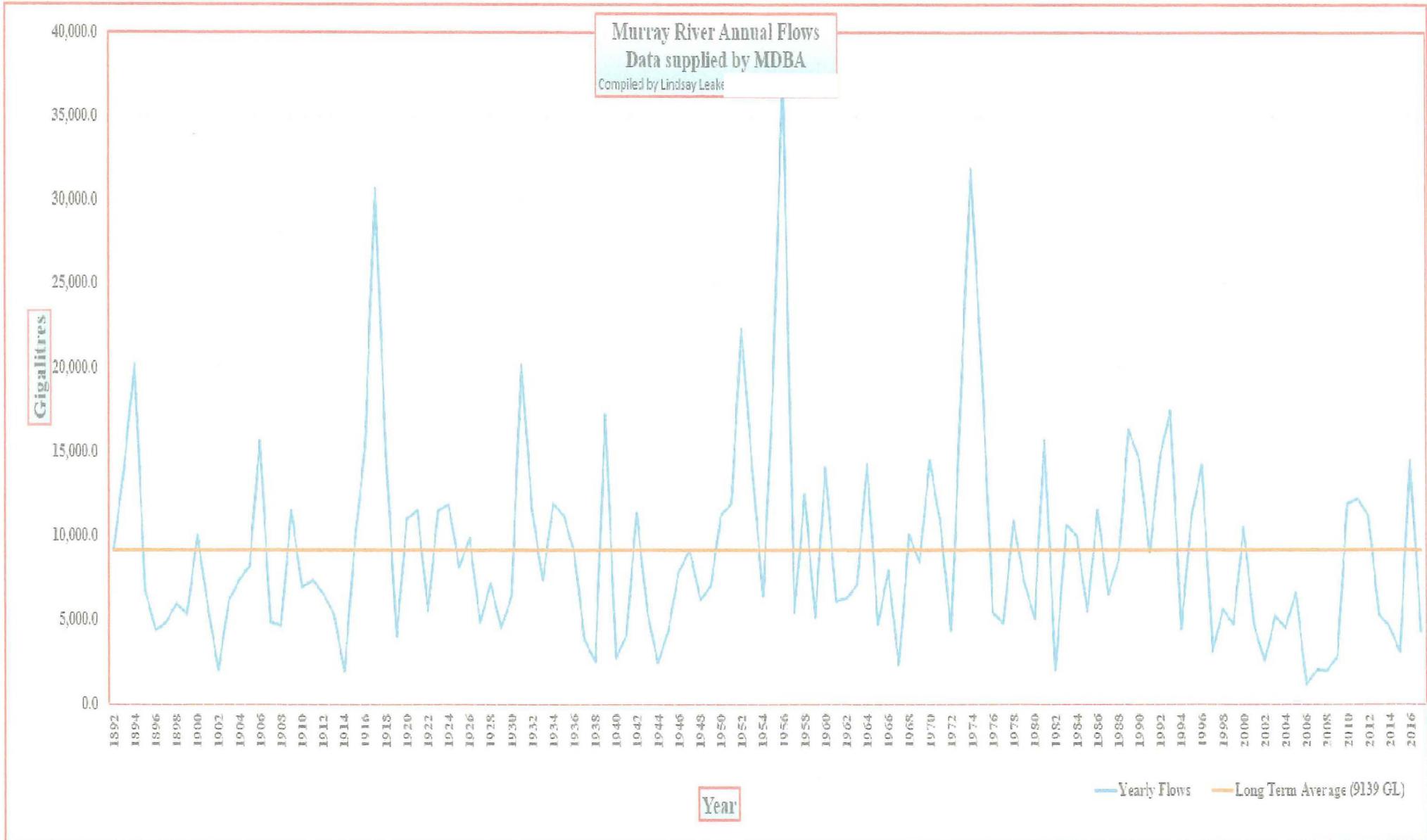


24/5/2018

To whom it may concern;

The enclosed graphs and data have been compiled by myself to highlight the substantial decrease in flows into rivers in southern Australia they are as follows;

1. Murray System Inflows (excl. Snowy, Darling, Inter-valley trade and Environmental Inflows).
 - a. I have obtained from MDBA annual inflow figures and compiled graphs showing:
 - i. 5,10,20,30,40-year moving average inflows
 - ii. 5,10,20,30,40-year block average inflows (where there is a balance of years less than the number of years I have used the balance number of years)
 - iii. I have also included the calculations
2. Perth dam Inflows
 - a. Graph titled "Changes in rain and Water Supply" obtained from Professor Mike Young Adelaide University showing the relationship between decrease in rainfall and decrease in inflows.
 - b. Graph obtained from Water Corporation Perth web site (link shown on graph from Water Corp)
 - c. Graphs for Annual, 5,10,20,30,40-year moving averages
 - d. Graphs for 5,10,20,30,40-year Block average.
3. Grampians Wimmera, Mallee (Wimmera-Mallee System Headworks).
 - a. Graph obtained from Goulburn Wimmera Mallee Water web site (link is at bottom of graph).
 - b. Estimations of flows calculated by overlaying graph on excel spreadsheet (within 1% of GWM figures)
 - c. Graphs for Annual, 5,10,20,30,40-year moving averages
 - d. Graphs for 5,10,20,30,40-year Block average.
4. In my opinion these graphs quite clearly show that in recent years that there has been a significant deterioration in the inflows into these three river systems, which I believe is reasonable to attribute to climate change, and there needs to be added in the calculations for the availability of water to meet the needs of the Murray Darling Basin Plan a significantly large margin for error.

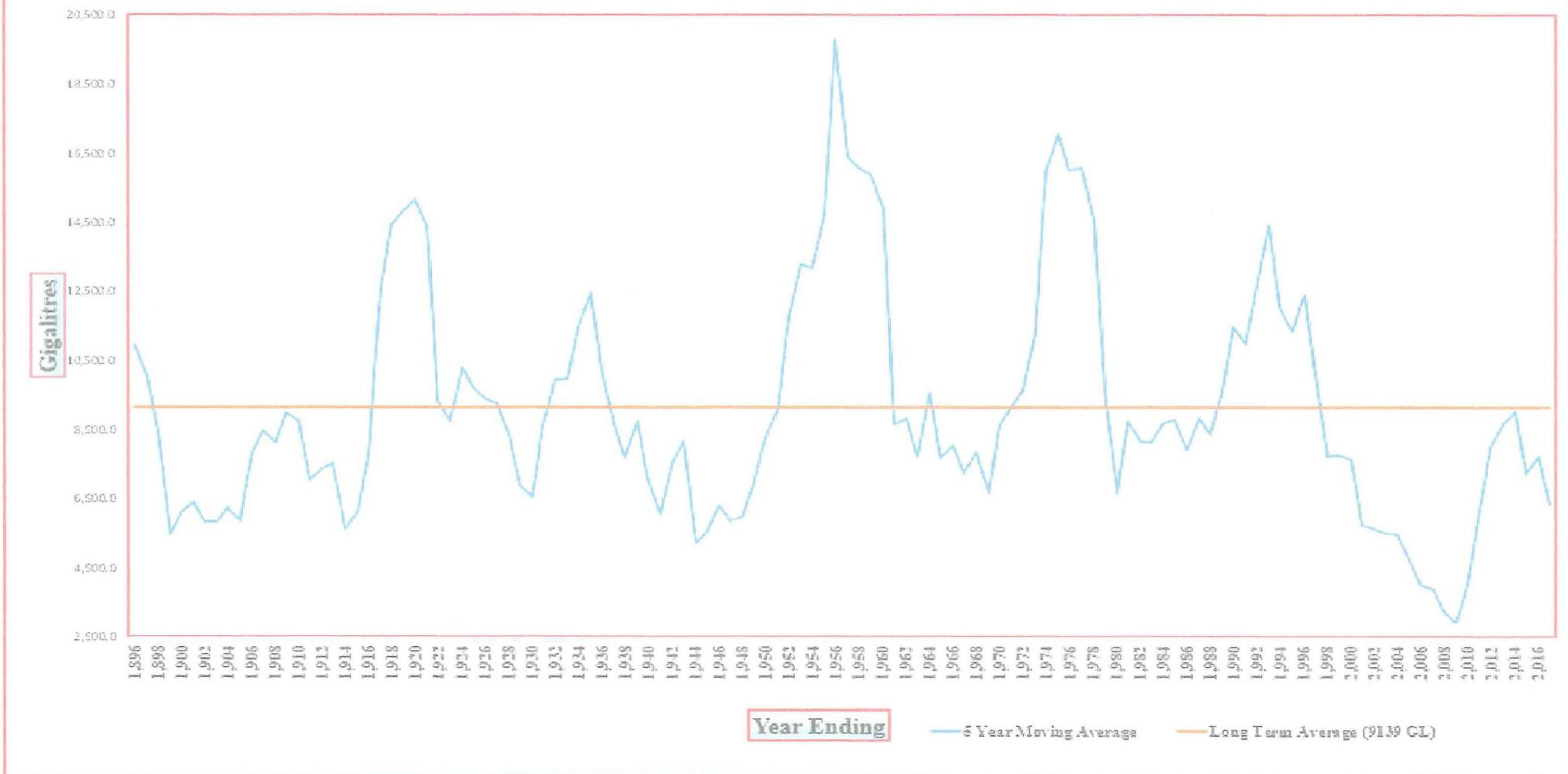


Compiled by **Lindsay Leake**

Murray River Inflows 5 Year Moving Average

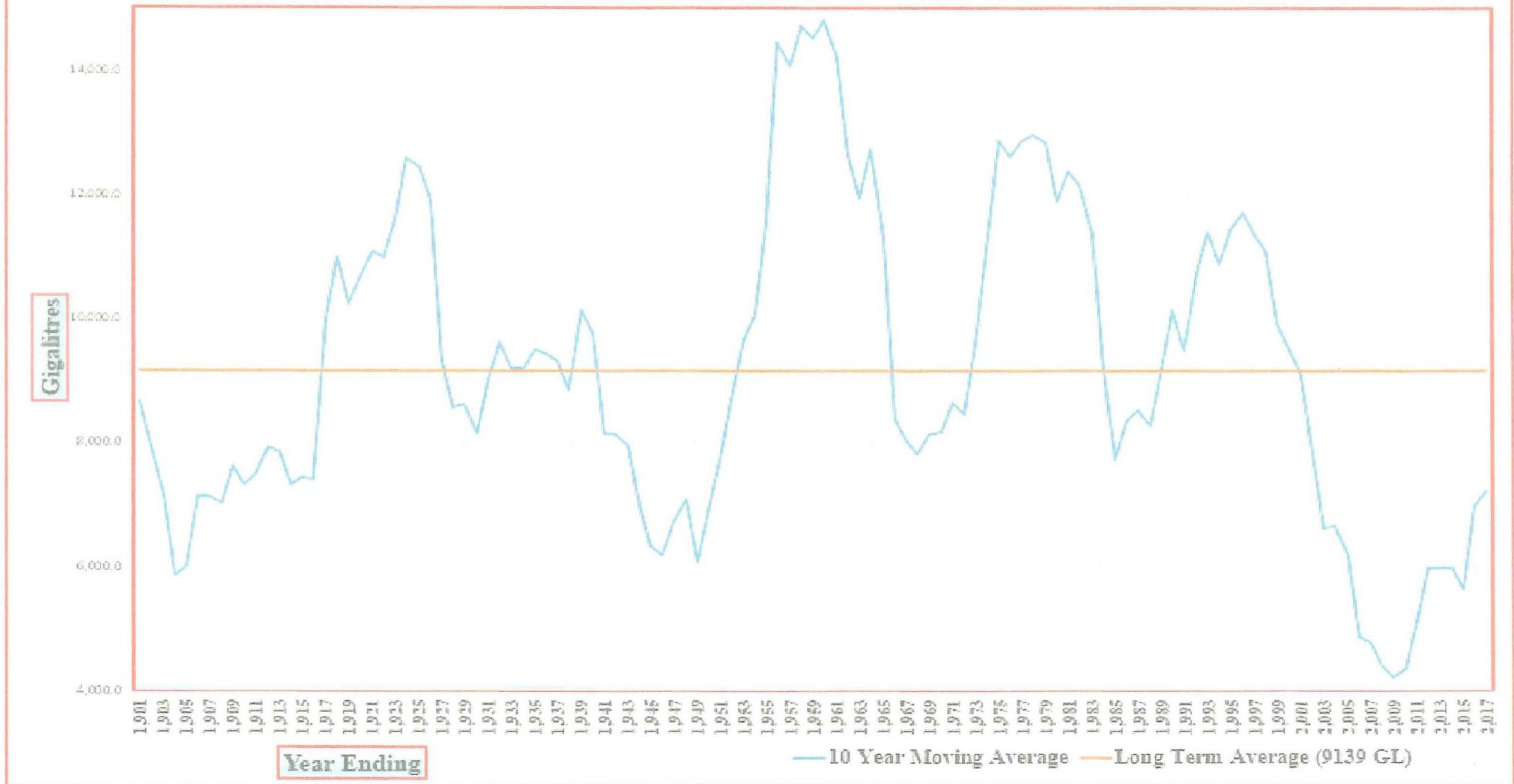
Data Supplied by MDBA

compiled by Lindsay Leake (



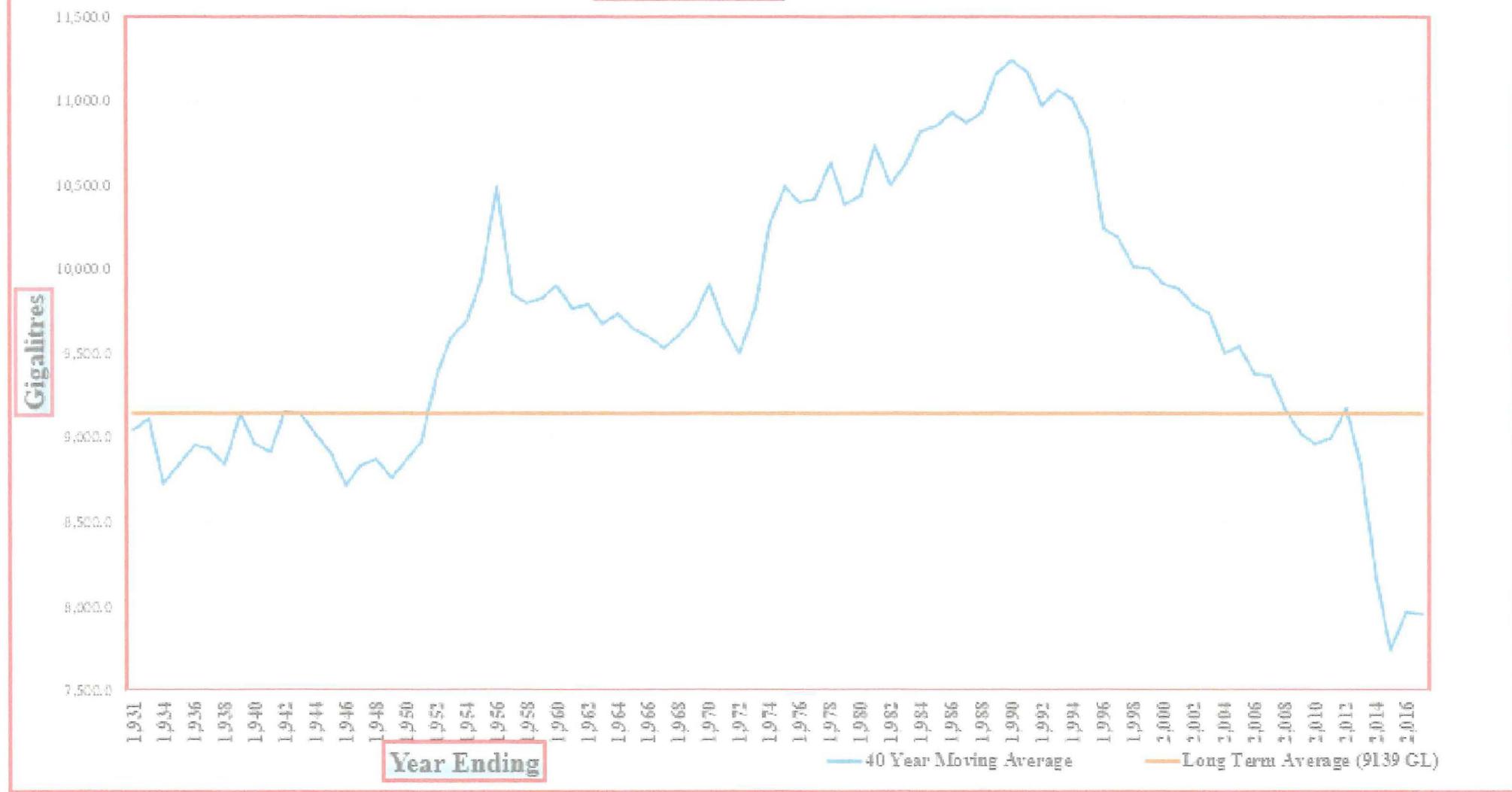
Compiled by Lindsay Leake

Murray River Inflows
10 Year Moving Average
Data Supplied by MDFA
Compiled by Lindsay Leake



Compiled by Lindsay Leake

Murray River Inflows
40 Yr Moving Average
Data supplied by MDBA
Compiled by Lindsay Leake



Compiled by Lindsay Leake

Long Term Average 1892-2017

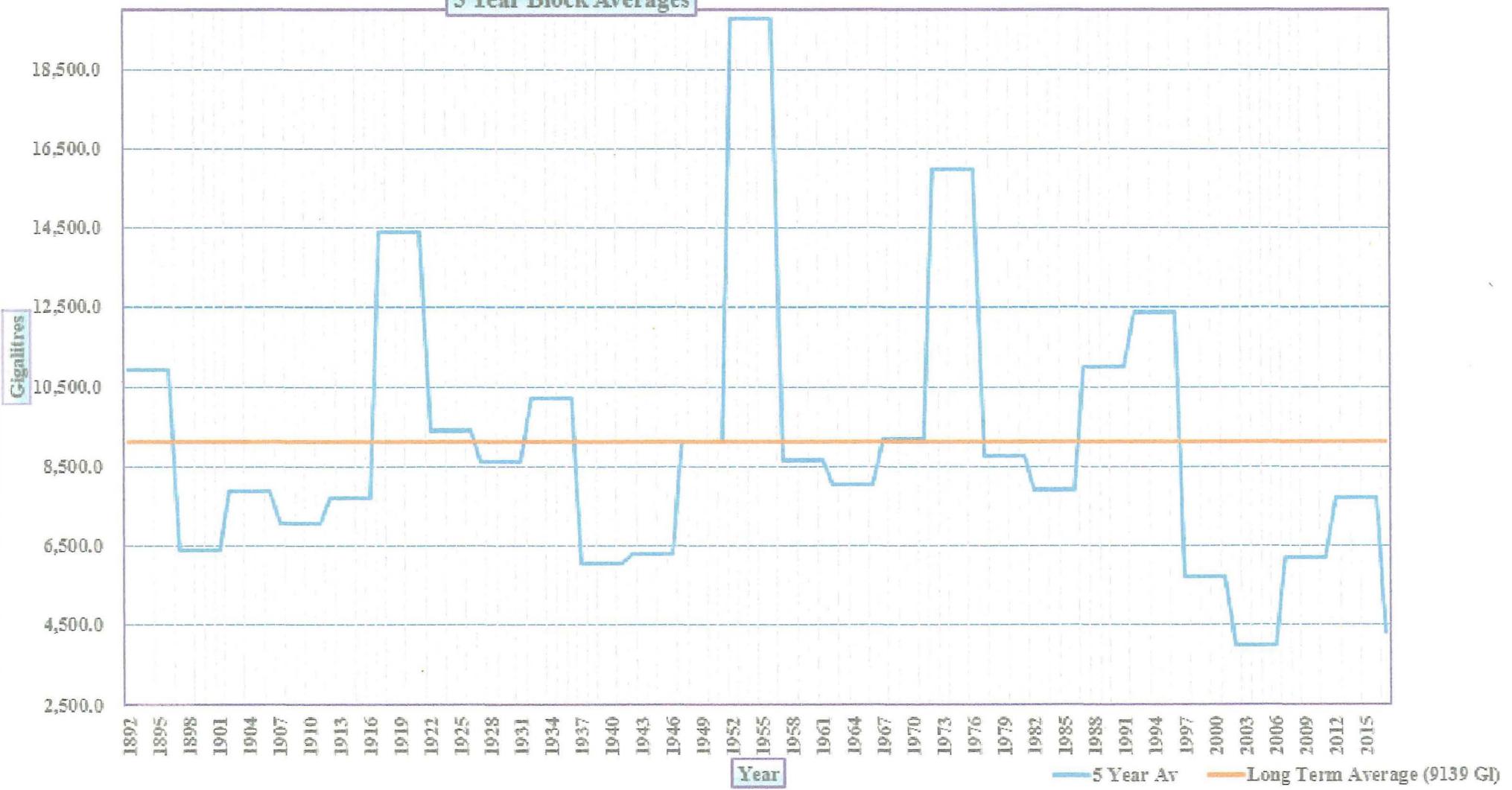
Gigalitres

9139.4

Average Inflow years ending 2017	Shortfall
5 Years	6343.5
10 Years	7187.2
20 Years	5972.6
30 Years	7765.0
40 Years	7950.5

