Work Method Statement to be developed for maintenance of basins to cover vehicle access, dewatering and personnel access and safety.</li> </ul>	2L (2R)	Owner, Design

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No	Job Step	What are the Hazards	Risk Score	Controls Required	Target Risk Score	Responsible Group
8	Longitudinal Drainage pipes behind walls	<ul style="list-style-type: none"> <li>Restricted access</li> <li>Damage to wall</li> <li>Working adjacent to traffic</li> </ul>	6H (3L)	<ul style="list-style-type: none"> <li>Design to allow for future access to pipe for replacement/maintenance</li> <li>Develop and implement IWMS/JSA/HESP for maintenance activities, including Traffic Control Plan as required</li> </ul>	3L (3R)	Owner, Design
9	Longitudinal drainage pipes in front of walls	<ul style="list-style-type: none"> <li>Retaining wall failure</li> <li>Working adjacent to traffic</li> </ul>	6H (3L)	<ul style="list-style-type: none"> <li>Design to allow for pipe to be maintained in front of wall</li> <li>Develop and implement IWMS/JSA/HESP for maintenance activities, including Traffic Control Plan as required</li> </ul>	3L (3R)	Owner, Design
10	Scour protection at stormwater outlets	<ul style="list-style-type: none"> <li>Access to structure for maintenance</li> <li>Loose debris / rubble</li> </ul>	5H (2L)	<ul style="list-style-type: none"> <li>Work Method Statement to be developed for maintenance of outlets.</li> <li>regular inspection and maintenance regime to check scour protection and possible blockages to culverts</li> <li>review scour protection design to ensure installation requires minimal maintenance</li> </ul>	3L (2U)	Owner, Design

Note: Parts of the SIDR highlighted in grey have been added after the original workshop date

Design Package: Zone 2 Transverse Drainage - Other Culverts Project Name: Ipswich Motorway Upgrade – Dinmore to Goodna

Date: 21 May 2009 / 09 July 2009 / 21 July 2009 S.I.D. Report No: SIDR#16

No	Job Step	What are the Hazards	Risk Score	Controls Required	Target Risk Score	Responsible Group
11	Regional Flood management	<ul style="list-style-type: none"> <li>Flooding of the traffic areas</li> <li>Electrical hazards, public/environmental health hazards due to waste products/pollution</li> <li>Emergency vehicle access restrictions, public access/escape prevented by floodwaters</li> <li>Drowning</li> <li>Increase depth and area of flood inundation</li> </ul>	7A (5P)	<ul style="list-style-type: none"> <li>Flood modelling to be undertaken to assess flood extents</li> <li>Bulk motorway to be designed to not worsen/change the pre-existing regional flood regime</li> <li>Disaster/emergency management plans</li> <li>Traffic control plans as required, Develop integrated work method statements for maintenance during floods</li> <li>Liaise with flood emergency response personnel/emergency services</li> </ul>	6H (4P)	Owner
RERODR206-1	Inlet screens at transverse culverts	<ul style="list-style-type: none"> <li>People being injured if washed into culvert structures</li> <li>Drowning</li> <li>Being pinned against an inlet screen</li> </ul>	7A (5P)	<ul style="list-style-type: none"> <li>Sloped inlet screens to prevent unauthorised access</li> <li>Sloped screens with horizontal bars to assist people to climb up and out to safety (as per QUDM recommendations)</li> </ul>	5H (5R)	Owner, Designer

Note: Parts of the SIDR highlighted in grey have been added after the original workshop date

Design Package: Zone 2 Transverse Drainage - Other Culverts Project Name: Ipswich Motorway Upgrade – Dinmore to Goodna

Date: 21 May 2009 / 09 July 2009 / 21 July 2009 S.I.D. Report No: SIDR#16

No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group/Sign Off	Group Risk Transferred to	Recipient Group Acceptance Initial
<b>Operation and Maintenance – Mitigation (CHAIR 3)</b>						
1	<p><u>Proximity to traffic:</u> Manhole locations designed (where practical) to be offset from roadways to allow safe access, and in accordance with the applicable design standards.</p> <p>Step irons have also been provided inside manholes as per Australian Standards (where required)</p>	<ul style="list-style-type: none"> <li>Working adjacent to live traffic and being struck by vehicle (where pits are adjacent to roadways)</li> <li>Harm to people and/or equipment</li> </ul>	6H (5U)	Design – 11/2/10	Owner	
2	<p><u>Dangerous liquid discharges:</u> Spill containment ( 40 000L) has been included in the water quality device within Zone 1 and 2</p>	<ul style="list-style-type: none"> <li>Pollution due to drainage discharges to an open drain that runs adjacent houses and public space leading to environmental harm and/or harm to people.</li> <li>Ignition of liquid leading to injury/fire</li> <li>Public safety and health</li> </ul>	4M (4R)	Design – 12/2/10	Owner	
3	<p><u>Proximity to traffic:</u> Design carried out in accordance with the applicable design standards.</p>	<ul style="list-style-type: none"> <li>Working adjacent to live traffic and being struck by vehicle (where pits are adjacent to roadways)</li> <li>Harm to people and/or equipment</li> </ul>	6H (5U)	Design – 12/2/10	Owner	

Note: Parts of the SIDR highlighted in grey have been added after the original workshop date

Design Package: Zone 2 Transverse Drainage - Other Culverts Project Name: Ipswich Motorway Upgrade – Dinmore to Goodin

Date: 21 May 2009 / 09 July 2009 / 21 July 2009 S.I.D. Report No: SIDR#16




No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Group Risk Transferred to	Recipient Group Acceptance Initial
4	<u>Pit inlets and outlets:</u> Inlet structures and outlet structures provided in locations in accordance with QUDM 12.04 and in consultation with ICC where applicable. Maintenance tracks or access points have been provided to assist in inspection where there are no spatial constraints.	<ul style="list-style-type: none"> <li>Objects/people caught in inlet/outlet structures with no means of escape</li> <li>Access to structure for maintenance (potential confined space depending upon the structure)</li> <li>Harm to people and/or equipment</li> </ul>	5H (4U)	Design – 12/2/10 [Redacted]	Owner	
5	<u>Overtopping basin spillway:</u> Design provides an outlet for a controlled discharge up to the design storm event for the basin.	<ul style="list-style-type: none"> <li>Overtopping of basin spillway causing downstream harm to environment and /or people</li> <li>Nuisance Flooding/erosion</li> </ul>	5H (4U)	Design – 12/2/10 [Redacted]	Owner	
6	<u>Basin failure:</u> Design provides an outlet for a controlled discharge from the basin up to the design storm event for the basin.  <u>Rainfall greater than design storm:</u> Design undertaken includes a desk top study of the events that may occur based on culverts becoming blocked or for events greater than a Q100.	<ul style="list-style-type: none"> <li>Overtopping of basin spillway causing downstream harm to environment and /or people</li> <li>Nuisance Flooding/erosion</li> <li>Flooding impacts due to rainfall greater than design storm</li> <li>Overtopping of basin spillway causing downstream harm to environment and /or people</li> <li>Nuisance Flooding/erosion</li> </ul>	5H (4U)	Design – 12/2/10 [Redacted]	Owner	
			4M (3U)	Design – 12/2/10 [Redacted]	Owner	



Note: Parts of the SIDR highlighted in grey have been added after the original workshop date

Design Package: Zone 2 Transverse Drainage - Other Culverts Project Name: Ipswich Motorway Upgrade – Dinmore to Goodna

Date: 21 May 2009 / 09 July 2009 / 21 July 2009 S.I.D. Report No: SIDR#16

No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Group Risk Transferred to	Recipient Group Acceptance Initial
7	<p><u>Sediment build-up:</u> Depth gauge markers have been added to basins that are designed to retain water A rock lined invert to the basins has been proposed to indicate the base of the basins and to assist with maintenance.</p>	<ul style="list-style-type: none"> <li>Improper access by personnel or plant resulting in comprising the basins functionality</li> <li>Increased difficulty for maintenance people/equipment to service the basin causing harm to people and/or equipment.</li> </ul>	3L (2U)	Design – 12/2/10 	Owner	
	<p><u>Access to basin:</u> Designated maintenance access ramps have been provided in the design and highlighted on the construction plans. All water quality basin devices have been fenced and are generally located in between high volume traffic road with access tracks. Warning signage has been provided.</p>	<ul style="list-style-type: none"> <li>Public safety due to forced access to basin</li> <li>Damage to basin during maintenance activities</li> <li>Personnel safety during maintenance activities (working over water)</li> </ul>	3L (3R)	Design – 12/2/10 	Owner	
8	<p><u>Longitudinal drainage behind walls:</u> Buried Longitudinal drainage pipes in close proximity behind walls have been avoided where possible throughout the design. Where longitudinal pipe are required behind a retaining wall, the design of the pipe has been integrated into the design of the wall (refer to individual retaining wall packages for details)</p>	<ul style="list-style-type: none"> <li>Future access to pipes behind permanent walls</li> <li>Damage to wall structural component causing harm to people or equipment</li> </ul>	4M (3U)	Design – 12/2/10 	Owner	

Note: Parts of the SIDR highlighted in grey have been added after the original workshop date

Design Package: Zone 2 Transverse Drainage - Other Culverts Project Name: Ipswich Motorway Upgrade – Dinmore to Goodna

Date: 21 May 2009 / 09 July 2009 / 21 July 2009 S.I.D. Report No: SIDR#16

No	Actions Taken by Responsible Group	Residual Risk	Achieved Risk Score	Responsible Group Sign Off	Group Risk Transferred to	Recipient Group Acceptance Initial
9	<u>Longitudinal drainage in front of walls:</u> Buried Longitudinal drainage pipes in close proximity to the front of the wall have been avoided where possible throughout the design. However where the longitudinal drainage line is located in front of the wall the retaining wall footing design has allowed for the possible future excavation.	<ul style="list-style-type: none"> <li>Retaining wall failure if trench is over-excavated in front of wall causing harm to people or equipment</li> </ul>	4M (3U)	Design – 12/2/10 [Redacted]	Owner	
10	<u>Access to stormwater outlets:</u> Access tracks have been designed to provide access to stormwater outlets where space allows, assisting in the visual inspection of stormwater outlet structures. Scour protection sized for the design flood velocities and detailed to minimise the need for maintenance	<ul style="list-style-type: none"> <li>Access via rock protection/unstable ground leading to personnel injury</li> <li>Access during flood event causing personnel injury due to water pressures/flows.</li> </ul>	4M (2P)	Design – 12/2/10 [Redacted]	Owner	
11	<u>Regional Flood Management</u> Bulk motorway designed so to not worsen/change the pre-existing regional flood regime.  <u>Drainage infrastructure designed for recognised and appropriate design storm events.</u>	<ul style="list-style-type: none"> <li>Flooding to traffic areas causing accidents and harm to people and or equipment</li> <li>Drowning</li> <li>Impacts on local business and economy</li> </ul>	7A (5P)	Design 22/2/10 [Redacted]	Owner	
RERODR206-1	<u>Inlet screens at transverse culverts:</u> Installation of inlet screens at culverts deemed to be "Class A" contact classification as per QUDM.	<ul style="list-style-type: none"> <li>People being pinned against screen</li> <li>Drowning</li> </ul>	6H (5U)	Design 25/2/10 [Redacted]	Owner	

Note: Parts of the SIDR highlighted in grey have been added after the original workshop date

Design Package: Zone 2 Transverse Drainage - Other Culverts

Project Name: Ipswich Motorway Upgrade – Dinmore to Goodna

Date: 21 May 2009 / 09 July 2009 / 21 July 2009

S.I.D. Report No: SIDR#16

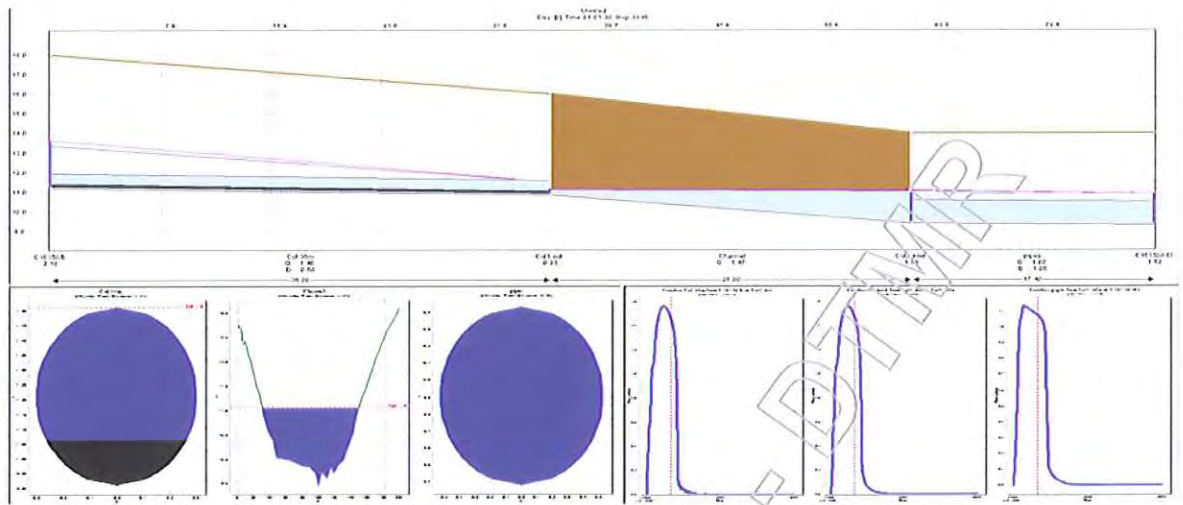
Design Lot	Design Lot Description
DGENKS103	Environmental Works Report
DGRODR100	Drainage Details
GORODR102	Longitudinal Drainage
GORODR103	Water Quality
GORODR105	Longitudinal Drainage - Church St. EB Exit Ramp
GORODR106	Transverse Drainage - Culvert 1
GORODR107	Transverse Drainage - Culverts 2 & 3
RERODR104	Goodna Creek Rehabilitation
RERODR201	Longitudinal Drainage
RERODR202	Water Quality
RERODR205	Transverse Drainage (Early works culvert)
RERODR206	Transverse Drainage (Other Zone 2 culverts)
RIRODR300	Transverse Drainage
RIRODR301	Longitudinal Drainage
RIRODR302	Water Quality
RIRODR304	Longitudinal Drainage - Southern Service Roads
DIRODR400	Transverse Drainage
DIRODR401	Longitudinal Drainage
DIRODR402	Water Quality
DGFHKS100	Regional Flood Modelling Report

## Appendix L – XP-SWMM Outputs

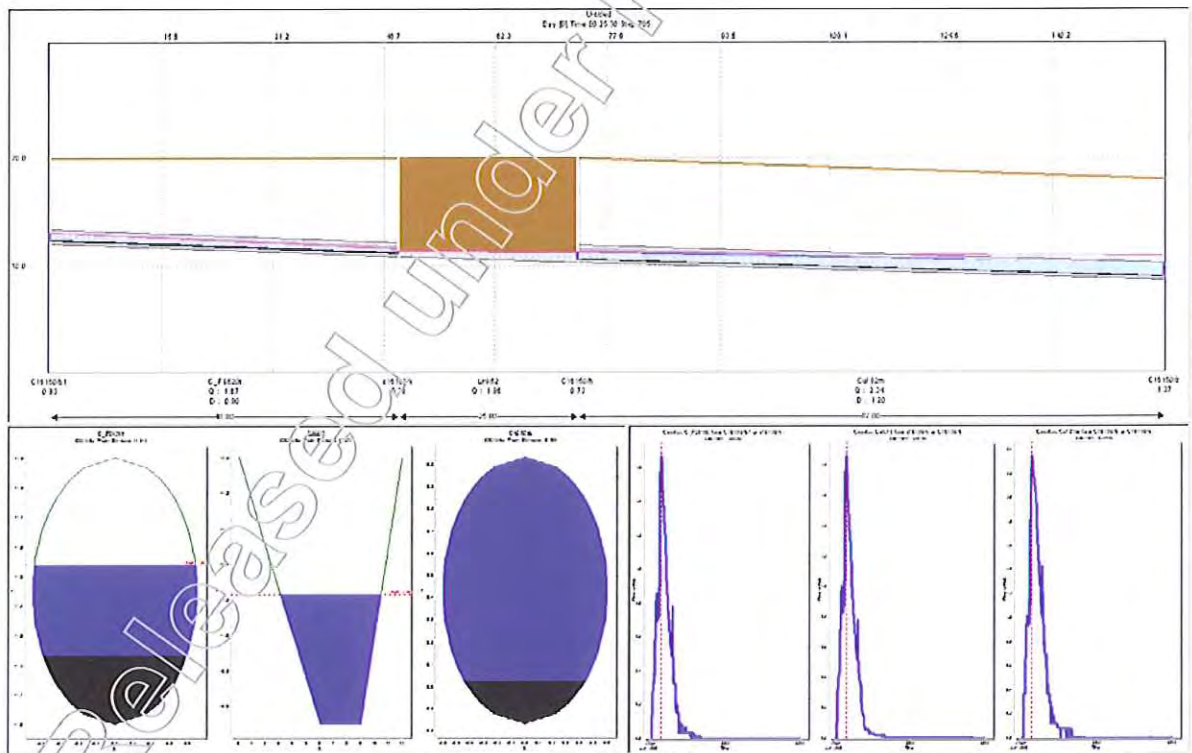
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Released under RTI - DTMR

