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Australian Government

MURRAY–DARLING BASIN AUTHORITY

Office of the Chief Executive

Secretary
Standing Committee on Education and Employment
Standing Committee on Regional Australia
Department of the House of Representatives
Parliament House
CANBERRA ACT 2600

Dear Mr Worthington

I refer to your e-mail correspondence of 21 February 2011 in which you referred four questions from the Chair of the House of Representatives Standing Committee on Regional Australia for response.

Responses to each of the four questions are addressed in the following attachments:

Attachment A - What role has the end of system flow calculations played in the development of the SDL targets?

Attachment B - What modelling was used to develop the pre-development and post-development end of system flow numbers?

Attachment C - Appropriation Bill No 3 presented on 24 February 2011 shows a new appropriation for $26,613,000. What will this new appropriation be used for, is it additional to the standing appropriation voted on by Parliament last year?

Attachment D - What is the cost of the recently commissioned social and economic studies? What is the timeframe for this work, its terms of reference, is the timeframe adequate?

In addition to the above questions, the House of Representatives Standing Committee on Regional Australia, during an earlier private briefing, had requested historical diversions and allocations data from the Murray-Darling Basin Authority. This information is provided at Attachment B1.

Should you need to discuss any of the attached information please contact Ms Lorraine Haalebos in the first instance.

Yours sincerely

Rob Freeman
Chief Executive

/ / 3 /2011

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Attachment A

Subject: House of Representatives Standing Committee on Regional Australia – some additional questions from the Chair

Question 1

What role has the end of system flow calculations played in the development of SDL targets?

Answer

To determine the long term average sustainable diversion limits (SDL) required to enable the achievement of the environmental water requirements of key environmental assets and key ecosystem functions, the environmental water requirements must be converted to, and expressed as, a long term average volume of additional water required by the environment. The Murray-Darling Basin Authority (MDBA) has used hydrologic modelling and other analyses to estimate these volumes.

The first step in the process was to model the environmental water requirements of the 18 indicator assets. These model runs estimated that, at a Basin scale, a reduction in diversions in the order of 3800-4000 GL would be required to achieve the low uncertainty environmental water requirements of the indicator assets. Whilst this modelling gave an initial sense of the volume of water required by the environment, it was clear that further modelling and analysis would be required to:

1. Estimate the reduction in diversions required to achieve all of the environmental water requirements (ie beyond the 18 indicator assets and including key ecosystem functions);
2. Investigate environmental water delivery options to identify potential efficiencies; and
3. Provide a consistent approach to estimating SDLs at a regional scale.

A range of challenges must be addressed to do this effectively, including:

- The models have been developed to represent the management of water for consumptive use and their ability to effectively model the management of environmental water is constrained;
- Some of the environmental water requirements targets are difficult to express as a specific water demand at an operational level/daily timestep, as required in the models;
- The nature of the models differs (eg model timesteps, model structure and function) significantly between regions, providing potential inconsistencies in SDLs determined using models alone; and
- Whilst models connect effectively in a downstream direction, there is limited upstream connectivity between models. This makes it difficult to include the influence of downstream environmental water requirements (eg the Coorong, Lower Lakes and Murray Mouth) on water sharing in upstream regions.

The MDBA has undertaken, and continues to undertake work to address each of these challenges. However, for the purpose of the *Guide to the proposed Basin Plan,* it became clear that an alternative approach, informed by modelling but outside of the models, would be required to estimate regional SDLs on a consistent basis.

The end of system flow analysis was used as it provides a consistent method to determine regional SDLs in a way that aligns with the Basin wide reductions estimated by the modelling. End of system flows were used because they provide a measure of environmental water provision in the upstream region as a whole.

They also provide a measure of connectivity between regions, which is important for key ecosystem functions such as transport of nutrients and carbon, and migration of fish.