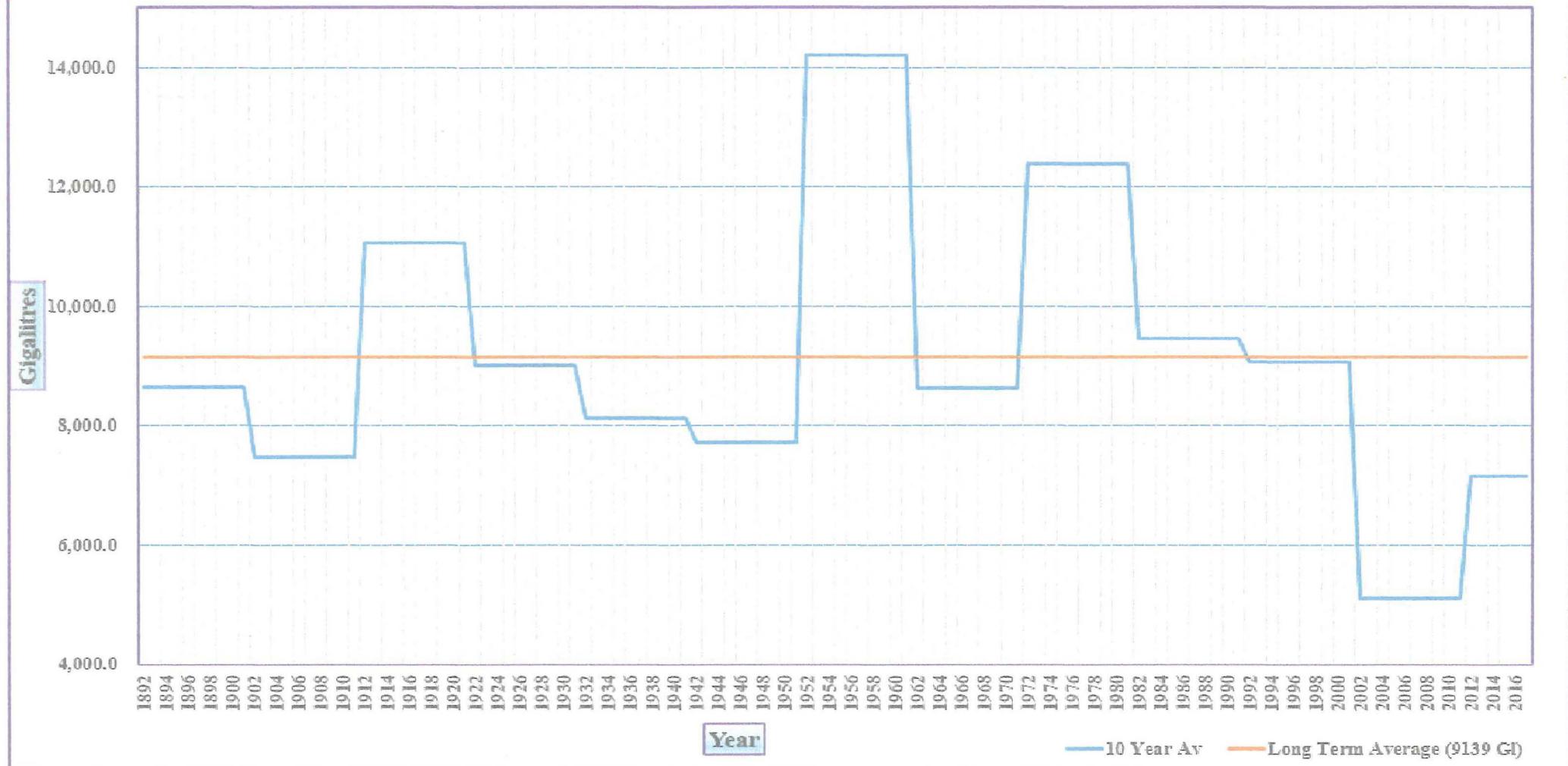
Compiled by Lindsay Leake

Murray Inflows
Source MDBA
5 Year Block Averages



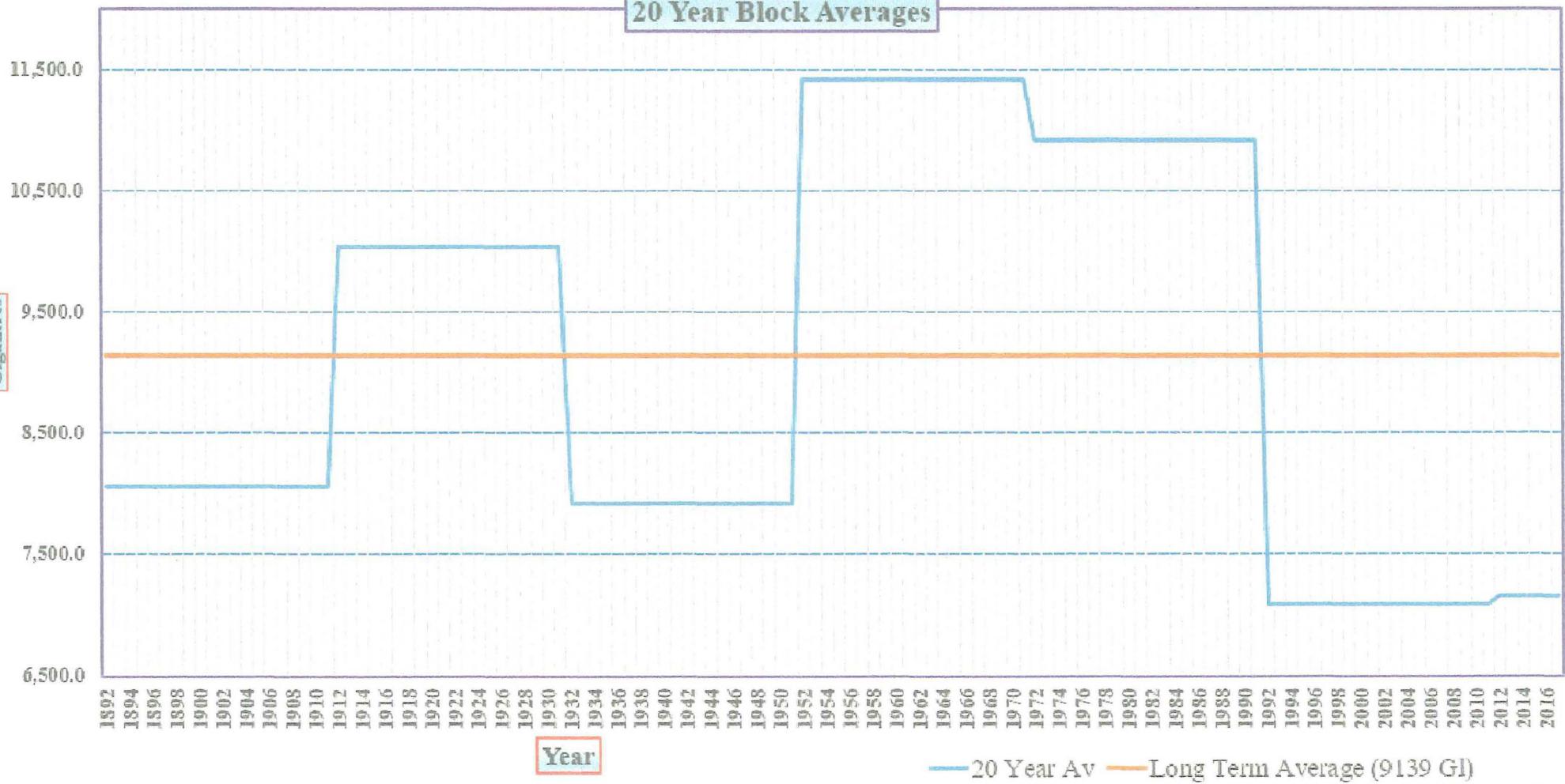
Compiled by Lindsay Leake

Murray Inflows
Source MDBA
10 Year Block Averages

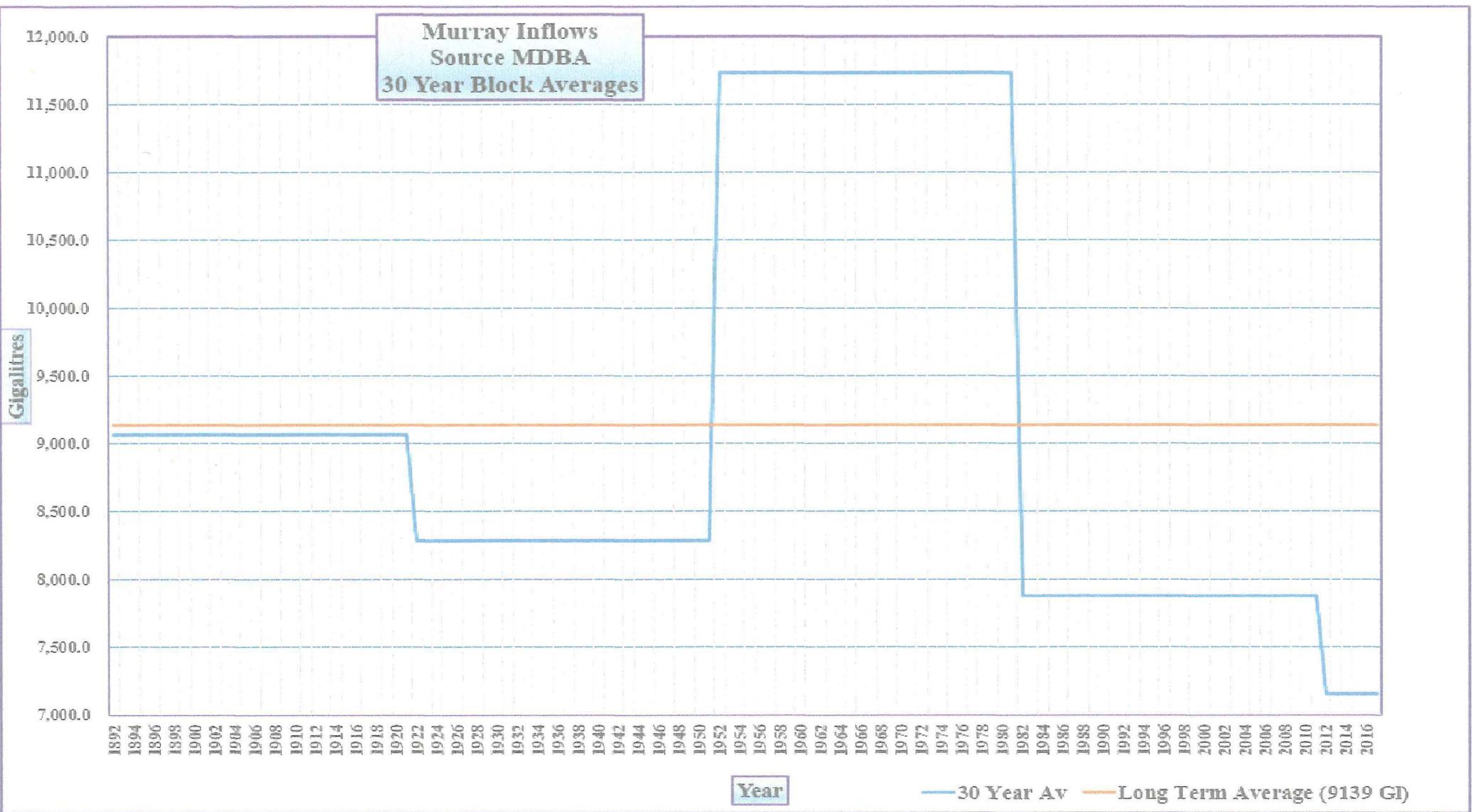


Compiled by Lindsay Leake

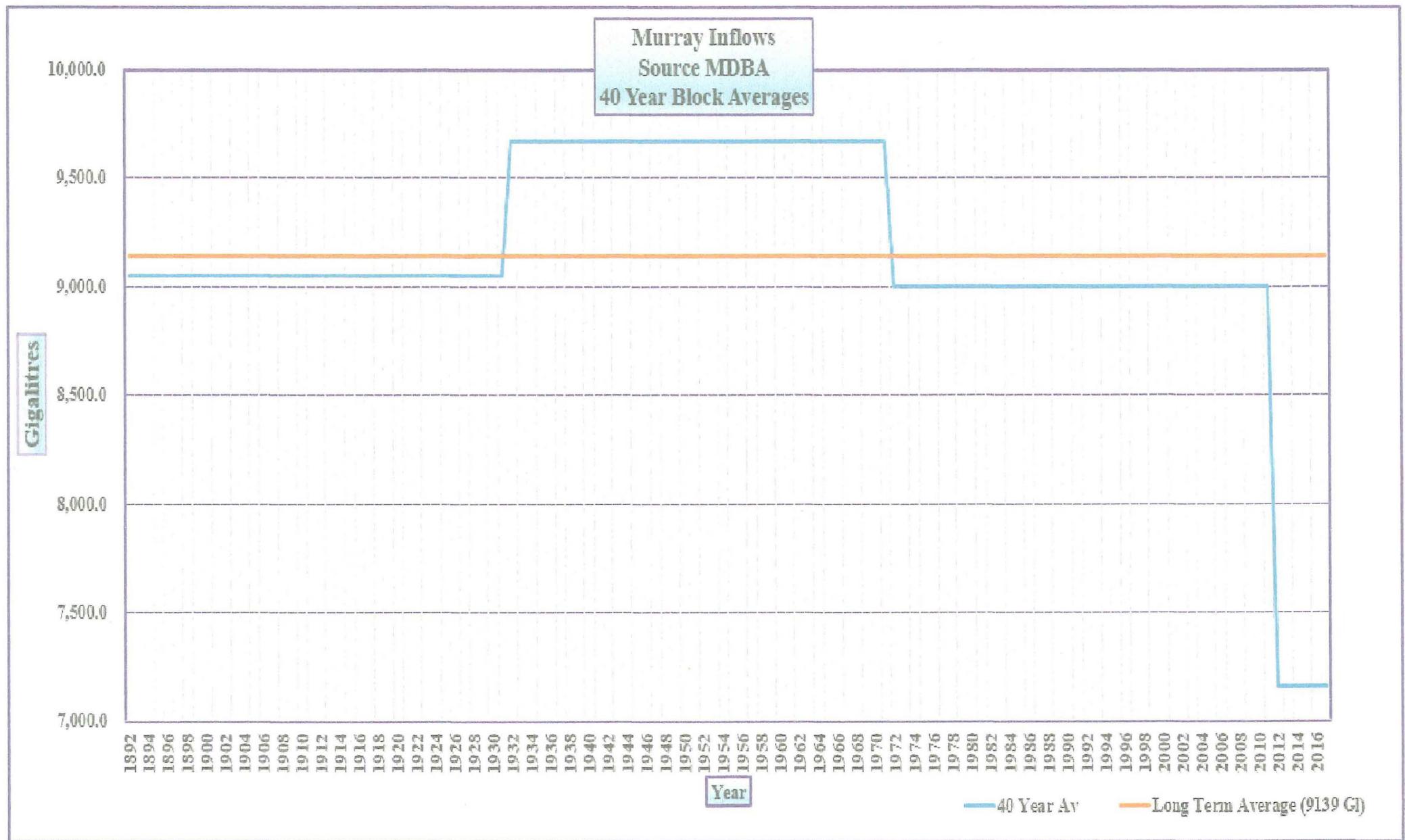
Murray Inflows
Source MDBA
20 Year Block Averages



Compiled by Lindsay Leake



Compiled by Lindsay Leake



Compiled by Lindsay Leake

Murray Inflows 1892 to 2017 (Base data supplied by MDBA)

Long Term Average (9139 GI)	Year	Gigalitres	5 Year Av	10 Year Av	20 Year Av	30 Year Av	40 Year Av
9139	1892	9,221.9		10,921.4	8,659.2	8,063.3	9,062.3
9139	1893	14,048.5		10,921.4	8,659.2	8,063.3	9,062.3
9139	1894	20,216.5		10,921.4	8,659.2	8,063.3	9,062.3
9139	1895	6,766.7		10,921.4	8,659.2	8,063.3	9,062.3
9139	1896	4,353.6	10,921.4	10,921.4	8,659.2	8,063.3	9,047.5
9139	1897	4,895.2		6,397.0	8,659.2	8,063.3	9,047.5
9139	1898	5,995.8		6,397.0	8,659.2	8,063.3	9,047.5
9139	1899	5,345.4		6,397.0	8,659.2	8,063.3	9,062.3
9139	1900	9,978.7		6,397.0	8,659.2	8,063.3	9,062.3
9139	1901	5,769.8	6,397.0	6,397.0	8,659.2	8,063.3	9,062.3
9139	1902	1,995.7		7,870.2	7,467.4	8,063.3	9,062.3
9139	1903	6,125.6		7,870.2	7,467.4	8,063.3	9,047.5
9139	1904	7,364.8		7,870.2	7,467.4	8,063.3	9,062.3
9139	1905	8,187.3		7,870.2	7,467.4	8,063.3	9,047.5
9139	1906	15,677.7	7,870.2	7,870.2	7,467.4	8,063.3	9,062.3
9139	1907	4,901.7		7,064.5	7,467.4	8,063.3	9,062.3
9139	1908	4,667.9		7,064.5	7,467.4	8,063.3	9,047.5
9139	1909	11,501.5		7,064.5	7,467.4	8,063.3	9,062.3
9139	1910	6,919.1		7,064.5	7,467.4	8,063.3	9,047.5
9139	1911	7,332.2	7,064.5	7,064.5	7,467.4	7,467.4	8,063.3
9139	1912	6,505.3		7,722.5	11,060.2	10,031.7	9,062.3
9139	1913	5,358.2		7,722.5	11,060.2	10,031.7	9,062.3
9139	1914	1,984.7		7,722.5	11,060.2	10,031.7	9,062.3
9139	1915	9,480.6		7,722.5	11,060.2	10,031.7	9,062.3
9139	1916	15,283.9	7,722.5	7,722.5	11,060.2	10,031.7	9,062.3
9139	1917	30,699.5		14,397.9	11,060.2	10,031.7	9,062.3
9139	1918	14,706.3		14,397.9	11,060.2	10,031.7	9,062.3
9139	1919	4,015.1		14,397.9	11,060.2	10,031.7	9,062.3
9139	1920	11,061.2		14,397.9	11,060.2	10,031.7	9,062.3
9139	1921	11,507.3	14,397.9	14,397.9	11,060.2	10,031.7	9,062.3
9139	1922	5,531.5		9,390.7		9,003.2	10,031.7
9139	1923	11,543.4		9,390.7		9,003.2	8,284.4