**C-FS620\_Base**

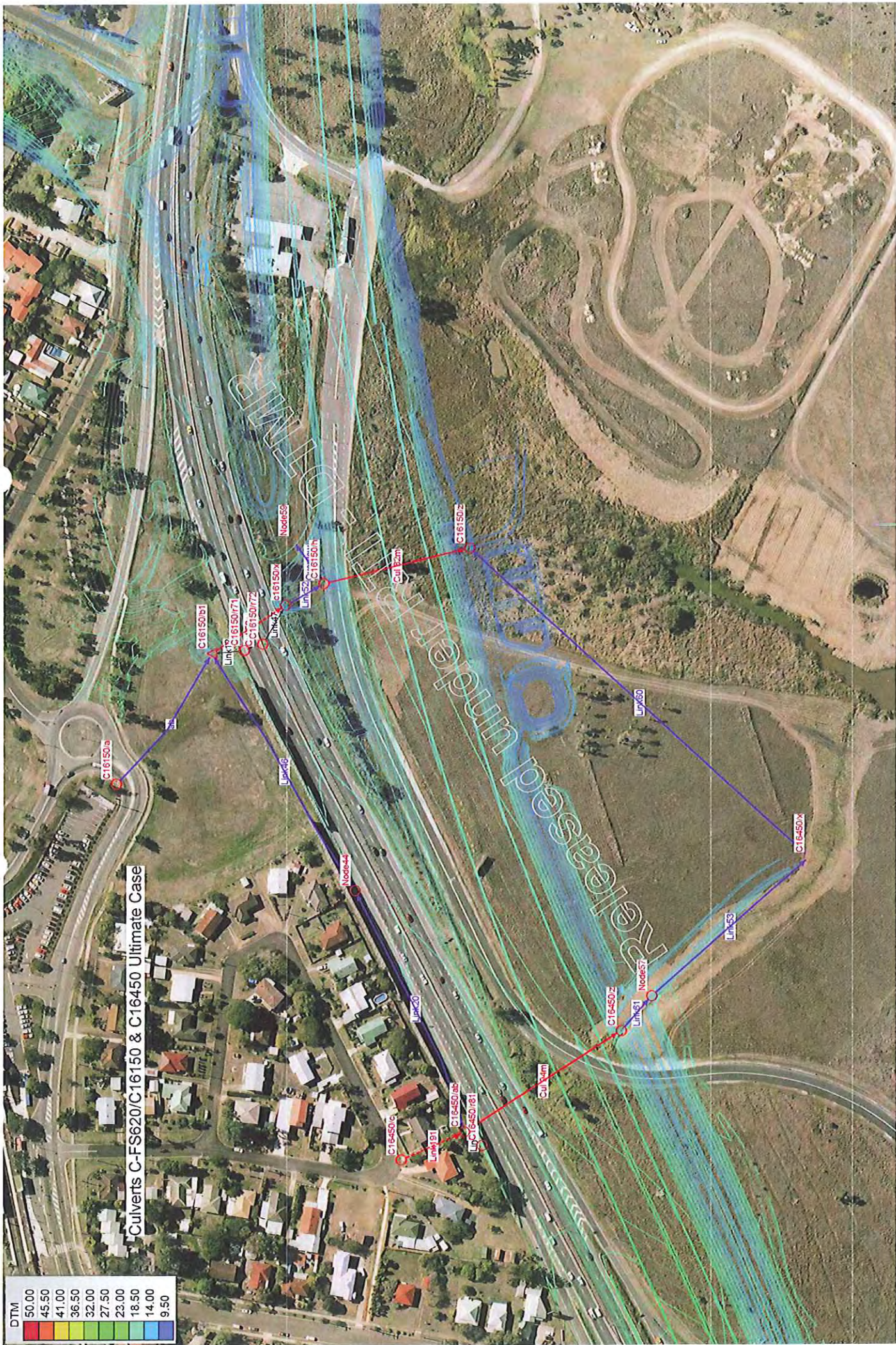


**C-FS620\_Ultimate**





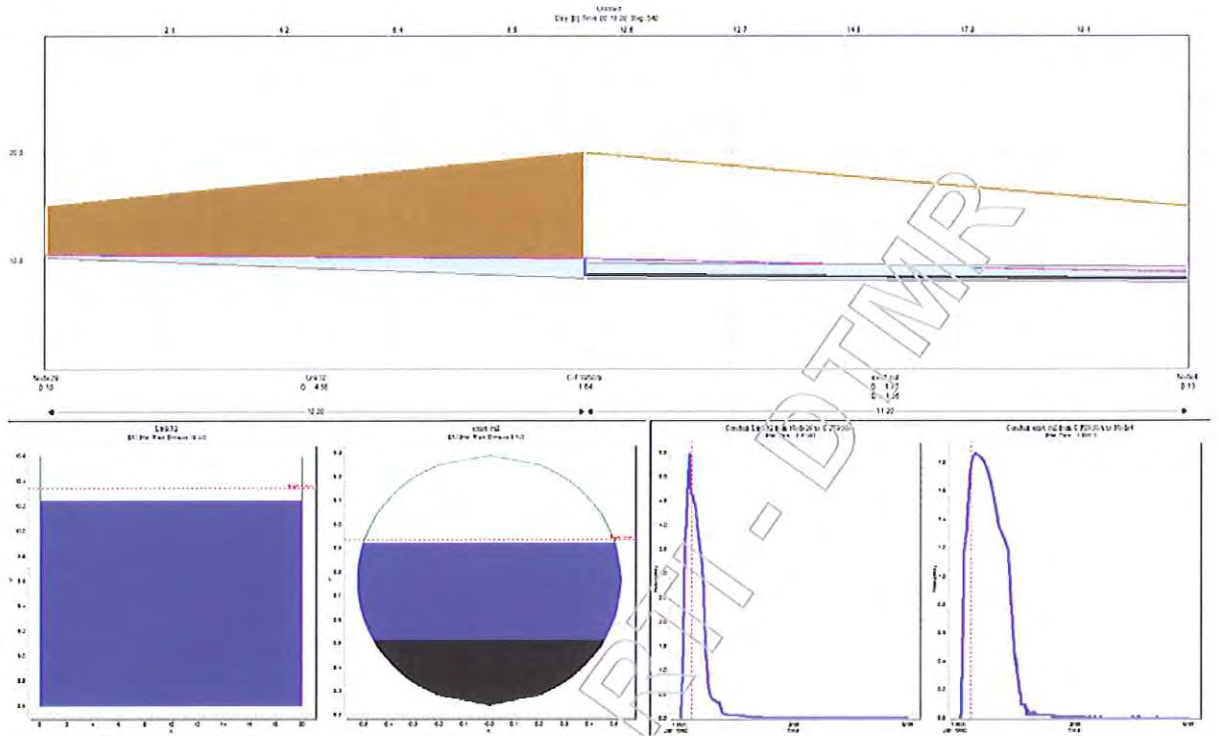
Culverts C-FS620/C16150 & C16450 Base Case



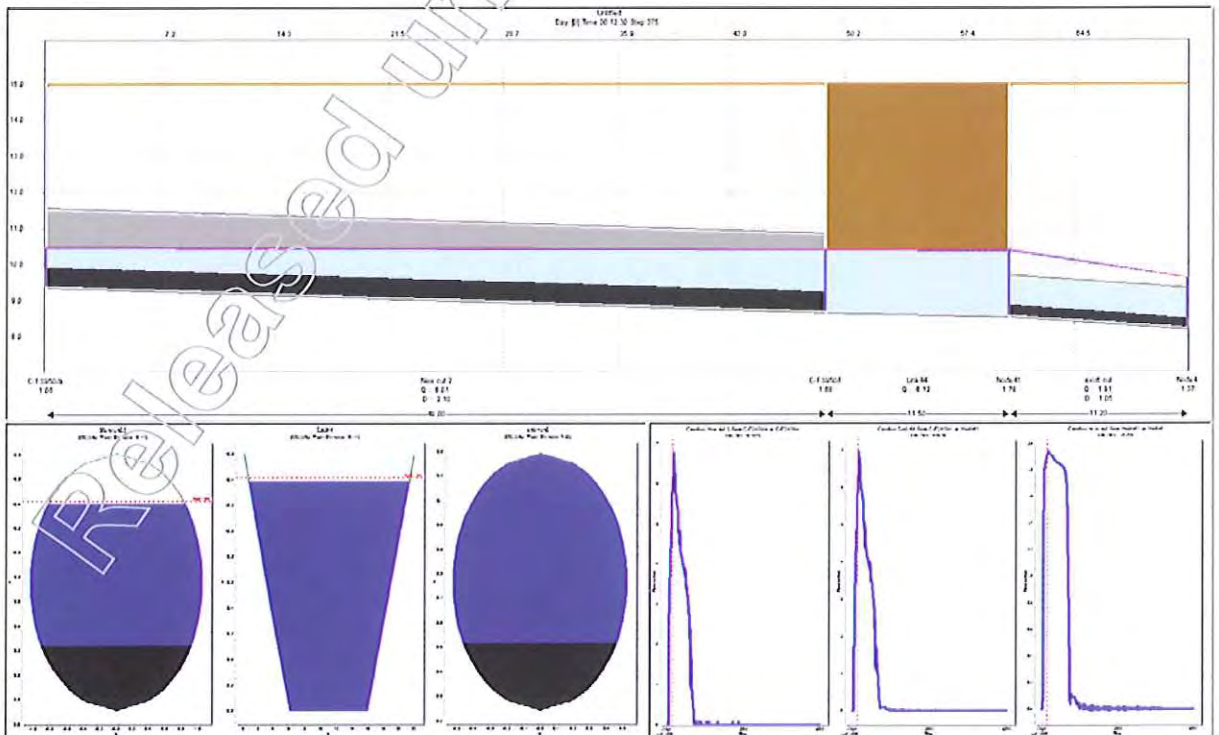
Culverts C-FS620/C16150 & C16450 Ultimate Case

DTM	Color
50.00	Red
45.50	Orange
41.00	Yellow
36.50	Light Green
32.00	Green
27.50	Dark Green
23.00	Blue-Green
18.50	Blue
14.00	Dark Blue
9.50	Very Dark Blue

