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LEAKAGE SUMMIT

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## The effect of the weather on water demand during restrictions

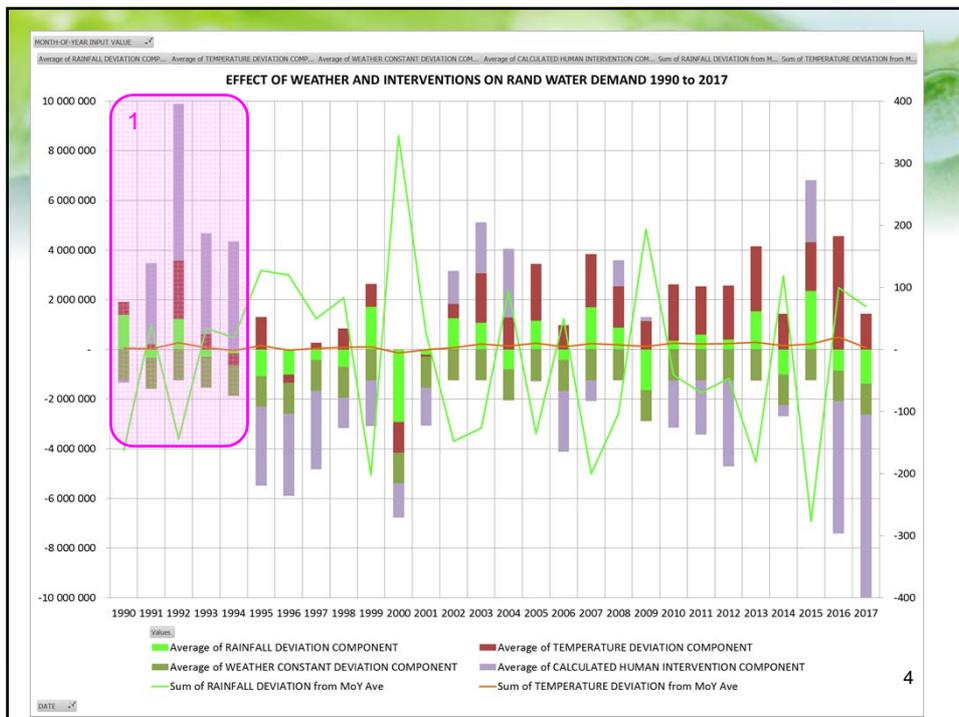
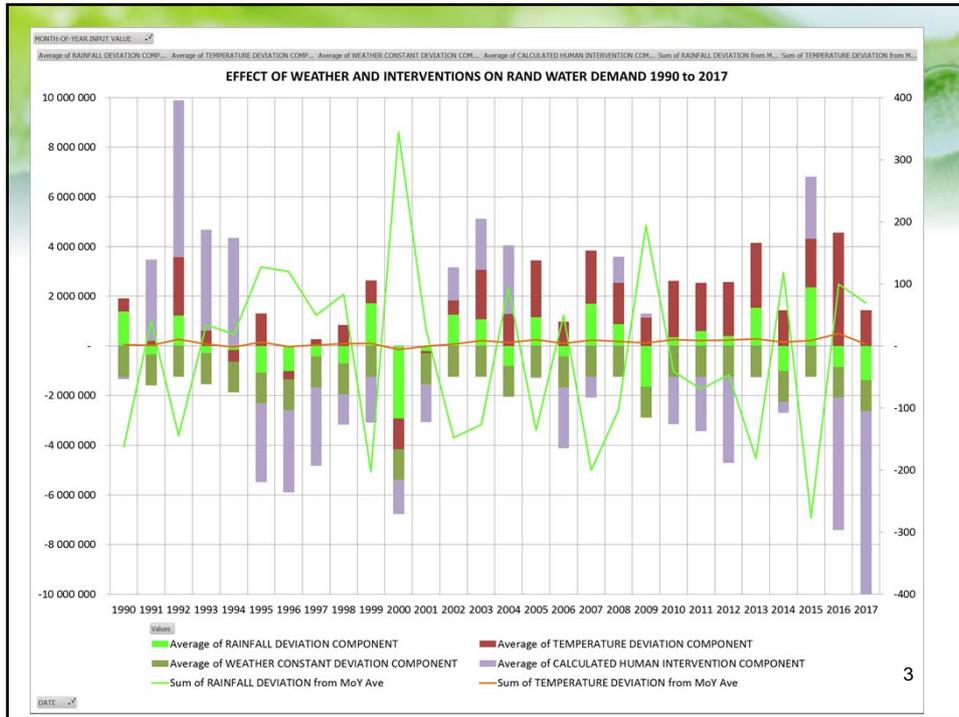