9139	1924	11,879.5		9,390.7		9,003.2		10,031.7		8,284.4		9,047.5
9139	1925	8,150.8		9,390.7		9,003.2		10,031.7		8,284.4		9,047.5
9139	1926	9,848.3	9,390.7	9,390.7		9,003.2		10,031.7		8,284.4		9,047.5
9139	1927	4,879.9		8,615.7		9,003.2		10,031.7		8,284.4		9,047.5
9139	1928	7,139.5		8,615.7		9,003.2		10,031.7		8,284.4		9,047.5
9139	1929	4,498.5		8,615.7		9,003.2		10,031.7		8,284.4		9,047.5
9139	1930	6,371.7		8,615.7		9,003.2		10,031.7		8,284.4		9,047.5
9139	1931	20,189.0	8,615.7	8,615.7	9,003.2	9,003.2	10,031.7	10,031.7		8,284.4	9,047.5	9,047.5
9139	1932	11,483.1		10,208.0		8,136.3		7,925.0		8,284.4		9,671.7
9139	1933	7,360.6		10,208.0		8,136.3		7,925.0		8,284.4		9,671.7
9139	1934	11,953.5		10,208.0		8,136.3		7,925.0		8,284.4		9,671.7
9139	1935	11,204.6		10,208.0		8,136.3		7,925.0		8,284.4		9,671.7
9139	1936	9,038.1	10,208.0	10,208.0		8,136.3		7,925.0		8,284.4		9,671.7
9139	1937	3,845.8		6,064.7		8,136.3		7,925.0		8,284.4		9,671.7
9139	1938	2,484.5		6,064.7		8,136.3		7,925.0		8,284.4		9,671.7
9139	1939	17,203.7		6,064.7		8,136.3		7,925.0		8,284.4		9,671.7
9139	1940	2,713.2		6,064.7		8,136.3		7,925.0		8,284.4		9,671.7
9139	1941	4,076.2	6,064.7	6,064.7	8,136.3	8,136.3	7,925.0		8,284.4		9,671.7	
9139	1942	11,380.4		6,302.6		7,713.6		7,925.0		8,284.4		9,671.7
9139	1943	5,471.0		6,302.6		7,713.6		7,925.0		8,284.4		9,671.7
9139	1944	2,473.7		6,302.6		7,713.6		7,925.0		8,284.4		9,671.7
9139	1945	4,351.1		6,302.6		7,713.6		7,925.0		8,284.4		9,671.7
9139	1946	7,836.7	6,302.6	6,302.6		7,713.6		7,925.0		8,284.4		9,671.7
9139	1947	9,181.8		9,124.6		7,713.6		7,925.0		8,284.4		9,671.7
9139	1948	6,195.8		9,124.6		7,713.6		7,925.0		8,284.4		9,671.7
9139	1949	7,024.1		9,124.6		7,713.6		7,925.0		8,284.4		9,671.7
9139	1950	11,269.1		9,124.6		7,713.6		7,925.0		8,284.4		9,671.7
9139	1951	11,952.2	9,124.6	9,124.6	7,713.6	7,713.6	7,925.0	7,925.0	8,284.4	8,284.4		9,671.7
9139	1952	22,299.7		19,772.5		14,212.3		11,418.4		11,735.8		9,671.7
9139	1953	13,946.5		19,772.5		14,212.3		11,418.4		11,735.8		9,671.7
9139	1954	6,374.9		19,772.5		14,212.3		11,418.4		11,735.8		9,671.7
9139	1955	18,913.8		19,772.5		14,212.3		11,418.4		11,735.8		9,671.7
9139	1956	37,327.7	19,772.5	19,772.5		14,212.3		11,418.4		11,735.8		9,671.7
9139	1957	5,407.2		8,652.0		14,212.3		11,418.4		11,735.8		9,671.7
9139	1958	12,478.3		8,652.0		14,212.3		11,418.4		11,735.8		9,671.7
9139	1959	5,178.1		8,652.0		14,212.3		11,418.4		11,735.8		9,671.7
9139	1960	14,085.6		8,652.0		14,212.3		11,418.4		11,735.8		9,671.7

9139	1961	6,111.0	8,652.0	8,652.0	14,212.3	14,212.3		11,418.4		11,735.8		9,671.7
9139	1962	6,273.2		8,046.4		8,624.5		11,418.4		11,735.8		9,671.7
9139	1963	7,062.5		8,046.4		8,624.5		11,418.4		11,735.8		9,671.7
9139	1964	14,309.9		8,046.4		8,624.5		11,418.4		11,735.8		9,671.7
9139	1965	4,702.1		8,046.4		8,624.5		11,418.4		11,735.8		9,671.7
9139	1966	7,884.2	8,046.4	8,046.4		8,624.5		11,418.4		11,735.8		9,671.7
9139	1967	2,315.8		9,202.6		8,624.5		11,418.4		11,735.8		9,671.7
9139	1968	10,037.7		9,202.6		8,624.5		11,418.4		11,735.8		9,671.7
9139	1969	8,382.1		9,202.6		8,624.5		11,418.4		11,735.8		9,671.7
9139	1970	14,510.9		9,202.6		8,624.5		11,418.4		11,735.8		9,671.7
9139	1971	10,766.4	9,202.6	9,202.6	8,624.5	8,624.5	11,418.4	11,418.4		11,735.8	9,671.7	9,671.7
9139	1972	4,412.0		15,989.5		12,370.7		10,912.8		11,735.8		8,997.3
9139	1973	18,280.8		15,989.5		12,370.7		10,912.8		11,735.8		8,997.3
9139	1974	31,775.3		15,989.5		12,370.7		10,912.8		11,735.8		8,997.3
9139	1975	20,048.7		15,989.5		12,370.7		10,912.8		11,735.8		8,997.3
9139	1976	5,430.5	15,989.5	15,989.5		12,370.7		10,912.8		11,735.8		8,997.3
9139	1977	4,831.1		8,751.9		12,370.7		10,912.8		11,735.8		8,997.3
9139	1978	10,867.5		8,751.9		12,370.7		10,912.8		11,735.8		8,997.3
9139	1979	7,300.2		8,751.9		12,370.7		10,912.8		11,735.8		8,997.3
9139	1980	5,057.2		8,751.9		12,370.7		10,912.8		11,735.8		8,997.3
9139	1981	15,703.7	8,751.9	8,751.9	12,370.7	12,370.7		10,912.8	11,735.8	11,735.8		8,997.3
9139	1982	2,005.1		7,927.0		9,454.9		10,912.8		7,872.8		8,997.3
9139	1983	10,708.7		7,927.0		9,454.9		10,912.8		7,872.8		8,997.3
9139	1984	9,969.9		7,927.0		9,454.9		10,912.8		7,872.8		8,997.3
9139	1985	5,469.0		7,927.0		9,454.9		10,912.8		7,872.8		8,997.3
9139	1986	11,482.2	7,927.0	7,927.0		9,454.9		10,912.8		7,872.8		8,997.3
9139	1987	6,507.0		10,982.8		9,454.9		10,912.8		7,872.8		8,997.3
9139	1988	8,513.6		10,982.8		9,454.9		10,912.8		7,872.8		8,997.3
9139	1989	16,262.4		10,982.8		9,454.9		10,912.8		7,872.8		8,997.3
9139	1990	14,577.4		10,982.8		9,454.9		10,912.8		7,872.8		8,997.3
9139	1991	9,053.7	10,982.8	10,982.8	9,454.9	9,454.9	10,912.8	10,912.8		7,872.8		8,997.3
9139	1992	14,692.6		12,392.3		9,063.9		7,081.8		7,872.8		8,997.3
9139	1993	17,427.8		12,392.3		9,063.9		7,081.8		7,872.8		8,997.3
9139	1994	4,483.2		12,392.3		9,063.9		7,081.8		7,872.8		8,997.3
9139	1995	11,124.2		12,392.3		9,063.9		7,081.8		7,872.8		8,997.3
9139	1996	14,233.8	12,392.3	12,392.3		9,063.9		7,081.8		7,872.8		8,997.3
9139	1997	3,130.0		5,735.5		9,063.9		7,081.8		7,872.8		8,997.3

9139	1998	5,662.2		5,735.5		9,063.9		7,081.8		7,872.8		8,997.3
9139	1999	4,760.8		5,735.5		9,063.9		7,081.8		7,872.8		8,997.3
9139	2000	10,456.2		5,735.5		9,063.9		7,081.8		7,872.8		8,997.3
9139	2001	4,668.5	5,735.5	5,735.5	9,063.9	9,063.9		7,081.8		7,872.8		8,997.3
9139	2002	2,503.1		3,996.2		5,099.6		7,081.8		7,872.8		8,997.3
9139	2003	5,232.3		3,996.2		5,099.6		7,081.8		7,872.8		8,997.3
9139	2004	4,527.6		3,996.2		5,099.6		7,081.8		7,872.8		8,997.3
9139	2005	6,574.6		3,996.2		5,099.6		7,081.8		7,872.8		8,997.3
9139	2006	1,143.6	3,996.2	3,996.2		5,099.6		7,081.8		7,872.8		8,997.3
9139	2007	2,051.4		6,202.9		5,099.6		7,081.8		7,872.8		8,997.3
9139	2008	1,990.7		6,202.9		5,099.6		7,081.8		7,872.8		8,997.3
9139	2009	2,809.0		6,202.9		5,099.6		7,081.8		7,872.8		8,997.3
9139	2010	11,964.5		6,202.9		5,099.6		7,081.8		7,872.8		8,997.3
9139	2011	12,199.1	6,202.9	6,202.9	5,099.6	5,099.6	7,081.8	7,081.8	7,872.8	7,872.8	8,997.3	8,997.3
9139	2012	11,191.1		7,720.4		7,151.5		7,151.5		7,151.5		7,151.5
9139	2013	5,259.1		7,720.4		7,151.5		7,151.5		7,151.5		7,151.5
9139	2014	4,564.5		7,720.4		7,151.5		7,151.5		7,151.5		7,151.5
9139	2015	3,062.2		7,720.4		7,151.5		7,151.5		7,151.5		7,151.5
9139	2016	14,524.9	7,720.4	7,720.4		7,151.5		7,151.5		7,151.5		7,151.5
9139	2017	4,306.9	4,306.9	4,306.9	7,151.5	7,151.5	7,151.5	7,151.5	7,151.5	7,151.5	7,151.5	7,151.5
		1,151,566.5										

Average Inflows

9,139 (126 years)

5,973 Average last 20 years (1998-2017)