### C-FS950\_Base

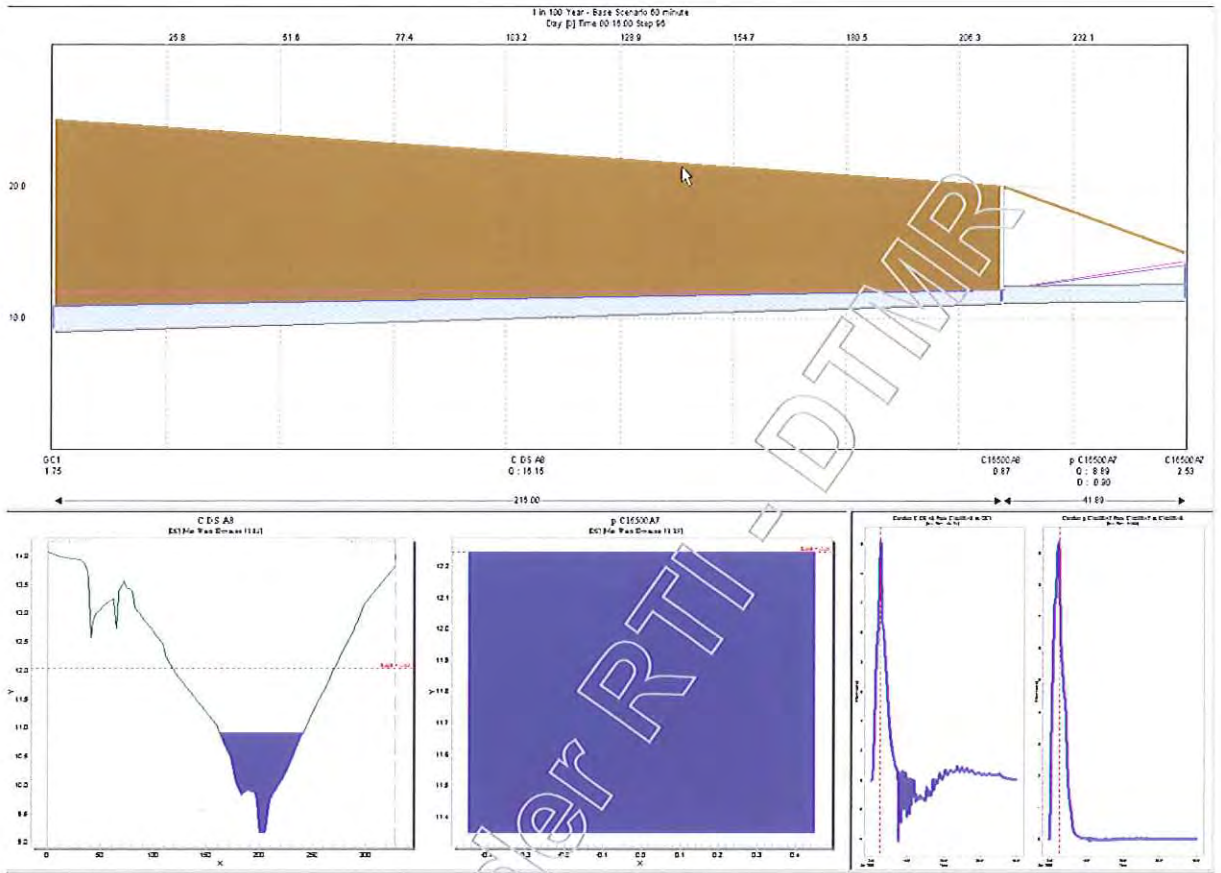


### C-FS950\_Ultimate

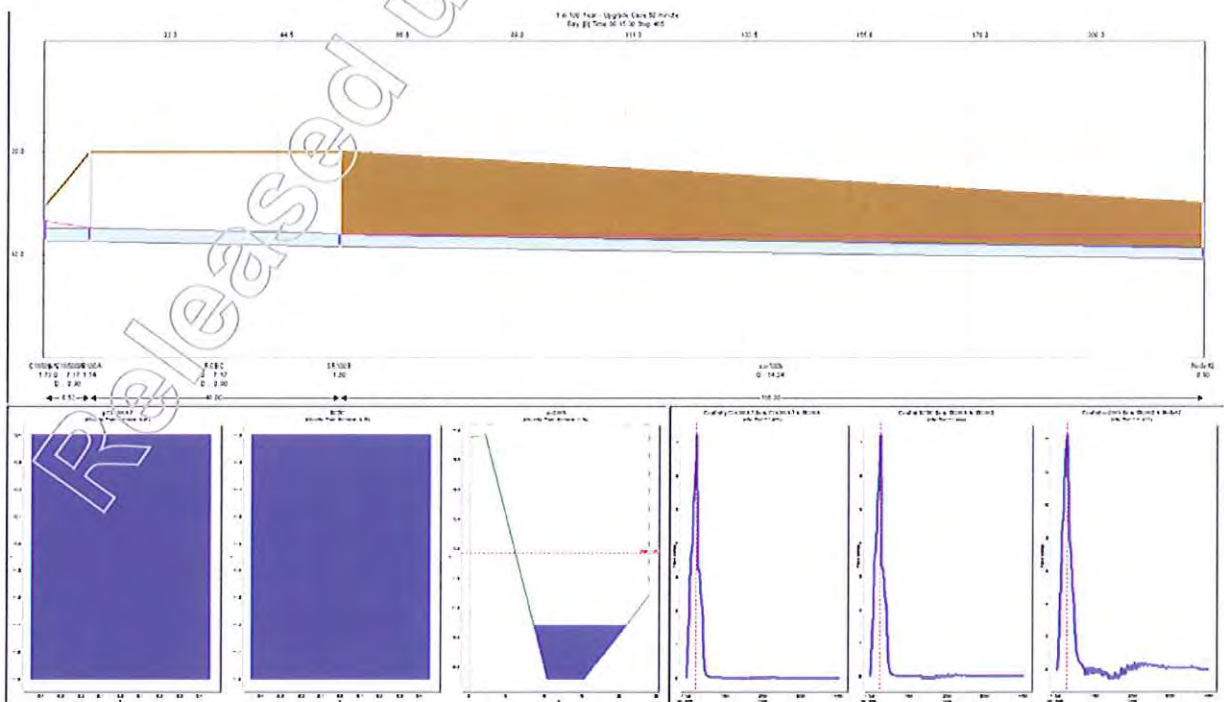




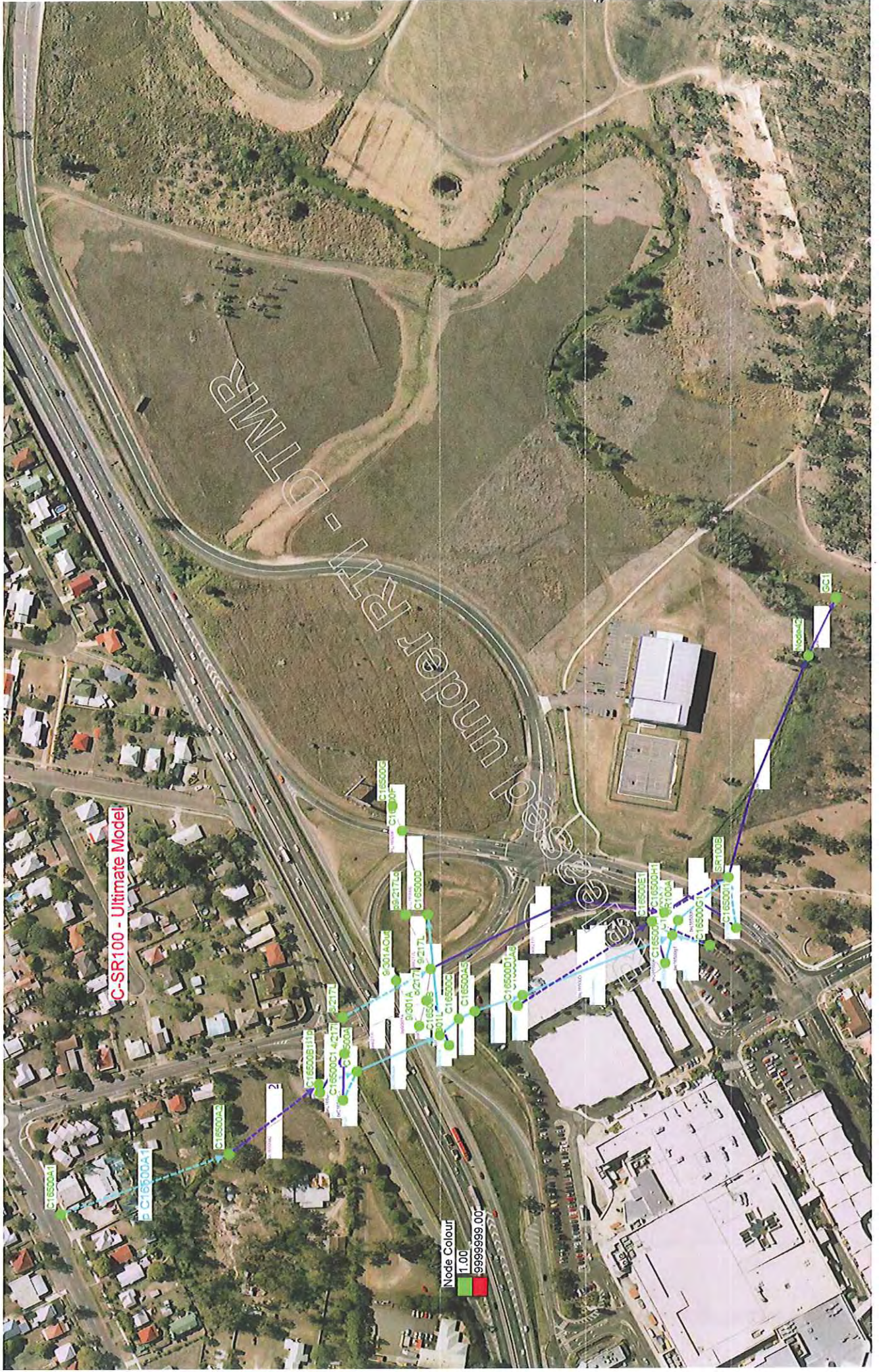
### C-SR100-Base Case



### C-SR100- Ultimate Case









Francis Street-Base Model



Design SR100A - Manhole

Checked \_\_\_\_\_

Date 27/11/09

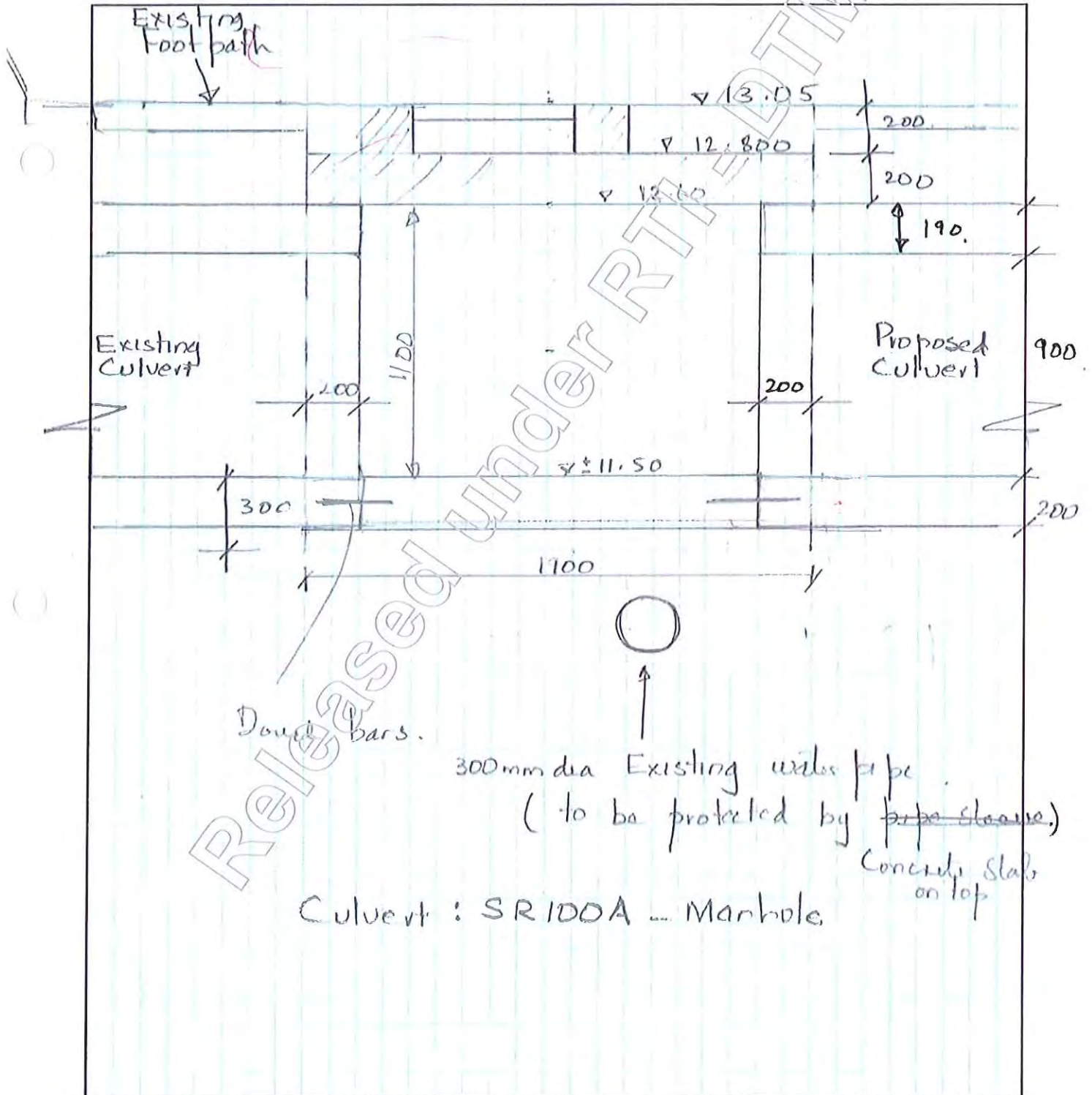
Date \_\_\_\_\_

Discipline \_\_\_\_\_

Zone 2 - Other Culverts

Page \_\_\_\_\_

Description \_\_\_\_\_

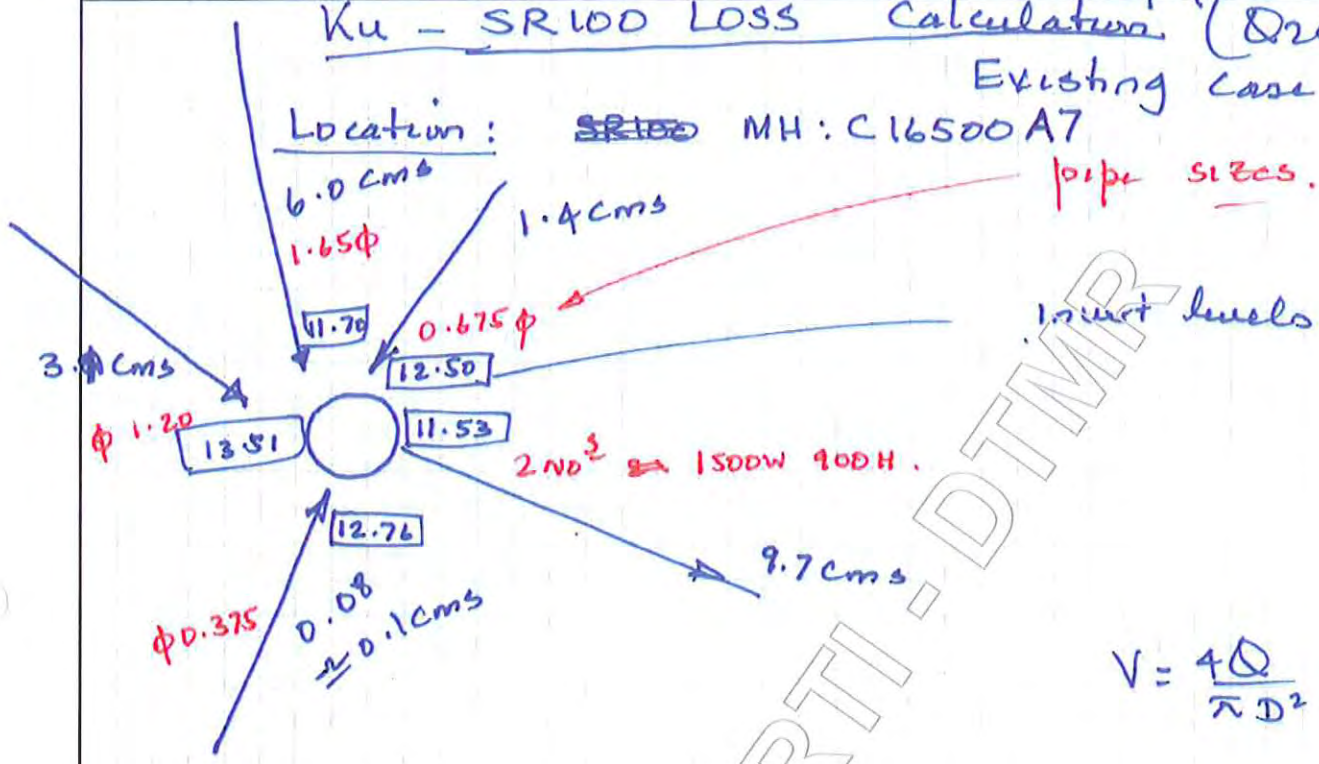


27/11/09

Ku - SR100 LOSS Calculation (Q20)

Existing Case.

Location: ~~SR100~~ MH: C16500A7



$$V = \frac{4Q}{\pi D^2}$$

Inlet

	Pipe (D) (m)	Q20 cms	V
1	0.675	1.4	Average diameter D <sub>a</sub> = 2.15 m
2	1.65	6.0	
3	1.20	3.1	
4	0.375	0.1	

Average diameter  
D<sub>a</sub> = 2.15 m

Outlet

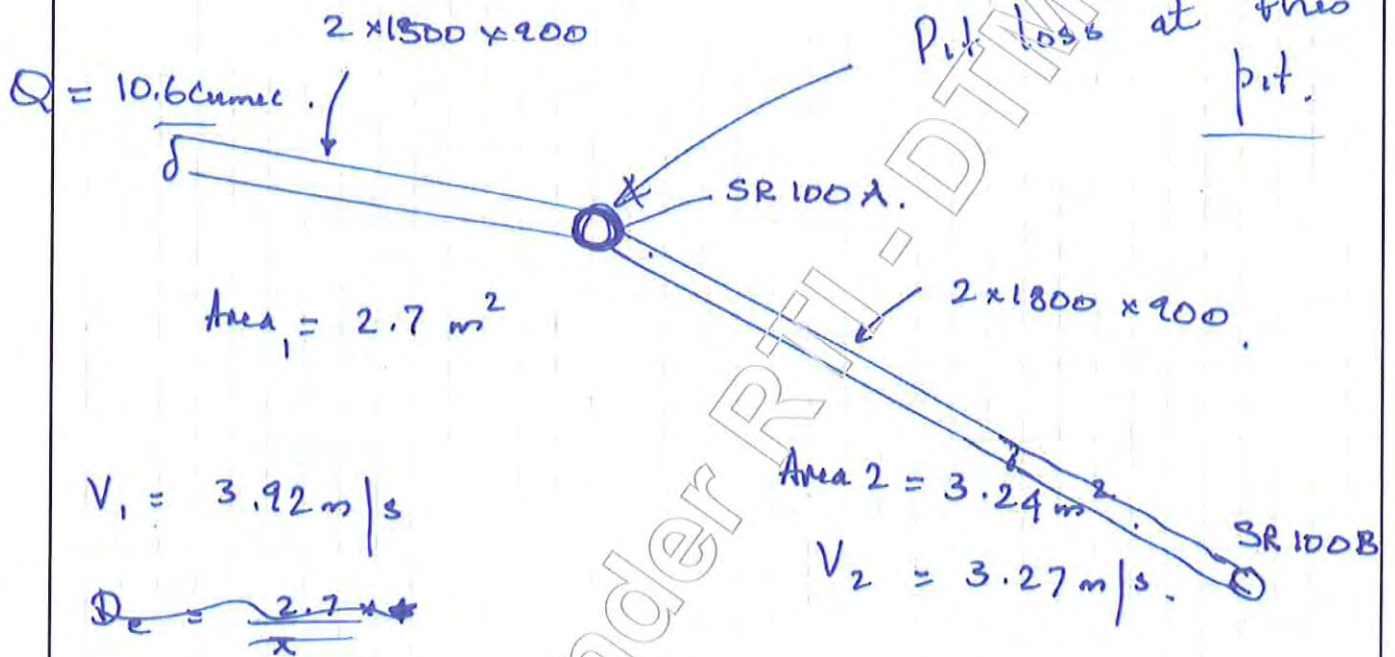
- 2 x 1500 W x 900 H

Average diameter  
D<sub>o</sub> = 3.92 m

$$\frac{D_v}{D_o} = \frac{2.15}{3.92} = \frac{2.15}{3.92} = 0.548 \approx 0.67 \text{ use } \boxed{0.7}$$

use K<sub>u</sub> = 1.5

New Pipes. : Pit Losses



$$2.7 = \frac{\pi D_u^2}{4}$$

$$D_u = 1.85 \text{ m.}$$

$$3.24 = \frac{\pi D_o^2}{4}$$

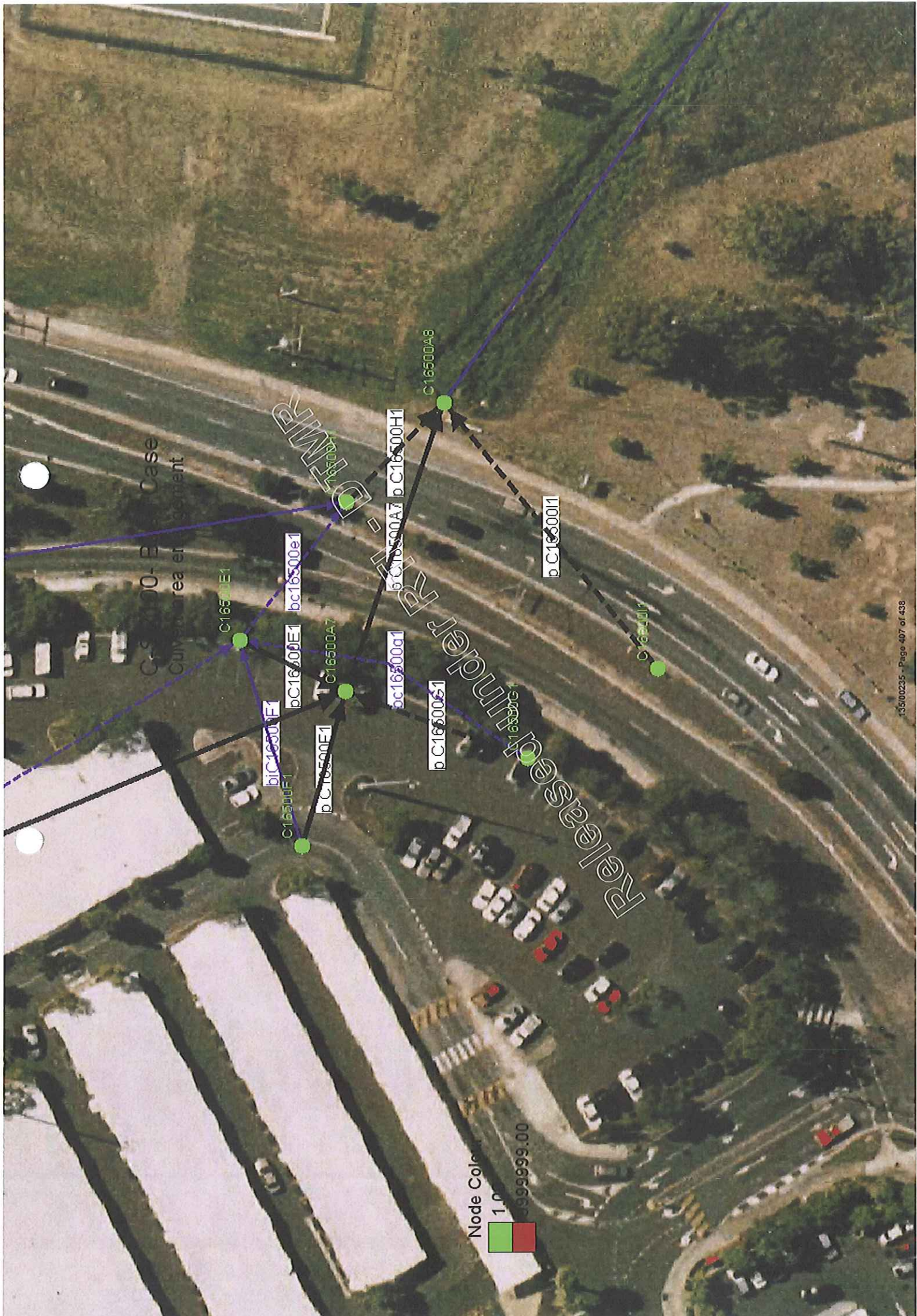
$$D_o = 2.03 \text{ m.}$$

$$\frac{D_u}{D_o} = \underline{\underline{0.9}}$$

$$\theta = 25^\circ - 30^\circ.$$

$$\boxed{\text{Loss}(K) = 0.5}$$





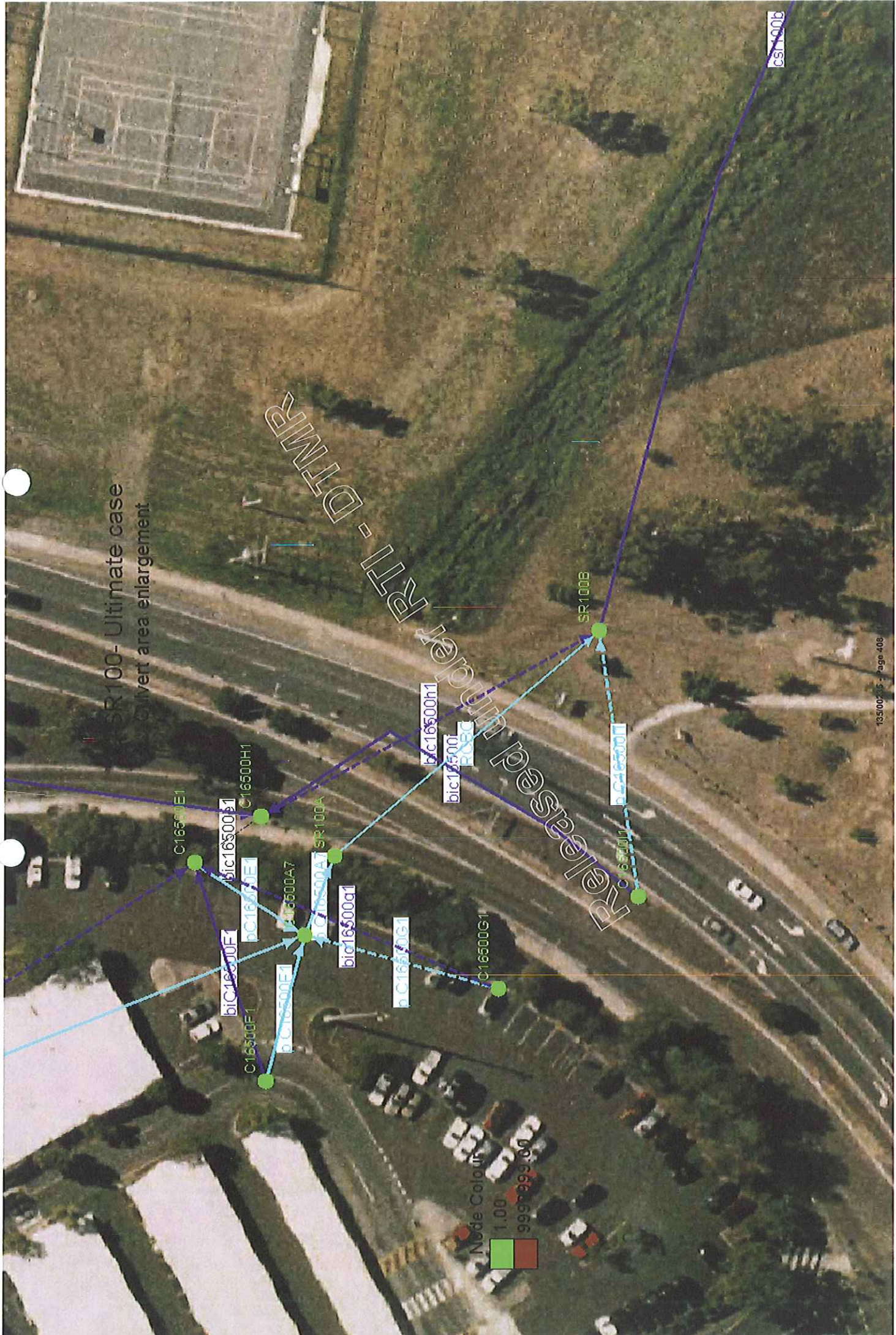
Case  
Area et

Released Under RIA - DMR

Node Color  
1.0  
9999999.00

SR100- Ultimate case  
Divert area enlargement

Released under RTI - DTMR



C-SR100 1in 20year ARI Base Scenario

SWMM Results

Links

Name	Max Vel. m/s	Max Flow cms
p C16500A1	4.17	1.14
p C16500A1	0.81	1.35
c C16500A2	0.47	2.96
P_C16500A2	3.21	1.16
p C16500B1	2.34	0.84
p C16500B1	0	0.00
biC16500A3	0.79	1.34
p C16500A3	3.54	1.01
p C16500A3	0.14	-0.43
biC16500F1	0	0.00
p C16500F1	3.06	3.10
p C16500A5	3.29	3.73
p C16500D1	5.49	2.45
bc16500d1	0.83	1.00
p C16500A6	2.95	6.02
p C16500G1	0.73	0.08
p C16500G1	0	0.00
bc16500g1	0.34	0.03
p C16500A7	3.44	9.38
p C16500I1	2.91	3.22
p C16500I1	0.73	1.81
C DS A8	0.84	16.15
pC16500E1	4.08	1.48
bc16500e1	1.12	0.29
p C16500H1	2.88	1.44
p C16500H1	0.63	1.37
p C16500C1	3.83	0.62
p C16500C1	0.84	0.85
p C16500A4	2.59	3.43
p C16500A4	2.6	3.44

Nodes

Name	Max Water Elevation (m)	Invert Elevation m
C16500A1	21.802	23.622
C16500A2	16.321	18.342
C16500B1	15.05	16.928
C16500A3	15.264	16.411
C16500F1	14.703	15.978
C16500A5	13.947	15.346
C16500D1	13.4	15.835
C16500A6	12.631	14.948
C16500G1	12.872	15.225
C16500A7	11.53	14.294
C16500I1	11.517	13.278
C16500A8	11.272	12.141
GC1	9.16	12.03
C16500E1	11.53	15.04
C16500H1	11.561	12.993
C16500C1	15.484	17.076
C16500A4	14.762	16.417

Released under RTI ? CF 5950

C-SR100 1in 20year ARI Ultimate Scenario  
SWMM Results

Links

Name	Max Velocity m	Max Flow cms
p C16500A1	4.04	1.14
p C16500A1	0.64	0.67
cc16500a2	0.48	1.94
p C16500A2	3.59	1.30
p C16500A2	0	0.00
biC16500B1	0	0.00
obi	1.47	1.94
obi	1.47	1.94
obi	1.47	1.94
biC16500C1	0	0.00
p C16500C1	2.69	0.66
p C16500B1	1.81	3.25
p C16500B1	1.81	3.25
p C16500B1	1.81	3.25
p C16500A	2.64	3.75
p7/301a	3.66	1.97
b7/301a	0.41	0.13
p9/301a	3.07	1.37
by9/301A	0	0.00
bi8/217l	0.88	0.60
p8/217l	1.82	1.58
p8/217L	2.11	0.34
p8/217L	0.66	0.75
bi9/217L	0.94	2.33
p9/217L	1.14	0.21
biC16500i	0.64	0.07
p C16500I1	2.34	5.26
p C16500A4	2.21	3.02
p C16500A5	3.12	3.02
p C16500D1	1.24	0.05
biC16500D	0	0.00
biC16500F1	0	0.00
p C16500F1	2.92	3.09
p C16500G1	1.06	0.03
p C16500G1	0	0.00
biC16500g1	0.14	1.35
pC16500E1	5.33	1.94
biC16500e1	0	0.00
p C16500A6	2.94	3.14
p C16500A7	2.7	7.32
RCBC	2.26	7.32
csr100b	1.59	14.24
Link54	1.71	-17.15
biC16500h1	3.17	2.70
biC16500h1	0	0.00
pc16500b	2.26	3.02
pc16500d	1.82	2.42
C C16500E	0.96	2.33
PC16500F	1.98	2.23
bi4/217l	2.12	0.34
bi4/217l	0.67	0.63