Chapter 4 in Volume 2 of the *Guide to the proposed Basin Plan* describes the process used to determine the reductions in diversions required to achieve environmental water requirements. Specifically, pages 108-115 describe the end-of-system flows methodology.

Attachment B

Subject: House of Representatives Standing Committee on Regional Australia: some additional questions from the Chair

Question 2

What modelling was used to develop the pre-development and post-development end of system flow numbers?

Answer

Twenty four river valley models were used to develop the without-development[1] and post development end of system flows numbers.

The river system models used have been developed over many years by State agencies, Murray-Darling Basin Authority (MDBA), CSIRO and Snowy Mountains Hydro Electric Authority (SMHEA) and have been used for policy development and implementation in the Murray-Darling Basin. To support the development of the *Basin Plan*, MDBA (with assistance from CSIRO and its consultants and state governments) linked these 24 river valley models in an Integrated River System Modelling Framework (IRSMF). This Framework allows seamless transfer of information between an upstream valley model to downstream valley models and management of databases for model inputs and results.

The models linked together to provide this basin wide modelling capability are shown in Figure 1. In addition, details of the developers of models linked and other key policy developments for which they have been used in the past are summarised in Table 1.

1 - The end-of-system flows derived by MDBA using models are for without development conditions and not pre-development conditions. The without development condition in the models represents river systems with flows corresponding to current land uses but without extractions from the water courses and infrastructure such as storages, weirs and regulators. In contrast, pre-development conditions imply state of catchment and river systems prior to any settlement.

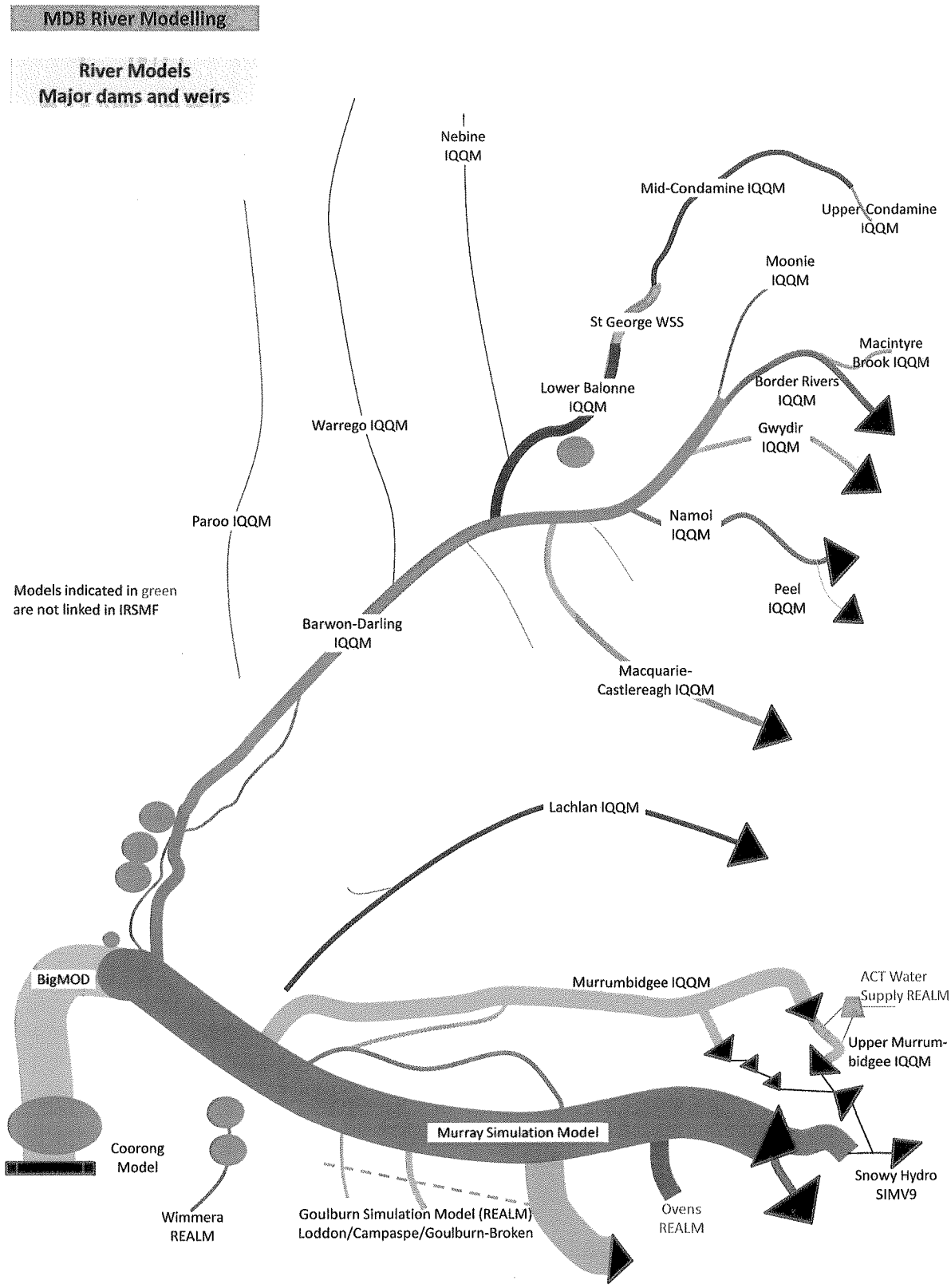
MDB River Modelling
River Models
Major dams and weirs
Nebine IQQM
Mid-Condamine IQQM
Upper Condamine IQQM
Moonie IQQM
St George WSS
Macintyre Brook IQQM
Lower Balonne IQQM
Border Rivers IQQM
Warrego IQQM
Gwydir IQQM
Paroo IQQM
Namoi IQQM
Models indicated in green are not linked in IRSMF
Peel IQQM
Barwon-Darling IQQM
Macquarie-Castlereagh IQQM
Lachlan IQQM
BigMOD
Murrumbidgee IQQM
ACT Water Supply REALM
Upper Murrum-bidgee IQQM
Murray Simulation Model
Coorong Model
Snowy Hydro SIMV9
Wimmera REALM
Goulburn Simulation Model (REALM)
Loddon/Campaspe/Goulburn-Broken
Ovens REALM