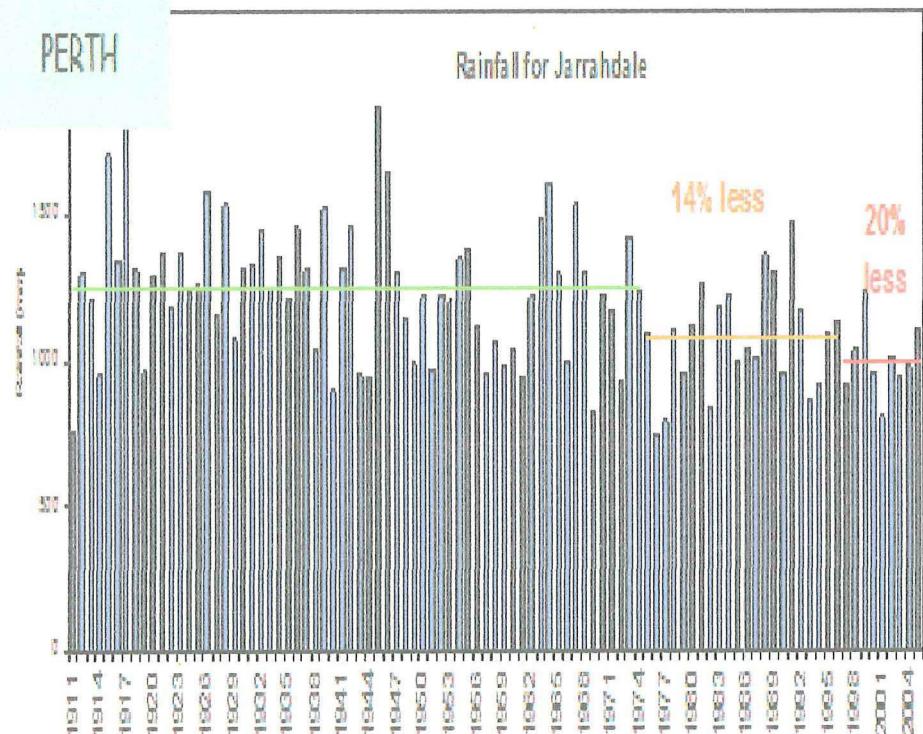
Compiled by Lindsay Leake



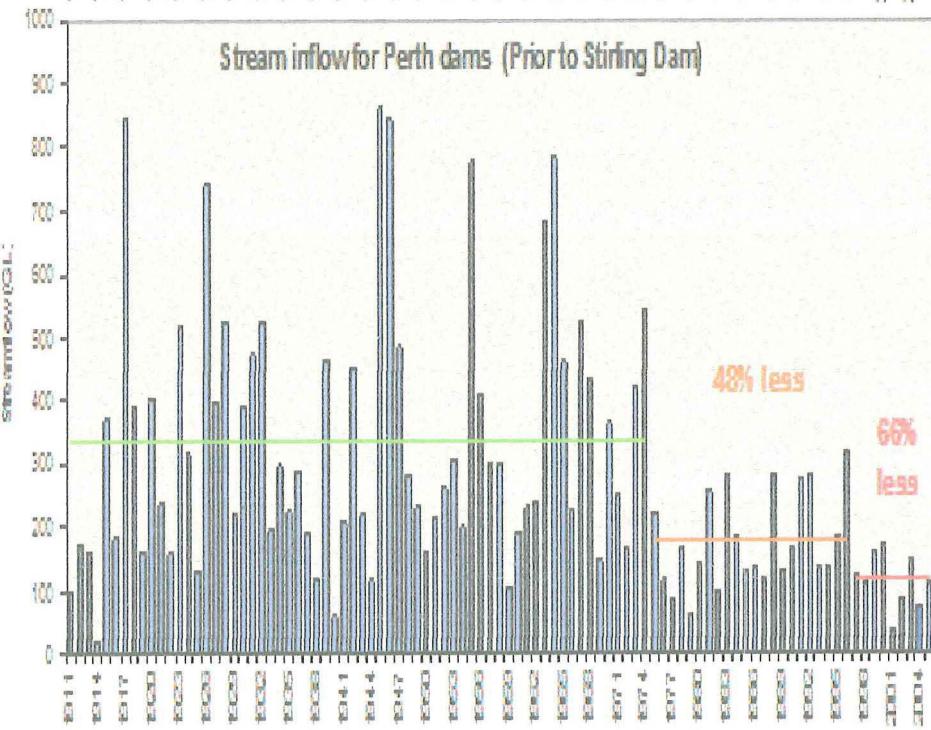
Changes in rain and water supply

PERTH

Rainfall for Jarrahdale



- 1%



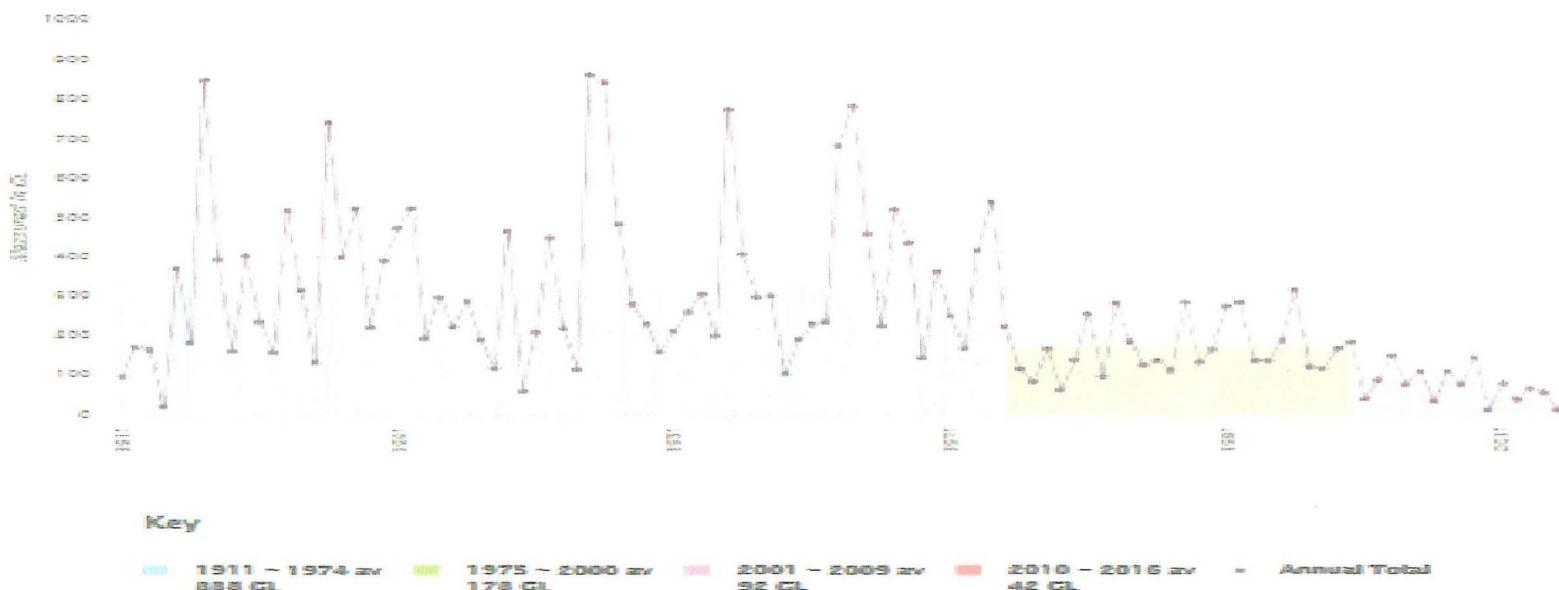
- 3%

Streamflow Historical

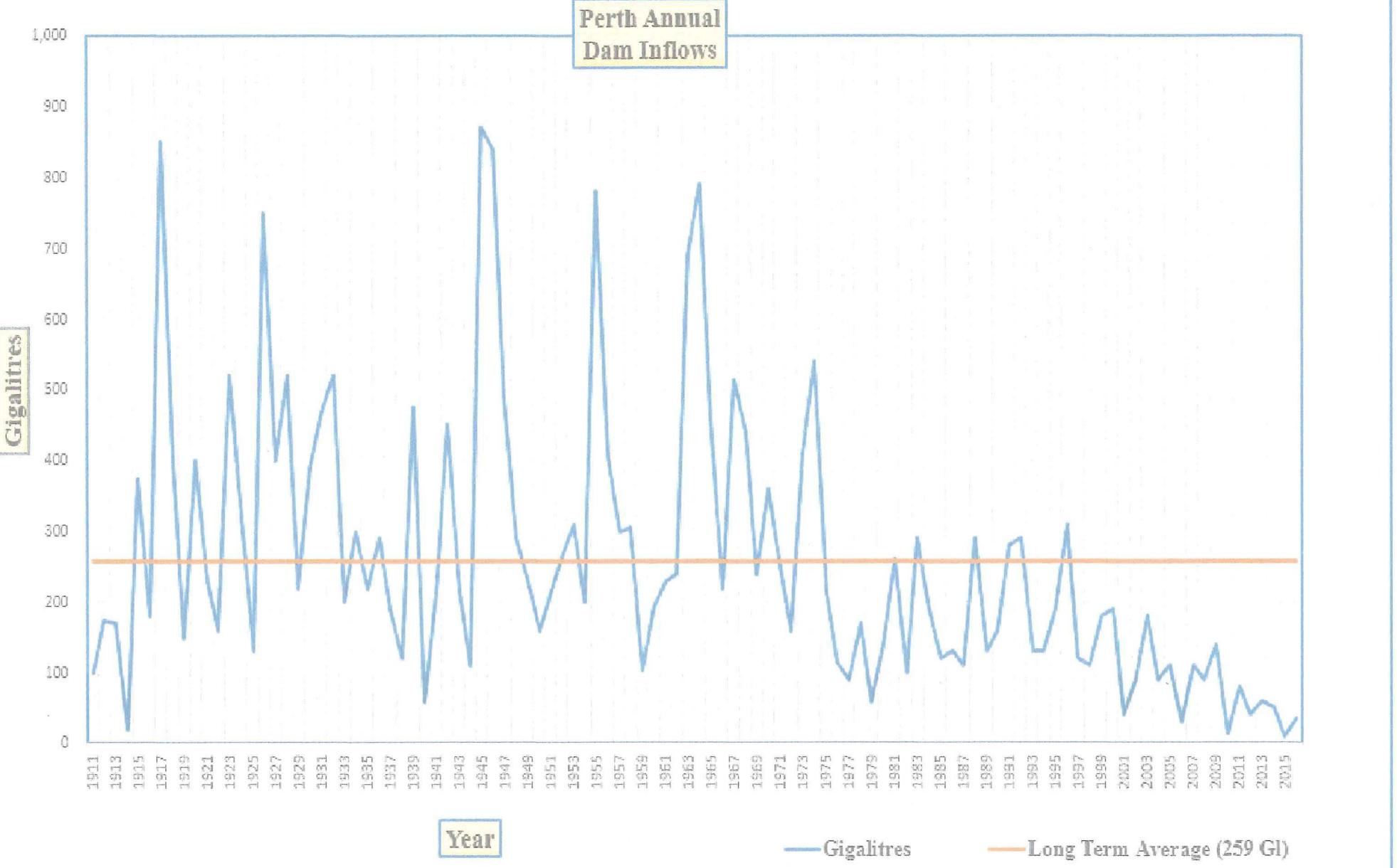


Historical streamflow

We need steady, regular rainfall in order to stock our catchments and get the streams flowing into our dams. Slowly declining rainfall means Perth's dams receive much less streamflow than in years past.

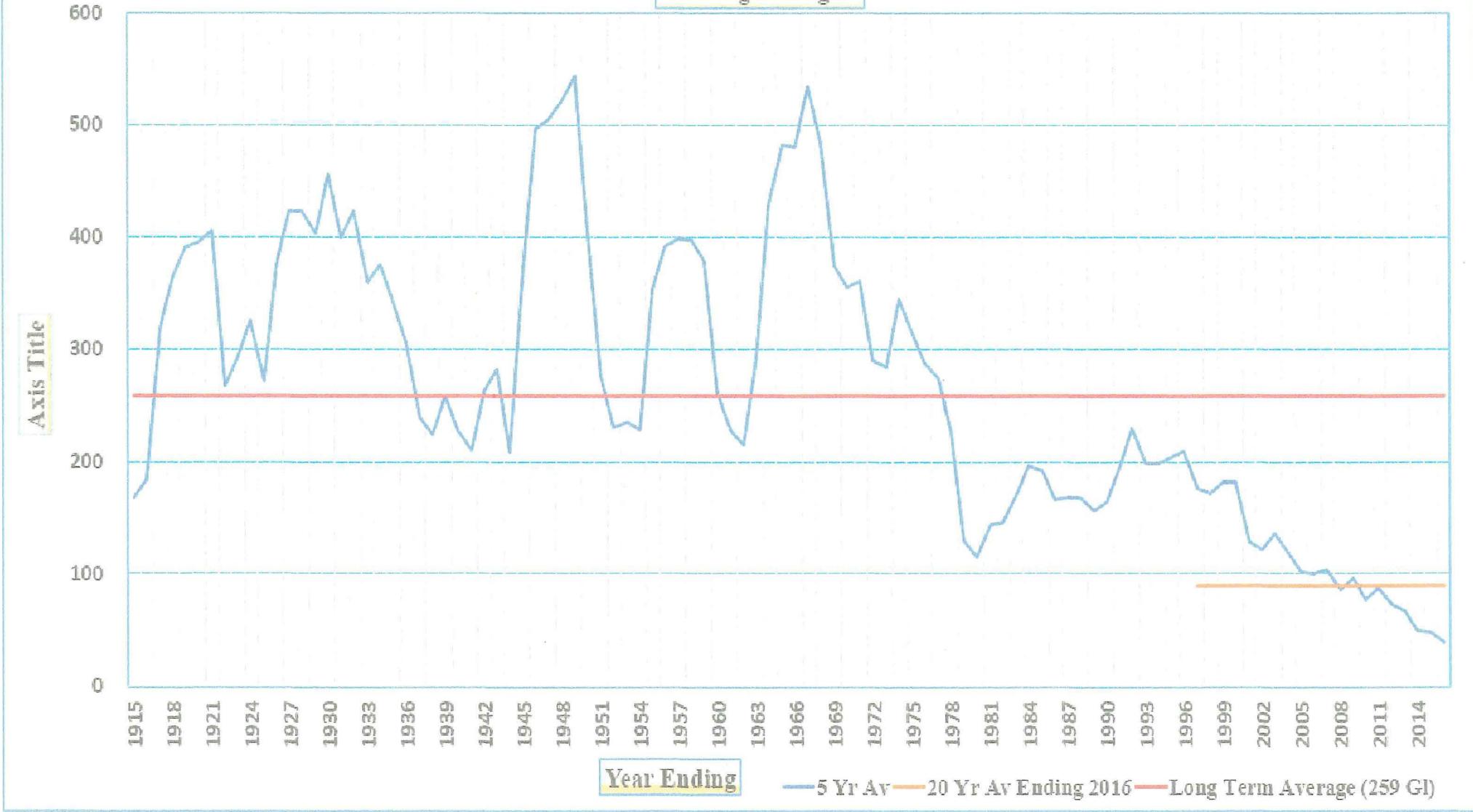


In order to provide an accurate historical comparison streamflow from Edirling and Sampson Brook Dams are not included in this data as these dams only came online in 2001. Inflow is therefore modelled on Perth dams pre-2001.



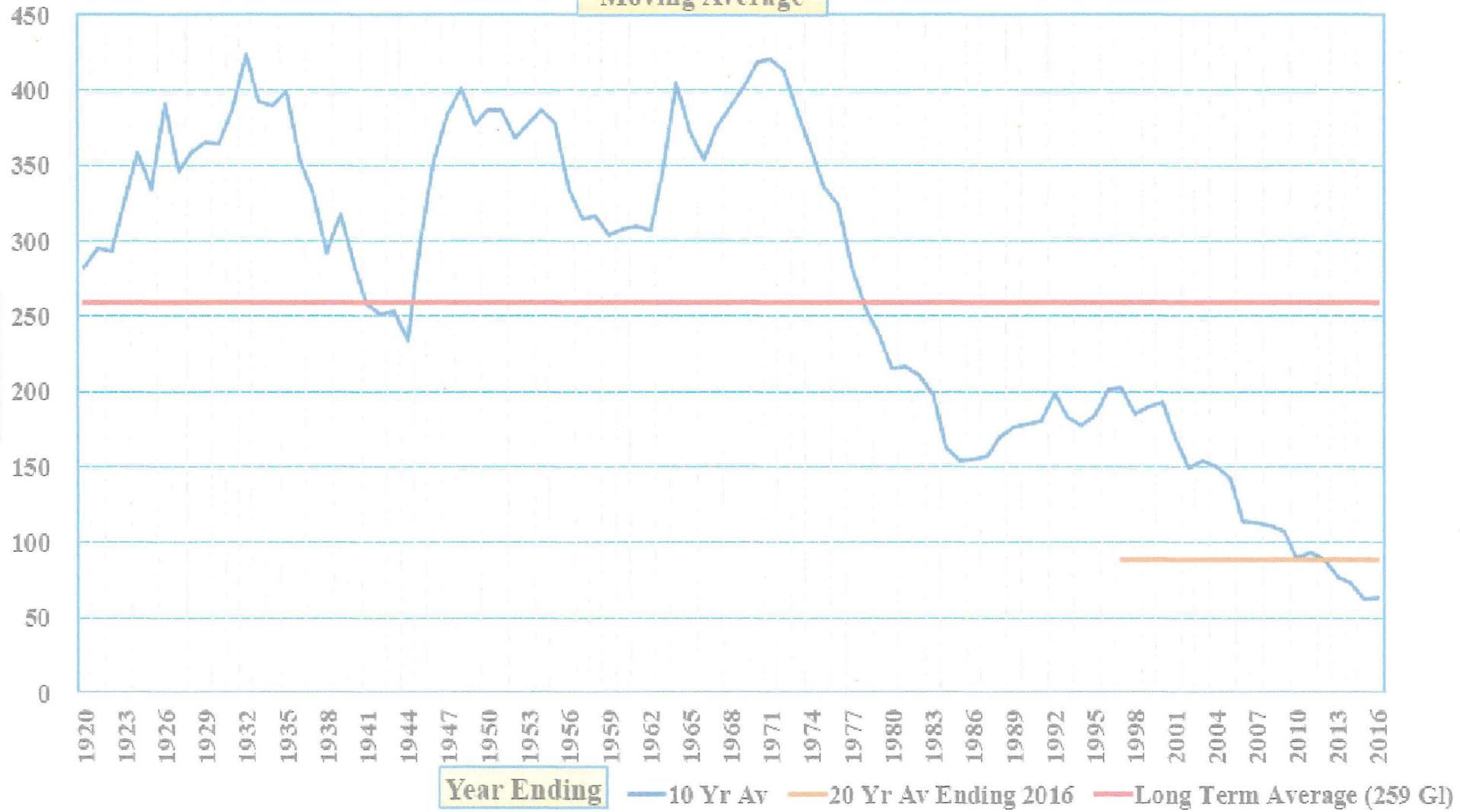
Compiled by Lindsay Leake

Perth Dam Inflows
5 Year
Moving Averages

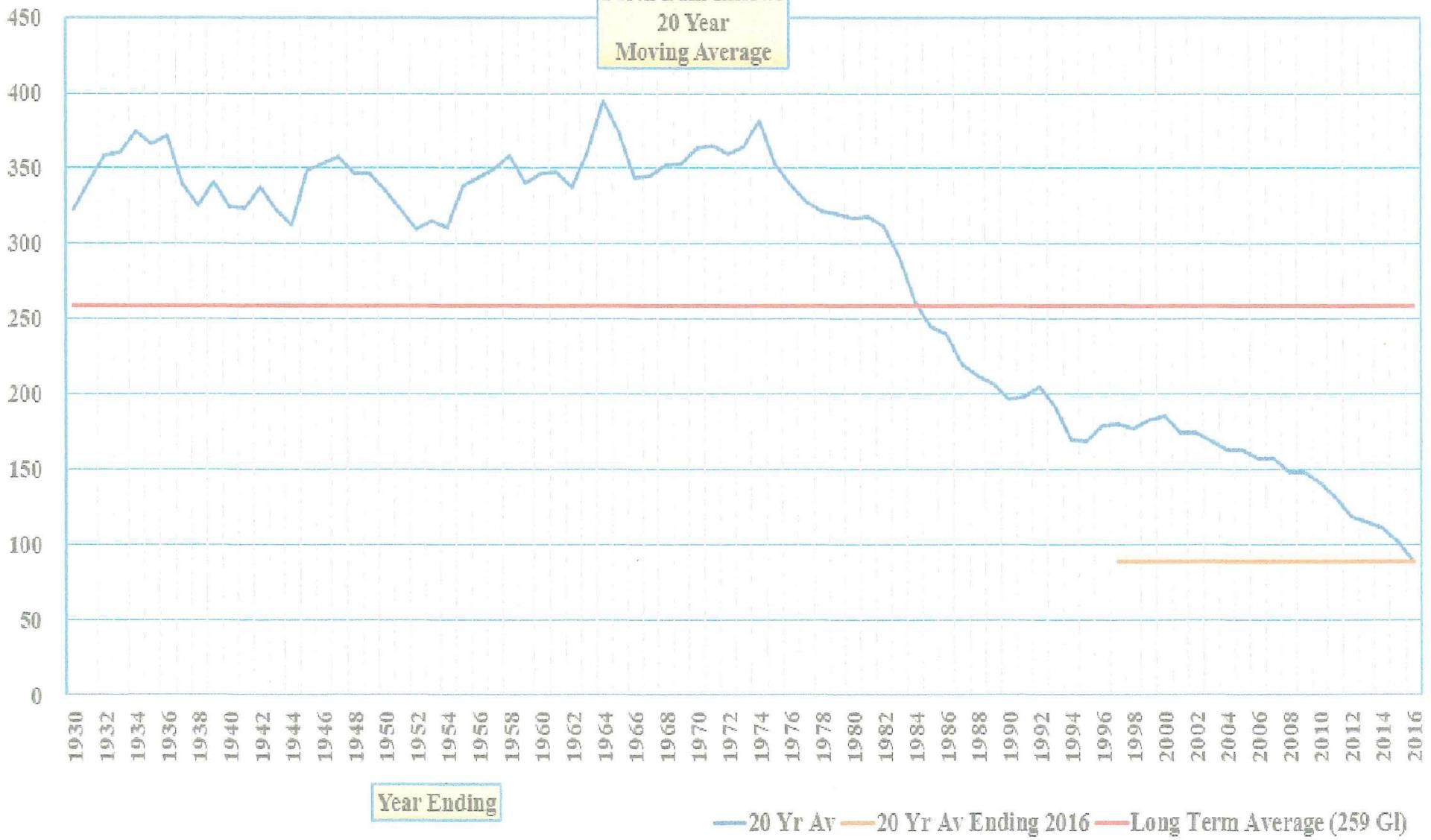


Compiled by Lindsay Leake

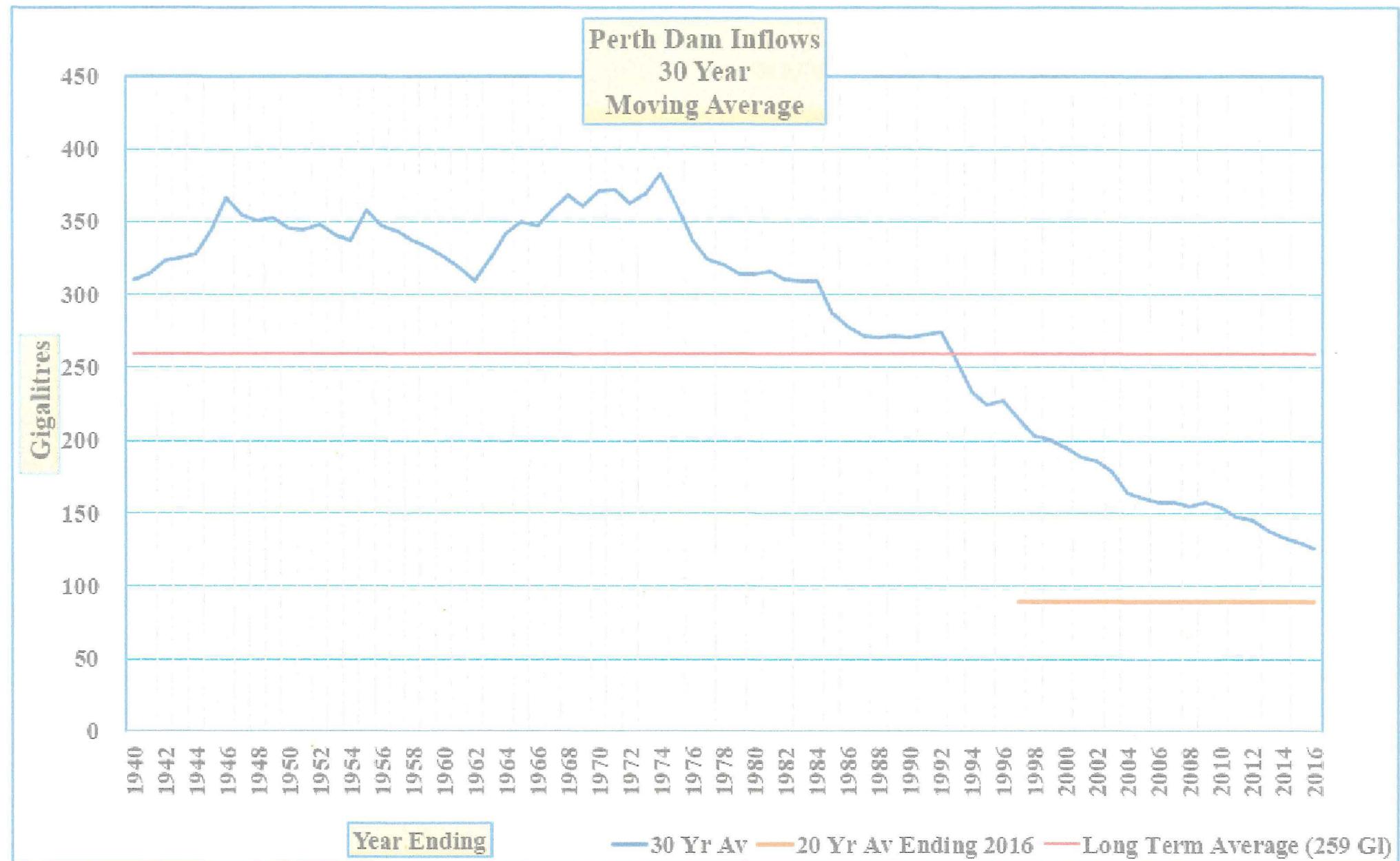
Perth Dam Inflows
10 Year
Moving Average