Nodes

Name	Max Water Elevation m	Invert Elevation m
C16500A1	21.80	23.59
C16500A2	16.32	18.32
C16500B1	16.10	16.52
C16500C1	15.64	16.25
C16500B1p	14.65	15.96
C16500A	14.50	15.79
6/301L	14.05	15.95
9/301A	14.03	15.67
9/301AOut	24.04	24.04
8/217l	13.61	15.28
8/217L	13.97	15.64
9/217L	13.24	15.20
p9/217Lo	13.03	15.29
C16500I1	11.26	13.83
C16500C	14.12	14.99
C16500A5	13.95	14.60
C16500D1	13.40	13.62
C16500F1	14.70	15.89
C16500G1	12.87	15.34
C16500E1	11.63	14.94
C16500A6	12.63	13.61
C16500A7	11.53	13.28
SR100A	11.50	12.64
SR100B	11.00	12.00
Node42	9.80	11.92
GC1	9.16	11.92
C16500H1	11.17	13.01
C16500B	13.92	15.37
C16500D	13.17	14.29
C16500F	12.90	14.28
C16500G	12.83	13.48
4/217l	14.35	15.93

**C-FS620 1in 20year ARI Base Scenario  
SWMM Results**

**Links**

Name	Max Velocity m/s	Max Flow cms
Channel1	0.70	2.38
Link39	0.58	3.25
Culvert	2.20	2.70
Ser Rd	0.00	0.00
Service Road	0.00	0.00
Link37	1.28	3.29
Link20	0.41	0.05
1200 pipe	2.67	2.40
Road1	1.34	3.33
Link18	0.79	0.19
Pipe	2.05	1.31
overland	0.25	2.29
Link35	0.44	0.04
Cul 36m	2.88	1.32
Weir	0.00	0.00
W1	0.00	0.00
Channel	0.57	1.32
pipes	1.82	1.60
ChalkST	0.00	0.00
Road	0.00	0.00
db	1.22	0.19
cb	1.17	0.65
Link11	0.94	0.34
Link9	1.05	0.43
Link12	0.64	0.07
ab	0.74	0.49
Link21	0.00	0.00
Link34	3.37	0.65
Link38	0.99	3.30

**Nodes**

Name	Invert Elevation m	Max Water Elevation m
C16450/K	14.86	15.84
C16450/x	10.00	10.17
C16450/rd2	14.65	15.84
C16450/rd3	14.32	14.89
C16450/ab	15.37	17.17
C16450/rd1	18.00	18.03
C16450/c	15.54	17.19
Node18	16.80	16.94
C16150/b	11.28	13.02
C16150/rd3	9.38	10.10
Cul1 out	10.91	11.13
Cul2 inlet	9.47	10.67
C16150/rd1	14.37	14.49
C16150/x	13.58	13.76
C16450/w	14.00	14.00
C16150/g1	13.00	13.06
C16150/g2	13.00	13.06
C16150/rd2	15.00	15.01
C16150/a	20.00	20.03
C16150/c	13.81	14.14
Node22	13.61	13.61
C16450/n	14.00	14.48

**C-FS620 1in 20year ARI Ultimate Scenario**

Name	Max Velocity m/s	Max Flow cms
Link20	0.00	0.00
Cul 94m	3.74	3.85
Link18	0.52	0.07
Pipe	2.89	1.83
overland	0.29	1.41
C FS620t	2.29	1.07
road	0.00	0.00
Link52	4.04	1.23
Link12	0.84	0.14
ab	0.97	0.50
Link47	0.90	0.17
Link46	0.00	0.00
Link61	1.40	3.90
Cul 82m	2.87	1.47
Overflow	0.00	0.00
Link60	1.26	8.33
Link53	2.06	8.34

Name	Invert Elevation m	Max Water Elevation m
C16450/ab	15.20	16.19
C16450/r81	18.00	18.02
C16450/c	15.54	17.07
C16150/b1	12.25	13.02
c16150/x	11.00	11.26
C16150/r71	15.00	15.02
C16150/a	20.00	20.03
C16150/r72	15.00	15.02
Node44	16.00	16.00
C16450/z	12.80	13.25
C16150/h	10.50	10.93
C16150/z	8.83	9.81
C16450/x	10.00	10.21
Node57	12.20	12.89
Node59	13.00	13.00

**Culverts C-FS 750 & C-FS 1250-Inlet Losses**

**Inlet Capacities (cumec)**

**Double Inlet Gully Pits**

1800mmx900mm		
depth(m)	0% blocked	50% blocked
0	0	0
0.05	0.055	0.055
0.1	0.156	0.156
0.14	0.26	0.26
0.2	0.444	0.444
0.25	0.621	0.621
0.3	0.73	0.73
0.35	0.789	0.789
0.4	0.843	0.843
0.45	0.895	0.895
0.5	0.943	0.943

**Pit head Losses**

Pipe Losses	Coefficients
Pit Loss	4
Exit Loss	1

**Pipe Losses**

Pipe Losses	Mannings n value
Concrete Pipes	0.014

**Culverts C-SR 100-Pipe Losses**

**Pipe head Losses**

Pipe Losses	Coefficients
Entrance Loss	0.7
Exit Loss	1

**Pipe Losses**

Pipe Losses	Mannings n value
RCBC Concrete bc	0.014

**SWMM Results**

**C-FS950 1in 20year ARI Base Scenario**

**Links**

Name	Max Flow cms	Max Velocity m/s
Link28	0.00	0.00
cul1	3.98	4.59
Overflow	12.60	3.01
Link10	4.16	0.68
exist cul	1.86	2.79
Mc Road	5.78	2.57
old rd	5.78	2.57
Mc Weir1	2.52	0.00
MCWeir	2.52	0.00
Link11	4.37	1.27
Cul 4	0.32	1.22
Rd Weir2	2.37	1.89
road 1	2.37	1.89
Link17	3.00	0.59
Link24	1.83	0.56
Pipe	4.53	5.16
Link27	0.81	0.93
Link29	0.64	1.22
Link23	1.36	0.51
Link21	1.01	1.03
Link30	0.92	1.65
Link32	5.51	1.13
Channel	2.51	0.77

**Nodes**

Name	Max Water Elevation m	Invert Elevation m
C-FS950/d	16.89	13.44
C-FS950/q1	13.78	12.90
C-FS950/a	10.33	8.60
Node4	8.80	8.24
Node12	8.80	7.50
C-FS950/f	16.96	17.73
C-FS950/e	17.56	17.50
C-FS950/h	20.22	18.84
C-FS950/g	21.05	17.54
C-FS1100/a	16.43	16.30
Node23	15.03	14.88
C-FS950/b	11.24	11.00
C-FS1100/b	16.16	16.00
C-FS950/q2	19.17	19.00
Node29	10.61	10.50
Node31	19.79	19.75
Node34	9.77	9.60

**C-FS750 1in 20year ARI Base Scenario**

Name	Max Flow cms	Max Velocity m/s
Link20	0.28	0.84
Link34	0.61	1.74
Link35	0.00	0

Name	Max Water Elevation m	Invert Elevation m
C-FS750/a	13.34	13
Node28	11.28	11
C-FS750/b	14.42	13.8
Node33	13.89	13.6

**C-FS1250 1in 20year ARI Base Scenario**

Name	Max Flow cms	Max Velocity m/s
Link33	0.52	1.21

Name	Max Water Elevation m	Invert Elevation m
C-FS1250/a	22.07	22

**SWMM Results**

**C-FS950 1in 20year ARI Ultimate Scenario**

**Links**

Name	Max Flow cms	Max Velocity m/s
Link28	0.00	0.00
cul1	3.98	4.73
Link10	4.09	2.48
Link11	5.88	1.43
Cul 4	0.63	2.36
Rd Weir2	1.61	1.62
road 1	1.61	1.62
Link17	2.57	3.67
Link24	1.82	0.57
Pipe	4.50	5.12
Link27	0.36	0.66
Link29	0.42	1.07
Link23	1.11	0.50
FS1100	0.30	1.56
Link30	0.85	1.60
New cul 2	5.74	2.06
Box Cul	5.49	1.77
old rd	5.49	1.77
Link44	5.98	0.43
Link21	0.68	0.88
exist cul	1.91	2.86
Mc Road	4.04	2.23
Weir	0.88	0.00
Channel2	6.38	0.61
Mc Weir	0.88	0.00
Mc Weir1	4.00	0.00
MCweir	4.00	0.00
Road.1	0.00	0.00
Road	0.00	0.00
Channel	3.97	0.94

**Nodes**

Name	Max Water Elevation m	Invert Elevation m
C-FS950/d	16.89	13.44
C-FS950/q1	13.50	12.90
Node4	8.83	8.24
Node12	8.83	7.50
C-FS950/f	16.95	17.73
C-FS950/e	17.71	17.50
C-FS950/h	20.22	18.84
C-FS950/g	21.03	17.54
C-FS1100/a	16.40	16.30
Node23	14.99	14.88
C-FS950/b	11.21	10.50
C-FS1100/b	16.75	16.25
C-FS950/q2	19.16	19.00
C-FS950/a	10.55	9.40
C-FS950/i	10.38	8.70
Node39	16.13	16.00
Node41	10.38	8.60
Node46	9.82	9.60

**C-FS750 1in 20year ARI Ultimate Scenario**

Name	Max Flow cms	Max Velocity m/s
Link33	0.34	0.274
Link35	0.84	0.884
Cul 35	1.80	0.899
Link51	0.39	0.744

Name	Max Water Elevation m	Invert Elevation m
C-FS750/rd	13.53	13.5
Node32	11.24	10.75
Node33	10.33	10
Node43	12.74	11
C-FS750/a	12.83	12.75

**C-FS1250 1in 20year ARI Ultimate Scenario**

Name	Max Flow cms	Max Velocity m/s
Link47	0.52	0.65
Link38	0.50	0.77
cul 6.1	0.52	1.51

Name	Max Water Elevation m	Invert Elevation m
C-FS1250/a	22.07	22
C-FS1250/b	20.98	20.4
C-FS1250/c	20.11	19.7
Node42	21.82	20.7



## Appendix M – Pipe Class Outputs

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Released under RTI - DTMR

DESIGN OF 750 DIA. FJ DRAINAGE PIPE

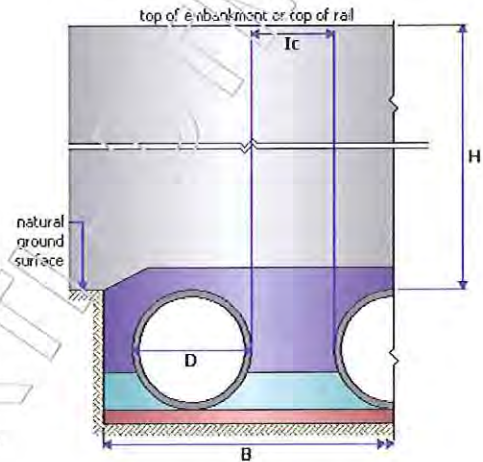
Client And Project Details

Date: 09-Feb-2009

Job number:	Design: C-FS620
Client:	Designer:
Project: New Project	Company:
Description:	File: Pipe Class C7&C8 ppr

Design Parameters

Installation Condition:	embankment
Projection Type:	positive
Pipe Nominal Diameter (mm):	750
Pipe External Diameter, D (mm):	870
Number of Panels:	2
Panel Spacing, K (m):	0.600
Soil Type:	other
Soil Density (kN/m <sup>3</sup> ):	20
Soil Parameter K:	0.1924
Width, B (m):	2.740
Height of Fill, H (m):	1.900
Projection Height, h (m):	0.000
Projection Ratio, p (h/D):	0.000
Support Type:	H2
Bedding Factor:	2.0



Long Term Load Cases/Combinations Considered (controlling load case/com bination highlighted)

Load Description*	Fill Height (m)	W q/2.0	W q/1.5	Tc	Pipe Class
earth	1.900	16.5		16.5	2
uniform surcharge load	1.900	21.8		21.8	2
W 80	1.900	16.5	4.1	20.7	2
A160	1.900	16.5	5.7	22.2	2
M 1600	1.900	16.5	7.4	23.9	2
S1600	1.900	16.5	6.1	22.7	2

All loads in kN/m. \*Includes earth load at fill height shown.

Controlling Loads: earth + M 1600 standard vehicle

Minimum Test Load:  $T_c = 16.5 + 7.4 = 23.9$  kN/m

Short Term Load Cases/Combinations Considered (adjusted to pipe class 3)

Load Description*	Allowable Fill Ranges (m)
CPAAVR-10T (Const)	0.400 - 5.364
CAT140H (Const)	0.000 - 5.441
CATD300E (Const)	0.400 - 5.288, 0.000 - 0.154
CAT621F (Const)	0.400 - 5.303
CAT815F (Const)	0.000 - 5.410

All loads in kN/m. \*Includes earth load at fill ranges shown.

Adopt 750 dia. Class 3 FJ pipe (750/3 FJ) in accordance with AS/NZS 4058:2007.

Design Notes:

- Short term live loads are considered as acting directly on the pipe (no distribution) in accordance with AS/NZS 3725:2007.
- A nominal pipe wall thickness of 54 mm has been assumed.

INSTALLATION OF 750 DIA. CLASS 3 FJ DRAINAGE PIPE

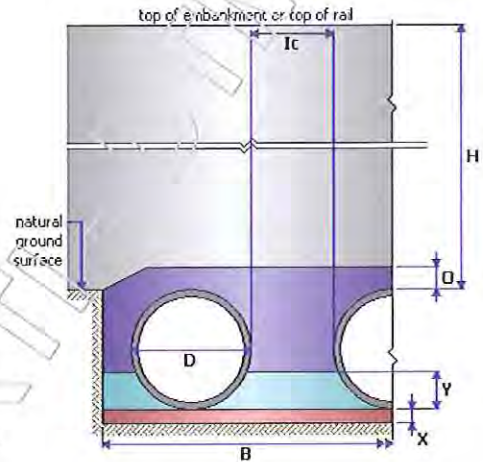
Client And Project Details

Date: 09-Feb-2009

Job number:	Design: C-FS620
Client:	Designer:
Project: New Project	Company:
Description:	File: PipeClass_C7&C8.ppr

Design Parameters

Installation Condition:	embankment
Projection Type:	positive
Pipe Nominal Diameter (mm):	750
Pipe External Diameter, D (mm):	870
Number of Panels:	2
Panel Spacing, Ic (m):	0.600
Width, B (m):	2.740
Height of Fill, H (m):	1.900
Projection Height, h (m):	0.000
Projection Ratio, p (h/D):	0.000
Support Type:	H2
Excavation Volume (solid) (m <sup>3</sup> /m):	2.7



Installation Quantities

Support Zone	Depth (mm)	Quantities (m <sup>3</sup> /m)		Minimum Zone Compaction (%)	
		Solid	Loose	Density Index (for cohesionless soils)	Relative Density (standard compaction)
Bed zone	X = 100	0.274	0.329	60	-
Haunch zone	Y = 265	0.420	0.504	60	-
Overlay zone	O = 150	0.093	0.000	as per project specification	as per project specification

Material Grading Requirements

Sieve Size (mm)	75.0	19.0	9.5	2.36	0.60	0.30	0.15	0.075
Bed & Haunch Zones (% mass passing)	-	100	-	100-50	90-20	60-10	25-0	10-0

Construction Equipment Requirements

Name	Description	Allowable Fill Ranges* (m)
CPAAVR-10T	CPAA Construction Vehicle - Smooth Drum Vibratory Roller (..	0.400 - 5.364
CAT140H	Grader CAT 140H - Total weight 17.0 tonnes	0.000 - 5.441
CATD300E	Truck, Articulated CATD300E - Total weight (loaded) 49.2 t	0.400 - 5.288, 0.000 - 0.154
CAT621F	Scraper CAT621F - Total weight (loaded) 53.8t	0.400 - 5.303
CAT815F	Compactor, Soil CAT815F - Operating weight 20.9 t	0.000 - 5.410

\*Equipment is not to be used outside of these fill ranges over top of pipe.

Design Notes:

- All bed and haunch zone material passing the 0.075 mm sieve to have low plasticity (AS 1726).
- Ordinary fill material to have no stones > 150 mm dia., and no more than 20% to be 75-150 mm.
- For additional information refer to the project specification.
- A nominal pipe wall thickness of 54 mm has been assumed.



DESIGN OF 750 DIA .CLASS 3 FJ DRAINAGE PIPE

Client And Project Details

Date: 09-Feb-2009

Job number:	Design: C-FS620
Client:	Designer:
Project: New Project	Company:
Description:	File: PipeClass_C7&C8.ppr

Long Term Load Cases/Combinations Considered (controlling bad case/com bination highlighted)

Load Description*	Fill Height (m)	W <sub>g/2.0</sub>	W <sub>g/1.5</sub>	T <sub>c</sub>	Pipe Class
earth	1.900	16.5		16.5	2
uniform surcharge bad	1.900	21.8		21.8	2
W 80	1.900	16.5	4.1	20.7	2
A160	1.900	16.5	5.7	22.2	2
M 1600	1.900	16.5	7.4	23.9	2
S1600	1.900	16.5	6.1	22.7	2

All bads in kN/m . \*Includes earth bad at fill height shown

Short Term Load Cases/Combinations Considered (adjusted to pipe class 3)

Load Description*	Allowable Fill Ranges (m)
CPAAVR-10T (Const)	0.400 - 5.364
CAT140H (Const)	0.000 - 5.441
CATD300E (Const)	0.400 - 5.288, 0.000 - 0.154
CAT621F (Const)	0.400 - 5.303
CAT815F (Const)	0.000 - 5.410

All bads in kN/m . \*Includes earth bad at fill ranges shown.

earth

Height of fill, H = 1.900 m

Em bankment Condition, positive projection

Settlement ratio, s = 1.000

Projection ratio, p = 0.000

Equal plane of settlement height, H<sub>e</sub> = 0.000

Spangler coefficient, C<sub>s</sub> = 1.000

Working bad due to earth fill, W<sub>g</sub> = 33.1 kN/m

W 80

Footprint width at top of pipe, L<sub>1</sub> = 3.256 m

Footprint length at top of pipe, L<sub>2</sub> = 2.956 m

Footprint area, A = 9.625 m<sup>2</sup>

Load on footprint = 80.0 kN

Impact factor = 1.12

Live bad pressure at top of pipe, q = 9.268 kPa

Minimum of L<sub>2</sub> and D, S = 0.870 m

Effective supporting length of pipe, L<sub>e</sub> = 4.202 m

Working bad due to live bad, W<sub>q</sub> = 6.2 kN/m

## DESIGN OF 750 DIA .CLASS 3 FJ DRAINAGE PIPE

A160

Footprint width at top of pipe,  $L1 = 5.256$  m  
Footprint length at top of pipe,  $L2 = 2.956$  m  
Footprint area,  $A = 15.537$  m<sup>2</sup>  
Load on footprint = 160.0 kN

Impact factor = 1.12  
Live load pressure at top of pipe,  $q = 11.482$  kPa

Minimum of  $L2$  and  $D$ ,  $S = 0.870$  m  
Effective supporting length of pipe,  $L_e = 6.202$  m

Working load due to live load,  $W_q = 8.5$  kN/m

S1600

Wheel footprint width at top of pipe,  $L1 = 5.256$  m  
Wheel footprint length at top of pipe,  $L2 = 5.454$  m  
Wheel footprint area,  $A = 28.666$  m<sup>2</sup>  
Load on wheel footprint = 240.0 kN

Impact factor = 1.00  
Wheel pressure at top of pipe,  $q = 8.372$  kPa

Minimum of  $L2$  and  $D$  for wheel,  $S = 0.870$  m  
Effective supporting length of pipe for wheel,  $L_e = 6.202$  m

Working load due to live load,  $W_q$  (wheel) = 6.2 kN/m

UDL footprint width at top of pipe,  $L1 = 5.956$  m  
UDL Footprint length at top of pipe,  $L2 = 1.000$  m  
UDL footprint area,  $A = 5.956$  m<sup>2</sup>  
Load on UDL footprint = 24.0 kN

Impact factor = 1.00  
UDL pressure at top of pipe,  $q = 4.030$  kPa

Minimum of  $L2$  and  $D$  for UDL,  $S = 0.870$  m  
Effective supporting length of pipe for UDL,  $L_e = 6.902$  m