Presented by: Kobie Mare, Rand Water

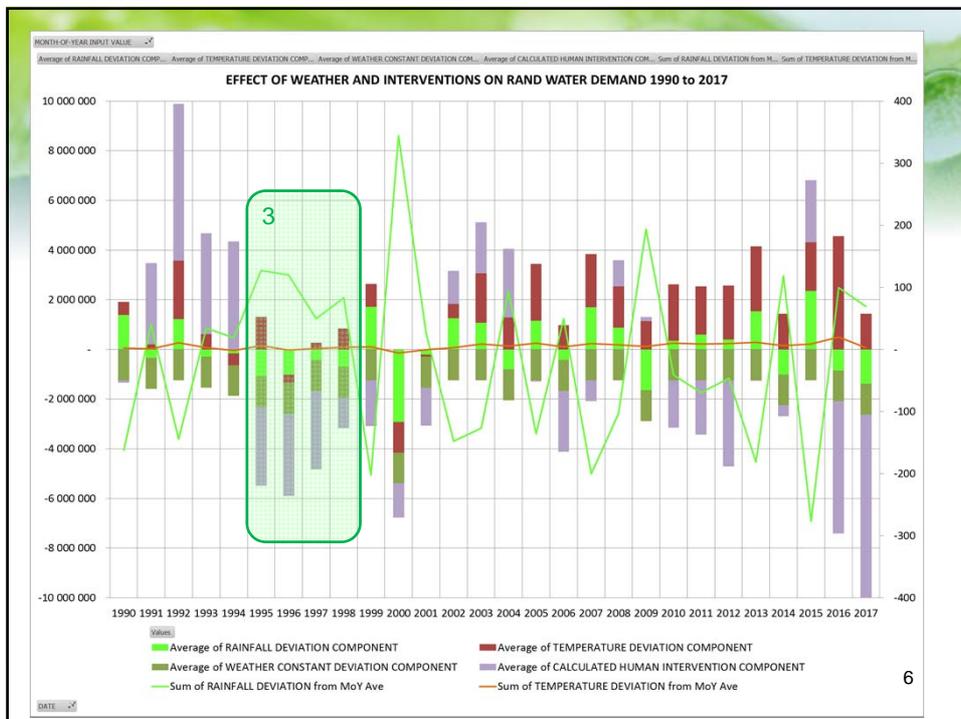
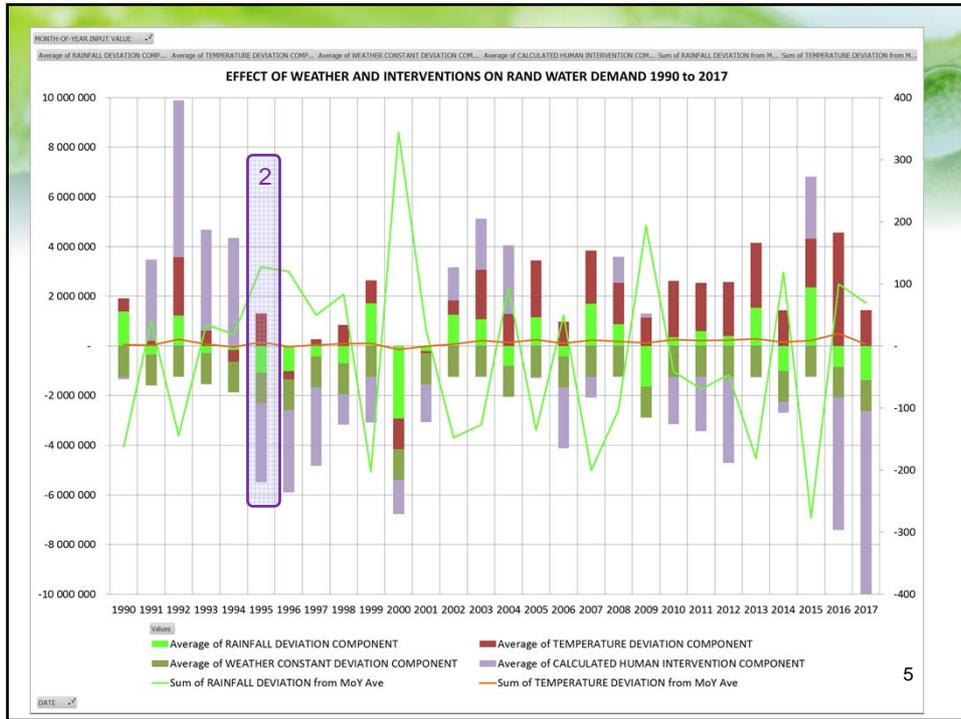
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