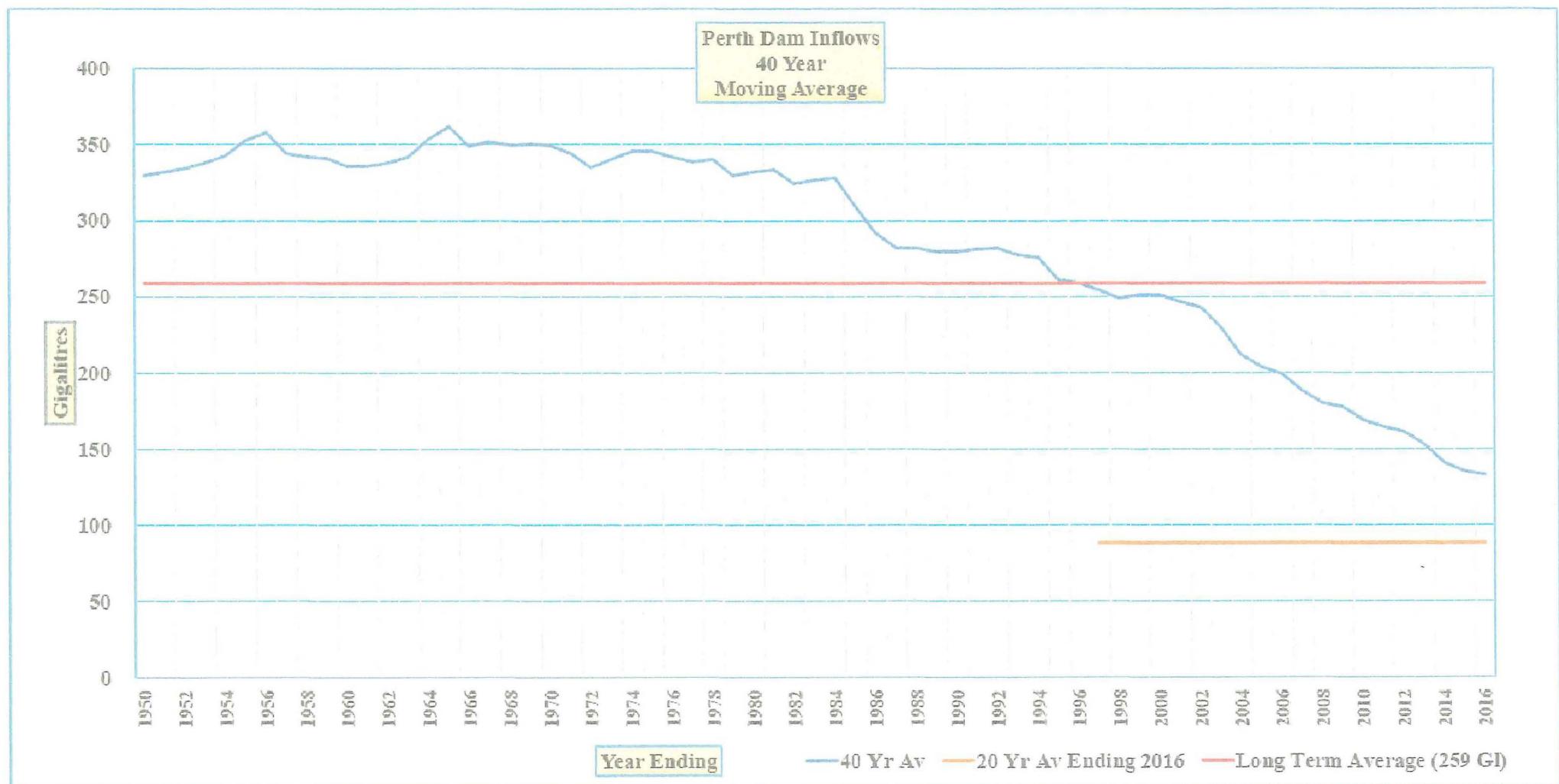
Compiled by Lindsay Leake



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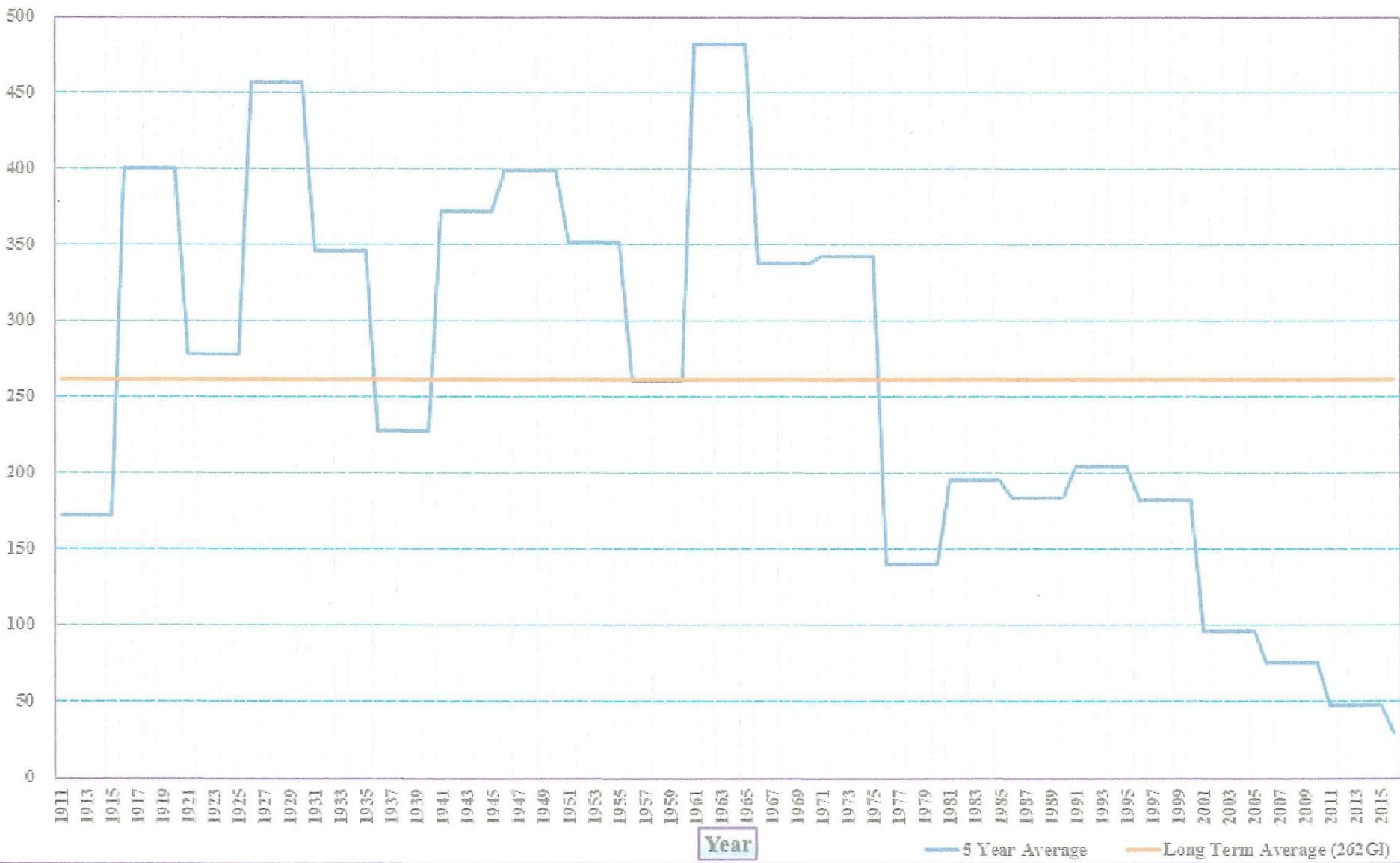


Compiled by Lindsay Leake



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Perth Dam Inflows
5 year average blocks

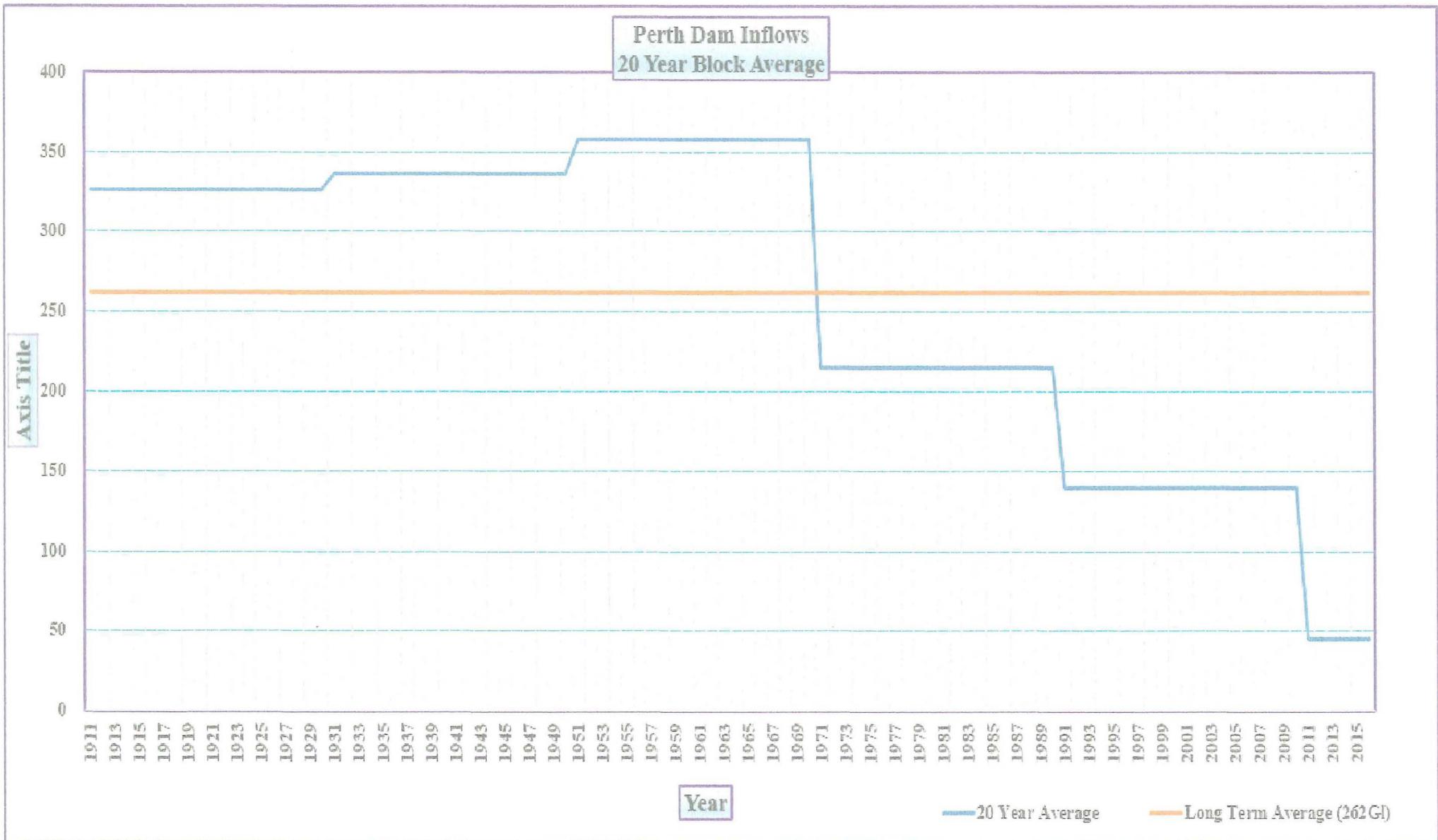


Compiled by Lindsay Leake

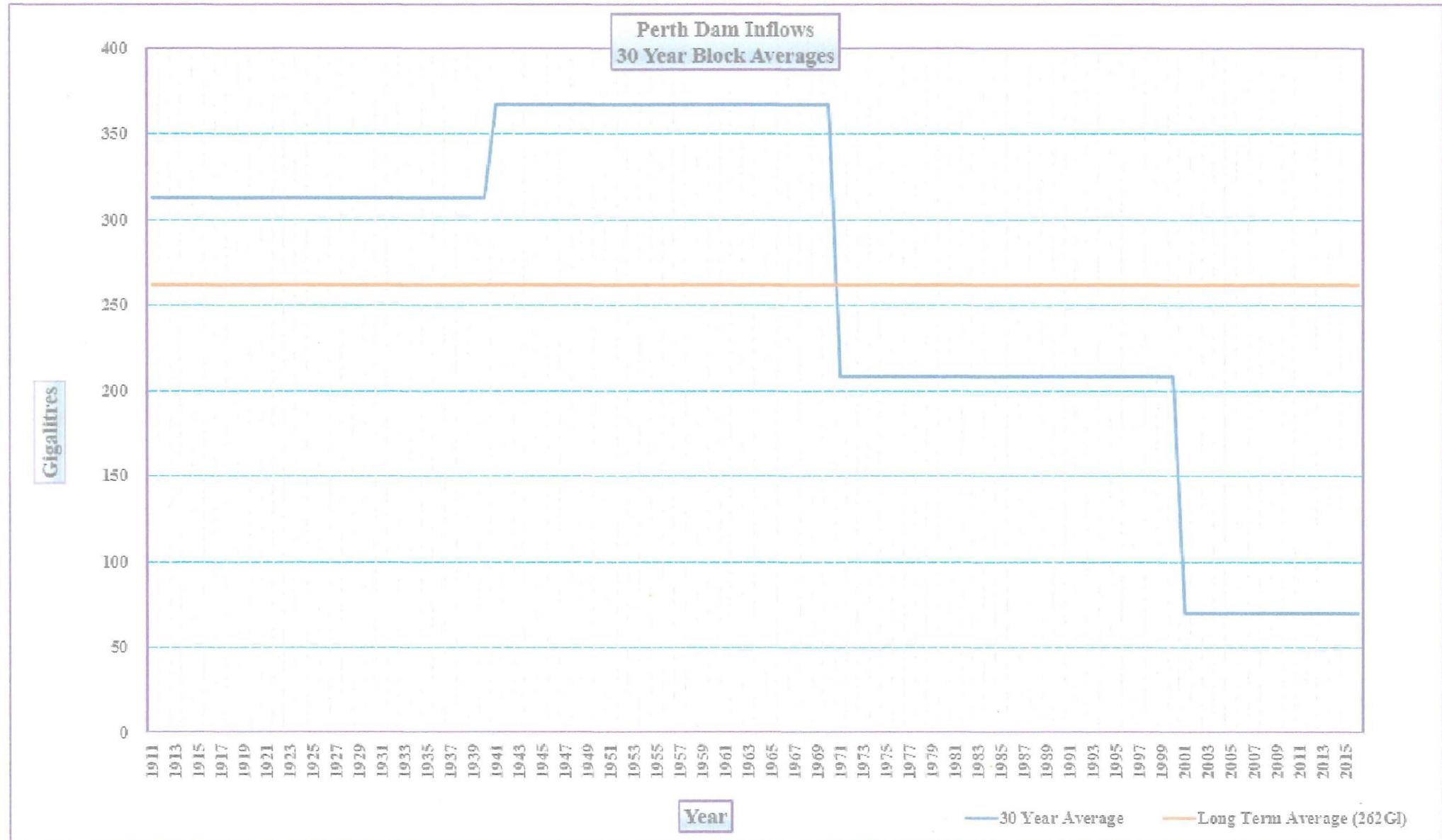
Perth Dam Inflows
10 Year Average Blocks



Compiled by Lindsay Leake

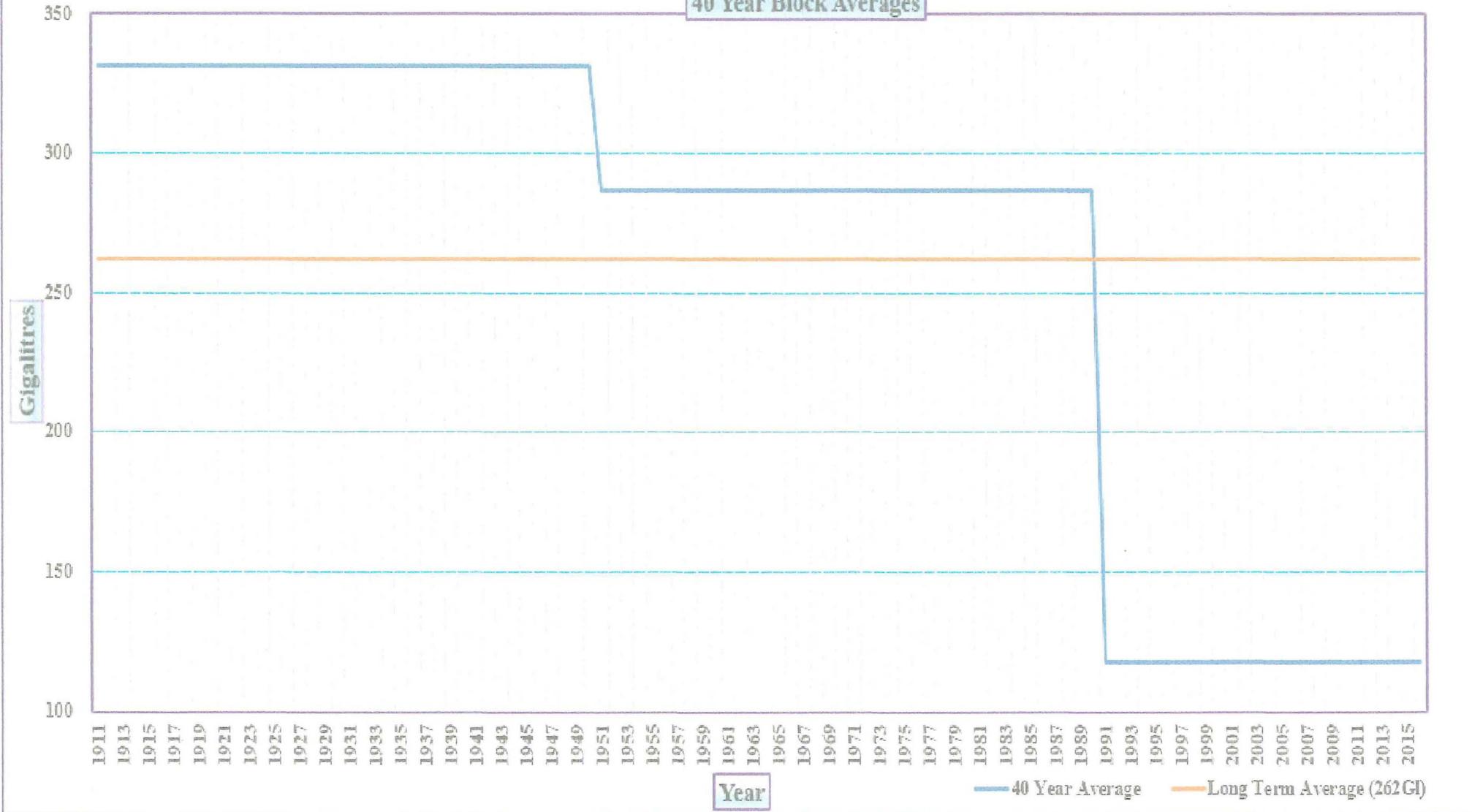


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Perth Dam Inflows
40 Year Block Averages