Working load due to live load,  $W_q$  (UDL) = 3.0 kN/m

Total working load due to live load,  $W_q = 9.2$  kN/m

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## DESIGN OF 750 DIA .CLASS 3 FJ DRAINAGE PIPE

M 1600Wheel footprint width at top of pipe,  $L1 = 5.256$  mWheel footprint length at top of pipe,  $L2 = 5.454$  mWheel footprint area,  $A = 28.666$  m<sup>2</sup>

Load on wheel footprint = 360.0 kN

Impact factor = 1.11

Wheel pressure at top of pipe,  $q = 13.940$  kPaMinimum of  $L2$  and  $D$  for wheel,  $S = 0.870$  mEffective supporting length of pipe for wheel,  $Le = 6.202$  mWorking load due to live load,  $Wq$  (wheel) = 10.3 kN/mUDL footprint width at top of pipe,  $L1 = 5.956$  mUDL Footprint length at top of pipe,  $L2 = 1.000$  mUDL footprint area,  $A = 5.956$  m<sup>2</sup>

Load on UDL footprint = 6.0 kN

Impact factor = 1.11

UDL pressure at top of pipe,  $q = 1.118$  kPaMinimum of  $L2$  and  $D$  for UDL,  $S = 0.870$  mEffective supporting length of pipe for UDL,  $Le = 6.902$  mWorking load due to live load,  $Wq$  (UDL) = 0.8 kN/mTotal working load due to live load,  $Wq = 11.1$  kN/muniform surcharge loadWorking load due to uniform surcharge load,  $Wg = 10.4$  kN/m

Released under RTI - DTMR



DESIGN OF 900 DIA. FJ DRAINAGE PIPE

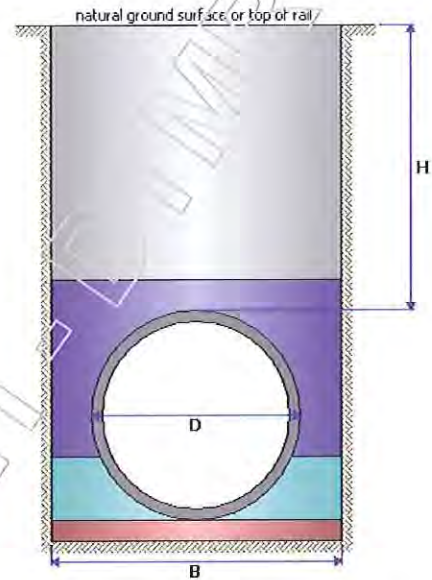
Client And Project Details

Date: 09-Feb-2009

Job number:	Design: C-FS750
Client:	Designer:
Project: New Project	Company:
Description:	File: Francis Street.ppr

Design Parameters

Installation Condition:	trench
Pipe Nominal Diameter (mm):	900
Pipe External Diameter, D (mm):	1029
Soil Type:	other
Soil Density (kN/m <sup>3</sup> ):	20
Soil Parameter K:	0.1924
Trench Width, B (m):	1.429
Height of Fill, H (m):	1.400
Support Type:	H2
Bedding Factor:	2.0



Long Term Load Cases/Combinations Considered (controlling bad case/com bination highlighted)

Load Description*	Fill Height (m)	W g/2.0	W q/1.5	Tc	Pipe Class
earth	1.400	16.7		16.7	2
uniform surcharge bad	1.400	22.8		22.8	2
W 80	1.400	16.7	8.0	24.7	2
A160	1.400	16.7	10.4	27.1	2
M 1600	1.400	16.7	11.5	28.2	2
S1600	1.400	16.7	8.7	25.4	2

All bads in kN/m . \*Includes earth bad at fill height shown.

Controlling Loads: earth + M 1600 standard vehicle

Minimum Test Load: Tc = 16.7 + 11.5 = 28.2 kN/m

Short Term Load Cases/Combinations Considered (adjusted to pipe class 3)

Load Description*	Allowable Fill Ranges (m)
CPAAVR -10T (Const)	0.000 - 50.000
CAT140H (Const)	0.000 - 50.000
CATD300E (Const)	0.000 - 50.000
CAT621F (Const)	0.400 - 50.000
CAT815F (Const)	0.000 - 50.000

All bads in kN/m . \*Includes earth bad at fill ranges shown.

Adopt 900 dia. Class 3 FJ pipe (900/3 FJ) in accordance with AS/NZS 4058:2007.

Design Notes:

1. Short term live loads are considered as acting directly on the pipe (no distribution) in accordance with AS/NZS 3725:2007.
2. A nominal pipe wall thickness of 57 mm has been assumed.

INSTALLATION OF 900 DIA. CLASS 3 FJ DRAINAGE PIPE

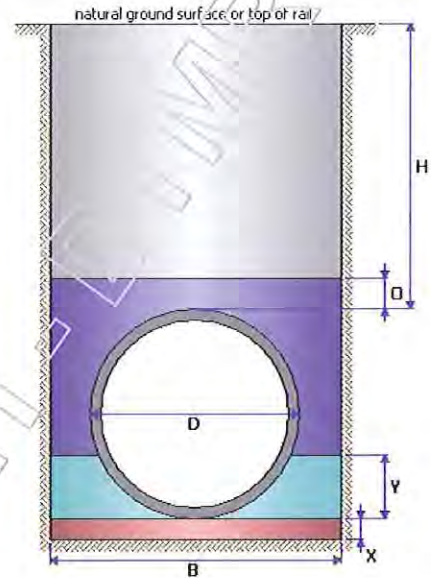
Client And Project Details

Date: 09-Feb-2009

Job number:	Design: C-FS750
Client:	Designer:
Project: New Project	Company:
Description:	File: Francis Street ppr

Design Parameters

Installation Condition:	trench
Pipe Nominal Diameter (mm):	900
Pipe External Diameter (mm):	1029
Trench Width, B (m):	1.429
Height of Fill, H (m):	1.400
Support Type:	H2
Excavation Volume (solid) (m <sup>3</sup> /m):	3.7



Installation Quantities

Support Zone	Depth (m)	Quantities (m <sup>3</sup> /m)		Minimum Zone Compaction (%)	
		Solid	Loose	Density Index (for cohesionless soils)	Relative Density (standard compaction)
Bed zone	X = 100	0.143	0.172	60	-
Haunch zone	Y = 310	0.232	0.279	60	-
Overlay zone	O = 150	0.622	0.000	as per project specification	as per project specification
Backfill	1250	1.787	0.000	as per project specification	as per project specification

Material Grading Requirements

Sieve Size (mm)	75.0	19.0	9.5	2.36	0.60	0.30	0.15	0.075
Bed & Haunch Zones (% mass passing)	-	100	-	100-50	90-20	60-10	25-0	10-0

Construction Equipment Requirements

Name	Description	Allowable Fill Ranges* (m)
CPAAVR-10T	CPAA Construction Vehicle - Smooth Drum Vibratory Roller (..	0.000 - 50.000
CAT140H	Grader CAT 140H - Total weight 17.0 tonnes	0.000 - 50.000
CATD300E	Truck, Articulated CATD300E - Total weight (loaded) 49.2 t	0.000 - 50.000
CAT621F	Scraper CAT621F - Total weight (loaded) 53.8 t	0.400 - 50.000
CAT815F	Compactor, Soil CAT815F - Operating weight 20.9 t	0.000 - 50.000

\*Equipment is not to be used outside of these fill ranges over top of pipe.

Design Notes:

1. All bed and haunch zone material passing the 0.075 mm sieve to have low plasticity (AS 1726).
2. Ordinary fill material to have no stones > 150 mm dia., and no more than 20% to be 75-150 mm.
3. For additional information refer to the project specification.
4. The trench width shown above is not to be exceeded.
5. A nominal pipe wall thickness of 57 mm has been assumed.



DESIGN OF 900 DIA .CLASS 3 FJ DRAINAGE PIPE

Client And Project Details

Date: 09-Feb-2009

Job number:	Design: C-FS750
Client:	Designer:
Project: New Project	Company:
Description:	File: Francis Street.ppr

Long Term Load Cases/Combinations Considered (controlling bad case/com bination highlighted)

Load Description*	Fill Height (m)	W g/2.0	W g/1.5	Tc	Pipe Class
earth	1.400	16.7		16.7	2
uniform surcharge bad	1.400	22.8		22.8	2
W 80	1.400	16.7	8.0	24.7	2
A160	1.400	16.7	10.4	27.1	2
M1600	1.400	16.7	11.5	28.2	2
S1600	1.400	16.7	8.7	25.4	2

All bads in kN/m . \*Includes earth bad at fill height shown

Short Term Load Cases/Combinations Considered (adjusted to pipe class 3)

Load Description*	Allowable Fill Ranges (m)
CPAAVR-10T (Const)	0.000 - 50.000
CAT140H (Const)	0.000 - 50.000
CATD300E (Const)	0.000 - 50.000
CAT621F (Const)	0.400 - 50.000
CAT815F (Const)	0.000 - 50.000

All bads in kN/m . \*Includes earth bad at fill ranges shown.

earth

Height of fill, H = 1.400 m

Trench Condition, vertical walls

Spangler coefficient, Ct = 0.816

Working bad due to earth fill, W g = 33.3 kN/m

Positive Projection Check

Settlement ratio, rs = 1.000

Projection ratio, p = 0.389

Plane of equal settlement height, He = 1.400

Modified Spangler coefficient, Ce = 1.314

Working bad due to earth fill, W g = 37.9 kN/m

Trench controls, adopt W g = 33.3 kN/m

W 80

Footprint width at top of pipe, L1 = 2.530 m

Footprint length at top of pipe, L2 = 2.230 m

Footprint area, A = 5.642 m<sup>2</sup>

Load on footprint = 80.0 kN

Impact factor = 1.19

Live bad pressure at top of pipe, q = 16.874 kPa

Minimum of L2 and D, S = 1.029 m

Effective supporting length of pipe, Le = 3.649 m

Working bad due to live bad, W q = 12.0 kN/m



DESIGN OF 900 DIA. CLASS 3 FJ DRAINAGE PIPE

A160

Footprint width at top of pipe, L1 = 4.530 m  
Footprint length at top of pipe, L2 = 2.230 m  
Footprint area, A = 10.102 m<sup>2</sup>  
Load on footprint = 160.0 kN

Impact factor = 1.19  
Live load pressure at top of pipe, q = 18.848 kPa

Minimum of L2 and D, S = 1.029 m  
Effective supporting length of pipe, Le = 5.649 m

Working load due to live load, Wq = 15.6 kN/m

S1600

Wheel footprint width at top of pipe, L1 = 4.730 m  
Wheel footprint length at top of pipe, L2 = 4.530 m  
Wheel footprint area, A = 21.427 m<sup>2</sup>  
Load on wheel footprint = 240.0 kN

Impact factor = 1.00  
Wheel pressure at top of pipe, q = 11.201 kPa

Minimum of L2 and D for wheel, S = 1.029 m  
Effective supporting length of pipe for wheel, Le = 5.849 m

Working load due to live load, Wq (wheel) = 9.3 kN/m

UDL footprint width at top of pipe, L1 = 5.230 m  
UDL Footprint length at top of pipe, L2 = 1.000 m  
UDL footprint area, A = 5.230 m<sup>2</sup>  
Load on UDL footprint = 24.0 kN

Impact factor = 1.00  
UDL pressure at top of pipe, q = 4.589 kPa

Minimum of L2 and D for UDL, S = 1.000 m  
Effective supporting length of pipe for UDL, Le = 6.349 m

Working load due to live load, Wq (UDL) = 3.8 kN/m

Total working load due to live load, Wq = 13.1 kN/m

Released under RTI - DTMR



DESIGN OF 900 DIA .CLASS 3 FJ DRAINAGE PIPE

M 1600

Wheel footprint width at top of pipe, L1 = 4.730 m

Wheel footprint length at top of pipe, L2 = 4.530 m

Wheel footprint area, A = 21.427 m<sup>2</sup>

Load on wheel footprint = 360.0 kN

Impact factor = 1.16

Wheel pressure at top of pipe, q = 19.490 kPa

Minimum of L2 and D for wheel, S = 1.029 m

Effective supporting length of pipe for wheel, Le = 5.849 m

Working load due to live load, Wq (wheel) = 16.2 kN/m

UDL footprint width at top of pipe, L1 = 5.230 m

UDL Footprint length at top of pipe, L2 = 1.000 m

UDL footprint area, A = 5.230 m<sup>2</sup>

Load on UDL footprint = 6.0 kN

Impact factor = 1.16

UDL pressure at top of pipe, q = 1.331 kPa

Minimum of L2 and D for UDL, S = 1.000 m

Effective supporting length of pipe for UDL, Le = 6.349 m

Working load due to live load, Wq (UDL) = 1.1 kN/m

Total working load due to live load, Wq = 17.3 kN/m

uniform surcharge load

Working load due to uniform surcharge load, Wg = 12.3 kN/m

Released under RTI - DTMR

DESIGN OF 2100 DIA. FJ DRAINAGE PIPE

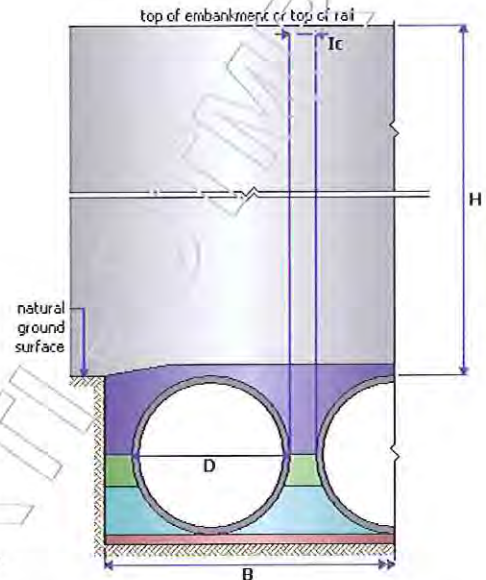
Client And Project Details

Date: 09-Feb-2009

Job number:	Design: C-FS950
Client:	Designer:
Project: New Project	Company:
Description:	File: Francis Street.ppr

Design Parameters

Installation Condition:	embankment
Projection Type:	positive
Pipe Nominal Diameter (mm):	2100
Pipe External Diameter, D (mm):	2388
Number of Panels:	3
Panel Spacing, E (m):	0.398
Soil Type:	other
Soil Density (kN/m <sup>3</sup> ):	20
Soil Parameter K:	0.1924
Width, B (m):	8.756
Height of Fill, H (m):	7.800
Projection Height, h (m):	0.000
Projection Ratio, p (h/D):	0.000
Support Type:	HS3
Bedding Factor:	4.0



Long Term Load Cases/Combinations Considered (controlling load case/com bination highlighted)

Load Description*	Fill Height (m)	W <sub>g/4.0</sub>	W <sub>q/1.5</sub>	W <sub>w/4.0</sub>	T <sub>c</sub>	Pipe Class
earth + weight of internal water	7.800	93.1		7.0	100.2	3
uniform surcharge load	7.800	102.7		7.0	109.7	4
W80	7.800	93.1	0.9	7.0	101.0	3
A160	7.800	93.1	1.5	7.0	101.6	3
M1600	7.800	93.1	4.5	7.0	104.6	3
S1600	7.800	93.1	3.5	7.0	103.6	3

All loads in kN/m. \*Includes earth load at fill height shown.

Controlling Loads: uniform surcharge load + weight of internal water

Minimum Test Load:  $T_c = 102.7 + 7.0 = 109.7$  kN/m

Short Term Load Cases/Combinations Considered

Load Description*	Allowable Fill Ranges (m)
CPAAVR-10T (Const)	0.000 - 11.653
CAT140H (Const)	0.000 - 11.676
CATD300E (Const)	0.000 - 11.586
CAT621F (Const)	0.000 - 11.586
CAT815F (Const)	0.000 - 11.659

All loads in kN/m. \*Includes earth load at fill ranges shown.

Adopt 2100 dia. Class 4 FJ pipe (2100/4 FJ) in accordance with AS/NZS 4058:2007.

Design Notes:

- Short term live loads are considered as acting directly on the pipe (no distribution) in accordance with AS/NZS 3725:2007.
- A nominal pipe wall thickness of 102 mm has been assumed.



INSTALLATION OF 2100 DIA. CLASS 4 FJ DRAINAGE PIPE

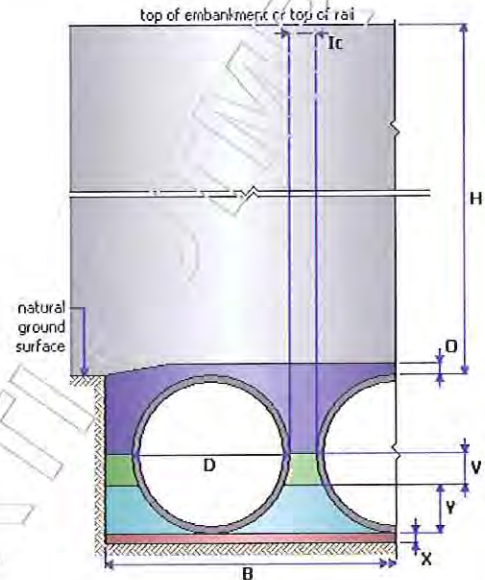
Client And Project Details

Date: 09-Feb-2009

Job number:	Design: C-FS950
Client:	Designer:
Project: New Project	Company:
Description:	File: Francis Street.ppr

Design Parameters

Installation Condition:	embankment
Projection Type:	positive
Pipe Nominal Diameter (mm):	2100
Pipe External Diameter, D (mm):	2388
Number of Panels:	3
Panel Spacing, E (m):	0.398
Width, B (m):	8.756
Height of Fill, H (m):	7.800
Projection Height, h (m):	0.000
Projection Ratio, p (h/D):	0.000
Support Type:	HS3
Excavation Volume (solid) (m <sup>3</sup> /m):	22.3



Installation Quantities

Support Zone	Depth (mm)	Quantities (m <sup>3</sup> /m)		Minimum Zone Compaction (%)	
		Solid	Loose	Density Index (for cohesionless soils)	Relative Density (standard compaction)
Bed zone	X = 150	1.314	1.577	70	-
Haunch zone	Y = 720	2.891	3.469	70	-
Side zone	V = 475	0.848	1.018	70	95
Overlay zone	O = 150	4.651	0.000	as per project specification	as per project specification

Material Grading Requirements

Sieve Size (mm)	75.0	19.0	9.5	2.36	0.60	0.30	0.15	0.075
Bed & Haunch Zones (% mass passing)	-	100	-	100-50	90-20	60-10	25-0	10-0
Side Zone (% mass passing)	100	-	100-50	100-30	50-15	-	-	20-0

Construction Equipment Requirements

Name	Description	Allowable Fill Ranges* (m)
CPAAVR-10T	CPAA Construction Vehicle - Smooth Drum Vibratory Roller (..	0.000 - 11.653
CAT140H	Grader CAT 140H - Total weight 17.0 tonnes	0.000 - 11.676
CATD300E	Truck, Articulated CATD300E - Total weight (baded) 49.2 t	0.000 - 11.586
CAT621F	Scraper CAT621F - Total weight (baded) 53.8t	0.000 - 11.586
CAT815F	Compacter, Soil CAT815F - Operating weight 20.9 t	0.000 - 11.659

\*Equipment is not to be used outside of these fill ranges over top of pipe.

Design Notes:

1. All bed, haunch and side zone material passing the 0.075 mm sieve to have low plasticity (AS 1726).
2. Ordinary fill material to have no stones > 150 mm dia., and no more than 20% to be 75-150 mm.
3. For additional information refer to the project specification.
4. A nominal pipe wall thickness of 102 mm has been assumed.

DESIGN OF 2100 DIA .CLASS 4 FJ DRAINAGE PIPE

Client And Project Details

Date: 09-Feb-2009

Job number:	Design: C-FS950
Client:	Designer:
Project: New Project	Company:
Description:	File: Francis Street.ppr

Long Term Load Cases/Combinations Considered (controlling load case/com bination highlighted)

Load Description*	Fill Height (m)	W <sub>g/4.0</sub>	W <sub>q/1.5</sub>	W <sub>w/1.0</sub>	Tc	Pipe Class
earth + weight of internal water	7.800	93.1		7.0	100.2	3
uniform surcharge load	7.800	102.7		7.3	109.7	4
W 80	7.800	93.1	0.9	7.0	101.0	3
A160	7.800	93.1	1.5	7.0	101.6	3
M1600	7.800	93.1	4.5	7.0	104.6	3
S1600	7.800	93.1	3.5	7.0	103.6	3

All loads in kN/m. \*Includes earth load at fill height shown.