Table 1 – List of models used for Basin Plan modelling and their previous use

Valley	Model	Developed by	Model previously used for
Paroo	IQQM	DERM, Queensland	Development of Resource Operations Plan
Warrego	IQQM	DERM, Queensland	Development of Resource Operations Plan
Upper Condamine	IQQM	DERM, Queensland	Development of Resource Operations Plan
Mid Condamine	IQQM	DERM, Queensland	Development of Resource Operations Plan
St George		DERM, Queensland	Development of Resource Operations Plan
Nebine	IQQM	DERM, Queensland	Development of Resource Operations Plan
Lower Balonne	IQQM	DERM, Queensland	Development of Resource Operations Plan
Moonie	IQQM	DERM, Queensland	Development of Resource Operations Plan
Macintyre Brook	IQQM	DERM, Queensland	Development of Resource Operations Plan
Border Rivers	IQQM	DERM, Queensland and Office of Water, NSW	Development of Resource Operations Plan and Water Sharing Plan
Gwydir	IQQM	Office of Water, NSW	Water Sharing Plan and MDB Cap
Peel	IQQM	Office of Water, NSW	Water Sharing Plan and MDB Cap
Namoi	IQQM	Office of Water, NSW	Water Sharing Plan and MDB Cap
Macquarie	IQQM	Office of Water, NSW	Water Sharing Plan and MDB Cap
Barwon Darling	IQQM	Office of Water, NSW	MDB Cap
Lachlan	IQQM	Office of Water, NSW	Water Sharing Plan and MDB Cap
Upper Murrumbidgee	IQQM	CSIRO	MDBSY study
Murrumbidgee	IQQM	Office of Water, NSW	Water Sharing Plan and MDB Cap
Murray	MSM	MDBA	MDB Cap, other system management policies development and water recovery assessments
Murray	BIGMOD	MDBA	Basin Salinity Management Strategy, other system management policies development and water recovery assessments
Goulburn-Broken-Campaspe-Loddon	GSM	Department of Sustainability, Victoria	Bulk entitlements, Cap and Water Recovery assessments
Snowy-Hydro	SIM-V9	SMHEA	Snowy transfers to Murray and Murrumbidgee systems
Coorong	Coorong	CSIRO	Coorong salinity and health assessments
Wimmera	GSM	Department of Sustainability, Victoria	Bulk entitlements, Cap and Water Recovery assessments
Framework linking above models	IRSMF	CSIRO	MDBSY Study