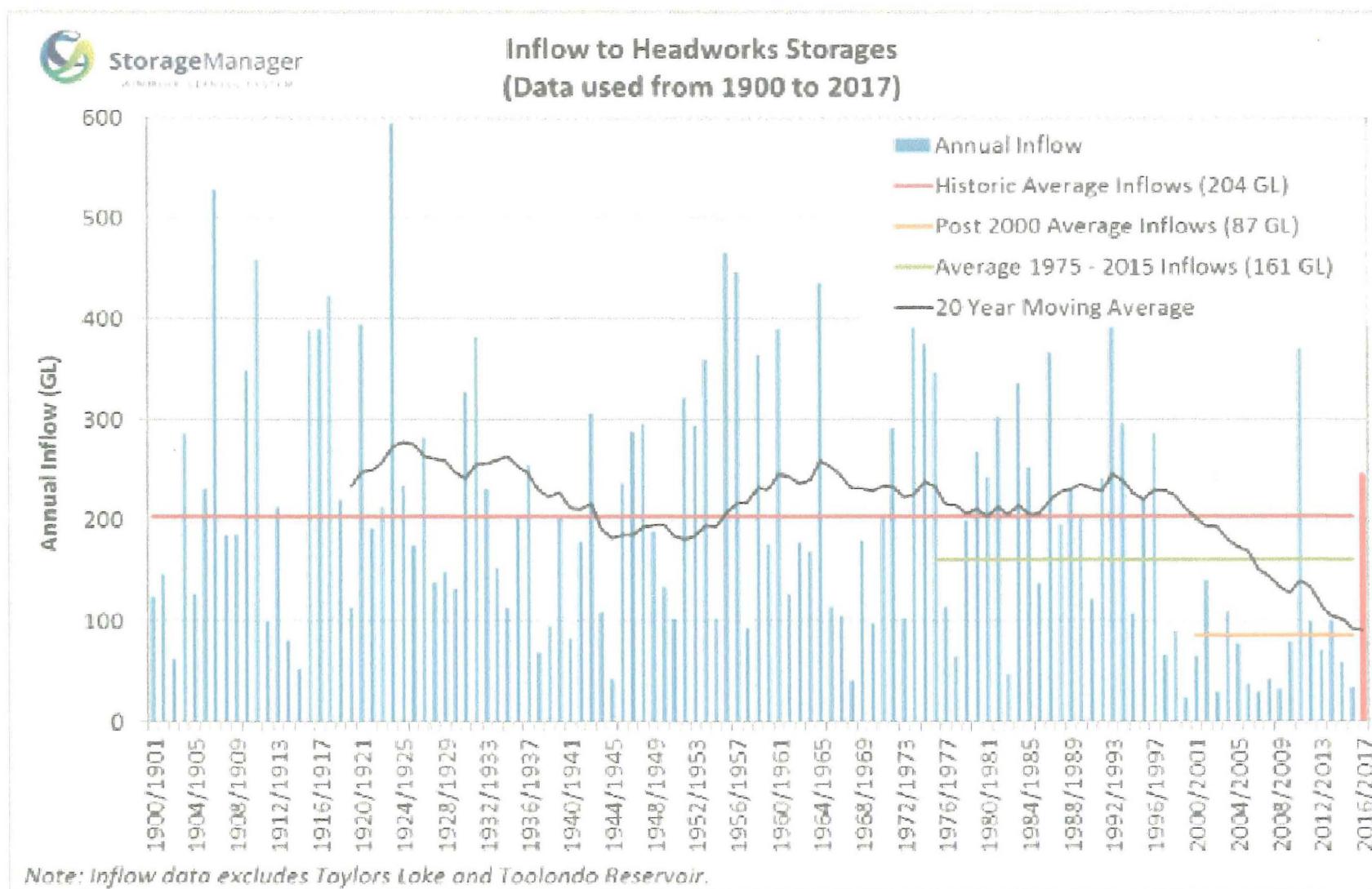


Compiled by Lindsay Leake

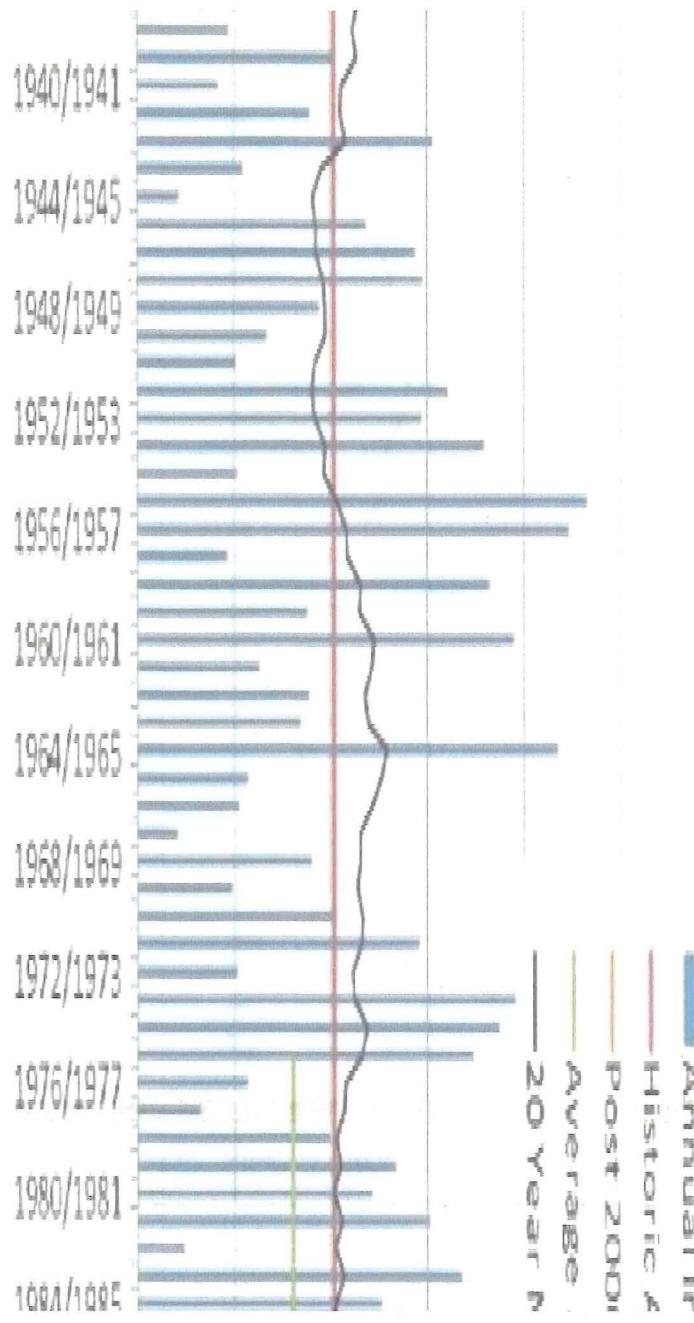
2017-2018 Operating Plan:
 Wimmera-Mallee System Headworks

 Doc Ref: R2017-17697
 Date Approved: 19/07/17
 Review Date: 30/06/18

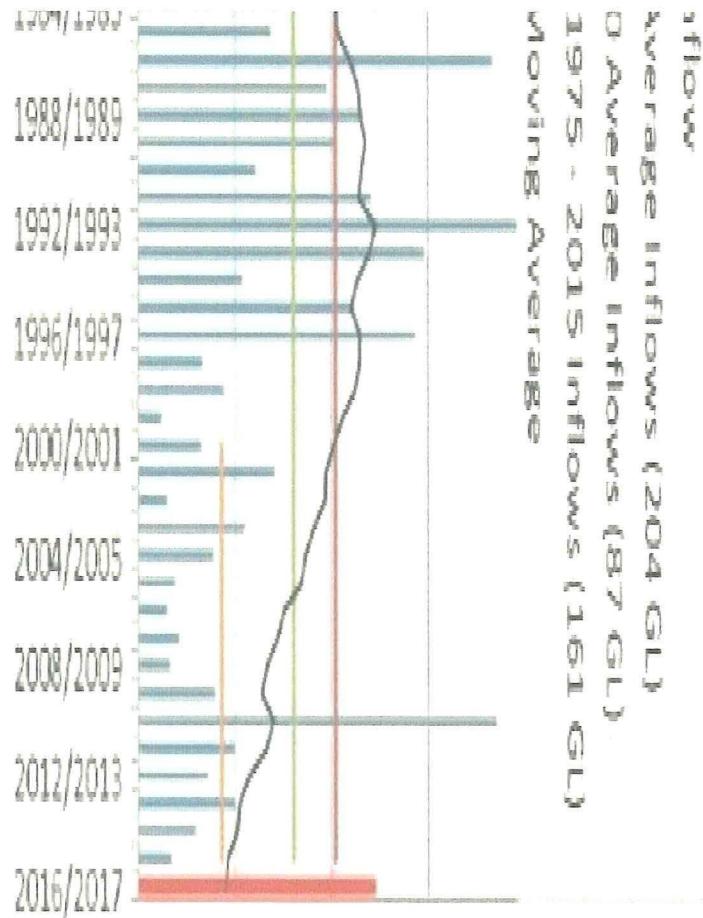
Figure 3: Historical inflows to the Wimmera-Mallee System Headworks



Grampian Wimmera Mallee- Wimmera-Mallee System Headworks-Historical Inflows																
			100	200	300	400	500	600		5 Yr M-Av	10 Yr M-Av	20 Yr M-Av	30 Yr M-Av	40 Yr M-Av	Long Term Average (202GI)	20 Yr Av end 2017
									4242							
1900/1901			125		1901										202	
			150		1902										202	
			75		1903										202	
1904/1905			290		1904										202	
			125		1905	153									202	
			225		1906	173									202	
1908/1909			520		1907	247									202	
			190		1908	270									202	
			190		1909	250									202	
			350		1910	295	224								202	
1912/1913			460		1911	342	258								202	
			100		1912	258	253								202	
			210		1913	262	266								202	
			80		1914	240	245								202	
			50		1915	180	238								202	
1916/1917			380		1916	164	253								202	
			380		1917	220	239								202	
			420		1918	262	262								202	
1920/1921			210		1919	288	264								202	
			110		1920	300	240	232							202	
			395		1921	303	234	246							202	
			195		1922	266	243	248							202	
			205		1923	223	243	254							202	
1924/1925			595		1924	300	294	270							202	
			220		1925	322	311	274							202	
			185		1926	280	292	272							202	
			280		1927	297	282	260							202	
1928/1929			135		1928	283	253	258							202	
			150		1929	194	247	256							202	
			130		1930	176	249	245	238						202	
			320		1931	203	242	238	244						202	
			380		1932	223	260	252	252						202	
1932/1933			220		1933	240	262	252	257						202	
			150		1934	240	217	256	252						202	
			110		1935	236	206	259	252						202	
1936/1937			200		1936	212	208	250	251						202	
			250		1937	186	205	243	242						202	
			80		1938	158	199	226	238						202	



95		1939	147	194	220	235		202
200		1940	165	201	225	230	228	202
80		1941	141	177	209	217	227	202
180		1942	127	157	208	220	228	202
310		1943	173	166	214	223	234	202
110		1944	176	162	189	224	229	202
40		1945	144	155	180	224	227	202
220		1946	172	157	182	219	227	202
290		1947	194	161	183	216	221	202
295		1948	191	182	191	211	224	202
185		1949	206	191	192	211	224	202
125		1950	223	184	192	211	218	202
100		1951	199	186	181	201	209	202
315		1952	204	199	178	205	215	202
295		1953	204	198	182	208	217	202
355		1954	238	222	192	200	224	202
105		1955	234	229	192	196	225	202
465		1956	307	253	205	206	227	202
440		1957	332	268	214	211	229	202
90		1958	291	248	215	210	220	202
365		1959	293	266	228	217	224	202
180		1960	308	271	227	218	226	202
390		1961	293	300	243	221	226	202
120		1962	229	281	240	212	224	202
175		1963	246	269	233	211	223	202
170		1964	207	250	236	211	213	202
425		1965	256	282	255	222	218	202
110		1966	200	247	250	219	216	202
110		1967	198	214	241	214	212	202
40		1968	171	209	228	213	209	202
180		1969	173	190	228	216	210	202
95		1970	107	182	226	212	209	202
200		1971	125	163	231	216	206	202
290		1972	161	180	230	220	204	202
105		1973	174	173	221	213	201	202
390		1974	216	195	222	222	207	202
370		1975	271	189	236	233	214	202
340		1976	299	212	229	237	217	202
110		1977	263	212	213	231	214	202
75		1978	257	216	212	224	213	202
200		1979	219	218	204	224	216	202
270		1980	199	235	208	229	218	202
250		1981	181	240	201	234	222	202
300		1982	219	241	210	234	225	202
50		1983	214	236	204	226	219	202
335		1984	241	230	212	225	224	202
265		1985	240	220	204	230	230	202

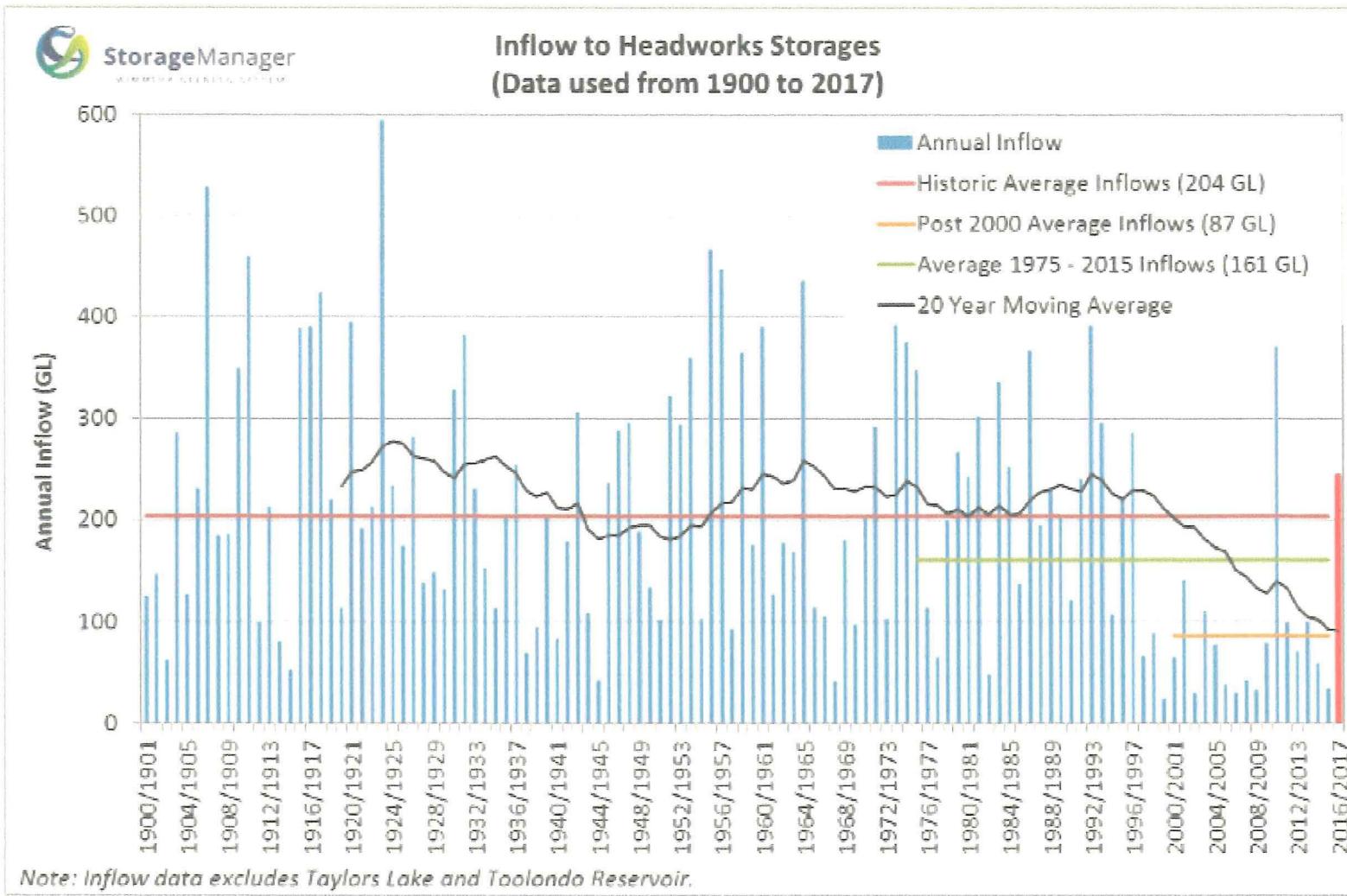


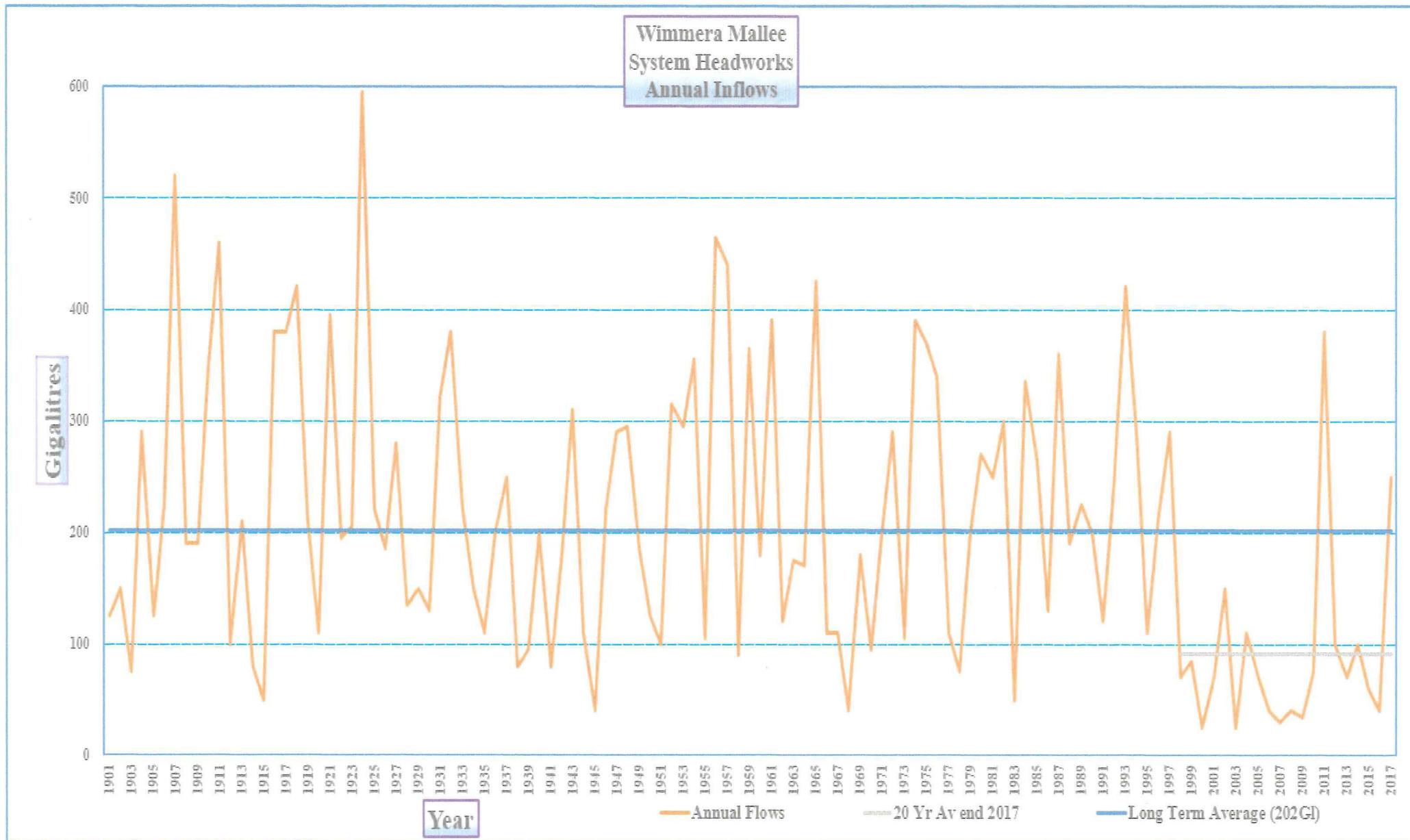
130		1986	216	199	205	219	228	202
360		1987	228	224	218	216	229	202
190		1988	256	235	225	220	227	202
225		1989	234	238	228	215	228	202
200		1990	221	231	233	216	230	202
120		1991	219	218	229	207	230	202
240		1992	195	212	226	211	228	202
420		1993	241	249	242	219	231	202
290		1994	254	244	237	223	230	202
110		1995	236	229	224	212	230	202
210		1996	254	237	218	216	223	202
290		1997	264	230	227	222	220	202
70		1998	194	218	226	223	219	202
85		1999	153	204	221	220	212	202
25		2000	136	186	208	217	208	202
70		2001	108	181	199	213	200	202
150		2002	80	172	192	208	201	202
25		2003	71	133	191	206	197	202
110		2004	76	115	179	196	196	202
70		2005	85	111	170	186	187	202
40		2006	79	94	165	176	185	202
30		2007	55	68	149	174	183	202
40		2008	58	65	141	172	183	202
35		2009	43	60	132	167	180	202
75		2010	44	65	125	160	179	202
380		2011	112	96	138	165	184	202
100		2012	126	91	131	158	179	202
70		2013	132	95	114	159	178	202
100		2014	145	94	104	151	171	202
60		2015	142	93	102	144	163	202
40		2016	74	93	93	141	155	202
250		2017	104	115	91	137	159	202
23,655								