Short Term Load Cases/Combinations Considered

Load Description*	Allowable Fill Ranges (m)
CPAAVR-10T (Const)	0.000 - 11.653
CAT140H (Const)	0.000 - 11.676
CATD300E (Const)	0.000 - 11.586
CAT621F (Const)	0.000 - 11.586
CAT815F (Const)	0.000 - 11.659

All loads in kN/m. \*Includes earth load at fill ranges shown.

weight of internal water

Working load due to water load,  $W_w = 28.1 \text{ kN/m}$

earth

Height of fill,  $H = 7.800 \text{ m}$

Embedment condition, positive projection

Settlement ratio,  $s = 1.000$

Projection ratio,  $p = 0.000$

Equal plane of settlement height,  $H_e = 0.000$

Spangler coefficient,  $C_e = 1.000$

Working load due to earth fill,  $W_g = 372.5 \text{ kN/m}$

W 80

Footprint width at top of pipe,  $L_1 = 11.810 \text{ m}$

Footprint length at top of pipe,  $L_2 = 11.510 \text{ m}$

Footprint area,  $A = 135.933 \text{ m}^2$

Load on footprint =  $80.0 \text{ kN}$

In fact factor = 1.10

Live load pressure at top of pipe,  $q = 0.647 \text{ kPa}$

Minimum of  $L_2$  and  $D$ ,  $S = 2.388 \text{ m}$

Effective supporting length of pipe,  $L_e = 14.407 \text{ m}$

Working load due to live load,  $W_q = 1.3 \text{ kN/m}$



DESIGN OF 2100 DIA .CLASS 4 FJ DRAINAGE PIPE

A160

Footprint width at top of pipe, L1 = 13.810 m  
Footprint length at top of pipe, L2 = 11.510 m  
Footprint area, A = 158.953 m<sup>2</sup>  
Load on footprint = 160.0 kN

Impact factor = 1.10  
Live load pressure at top of pipe, q = 1.107 kPa

Minimum of L2 and D, S = 2.388 m  
Effective supporting length of pipe, Le = 16.407 m

Working load due to live load, Wq = 2.2 kN/m

S1600

Wheel footprint width at top of pipe, L1 = 13.810 m  
Wheel footprint length at top of pipe, L2 = 36.510 m  
Wheel footprint area, A = 504.203 m<sup>2</sup>  
Load on wheel footprint = 960.0 kN

Impact factor = 1.00  
Wheel pressure at top of pipe, q = 1.904 kPa

Minimum of L2 and D for wheel, S = 2.388 m  
Effective supporting length of pipe for wheel, Le = 16.407 m

Working load due to live load, Wq (wheel) = 3.8 kN/m

UDL footprint width at top of pipe, L1 = 14.510 m  
UDL Footprint length at top of pipe, L2 = 1.000 m  
UDL footprint area, A = 14.510 m<sup>2</sup>  
Load on UDL footprint = 24.0 kN

Impact factor = 1.00  
UDL pressure at top of pipe, q = 1.654 kPa

Minimum of L2 and D for UDL, S = 1.000 m  
Effective supporting length of pipe for UDL, Le = 17.107 m

Working load due to live load, Wq (UDL) = 1.4 kN/m

Total working load due to live load, Wq = 5.2 kN/m

Released under RTI - DTMR



DESIGN OF 2100 DIA .CLASS 4 FJ DRAINAGE PIPE

M 1600

Wheel footprint width at top of pipe, L1 = 13.810 m  
Wheel footprint length at top of pipe, L2 = 36.510 m  
Wheel footprint area, A = 504.203 m<sup>2</sup>  
Load on wheel footprint = 1440.0 kN

Impact factor = 1.10  
Wheel pressure at top of pipe, q = 3.142 kPa

Minimum of L2 and D for wheel, S = 2.388 m  
Effective supporting length of pipe for wheel, Le = 16.407 m

Working load due to live load, Wq (wheel) = 6.3 kN/m

UDL footprint width at top of pipe, L1 = 14.510 m  
UDL Footprint length at top of pipe, L2 = 1.000 m  
UDL footprint area, A = 14.510 m<sup>2</sup>  
Load on UDL footprint = 6.0 kN

Impact factor = 1.10  
UDL pressure at top of pipe, q = 0.455 kPa

Minimum of L2 and D for UDL, S = 1.000 m  
Effective supporting length of pipe for UDL, Le = 17.107 m

Working load due to live load, Wq (UDL) = 0.4 kN/m

Total working load due to live load, Wq = 6.7 kN/m

uniform surcharge load

Working load due to uniform surcharge load, Wg = 39.2 kN/m

Released under RTI - DTMR



DESIGN OF 750 DIA. FJ DRAINAGE PIPE

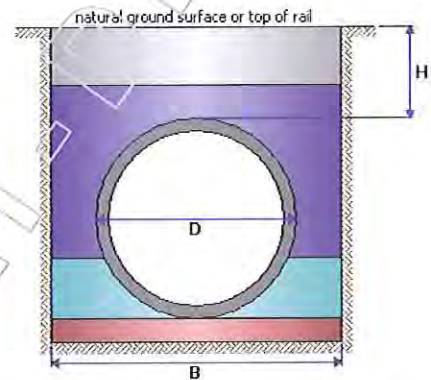
Client And Project Details

Date: 09-Feb-2009

Job number:	Design: C-FS1250
Client:	Designer:
Project: New Project	Company:
Description:	File: Francis Street.ppr

Design Parameters

Installation Condition:	trench
Pipe Nominal Diameter (mm):	750
Pipe External Diameter, D (mm):	870
Soil Type:	other
Soil Density (kN/m <sup>3</sup> ):	20
Soil Parameter K:	0.1924
Trench Width, B (m):	1.270
Height of Fill, H (m):	0.400
Support Type:	H2
Bedding Factor:	2.0



Long Term Load Cases/Combinations Considered (controlling load case/combinations highlighted)

Load Description*	Fill Height (m)	W <sub>g/2.0</sub>	W <sub>q/1.5</sub>	T <sub>c</sub>	Pipe Class
earth	0.400	3.8		3.8	2
uniform surcharge load	0.400	9.0		9.0	2
W80	0.400	3.8	35.3	39.1	3
A160	0.400	3.8	35.3	39.1	3
M1600	0.400	3.8	25.8	29.6	2
S1600	0.400	3.8	16.1	19.9	2

All loads in kN/m. \*Includes earth load at fill height shown.

Controlling Loads: earth + W80 standard vehicle

Minimum Test Load:  $T_c = 3.8 + 35.3 = 39.1$  kN/m

Short Term Load Cases/Combinations Considered

Load Description*	Allowable Fill Ranges (m)
CPAAVR-10T (Const)	0.400 - 50.000
CAT140H (Const)	0.000 - 50.000
CATD300E (Const)	0.400 - 50.000, 0.000 - 0.149
CAT621F (Const)	0.400 - 50.000
CAT815F (Const)	0.000 - 50.000

All loads in kN/m. \*Includes earth load at fill ranges shown.

Adopt 750 dia. Class 3 FJ pipe (750/3 FJ) in accordance with AS/NZS 4058:2007.

Design Notes:

1. Long term live loads are considered as acting directly on the pipe (no distribution) in accordance with AS/NZS 3725:2007.
2. Short term live loads are considered as acting directly on the pipe (no distribution) in accordance with AS/NZS 3725:2007.
3. A nominal pipe wall thickness of 54 mm has been assumed.

INSTALLATION OF 750 DIA. CLASS 3 FJ DRAINAGE PIPE

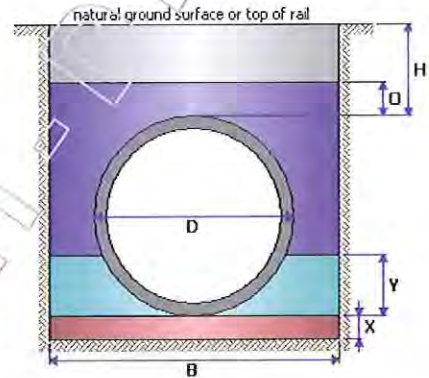
Client And Project Details

Date: 09-Feb-2009

Job number:	Design: C-FS1250
Client:	Designer:
Project: New Project	Company:
Description:	File: Francis Street.ppr

Design Parameters

Installation Condition:	trench
Pipe Nominal Diameter (mm):	750
Pipe External Diameter, D (mm):	870
Trench Width, B (mm):	1270
Height of Fill, H (mm):	0.400
Support Type:	H2
Excavation Volume (solid) (m <sup>3</sup> /m):	1.8



Installation Quantities

Support Zone	Depth (mm)	Quantities (m <sup>3</sup> /m)		Minimum Zone Compaction (%)	
		Solid	Loose	Density Index (for cohesionless soils)	Relative Density (standard compaction)
Bed zone	X = 100	0.127	0.153	60	-
Haunch zone	Y = 265	0.184	0.221	60	-
Overlay zone	O = 150	0.518	0.000	as per project specification	as per project specification
Backfill	250	0.318	0.000	as per project specification	as per project specification

Material Grading Requirements

Sieve Size (mm)	75.0	19.0	9.5	2.36	0.60	0.30	0.15	0.075
Bed & Haunch Zones (% mass passing)	-	100	-	100-50	90-20	60-10	25-0	10-0

Construction Equipment Requirements

Name	Description	Allowable Fill Ranges* (m)
CPAAVR-10T	CPAA Construction Vehicle - Smooth Drum Vibratory Roller (..	0.400 - 50.000
CAT140H	Grader CAT 140H - Total weight 17.0 tonnes	0.000 - 50.000
CATD300E	Truck, Articulated CATD300E - Total weight (loaded) 49.2 t	0.400 - 50.000, 0.000 - 0.149
CAT621F	Scraper CAT621F - Total weight (loaded) 53.8t	0.400 - 50.000
CAT815F	Compactor, Soil CAT815F - Operating weight 20.9 t	0.000 - 50.000

\*Equipment is not to be used outside of these fill ranges over top of pipe.

Design Notes:

- All bed and haunch zone material passing the 0.075 mm sieve to have low plasticity (AS 1726).
- Ordinary fill material to have no stones > 150 mm dia., and no more than 20% to be 75-150 mm.
- For additional information refer to the project specification.
- A nominal pipe wall thickness of 54 mm has been assumed.



DESIGN OF 750 DIA .CLASS 3 FJ DRAINAGE PIPE

Client And Project Details

Date: 09-Feb-2009

Job number:	Design: C-FS1250
Client:	Designer:
Project: New Project	Company:
Description:	File: Francis Street.ppr

Long Term Load Cases/Combinations Considered (controlling bad case/com bination highlighted)

Load Description*	Fill Height (m)	W g/2.0	W g/1.5	Tc	Pipe Class
earth	0.400	3.8		3.8	2
uniform surcharge bad	0.400	9.0		9.0	2
W 80	0.400	3.8	35.3	39.1	3
A160	0.400	3.8	35.3	39.1	3
M 1600	0.400	3.8	25.8	29.6	2
S1600	0.400	3.8	16.1	19.9	2

All bads in kN/m . \*includes earth bad at fill height shown

Short Term Load Cases/Combinations Considered

Load Description*	Allowable Fill Ranges (m)
CPAAVR-10T (Const)	0.400 - 50.000
CAT140H (Const)	0.000 - 50.000
CATD300E (Const)	0.400 - 50.000, 0.000 - 0.149
CAT621F (Const)	0.400 - 50.000
CAT815F (Const)	0.000 - 50.000

All bads in kN/m . \*includes earth bad at fill ranges shown.

earth

Height of fill, H = 0.400 m

Trench Condition, vertical walls

Spangler coefficient, Ct = 0.297

Working bad due to earth fill, W g = 9.6 kN/m

Positive Projection Check

Settlement ratio, rs = 1.000

Projection ratio, p = 0.389

Plane of equal settlement height, He = 0.400

Modified Spangler coefficient, Ce = 1.094

Working bad due to earth fill, W g = 7.6 kN/m

Positive projection controls, adopt W g = 7.6 kN/m

W 80

Footprint width at top of pipe, L1 = 1.080 m

Footprint length at top of pipe, L2 = 0.780 m

Footprint area, A = 0.842 m<sup>2</sup>

Load on footprint = 80.0 kN

Impact factor = 1.34

Live bad pressure at top of pipe, q = 127.255 kPa

Minimum of L2 and D, S = 0.780 m

Effective supporting length of pipe, Le = 2.026 m

Working bad due to live bad, W q = 52.9 kN/m



DESIGN OF 750 DIA .CLASS 3 FJ DRAINAGE PIPE

A160

Footprint width at top of pipe, L1 = 1.080 m

Footprint length at top of pipe, L2 = 0.780 m

Footprint area, A = 0.842 m<sup>2</sup>

Load on footprint = 80.0 kN

Impact factor = 1.34

Live load pressure at top of pipe, q = 127.255 kPa

Minimum of L2 and D, S = 0.780 m

Effective supporting length of pipe, Le = 2.026 m

Working load due to live load, Wq = 52.9 kN/m

S1600

Wheel footprint width at top of pipe, L1 = 1.080 m

Wheel footprint length at top of pipe, L2 = 0.780 m

Wheel footprint area, A = 0.842 m<sup>2</sup>

Load on wheel footprint = 40.0 kN

Impact factor = 1.00

Wheel pressure at top of pipe, q = 47.483 kPa

Minimum of L2 and D for wheel, S = 0.780 m

Effective supporting length of pipe for wheel, Le = 2.026 m

Working load due to live load, Wq (wheel) = 19.7 kN/m

UDL footprint width at top of pipe, L1 = 3.780 m

UDL Footprint length at top of pipe, L2 = 1.000 m

UDL footprint area, A = 3.780 m<sup>2</sup>

Load on UDL footprint = 24.0 kN

Impact factor = 1.00

UDL pressure at top of pipe, q = 6.349 kPa

Minimum of L2 and D for UDL, S = 0.870 m

Effective supporting length of pipe for UDL, Le = 4.726 m

Working load due to live load, Wq (UDL) = 4.4 kN/m

Total working load due to live load, Wq = 24.1 kN/m

Released under RTI - DTMR



DESIGN OF 750 DIA .CLASS 3 FJ DRAINAGE PIPE

M 1600

Wheel footprint width at top of pipe,  $L1 = 1.080$  m

Wheel footprint length at top of pipe,  $L2 = 0.780$  m

Wheel footprint area,  $A = 0.842$  m<sup>2</sup>

Load on wheel footprint =  $60.0$  kN

Impact factor =  $1.26$

Wheel pressure at top of pipe,  $q = 89.744$  kPa

Minimum of  $L2$  and  $D$  for wheel,  $S = 0.780$  m

Effective supporting length of pipe for wheel,  $Le = 2.026$  m

Working load due to live load,  $Wq$  (wheel) =  $37.3$  kN/m

UDL footprint width at top of pipe,  $L1 = 3.780$  m

UDL Footprint length at top of pipe,  $L2 = 1.000$  m

UDL footprint area,  $A = 3.780$  m<sup>2</sup>

Load on UDL footprint =  $6.0$  kN

Impact factor =  $1.26$

UDL pressure at top of pipe,  $q = 2.000$  kPa

Minimum of  $L2$  and  $D$  for UDL,  $S = 0.870$  m

Effective supporting length of pipe for UDL,  $Le = 4.726$  m

Working load due to live load,  $Wq$  (UDL) =  $1.4$  kN/m

Total working load due to live load,  $Wq = 38.7$  kN/m

uniform surcharge load

Working load due to uniform surcharge load,  $Wg = 10.4$  kN/m

Released under RTI - DTMR

## Appendix N – Sub-catchment land use break-up

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Released under RTI - DTMR

**C-FS 620/C16150**

**Base scenario**

Catchment	Total Area (ha)	LAND USE TYPE				Impervious Percentage
		Rural	Residential	Road	Urban	
C16150/a	0.78			100%		100%
C16150/b	2.44				28%	72%
C16150/c	1.60			18%	32%	50%
C16150/rd1	0.30			100%		100%
C16150/rd2	0.11			100%		100%
C16150/g1	0.76			44%		56%
C16150/g2	1.17			34%		66%
C16150/rd3	0.29			100%		100%

**Upgrade scenario**

Catchment	Total Area (ha)	LAND USE TYPE				Impervious Percentage
		Rural	Residential	Road	Urban	
C16150/a	0.78			100%		100%
C16150/b	2.07				28%	72%
C16150/r71	0.22			100%		100%
C16150/r72	0.26			100%		100%
C16150/h	1.89					100%
C16150/z	0.25			60%		40%

Released under DTWIR

## FRANCIS STREET

### Base scenario

		LAND USE TYPE					Impervious Percentage
Catchment	Total Area (ha)	Rural	Commercial	Road	Urban	Open Space	
<b>C-FS750</b>							
C-FS750/a	0.68			40%		60%	20%
C-FS750/b	1.50			18%	35%	47%	100%
<b>C-FS950</b>							
C-FS950/a	1.71				83%	17%	47%
C-FS950/b	2.68				100%		60%
C-FS950/qr1	0.46			100%			100%
C-FS950/qr2	1.32		20%	80%			98%
C-FS950/d	1.43		100%				90%
C-FS950/e	0.76			53%		47%	53%
C-FS950/f	0.75					100%	0%
C-FS950/g	11.86				100%		60%
C-FS950/h	4.09				100%		60%
C-FS1100/a	0.94		75%	25%			92%
C-FS1100/b	0.57		100%				50%
<b>C-FS950</b>							
C-FS1250/a	0.94				100%		60%
C-FS1250/r	0.11			100%			100%

### Upgrade scenario

		LAND USE TYPE					Impervious Percentage
Catchment	Total Area (ha)	Rural	Commercial	Road	Urban	Open Space	
<b>C-FS750</b>							
C-FS750/a	2.55			9%	19%	72%	20%
C-FS750/rd	0.43			100%			100%
<b>C-FS950</b>							
C-FS950/a	1.34				78%	22%	47%
C-FS950/b	2.24				100%		60%
C-FS950/qr1	0.46			100%			100%
C-FS950/qr2	1.32		20%	80%			98%
C-FS950/d	1.43		100%				90%
C-FS950/e	0.76			53%		47%	53%
C-FS950/f	0.75					100%	0%
C-FS950/g	11.86				100%		60%
C-FS950/h	4.09				100%		60%
C-FS950/i	0.86					100%	0%
C-FS1100/a	0.66		75%	25%			92%
C-FS1100/b	0.57			50%		50%	50%
<b>C-FS950</b>							
C-FS1250/a	0.94				100%		60%
C-FS1250/r	0.11			100%			100%





## A SYSTEM TO PRODUCE RAINFALL INTENSITY FREQUENCY DURATION DATA (IFD)

### What is IFD data?

The abbreviation IFD stands for Intensity-Frequency-Duration; it refers to statistics on rainfall.

In order to explain what it is, we must first define some terms about rainfall. We usually think of rainfall as being of a certain DEPTH (measured in mm). But for completeness, we also need to specify the length of time over which the rainfall occurred: one year - in the case of annual rainfall; one month (for many climate purposes); or so many days, hours or minutes. This period of time over which the rain is measured is called the DURATION.

So rain is well described in terms of a depth of rainfall over a certain duration. To compare the severity of different rainfall events, we might compare several rainfalls measured over one hour. For instance, we might be interested in the highest one-hour rainfall during a calendar year at a certain location. And going one step further, a civil engineer designing a drain intended to fail (no more frequently than) once every ten years (on average) might ask the question, "What is the rainfall depth over one hour exceeded, on average, once in ten years?". This "once in ten years" is a FREQUENCY.

Before going further, we will explain that the Bureau of Meteorology does not use depth of rainfall in this particular context but prefers to use rainfall rate (in mm per hour), known as INTENSITY. It is calculated by dividing the depth by the duration and is simply a measure of the 'heaviness' of the rainfall.

We now have our three terms: "Intensity", "Frequency" and "Duration" used in the abbreviation "IFD".