Cap – Murray Darling Basin Ministerial Cap on water use

DERM- Department of Environment, Resources and Minerals, Queensland

NSW – New South Wales

IQQM – Integrated Quantity and Quality Model

GSM – Goulburn Simulation Model

MSM – A monthly time step simulation model for the Murray and Lower Darling System Model

BIGMOD – A daily time step model for the Murray and Lower Darling System

Standing Committee on Regional Australia: Request for historical diversions and water allocations data for the Murray-Darling Basin

In addition to the questions for which a response has been requested, the Standing Committee on Regional Australia, during earlier private briefing, had requested historical diversions and allocations data from MDBA.

Attached are spreadsheets (Attachment B1) with water course diversions and allocations announced data available with MDBA. These spreadsheets contain annual water course diversions from the Murray-Darling Basin by NSW, Victoria, South Australia, Queensland and ACT. Also annual water course diversion data and maximum water allocation announced for each individual valley for the period 1997/98 onwards is included. This diversion data corresponds to water course diversions reported under the Murray-Darling Basin Ministerial Cap and does not include interceptions. More detailed data for water extractions by different uses within valleys may be available with State Agencies.

Australian Capital Territory

System	Australian Capital Territory Diversion (GL/y)
1997-98	44.2
1998-99	23.2
1999-00	26.5
2000-01	33.8
2001-02	36.4
2002-03	40.1
2003-04	27.8
2004-05	27.4
2005-06	32.0
2006-07	25.0
2007-08	15.6
2008-09	18.5
2009-10	20.6

Queensland

System	Condamine/ Balonne Diversion (GL/y)	Border Rivers/ Macintyre Brook Diversion (GL/y)	Moonie Diversion (GL/y)	Nebine Diversion (GL/y)	Warrego Diversion (GL/y)	Paroo Diversion (GL/y)	Total Queensland Diversion (GL/y)
1997-98	544.9	185.7	8.3	0.0	2.0	0.0	741
1998-99	467.1	123.2	8.1	0.0	10.2	0.0	609
1999-00	366.4	162.7	8.2	0.0	3.5	0.0	541
2000-01	360.4	288.1	30.6	0.0	9.2	0.0	688
2001-02	161.6	163.3	5.7	0.0	10.5	0.0	341
2002-03	123.1	78.0	6.1	0.0	7.2	0.0	214
2003-04	575.0	203.7	25.8	0.0	10.8	0.1	815
2004-05	167.0	191.6	23.2	0.0	10.5	0.1	392
2005-06	186.2	124.7	2.3	0.1	3.1	0.0	316
2006-07	57.4	70.8	9.4	0.2	20.6	2.0	160
2007-08	775.8	209.7	41.5	0.1	23.1	4.0	1054
2008-09	189.9	156.7	29.0	0.1	6.0	1.0	383
2009-10	1049.3	122.3	42.6	1.0	15.4	1.6	1232