202 Average

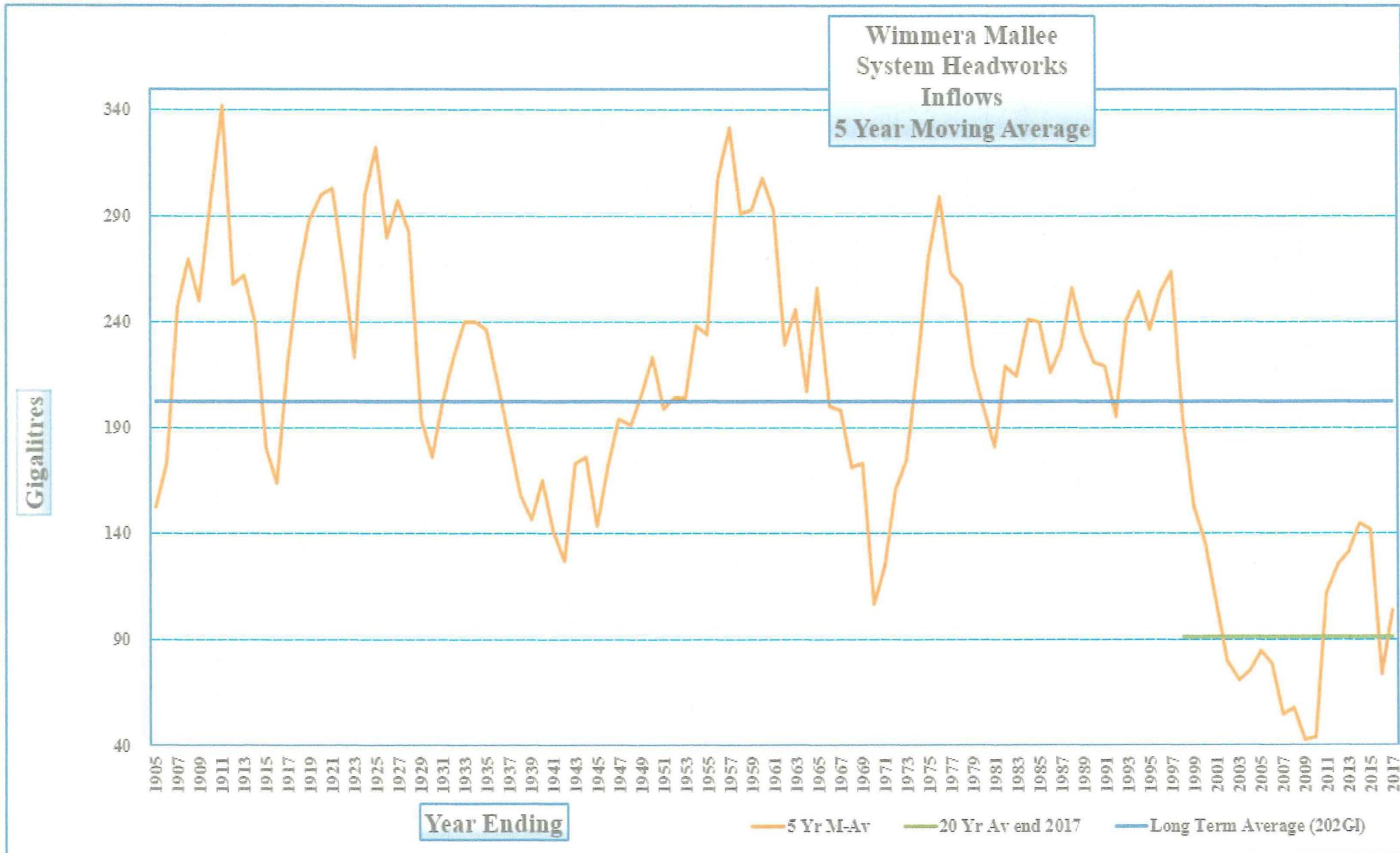
204 GWM Av

Figure 3: Historical inflows to the Wimmera-Mallee System Headworks

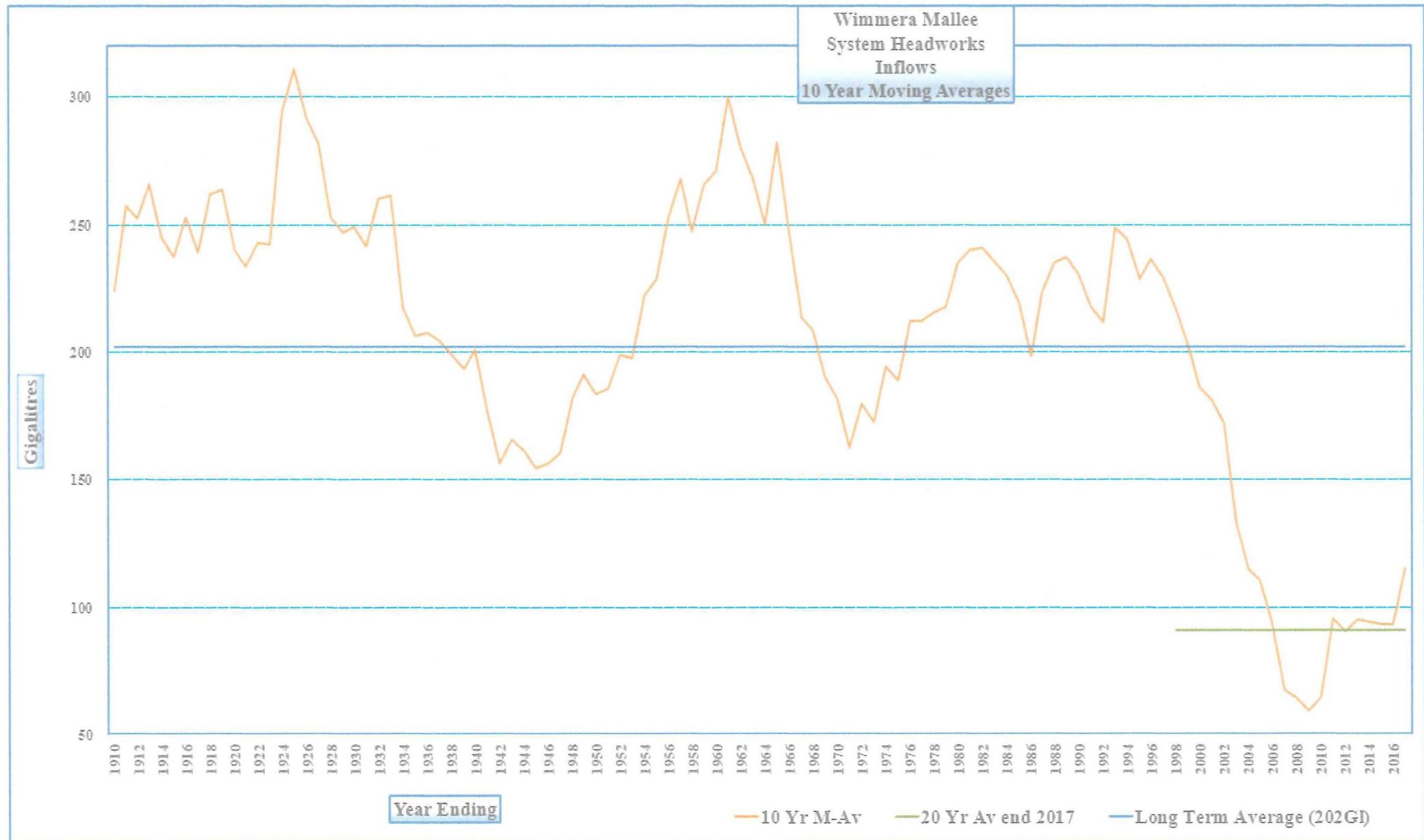




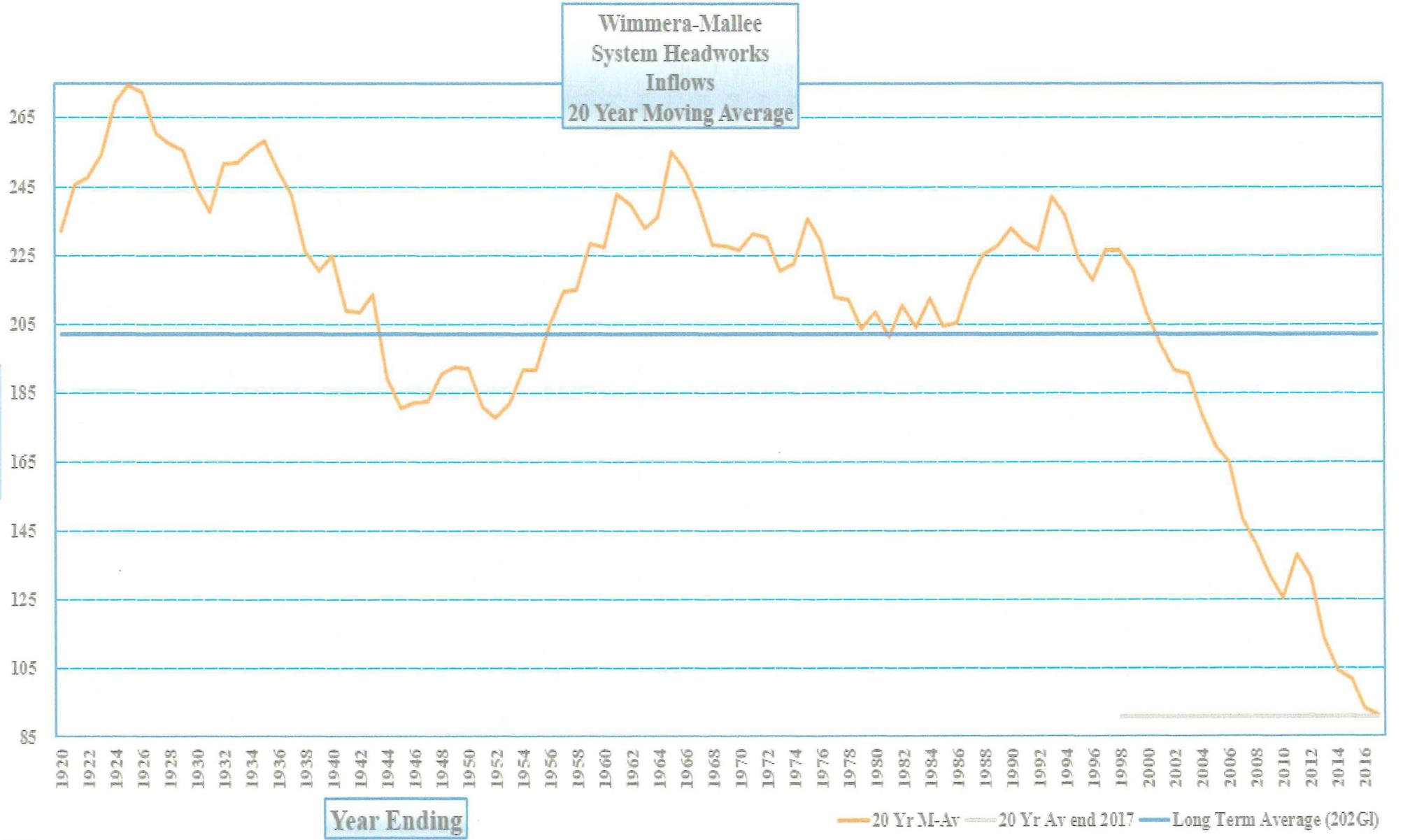
Compiled by Lindsay Leake



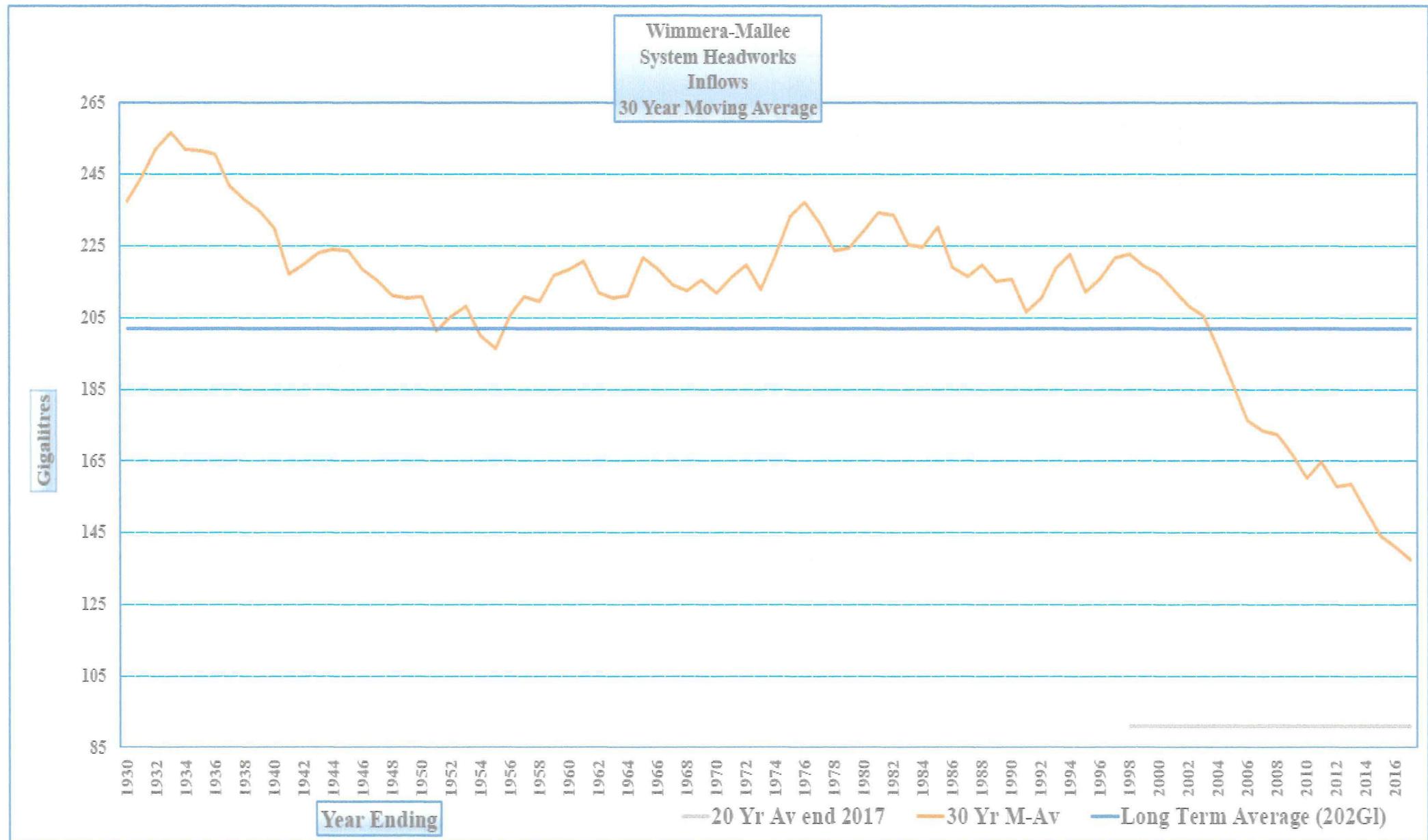
Compiled by Lindsay Leake



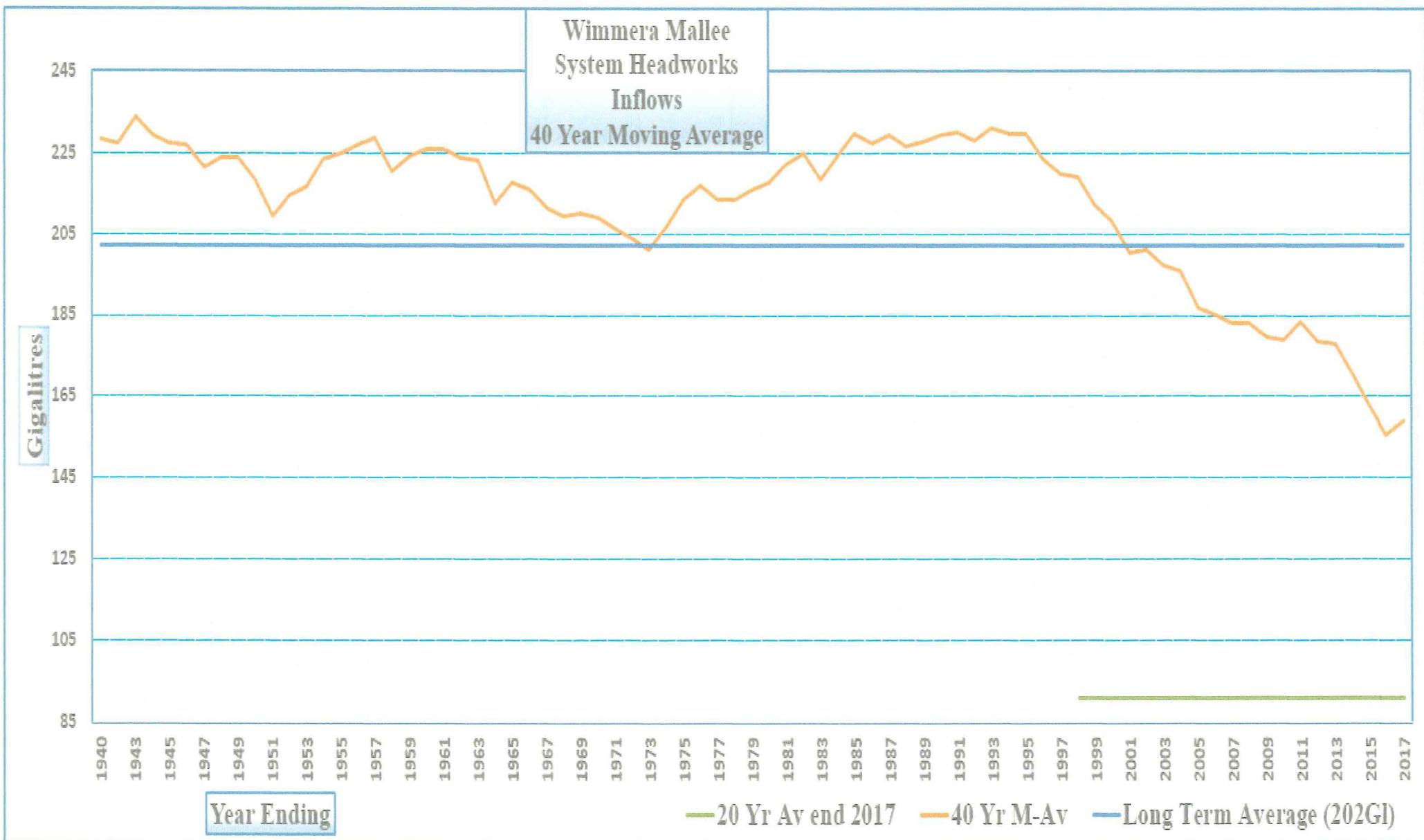
Compiled by Lindsay Leake



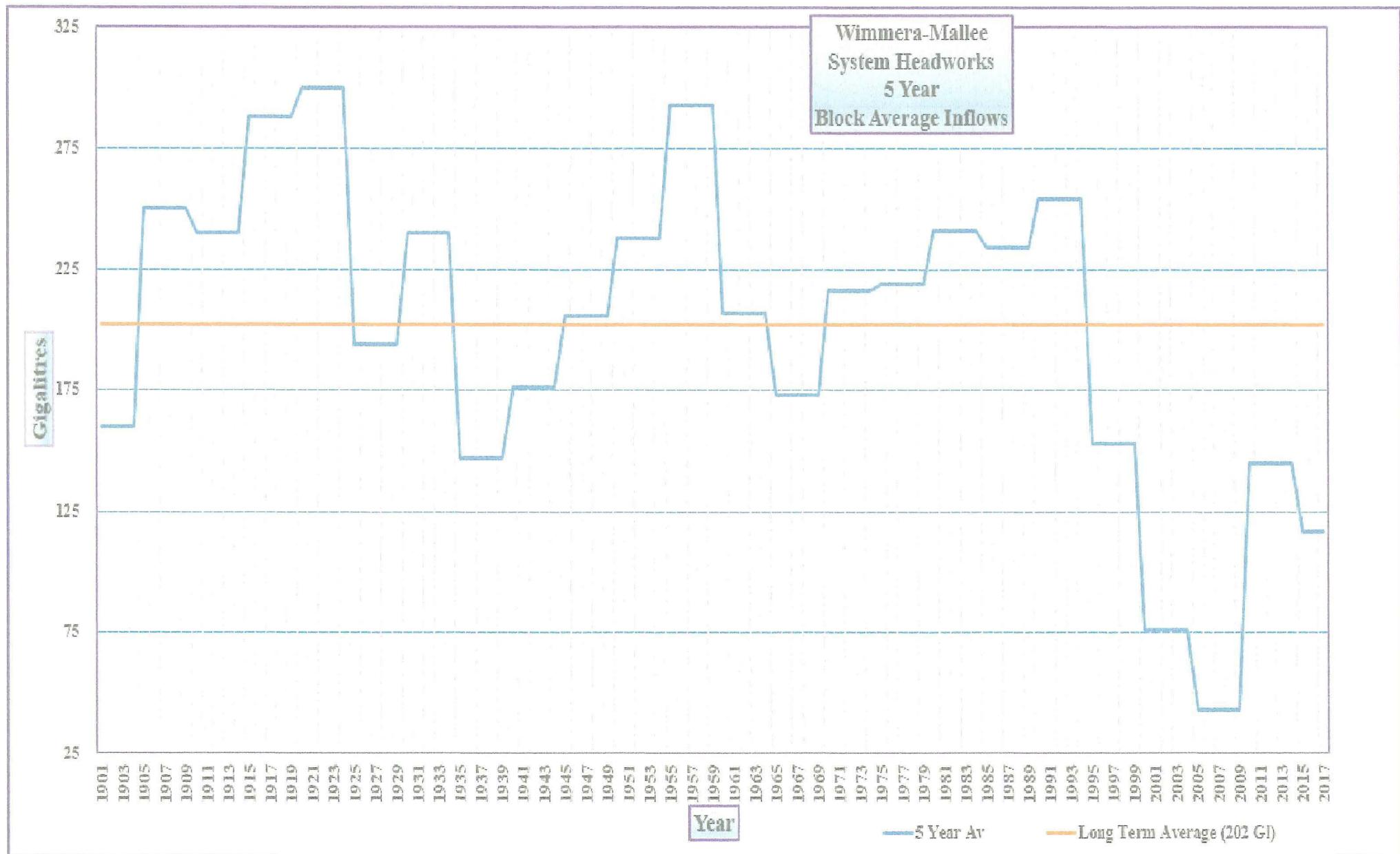
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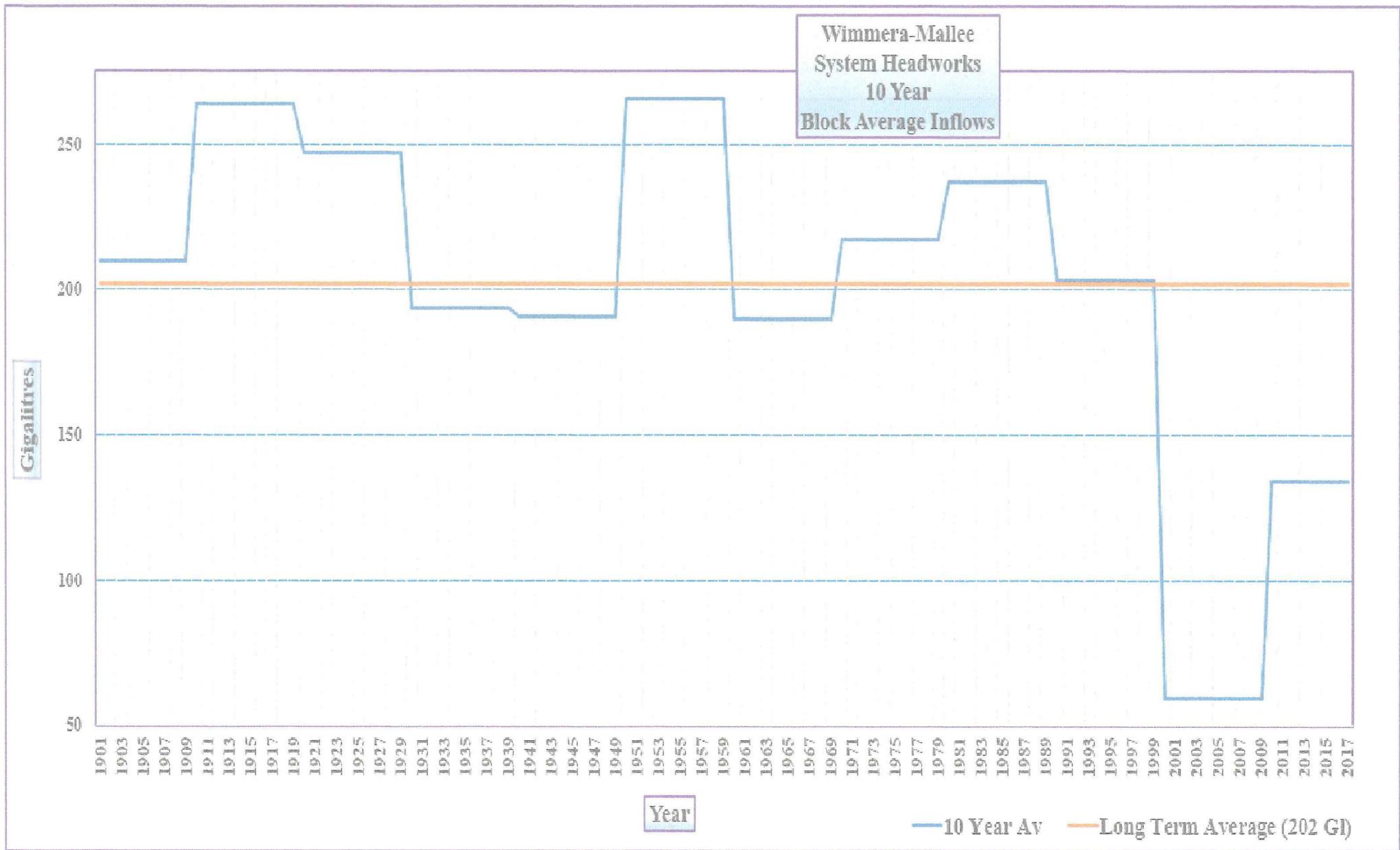