Just as the engineer might ask about the 1-hour rainfall exceeded on average once in 10 years, so another might ask about the 72-hour rainfall exceeded on average once every 100 years. In fact the number of possible combinations of duration and frequency is many - take any one of 13 standard durations from 5 minutes to 72 hours, and any one of 7 frequencies from 1 per year to 1 per 100 years, and you have 91 combinations. For this reason, the results are best tabulated, or represented as a graph of intensity versus duration for 7 different frequencies (see below). [For convenience, frequencies (e.g. 1 per 100 years) are replaced by "Average Recurrence Intervals" or "Return Periods" (e.g. 100 years).]

For a more in-depth discussion of ARI see the following: [WHY DO 100 YEAR EVENTS HAPPEN SO OFTEN?](#)

As implied above, the main use of these data is in engineering design.

IFDs are commonly used in:

- design and risk assessment of dams and bridges,
- design of roof and stormwater drainage systems,
- flood plain management,
- soil conservation studies,
- to express the "severity" of a single rainfall event (in terms of its rarity).

The process of estimating IFDs, known as frequency analysis, is an important part of hydrological design procedures. An analysis of rainfall data from a single station is often unreliable; not temporally or spatially consistent; and should generally not be used for design purposes. Instead a set of accurate, consistent IFD data have been derived for the whole of Australia. This work was carried out by the Bureau of Meteorology as part of the revision of Australian Rainfall and Runoff (Institute of Engineers Australia, 1987).

The variables used to calculate IFDs are stored on a 0.025° latitude by 0.025° longitude grid (approx 2.5km by 2.5km) covering Australia. These variables are displayed on the results pages under the heading "Raw data". When a set of coordinates is entered this system returns the IFD results for the nearest grid-point.

## Running the Program - Inputs

There are two versions of the system: for computers with and without Flash. The Flash version requires the Adobe Flashplayer.

Inputs are used to enter the coordinates required for producing the IFD chart and the place name for this location.

There are three possible ways of expressing the coordinate data.

1. Latitude and Longitude in decimal degrees.  
(N.B. negative and positive values are accepted for latitude and are assumed to be degrees south)  
e.g. -37.500°, 141.259°.
2. Latitude and Longitude as degrees, minutes and seconds. (Not available in the non-Flash version)  
e.g. 37° 30' 10", 141° 54' 32"
3. Easting and Northing. (Not available in the non-Flash version.)

The Australian Map Grid zone must be included (may be obtained from topographic maps or <http://www.environment.gov.au/erin/tools/geo2amg.html>).

e.g. 536,000.50, 6,548,000.25, zone=55.

IFD information is held at a resolution of about 2.5 km. It is therefore important to use accurate location data and not just the name, or central location, of a large city such as Melbourne or Sydney (which would contain many grid points). Professionals such as engineers and architects may be expected to have a topographic map or a GPS (Global Positioning System) receiver.

An alternative is to use the [Geoscience Australia](#) website for a [general place-name search](#) or use the [Map Connect](#) utility to find more specific coordinates. Please also note GeoScience Australia's policies and caveats on use of these systems for determining accurate coordinates. You may also like to download [GoogleEarth](#) which enables you to zoom down to street level in most larger cities and take note of the coordinates. Remember that for any serious use of this application it is recommended to seek professional advice concerning the exact location coordinates.

Only one set of coordinates is permitted at a time, so you cannot, for example, put decimal degrees coordinates and easting northing coordinates at the same time.

A place name may be entered in the location field, and this name will appear on the results page. Note however, the location name does not influence the coordinate choice in any way.

The RESET button is used to clear all input fields.

The SUBMIT button prepares the IFD chart and tables from this set of coordinates for viewing and subsequent printing if required.

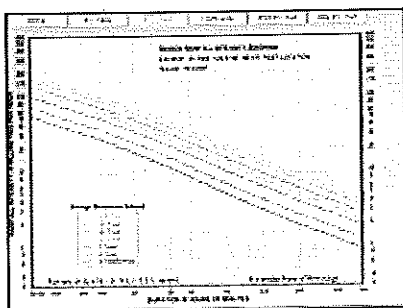
### Caveats on Coordinates

Data are derived automatically by computer using the values at the nearest grid-point to the input location on the 0.025° grid. In general therefore the location of the data produced will not match exactly that of the input location. To guard against the possibility of accidentally entering data incorrectly, it is essential that users check that the latitude and longitude on the chart and table produced correspond (to the nearest 0.025°) to the location required.

Users should be aware that, in some geographical areas, additional studies may have been undertaken to include additional data, and local authorities may require that, for certain design purposes, these results be used. If in doubt, users are advised to confirm the appropriate design standard with the relevant authority.

### Program Outputs

#### 1. IFD Chart



The rainfall intensity for each standard ARI is plotted on a graph of intensity versus duration. The range of duration on the x-axis is from 5 minutes to 72 hours. The seven curves: for 1, 2, 5, 10, 20, 50 and 100 year ARIs have a negative gradient, consistent with experience that "heavier" rainfall occurs over shorter durations.

To determine the ARI (rarity) of an event: Plot a point on the chart corresponding to the observed intensity and duration

Read which ARI curves the point falls between (say X and Y years)

Then it may be said that the event has an ARI between X and Y years at the specified duration.

#### 2. IFD Table

The tables are a tabulated version of the curves on the chart, they contain intensity values in mm/h at standard durations from 5 minutes to 72 hours and ARIs from 1 to 100 years. The intensity values are displayed to 3 significant figures.

### 3. Polynomial Coefficients and Constants Table

This table is unimportant for the average user; it just provides supplementary information about the curves on the IFD chart. The seven ARI curves on the IFD chart are sixth order polynomials. The Table contains the polynomial coefficients and constant for each ARI. Substituting these values and the duration (in hours) into the given equation provides an intensity for that duration (within the 5 min to 72 hour range). This may be used to calculate intensities accurately between standard durations (but at standard ARIs).

#### Example

Bathurst Airport, latitude -33.400°, longitude 149.650°, 6 minute duration and 100 year ARI.

- The constant and six coefficients are:

3.948788, -0.66752E+0, -0.41531E-1, 0.86465E-2, 0.11640E-2, -0.24334E-3 and -0.33721E-4.

The coefficients are in standard form where "E" indicates 10 to the power of the following exponent, as on many electronic calculators.

- The equation is:

$$\ln(I) = A + B(\ln(T)) + C(\ln(T))^2 + D(\ln(T))^3 + E(\ln(T))^4 + F(\ln(T))^5 + G(\ln(T))^6$$

- Substitute the seven coefficients into the equation.

$$\ln(I) = 3.948788 - 0.66752(\ln(T)) - 0.041531(\ln(T))^2 + 0.0086465(\ln(T))^3 + 0.001164(\ln(T))^4 - 0.00024334(\ln(T))^5 - 0.000033721(\ln(T))^6$$

- Substitute ln(0.1) hours for ln(T). Thus ln(T) = -2.302585093

$$\ln(I) = 3.948788 - 0.66752(-2.302585093) - 0.041531(-2.302585093)^2 + 0.0086465(-2.302585093)^3 + 0.001164(-2.302585093)^4 - 0.00024334(-2.302585093)^5 - 0.000033721(-2.302585093)^6$$

- Evaluate the exponentials and express all numbers to about 8 significant figures.

$$\ln(I) = 3.948788 - 0.66752(-2.302585093) - 0.041531(5.301898110) + 0.0086465(-12.208071554) + 0.001164(28.110123574) - 0.00024334(-64.725951503) - 0.000033721(149.037011062)$$

- Solve for ln(I).

$$\ln(I) = 3.948788000 + 1.537021601 - 0.220193130 - 0.105557091 + 0.032720184 + 0.015750413 - 0.005025677$$

$$\ln(I) = 5.203504300$$

- Take the exponential of both sides.

$$\exp(\ln(I)) = \exp(5.203504300)$$

$$I = 181.908588514$$

- Take I to three significant figures

$$I = 182 \text{ mm/hr.}$$

#### 4. Calculate an ARI

To determine the rarity of a rainfall event for the chosen co-ordinates, enter the Rainfall Total in millimetres and the duration, in minutes, over which the rain fell. The Average Recurrence Interval(ARI) and Average Exceedance Probability(AEP) will be given.

For a more in-depth discussion of ARI see the following: [WHY DO 100 YEAR EVENTS HAPPEN SO OFTEN?](#)

#### Example

Location : 33.400S 149.650E  
 Rainfall total : 40 mm  
 Duration : 30 minutes  
 Rainfall intensity : 80 mm/h

Average Recurrence Interval(ARI) of between 50 years and 100 years.

Average Exceedance Probability(AEP) estimate of between 1% and 2%.

### Conversion of units

1. To convert a duration in minutes into hours, divide by 60:

ie: 30 minutes =>  $30 / 60 = 0.5$  hour.  
 720 minutes =>  $720 / 60 = 12$  hours.

2. To convert a rainfall depth during a period of time into an intensity in mm/hr. The depth in mm is divided by the duration in hours :

ie: 50 mm over 30 minutes. =>  $50 / 0.5 = 100$  mm/hr.  
 100 mm over 720 minutes =>  $100 / 12.0 = 8.3$  mm/hr.

### References

Institution of Engineers, Australia (1987). Australian Rainfall and Runoff - A Guide to Flood Estimation, Revised Edition

### Frequently Asked Questions

Additional information may be found in the [Frequently Asked Questions](#).

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24/05/2010

## Jabiru Place CTS 19169

### Committee update

#### The Resumption

13/04/2010

Body Corporate Services received

Taking of Land Notice (No. 1985) published in the Government Gazette of Friday 09 April 2010.

Jabiru Place Body Corporate interest in the Land has been converted into a right to claim compensation.

Letter received by Chairman on 20/04/2010

I have spoken to [REDACTED] on [REDACTED] on 25/05/2010.

Program Development and Management

Property Services Branch

Our Ref: 510/06952 czj

He advised we will need to obtain the services of a Registered Valuer and a Solicitor. The Body Corporate will need to pay fees up front but we will be compensated for reasonable fees in the settlement.

He is not aware of a construction timetable or if sound proof barrier is to be built on overpass.

[REDACTED] advised for any other details on project to contact

[REDACTED]  
Project Manager  
[REDACTED]

I spoke to [REDACTED] of BCS it is OK to engage the services of a Registered Valuer and a Solicitor. He was unable to provide a recommendation.

I spoke to Tanya McLaughlin Committee member she had an excellent experience with Bushnell Power Lawyers on [REDACTED]

I called Bushnell Power Lawyers on [REDACTED]  
Have set up meeting with

[REDACTED]  
42 Roderick Street Ipswich  
27/05/2010 at 10.00am  
For a half hour initial consultation  
They require \$99.00 cash or direct deposit

26/05 E-mail to [REDACTED] to direct deposit initial consultation fee

27/05 Attended Solicitors office.  
[REDACTED] was ill meeting cancelled.  
[REDACTED] was advised to call Propell Valuers

27/05 Called [REDACTED] left message  
[REDACTED] returned call he does not have answers but has set up a meeting  
to update the Committee at 11.00am 28/05/2010.

27/05 Called Propell Valuers. They have taken details will check on the plan and call  
back.

28/05 Attended meeting with Ralph and Allan McLaughlin

28/05 Allan & Ralph to organise plant audit on resumed area - ASAP

08/06 Meeting with [REDACTED] of Bushnell & Power Lawyers at 3.00pm  
MM attended

08/06 Valuer Propell [REDACTED] has called Origin Alliance and asked for elevation  
plans

10/06 Origin Alliance – Danny O'Donnell [REDACTED] advised want to clear Jabiru  
Place block ASAP. Will hold work till 15/06/2010

11/06 Arborist visit – only 4 plants of value but not enough to warrant audit as is costs  
\$45.00 - \$60.00 per tree. Common species have no value ie Palms, Jacaranda,  
Poinciana, Mulberry. Other species are class 3 which are pests.  
He will Invoice at \$70.00 for call out.

15/06 Wrote notice to owners and occupants

**15/06/2010**



## **Notice from the Committee of the Body Corporate to all owners of Jabiru Place CTS 19169**

In May 2010 Body Corporate Serviced received a letter from the Queensland Government Department of Transport and Main Roads. It was a Taking of Land Notice (No. 1985) published in the Government gazette of Friday 09 April 2010.

This means 793 square metres east of the Tennis Court has been resumed.

**This will not affect any of the 42 Units buildings or yards.**

**This will not affect the Tennis Court area.**

This will only affect the common property area.

Jabiru Place's interest in the land has been converted into a right to claim compensation under the *Acquisition of Land Act 1967*.

The Committee has engaged the services of a Valuer, Solicitor and Arborist.

██████████ of Bushnell & Power Lawyers  
██████████ of Propell National Valuers

Reasonably costs will be covered by the resumption process. Please do not attempt to contact the Solicitor or Valuer as they have instructions to only deal with the Committee.

The Committee has liaised with Origin Alliance (the contractors building the Dinmore 2 Goodna section of Ipswich Motorway upgrade)

They are going to build a Railway overpass into Monash Road to provide access to the developing industrial estate on the Redbank Peninsular area. This will involve building an 8 metre high section of Road with the earth wall starting at the base of the Tennis Court.

They have advised work will commence as soon as possible as they need to work in with Qld Railways in building the bridge over the railway lines. They expect the construction process to take 12 - 18 months.

This project will affect Jabiru Place on three sides.

### **The Front Section**

They will end Bridge Street at house ████████ They will then dig up Bridge Street and our driveway to the front gate then re build a new driveway to give us access.

### The Side Section

They will demolish the house at number [REDACTED] Bridge Street.  
The fig trees will not be affected.

### The Back Section

A Hydrologist will be engaged to design suitable drainage that will flow into the Peace Park. (If they get this wrong we have a potential flooding problem)

**To protect the safety of occupants the Tennis Court and walk way next to Tennis Court will be secured as a no access area and a notice via letter box will inform all occupants.**

The Committee will keep owners informed with updates via mail or at the Garden Committee meeting held 1<sup>st</sup> Tuesday of each month at BBQ area at 6.00pm.

If you want to get involved in this process the Annual General Meeting will be set down for August or September 2010. The Committee is allowed seven members. It has only had four members over the last three years. All positions are vacant and can be filled from the floor by attending the Annual General Meeting. If you can not attend meeting you can still have a vote by completing ballot form or by giving a proxy form to someone who will attend the meeting.

If you have any questions on construction please contact Origin Alliance 1800 465 682

If you have any issues or concerns about Jabiru Place please do not hesitate to contact

Matthew Morgan  
Chairman of the Body Corporate for Jabiru Place



Regards

The Committee of the Jabiru Place Body Corporate

16/06 MM Purchased locks, chain, signs and roll mesh to fence off Tennis Court and walk way next to Tennis Court.  
Purchased envelops, stamps, ream of paper, ink cartridge and printing of notices.  
Total cost - \$294.65  
Placed Occupant notice 1 in every letter box  
Printed address labels for every owner  
Placed Owner Notice 1 envelop in 17 owner / occupied letter boxes

Posted Owner Notice 1 with Origin Alliance Monash Road connection – work begins notice to all 25 rental property owner

- 17/06 Secured Tennis Court with chain and padlocks.  
Erected safety fence across walk way  
Placed warning signs on Tennis Court gate and roll mesh fence.
- 21/06 Origin Alliance – Danny O'Donnell Block to be cleared on 24/06/2010
- 23/06 Unit [REDACTED] owner [REDACTED] called Ralph, Origin Alliance  
MM e-mailed Owner and occupant letter.
- 23/06 [REDACTED] of Automatic Gates & Doors attended for quote
- 23/06 [REDACTED] of ETS Integrated Systems attended for quote
- 24/06 Origin Alliance – Work has started to clear block of trees via chainsaw and mulcher
- 24/06 Origin Alliance – Danny O'Donnell visited Jabiru Place - project could be fast tracked if Origin Alliance has work force available from 18 months to 6 months.  
Drainage has been designed for drainage into Peace Park  
Access to back block will be via back of tennis court. (plan recently changed)  
Has spoken to Unit [REDACTED] owner Janiffer
- 24/06 Unit [REDACTED] owner [REDACTED] called in for update
- 25/06 Origin Alliance – Danny O'Donnell visited Jabiru Place with 2 engineers to measure ground vibrations. Equipment set up at back of Unit [REDACTED] (as closest to road works) Engineer remained with equipment.
- 25/06 E-Mail to Unit [REDACTED] owner [REDACTED] with update
- 25/06 Letter to BCS for MM reimbursement of \$294.65
- 25/06 Origin Alliance – Danny O'Donnell re visited Jabiru Place  
Sewer and Storm water next to Tennis Court to be replaced from 29/06/2010  
Job expected to take 1 week  
Water main at front gate to be rerouted parallel to driveway in house [REDACTED] easement at East section of Jabiru Place
- 01/07 Department of Transport and Main Road settlement of resumption offer  
\$10,000.00 as full and final settlement  
Letter e-mailed to Propell and Solicitor

- 22/07 Origin Alliance – Danny O’Donnell and Head Engineer called by to discuss front drive. Plans are not finalized yet.  
Confirmed Bridge Street sewer main has been completed under overpass.  
Confirmed Jabiru Place storm water outlet cut but not extended under overpass yet.  
They will install 3 x 2.1 metre storm water pipes that will handle 1 in 100 year flood.  
Bridge Street 100mm water main will be relocated after house at [REDACTED] demolished.
- 22/07 Propell National Valuers – [REDACTED] e-mails valuation and invoice
- 27/07 BCS at Toowong with [REDACTED] discussed AGM
- 27/07 Origin Alliance – Danny O’Donnell called to advise House [REDACTED] to be demolished over 3 days starting on 30/07/2010. The demolition crew will take care to check if site has asbestos and will be demolished under state and federal guidelines.
- 28/07 Propell National Valuers – [REDACTED] advised have 3 years to settle on injurious affection claim. Will need this time to allow audio tests, how fencing has been constructed, access to Peace Park, line of sight.  
3 types of claim.  
Loss of amenities (Access to Peace Park for all owners)  
Visual claim Sight (for affected Units)  
Audible claim ( for affected Units)
- 29/07 Notice to Occupant 2 placed in letterboxes
- 29/07/2010

## **Jabiru Place CTS 19169**

### **Notice from the Committee of the Body Corporate**

Origin Alliance advised the house at number [REDACTED] is due for demolition starting on 30/07/2010. The demolition crew will not work over the weekend.

This job will take 3 days as asbestos is present in the building.  
The demolition crew will take all precautions as advised in the building code.

If you have any questions or issues about this job please feel free to contact

Origin Alliance on 1800 465 682.  
The Chairman of the Body Corporate on [REDACTED]  
Your Managing Real Estate Agent.

Regards

The Committee of the Jabiru Place Body Corporate

- 04/08 E-Mail to Unit [REDACTED] owner Janiffer with update
- 05/08 Origin Alliance – Contractors divert 4inch water main (big blue) down by fig trees through where house [REDACTED] was.
- 05/08 ICC - Origin Alliance – Danny O'Donnell advised requires meeting for 09/08/2010 at 1.00pm to give update on time table for over pass construction
- 09/08 ICC - Origin Alliance – Danny O'Donnell advised Head Engineer not at work today. Need to postpone meeting
- 
- 21/09 Called Origin Alliance – Danny O'Donnell  
Asked for 8 copies of plan at Jabiru Place. OK to collect them at 1.30pm today
- 21/09 Attended at Bushnell & Powers Solicitors at  
44 Roderick Street Ipswich QLD 4305  
Matt, Ralph, Michael attended
- Gave Docs for Resumption
- 1/ Dept of Transport and Main Roads Settlement offer File No 510/06952
  - 2/ Statutory Declaration
  - 3/ Expenditure voucher
  - 4/ Acquisition of Land Act 1967. S18 – S23

- 5/ Propell National Valuers Compensation Assessment
- 6/ Propell National Valuers Invoice
  
- 7/ Chairman's letter for AGM 2010
- 8/ Minutes of AGM for Jabiru Place held on 26/08/2010
- 9/ Committee contact details

23/09 E-mail update on Solicitor visit to Committee

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E-mail 01/11/2010 (after Committee Meeting)

Matt,

Please address issue as soon as possible

**18/ Ipswich Motorway upgrade Dinmore to Goodna  
– Construction update**

Refer Maps of Construction site

Origin Alliance has started to dig next to the 3 x 2.1 metre drainage pipes. They are going to add 2 more 2.1 metre drainage pipes

Matthew Morgan Chairperson to follow up with Origin Alliance.