South Australia

System	Metro-Adelaide & Associated Country Areas Diversion (GL/y)	Lower Murray Swamps Diversion (GL/y)	Country Towns Diversion (GL/y)	All Other Uses of Water from the River Murray Diversion (GL/y)	Combined AOP + Swamps Diversion (GL/y)	Combined AOP + Swamps allocation (%)	Total South Australia Diversion (GL/y)
1997-98	153.1	91.6	35.2	384.2	475.8	na	664
1998-99	152.9	90.8	36.4	409.2	500.0	na	689
1999-00	138.7	89.7	36.5	377.2	466.9	na	642
2000-01	103.6	89.5	37.9	430.6	520.1	na	662
2001-02	82.5	90.1	35.5	412.6	502.7	100	621
2002-03	164.7	89.2	39.2	443.2	532.4	100	736
2003-04	82.1	67.4	35.4	422.5	489.9	95	607
2004-05	71.6	56.9	38.5	453.3	510.2	95	620
2005-06	73.9	58.7	40.3	417.0	475.7	100	590
2006-07	203.1	27.1	40.9	355.1	382.2	60	626
2007-08	89.4	14.7	37.0	281.5	296.2	32	423
2008-09	149.5	10.2	37.0	288.2	298.4	18	485
2009-10	56.9	14.3	37.6	371.6	385.9	62	480

Victoria

System	Goulburn/Broken/ Loddon		Campaspe		Wimmera-Mallee		Murray/Kiewa/Ovens		Total Victoria Diversion (GL/y)
	Diversion (GL/y)	Goulburn Allocation (%)	Diversion (GL/y)	Allocation (%)	Diversion (GL/y)	Allocation (%)	Diversion (GL/y)	Murray Allocation (%)	
1997-98	1909	120	96	na	184	na	1743	130	3932
1998-99	1699	100	76	na	159	na	1804	200	3738
1999-00	1553	100	73	na	103	na	1555	190	3285
2000-01	1569	100	113	na	68	na	1712	200	3461
2001-02	1700	100	124	na	84	na	1916	200	3824
2002-03	1076	57	74	na	60	na	1755	100	2965
2003-04	1596	100	73	na	66	na	1478	100	3212
2004-05	1553	100	40	39	50	na	1493	100	3136
2005-06	1592	100	22	31	60	na	1578	100	3252
2006-07	651	29	14	0	19	na	1406	95	2090
2007-08	684	57	26	18	45	na	801	43	1555
2008-09	628	33	26	0	11	na	837	35	1503
2009-10	804	71	26	0	9	na	971	100	1809

New South Wales

Water Year	Intersecting Streams		Border Rivers		Gwydir		Namoi/ Peel		Macquarie/ Castlereagh/ Bogan		Barwon-Darling/ Lower Darling		Lachlan		Murrumbidgee		Murray		Total NSW Diversion (GL/y)
	Diversion (GL/y)	Allocation (%)	Diversion (GL/y)	Allocation (%)	Diversion (GL/y)	Allocation (%)	Diversion (GL/y)	Allocation (%)	Diversion (GL/y)	Allocation (%)	Diversion	Lower Darling Allocation	Diversion (GL/y)	Allocation (%)	Diversion (GL/y)	Allocation (%)	Diversion (GL/y)	Allocation (%)	
1997-98	3.3	na	202	100/55	532	82	305	100	442	10	266	100	429	65	2585	90	1890	84	6655
1998-99	3.3	na	182	100/35	306	121#	322	149#	396	100	428	100	293	100	2505	85	2000	93	6435
1999-00	3.3	na	197	100/60	448	103	350	133	437	100	260	100	301	74	1875	78	1234	35	5105
2000-01	3.3	na	247	100/40	424	94	355	161	522	100	487	100	423	84	2747	90	2070	95	7279
2001-02	3.3	na	198	49#	462	45	363	89	597	90	202	100	457	58	2348	72	2113	105	6745
2002-03	3.3	na	137	12	238	0	294	10	411	0	127	100	253	3	1793	38	879	10	4135
2003-04	3.3	na	120	49	169	24	173	46	219	19	293	30	59	0	1775	41	1312	55	4122
2004-05	3.3	na	125	48	165	26	190	38	102	9	186	100	36	0	1618	40	1241	49	3666
2005-06	3.3	na	152	45	230	23	234	22	224	44	199	100	128	19	2200	54	1667	63	5038
2006-07	3.3	na	146	21	139	2	166	2	252	0	17	0	73	0	960	10	602	0	2358
2007-08	3.3	na	131	25	89	21	142	13	75	5	221	50	46	0	515	13	244	0	1466
2008-09	3.3	na	137	30	154	7	188	25	106	10	159	50	40	0	602	21	341	9	1729
2009-10	3.3	na	115	31	57	7	170	22	109	0	156	25	26	0	910	14	439	10	1985