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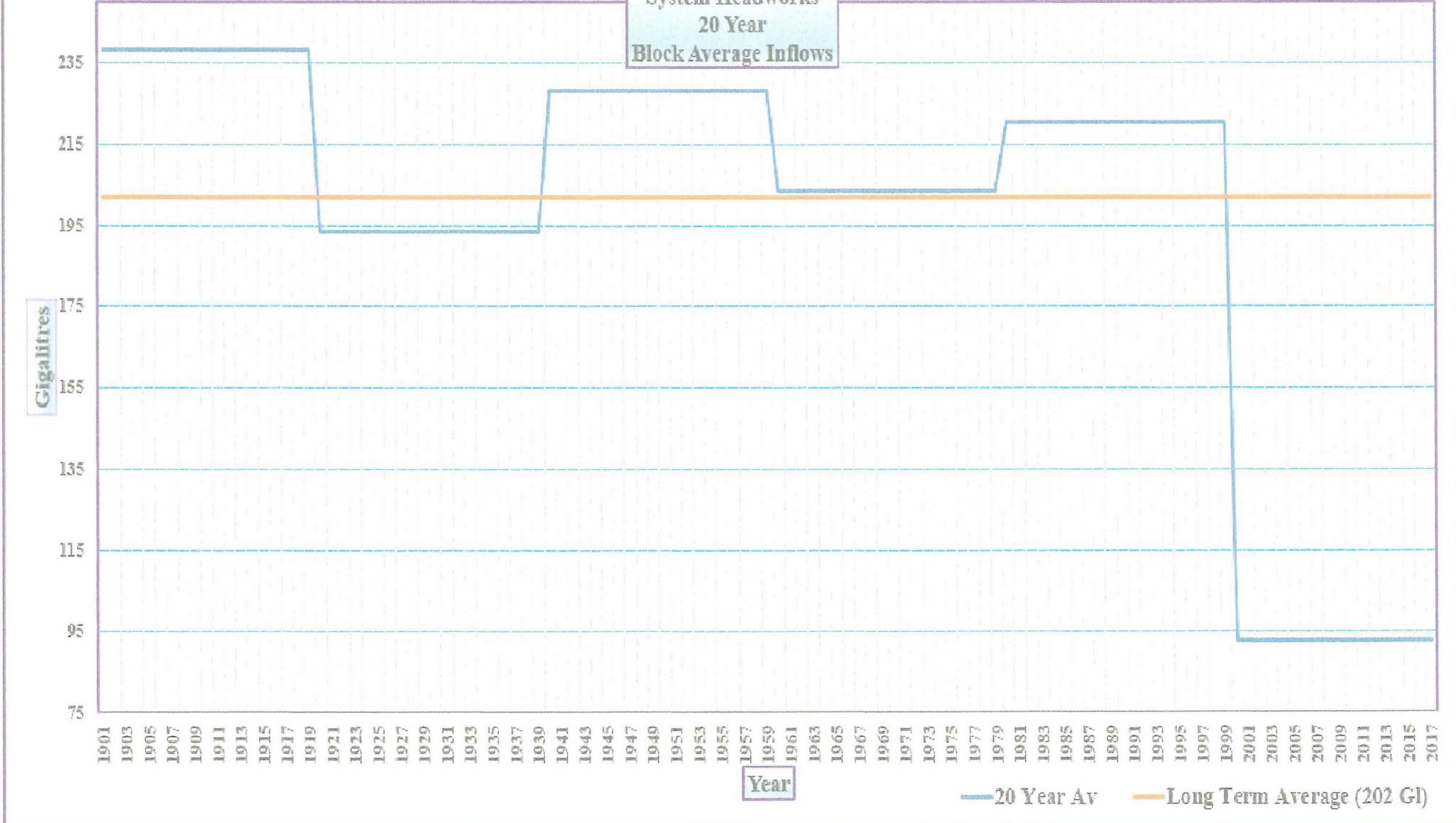


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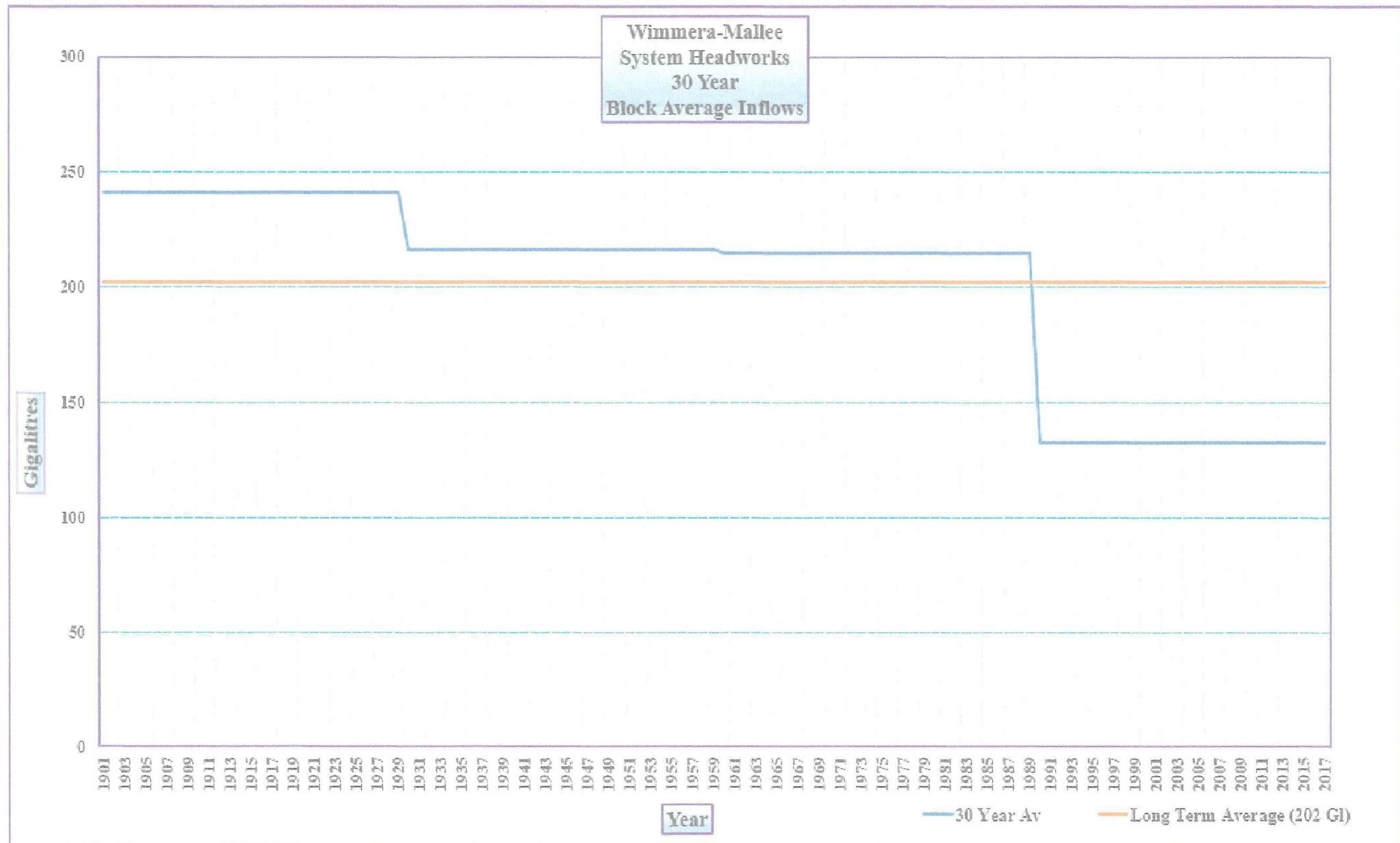


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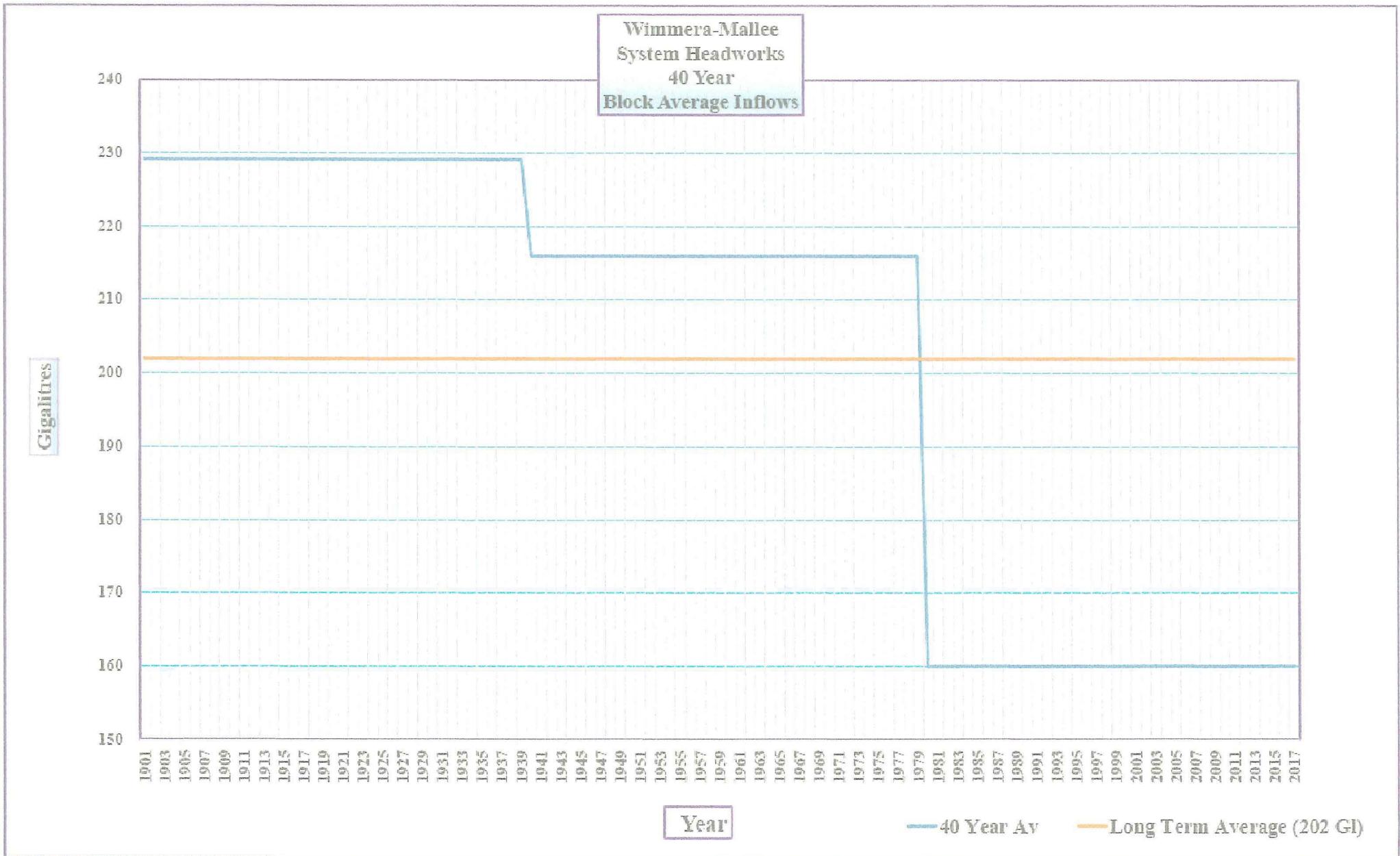
Wimmera-Mallee
System Headworks
20 Year
Block Average Inflows



Compiled by Lindsay Leake



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