Origin Alliance new contact liaison: Angela Bracey – [REDACTED]

---

03/11/2010 @ 11.09am MM called [REDACTED] Community Relations Officer

Planning on completing Railway overpass late January 2011. This will be night works  
So work has commenced on raising batter and building retaining walls

She was not aware drainage pipes have increased from 3 to 5.  
She will try to get answer of why.

03/11/2010 @ 1.36pm [REDACTED] Community Relations Officer advised  
Has spoken to head Engineer [REDACTED] and the 2 extra pipes installed are to improve  
flood mitigation for Jabiru Place. They are not aware of any thing happening with QLD  
railways

Night works to start soon from Sunday to Thursday for 3 – 4 weeks  
A flyer will be delivered to letterboxes shortly.

Jabiru Place has 3 Units in line for exceptional circumstances.  
To be sorted early next year

---

## Client - Jabiru Place Body Corporate CTS 19169

### 1<sup>st</sup> contact

Matthew Morgan, Chairman of the Body Corporate  
[REDACTED] 13 Bridge Street Redbank QLD 4301  
[REDACTED]

### CTS 19169 managed by

[REDACTED] Body Corporate Services  
[REDACTED]

### On site Manager

Ralph Hamilton  
[REDACTED] 13 Bridge Street  
Redbank QLD 4301  
[REDACTED]

### Body Corporate Committee

Bob Chalmers - [REDACTED]  
Tanya McLaughlin - [REDACTED]  
Any Hunter - Mob [REDACTED]

Body Corporate AGM to be set down for July – August 2010.  
I would expect to have 7 Body Corporate Committee members.

### Questions

Please explain process

- 27/05 Solicitor [REDACTED] – not at work to illness
- 28/05 Solicitor [REDACTED] – tried to reset meeting am. Unable to attend
- 08/06 Valuer Propell [REDACTED] – Will contact Origin Alliance to confirm how they want to proceed with Body Corp claim and personal claims.
- 08/06 Solicitor [REDACTED] – meeting at 3.00pm

Expected costs  
08/06 Unknown

Payment terms



08/06 Reasonable costs to be covered by the resumption process.

Do we need an audit of trees and size to be done?

27/05 Valuer Propell - probably not. He will comment further when on site

28/05 Valuer Propell [REDACTED] - Yes as Jabiru Place paid to plant out block and as the kids use area.

11/06 Arborist visit - only 4 plants of value but not enough to warrant audit as is costs \$45.00 - \$60.00 per tree. Common species have no value ie Palms, Jacaranda, Poinciana, Mulberry. Other species are class 3 which are pests. He will invoice at \$70.00 for call out.

We have a stripy marsh frog population (*Limnodynastes peronii*) on the resumed block that breeds every time it rains at any time of the year. Area resumed is the Body Corporate "green zone" or "rainforest"

Does this impact on valuation?

28/05 Valuer Propell [REDACTED] - This could be ground to go legal to hold construction .

How will Jabiru Place gain access to Peace Park?

28/05 Origin Alliance - No pedestrian crossings are planned at this stage

### Construction Issues

How do we get time frame is start of construction?

26/05 Flyer issued - work to commence May 2010.

26/05 [REDACTED] Program Development and Management - Does not know

27/05 [REDACTED] Project Manager - Does not know

28/05 Origin Alliance - Site works can start ASAP. They plan to clear vegetation and start dumping soil in place. They need to work in with QR to build bridge over railway line. Job will end at Brisbane Terrace.

10/06 Origin Alliance - Danny O'Donnell [REDACTED] advised want to clear Jabiru Place block ASAP. Will hold work till 15/06/2010

21/06 Origin Alliance - Danny O'Donnell Block to be cleared on 24/06/2010

24/06 Origin Alliance - Work has started to clear block of trees via chainsaw and mulcher

How long will construction take?

26/05 [REDACTED] Program Development and Management - Does not know

27/05 [REDACTED] Project Manager - Does not know

28/05 Origin Alliance - 18 months

24/06 Origin Alliance - Danny O'Donnell project could be fast tracked if Origin Alliance has work force available

Elevation of road?

27/05 [REDACTED] Project Manager - Will ask [REDACTED] to call back and organise collection of new plans

28/05 Origin Alliance – 7.5 metres to Road then a cash barrier to 8.0 metres  
08/06 Valuer Propell [REDACTED] has called Origin Alliance and asked for elevation plans

Is a noise barrier to be built on over pass?

26/05 [REDACTED] Program Development and Management – Does not know  
28/05 Origin Alliance – Not at this stage.

What will the planting scheme be on the batter?

28/05 Origin Alliance – Trees are in place on latest plans

What will the retaining wall around Tennis Court be made of?

Do we get compensation for dirt and dust through construction?

27/05 Valuer – Propell – Compensation 2 ways  
To Body Corporate – for land this will not be a large amount  
To each and every owner – if unit is affected  
28/05 Origin Alliance – Road works will be watered via water trucks

Noise during construction?

28/05 Origin Alliance – Will be minimised

Noise for ever more after construction?

### Rear Block Issues

How do we find out what steps will be taken to flood proof the tennis court?

28/05 Origin Alliance – This is not in the construction brief but if will not be any worse after job completed. They will have hydrologists look at issue.

How do we find out if drainage under over pass will be sufficient to prevent flooding to Jabiru Place in the future?

27/05 [REDACTED] Project Manager – Does not know  
28/05 Origin Alliance – Drainage has not been designed yet. Hydrologist will design taking into account of a rain event in ??? year.

[REDACTED]

Will drainage be high enough to walk through to give Jabiru Place a short cut to Peace Park?

24/06 Origin Alliance – Danny O'Donnell – drainage has been designed

Will Jabiru Place get access to isolated block?

24/06 Origin Alliance – Danny O'Donnell - Access to back block will be via back of tennis court. (plan recently changed)

Who will cut the grass and maintain block?

28/05 Origin Alliance – They expect block to transfer to being owned by QLD Main Roads.

24/06 Origin Alliance – Danny O'Donnell - Access to back block will be via back of tennis court. (plan recently changed)

Can the block be planted out with native vegetation?

28/05 Origin Alliance – No due to no access they are expecting to leave block as a grassed area.

Can the block incorporate a wetlands area?

28/05 Origin Alliance – They expect block to transfer to being owned by QLD Main Roads.

### **Driveway issues**

The road will be cut before our driveway so who will build and pay for driveway extension back to the Road?

27/05 [REDACTED] Project Manager – Does not think Jabiru Place will need to pay for extended drive way.

28/05 Origin Alliance – Will dig up and replace entire drive from front gate to Road Costs will be covered by Origin Alliance. We can divert Jabiru Place traffic between letter boxes and Moreton Bay Fig tree during construction. ( this will require hedge to be removed )

Drive is on the new plan

(This will be the time to replace front gate footing)

24/06 Origin Alliance – Danny O'Donnell – Plan has been changed again. He will re confirm where concrete drive to be replaced.

Who will own this area?

28/05 Origin Alliance – Ownership expected to transfer to QLD Main Roads.

Who will be responsible for maintaining area?

28/05 Origin Alliance – They expect Ipswich City Council

### **House to be removed at Number [REDACTED]**

Who will maintain area?

28/05 Origin Alliance – They expect Ipswich City Council

Will area be fenced off?

28/05 Origin Alliance – This is not on latest plan

### **Future Planned Construction Issues**

Time frame when over pass will be extended over Ipswich Motorway?  
28/05 Origin Alliance – No plan to extend over Ipswich Motorway.

Regards

Matthew Morgan

15/06/2010

## **Jabiru Place CTS 19169**

### **Notice from the Committee of the Body Corporate**

The land East of the tennis court has been resumed by the Queensland Government for the purpose of building an overpass across the railway line and connecting Riverview to Goodna via a secondary Road.

This affects Jabiru Place on three sides around the front entrance.

Construction has begun on the overpass and the trees on our block will be removed and cleared in the near future. The house at number ■ will be demolished to make way for the new Road as well.

#### **How will this affect the occupants of Jabiru Place**

The Tennis Court will be secured. If anyone wants to use the court you will need to contact Ralph or ■ and book the time.

The walkway next to the Tennis Court will also be secured.


This work will increase traffic volumes in Bridge Street with machinery and large dump trucks.

Construction noise.

Dust from construction site.

**If you have any questions on the project, you can contact**

Origin Alliance on 1800 465 682.

The Chairman of the Body Corporate on 

Your Managing Real Estate Agent.

Regards

The Committee of the Jabiru Place Body Corporate

15/06/2010

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The Chairman of the Body Corporate on [REDACTED]

Your Managing Real Estate Agent.

Regards

The Committee of the Jabiru Place Body Corporate

15/06/2010

**Notice from the Committee of the Body Corporate  
to all owners of Jabiru Place CTS 19169**

In May 2010 Body Corporate Serviced received a letter from the Queensland Government Department of Transport and Main Roads. It was a Taking of Land Notice (No. 1985) published in the Government gazette of Friday 09 April 2010.

This means 793 square metres east of the Tennis Court has been resumed.

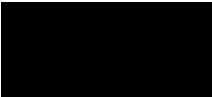
**This will not affect any of the 42 Units buildings or yards.**

**This will not affect the Tennis Court area.**

This will only affect the common property area.

Jabiru Place's interest in the land has been converted into a right to claim compensation under the *Acquisition of Land Act 1967*.

The Committee has engaged the services of a Valuer, Solicitor and Arborist.

 of Bushnell & Power Lawyers  
of Propell National Valuers

Reasonably costs will be covered by the resumption process. Please do not attempt to contact the Solicitor or Valuer as they have instructions to only deal with the Committee.

The Committee has liaised with Origin Alliance (the contractors building the Dinmore 2 Goodna section of Ipswich Motorway upgrade)

They are going to build a Railway overpass into Monash Road to provide access to the developing industrial estate on the Redbank Peninsular area. This will involve building an 8 metre high section of Road with the earth wall starting at the base of the Tennis Court.

They have advised work will commence as soon as possible as they need to work in with Qld Railways in building the bridge over the railway lines. They expect the construction process to take 12 - 18 months.

This project will affect Jabiru Place on three sides.

**The Front Section**

They will end Bridge Street at house [REDACTED] They will then dig up Bridge Street and our driveway to the front gate then re build a new driveway to give us access.

### The Side Section

They will demolish the house at number [REDACTED] Bridge Street.  
The fig trees will not be affected.

### The Back Section

A Hydrologist will be engaged to design suitable drainage that will flow into the Peace Park. (If they get this wrong we have a potential flooding problem)

**To protect the safety of occupants the Tennis Court and walk way next to Tennis Court will be secured as a no access area and a notice via letter box will inform all occupants.**

The Committee will keep owners informed with updates via mail or at the Garden Committee meeting held 1<sup>st</sup> Tuesday of each month at BBQ area at 6.00pm.

If you want to get involved in this process the Annual General Meeting will be set down for August or September 2010. The Committee is allowed seven members. It has only had four members over the last three years. All positions are vacant and can be filled from the floor by attending the Annual General Meeting. If you can not attend meeting you can still have a vote by completing ballot form or by giving a proxy form to someone who will attend the meeting.

If you have any questions on construction please contact Origin Alliance 1800 465 682

If you have any issues or concerns about Jabiru Place please do not hesitate to contact

Matthew Morgan  
Chairman of the Body Corporate for Jabiru Place

[REDACTED]

Regards

The Committee of the Jabiru Place Body Corporate



29/07/2010

**Jabiru Place CTS 19169**

**Notice from the Committee of the Body Corporate**

Origin Alliance advised the house at number [REDACTED] is due for demolition starting on 30/07/2010. The demolition crew will not work over the weekend.

This job will take 3 days as asbestos is present in the building.  
The demolition crew will take all precautions as advised in the building code.

If you have any questions or issues about this job please feel free to contact

Origin Alliance on 1800 465 682.

The Chairman of the Body Corporate on [REDACTED]

Your Managing Real Estate Agent.

Regards

The Committee of the Jabiru Place Body Corporate

E-mail 01/11/2010

Matt,

Please address issue as soon as possible

**18/ Ipswich Motorway upgrade Dinmore to Goodna  
– Construction update**

Refer Maps of Construction site

Origin Alliance has started to dig next to the 3 x 2.1 metre drainage pipes. They are going to add 2 more 2.1 metre drainage pipes

Matthew Morgan Chairperson to follow up with Origin Alliance.

Origin Alliance new contact liaison: [REDACTED]

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03/11/2010 @ 11.09am MM called [REDACTED] Community Relations Officer

Planning on completing Railway overpass late January 2011. This will be night works  
So work has commenced on raising batter and building retaining walls

She was not aware drainage pipes have increased from 3 to 5.  
She will try to get answer of why.

03/11/2010 @ 1.36pm [REDACTED] Community Relations Officer advised  
Has spoken to head Engineer [REDACTED], and the 2 extra pipes installed are to improve  
flood mitigation for Jabiru Place. They are not aware of any thing happening with QLD  
railways

Night works to start soon from Sunday to Thursday for 3 – 4 weeks  
A flyer will be delivered to letterboxes shortly.

Jabiru Place has 3 Units in line for exceptional circumstances.  
To be sorted early next year

---

12/11/2010 @ 2.00pm est

[REDACTED] Senior Project Engineer

██████████ Community Relations Officer

Male 3<sup>rd</sup> party

Attended on site at Jabiru Place for meeting with Anton Rush Secretary & Matthew Morgan Chairperson

Regards

**Water erosion at tennis court & Drainage ditch**

MM & AR - need to slash block. Need to clear silt and vegetation from ditch.  
Need to build a concrete spill way.

OA - No work has been scheduled in back block.  
It will now be referred to a suitable Engineer for review. They will get back to us.

No works planned in McAuliffe Street to build larger drainage under Road

2 extra pipes were installed are to improve flood mitigation for Jabiru Place.  
This was decided after a review.

**Damage to corner post at Tennis Court**

OA – They are aware of damage and it has been noted. It will be repaired at OA cost

**Lighting around front gate**

OA – Lighting on bypass Road will only be on the far side  
Not sure if lighting has been designed for footpath.  
He will see if a lighting plan has been completed and will forward a copy to Jabiru Place.

Confirmed bike path to extend from Goodna to Riverview and will run past Jabiru Place front gate.

**Chopping down Chinese Elm**

OA – He will need to check with their plant specialist first and get back to us

**Protecting Kauri Pine Tree**

OA – He will need to check with their plant specialist first and get back to us

**General**

Night works cancelled at last minute

They will shut down all work on the project over Christmas for 2 weeks starting on 17/12/2010 then restart on 04/12/2010.

All machinery will be relocated to a secure holding yard

Wed, 10 November, 2010 8:26:56 AM Origin engineers

From: Anton Rush [REDACTED] [View Contact](#)

To: Matt Morgan [REDACTED] Mike Wilkinson [REDACTED] cinna  
[REDACTED]

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Hey blokes,

Have been in contact with Origin Alliance and wanted to point out to them how drainage is now flowing differently onto our tennis court and under our pool foundations since they have been building their new drainage system under the mc aulliffe street bridge/roadway.

Origin got back to me after my statement and said they had been in contact with Mr. Mathew Morgan and their engineers. The engineers should be getting back to me today to arrange an onsite appointment to view my concerns. Will either of you be able to attend this at all today? Carol on phone advised it is likely to be around 2pm, give or take 4 hours.....

This is an item I wanted to raise with them to add to their list and ensure it wont be affecting our grounds and to add them into their plan for drainage on their side of the property line.

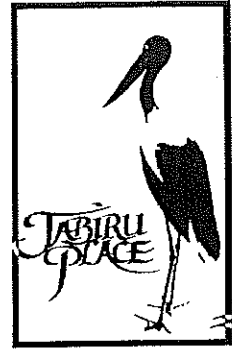
Water flow from the first property onto the second property is the responsibility of the first property holder. I intend to have Origin look at this as it is part of the roadway construction which has changed the flow of water and where it now sits, stagnating.

The property is being handed back to ICC after the project is complete, adding to the time and likely less budget thrown at fixing the drainage along our fence line.

Do you have any other thoughts that I should bring up with them today?

Keep in mind we will hopefully be able to have a say in how we would ideally like to drainage to be set up, this will be the first step for Origin Alliance, making them aware of the situation. Plans of action to be taken will hopefully coincide with us so long as we keep the pressure on.

Anton



Jabiru Place CTS 19169

1 December 2010

Melissa Carter  
Community Relations Officer Community Engagement Team  
Origin Alliance  
Dimore2Goodna  
Chalk Street  
Redbank QLD 4301

Dear Melissa,

**RE: PROPERTY AT JABIRU PLACE, 13 BRIDGE STREET REDBANK**

The Jabiru Place Committee has concerns with the progress of development in the Dinmore2 Goodna Project in the area that affects the owners of Jabiru Place. Our concerns are based in the scope of works with McAuliffe Street, the rear block, and the drainage allowed around our front gate.

We had a meeting to discuss some of these concerns with Councillor Paul Tully on 18/10/2010.

We also had an onsite meeting with Angela Bracey and David Halsall where concerns were raised but have not been addressed at this stage.

Jabiru Front Gate area

- 1/ Kerb and channelling not planned for at our front gate so the whole area will drain through our front gate entrance.
- 2/ Due to our loss of amenity of Street parking, can a car park be built at the front of property adjacent to House [REDACTED]
- 3/ Noxious Class 3 plants need removing (Chinese Elm, Pepperina etc)
- 4/ The Committee would like the Kauri Pine Tree in front of the property at 13 Bridge Street be protected.

- 5/ The Committee would like a copy of the lighting Plan for area adjacent to front entrance, as quotes are being obtained to replace front fence gate and security lighting will be a significant concern.

#### Vacant Block of Land between Jabiru Place and the Railway line

- 1/ Open drain from Railway storm water has been over grown with what looks like a water reed. This is diverting water out of the drain and against the Tennis Court, under cutting the slab.
- 2/ The whole area needs slashing.
- 3/ Noxious Class 3 plants need removing (Chinese Elm)
- 4/ A spill way entrance needs to be designed on both sides of the five 2.1 metre pipes to prevent erosion.
- 5/ Promised replacement of damaged north-east fence post of tennis court
- 6/ Replacement of fence adjacent to driveway after utilisation of temporary driveway access.

#### McAuliffe Street

- 1/ No allowance has been made for stormwater to pass over or under McAuliffe Street.
- 2/ Privacy for residents using complex amenities (pool, tennis court) needs to be addressed.

Yours sincerely,

The Committee of the Body Corporate for Jabiru Place

Thu, 16 December, 2010 8:24:27 AM

[ No Subject ]

From: Anton Rush [redacted]

[View Contact](#)

To: Matt Morgan [redacted] Mike Wilkinson [redacted]

[redacted] ralph [redacted]

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16/12/2010 - Anton Rush notes

Hello all,

Met with [redacted] again this morning, just a few quick notes on the back area.

After they go into a 2 week shutdown as of tommorrow, they should be doing the slashing as soon as they are all back to work, and it should be the whole grass area between our complex and the rail line.

The fencing work is going to be relatively difficult to work on due to soil being in a poor state and position. It is a very steep slope and many of the support poles have been replaced or pitched up with extra poles, simply means deeper holes for the concrete pillars supporting the fence.

We will have to inform Origin Alliance at least a week prior to anyone coming out to do work, and they will put up a temporary fence, away from our fence, allowing room to work.

There are a few Chinese Elm, fair bit of Lantana and those apple thingy things that kill the bee's (funny named one in front of 44 :D ) Origin will need to be informed we will have to remove some trees, if they don't remove the trees themselves. He doesnt see this being a problem, as it is 50+ metres from their site.

There will be a 2 metre "access" way though not designed for pedestrians, it will be a permnant access for walking around our complex.

Owen advised that he is pretty sure there is a minor update on the plans to do with our driveway, and there may be able to put a second carpark on the South side of the driveway as well.

Owen also feels it may be a viable method of just "building" our carpark, and wait to see who complains i.e Council

Funny bloke.

Chat later,  
Anton