- Continuous accounting was introduced in these valleys from this year and from this year onwards allocation reported is valley account balance at the end of water year.

Annual water course diversions for each State (GL/y)

Water Year	New South Wales	Victoria	South Australia	Australian Capital Teritory	Queensland	Water Year	New South Wales	Victoria	South Australia	Australian Capital Teritory	Queensland
1920						1966	3696	3405	420		
1921		842				1967	4048	3589	474		
1922		996	83			1968	3402	3813	589		
1923	707	1125	94			1969	3012	2896	416		
1924	1000	1174	87			1970	3633	3338	509		
1925	709	1385	81			1971	3758	3480	472		
1926	1057	1524	101			1972	4908	3601	493		
1927	842	1717	121			1973	4792	3750	555		
1928			131			1974	2496	1982	285		
1929	757	2001	157			1975	3948	3124	396		
1930	887	2106	164			1976	3882	3433	465		
1931	1193	1834	143			1977	5273	3991	603		
1932	1363	1507	137			1978	6994	3896	675		
1933	922	1683	135			1979	4768	3326	481		
1934	812	1807	163			1980	5881	3683	492		
1935	1206	2022	156			1981	5704	3785	593		
1936	1158	1953	157			1982	5832	3920	519		
1937	767	2249	165			1983	5099	3802	707		
1938	1051	2310	176			1984	5355	2803	508	12	
1939	703	2190	186			1985	6425	3847	547	37	
1940	772	1813	194			1986	6488	3567	568	35	
1941	1045	2556	199			1987	6180	3468	454	35	
1942	1054	2593	182			1988	6986	4251	521	41	
1943	905	2232	187			1989	5872	3188	548	32	
1944	1163	2455	215			1990	6057	3772	580	35	
1945	1077	2465	243			1991	6776	4408	627	46	
1946	887	2425	205			1992	7297	4434	589	28	
1947	1325	2382	187			1993	5526	2808	482	17	
1948	1115	2307	194			1994	5882	3421	587	28	
1949	1101	2435	228			1995	6419	4832	663	32	
1950	1074	1989	225			1996	6039	3985	568	23	515
1951	1064	2410	233			1997	7759	4108	600	30	456
1952	2463	2647	195			1998	6655	3932	664	44.2	741
1953	1096	2725	234			1999	6435	3738	689	23.2	609
1954	1494	2744	203			2000	5105	3285	642	26.5	541
1955	1575	3038	253			2001	7279	3461	662	33.8	688
1956	867	2012	235			2002	6745	3824	621	36.4	341
1957	1444	2382	182			2003	4135	2965	736	40.1	214
1958	2047	3695	305			2004	4122	3212	607	27.8	815
1959	1693	2692	321			2005	3666	3136	620	27.4	392
1960	2667	3629	338			2006	5038	3252	590	32.0	316
1961	1928	2888	284			2007	2358	2090	626	25.0	160
1962	2893	3396	369			2008	1466	1555	423	15.6	1054
1963	2865	3179	365			2009	1729	1503	485	18.5	383
1964	2889	3199	333			2010	1985	1809	480	20.6	1232
1965	3405	3175	359								

Attachment C

Subject: House of Representatives Standing Committee on Regional Australia: some additional questions from the Chair

Question 3

Appropriation Bill No 3 presented on 24 February 2011 shows a new appropriation for $26,613,000. What will this new appropriation be used for, is it additional to the standing appropriation voted on by Parliament last year?

Answer

The new funding of $26.613m is additional funding to the standing appropriation provided by Parliament in the 2010-11 Budget and has been provided for the following purposes:

1) Additional Basin Planning funding of $19.145m for the development of the Basin Plan, including research and knowledge activities, consultation and engagement activities and Basin Plan corporate overheads.
2) The Australian government contribution of $3.333m to undertake the upgrade to the Hume Dam spillway southern training wall. In 2010-11 there are also contributions from NSW ($3.8m), Victoria ($3.5m) and South Australia ($2.7m) for this project which are included in the "Other Revenue" figure in the Financial Statements on page 94 of the Portfolio Additional Estimates Statements 2010-11.
3) Additional interest equivalency for 2009-10 year of $4.135m. In the 2009-10 budget MDBA was appropriated $9.205m for interest equivalency based on the estimated balance in MDBA Special Account during 2009-10. As a result of higher than expected balances in the special account during the year a further $4.135m for interest equivalency has been provided to the MDBA.

Attachment D

Subject: House of Representatives Standing Committee on Regional Australia: some additional questions from the Chair

Question 4

What is the cost of the recently commissioned social and economic studies? What is the timeframe for this work, its terms of reference, is the timeframe adequate?

Answer

The MDBA has three recently commissioned projects which are yet to finally report. These are:

1. Assessment of local community impacts of proposals for the Murray-Darling Basin Plan

The objectives of this project being undertaken by a consortium led by Environment and Behaviour Consultants are to:

a) engage community leaders and acknowledge and report on the likely implications of the *Guide* proposals on affected local communities in the Basin

b) provide information that may also be useful to governments, parliamentary inquiries and others interested in understanding the extent of impacts and considering potential mitigation strategies

c) focus on enhancing the information base on the short run and transitional impacts of the *Guide* proposals for SDLs and on the flow-on effects for local community businesses and service provision, including how these may be affected by mitigation strategies.

These outcomes would then inform development of the proposed Basin Plan and, in particular:

d) the setting of the Basin-wide and regional SDLs the determination of transitional provisions.

The cost of this project is $1,646,382m (incl GST).

A report on this project is scheduled to be delivered to the MDBA on 15 March. However, because consultations have not been able to occur in some flood-affected areas, in particular Queensland but also delayed in parts of Victoria and NSW, the report will be incomplete and it is anticipated that an addendum will be made available by late April.

2. Benefits and costs of the proposed Basin Plan: analysis of alternative SDL scenarios

The purpose of this project being undertaken by the Centre for International Economics (The CIE) is to conduct a benefit cost analysis (BCA) of three sustainable diversion limit scenarios proposed in the Murray-Darling Basin Authority's *Guide to the proposed Basin Plan*. The study aims to provide a better understanding of the potential costs and benefits between economic, social and environmental outcomes from each of these SDL scenarios.

The cost of this project is $180,593 (incl GST).

A final report is expected by the end of March.

3. Lower Lakes Social Impacts Case Study

The objective of this project being undertaken by Dr Jonathon Sobels from Flinders University is to assess the social and some economic impacts of reduced access to Murray River water on the communities of the Murray River delta, comprising the Lakes Alexandrina and Albert and the Coorong and Murray Mouth, collectively referred to as the 'Lower Lakes'.

The cost of this project is $30,250 (incl GST).

A final report is expected in early March.