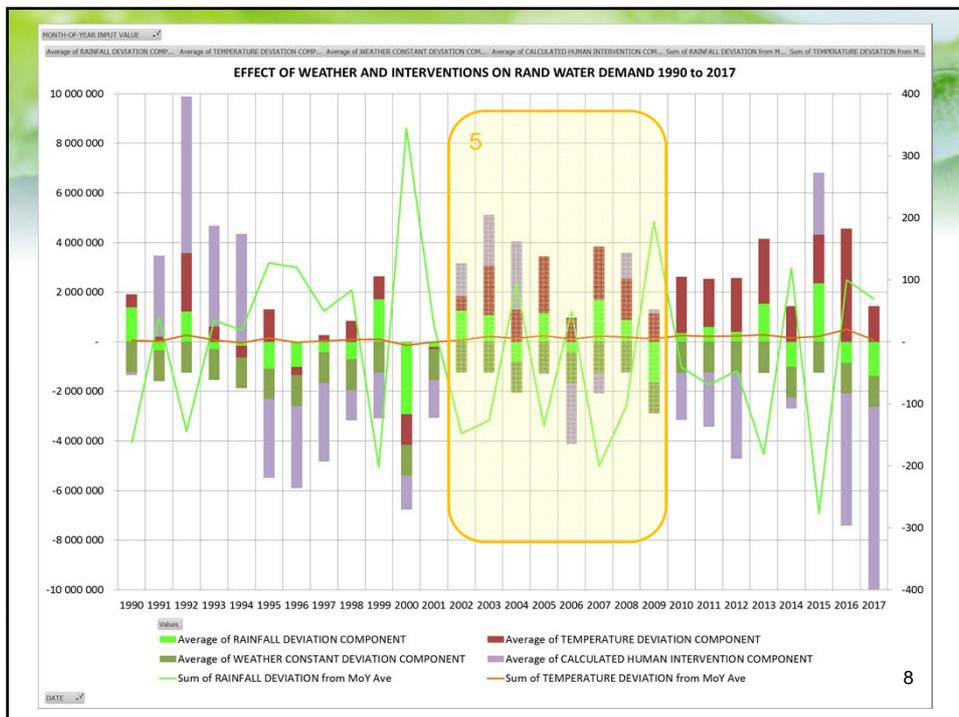
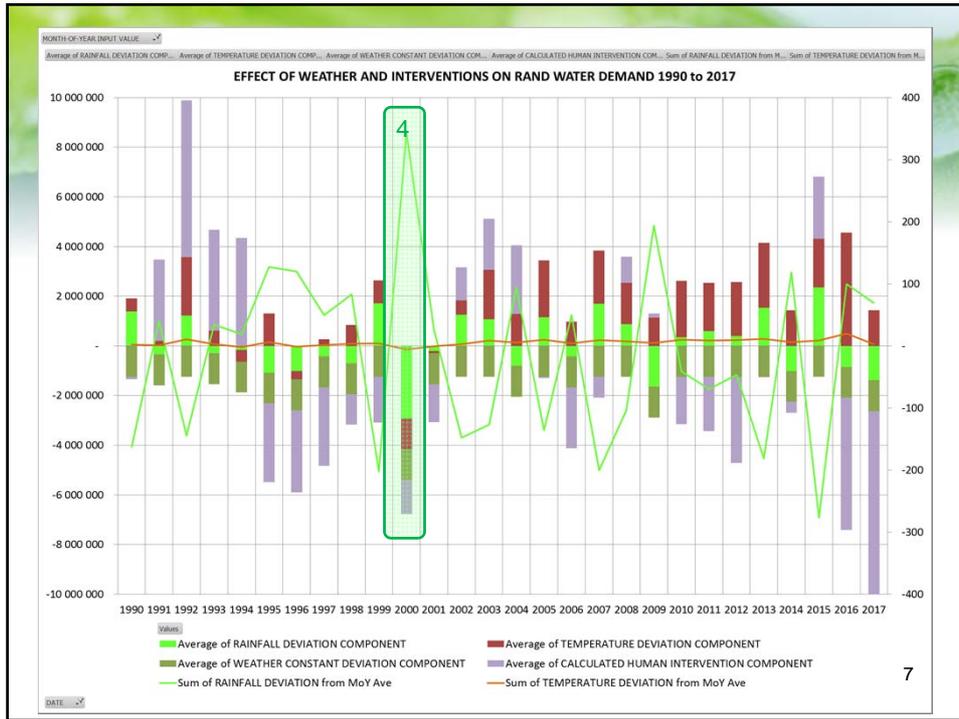


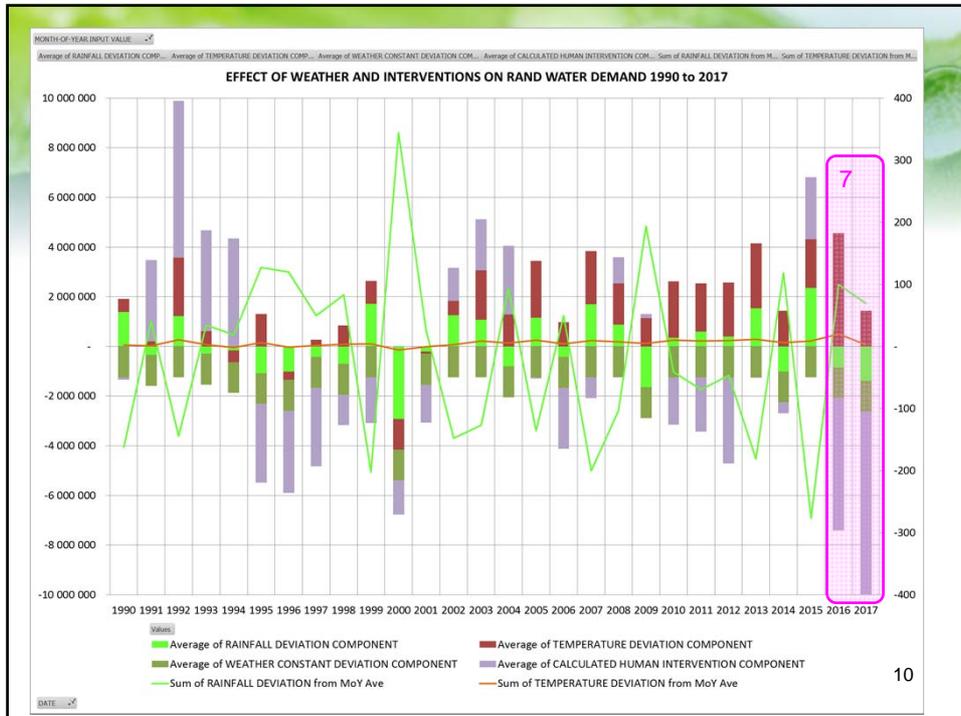
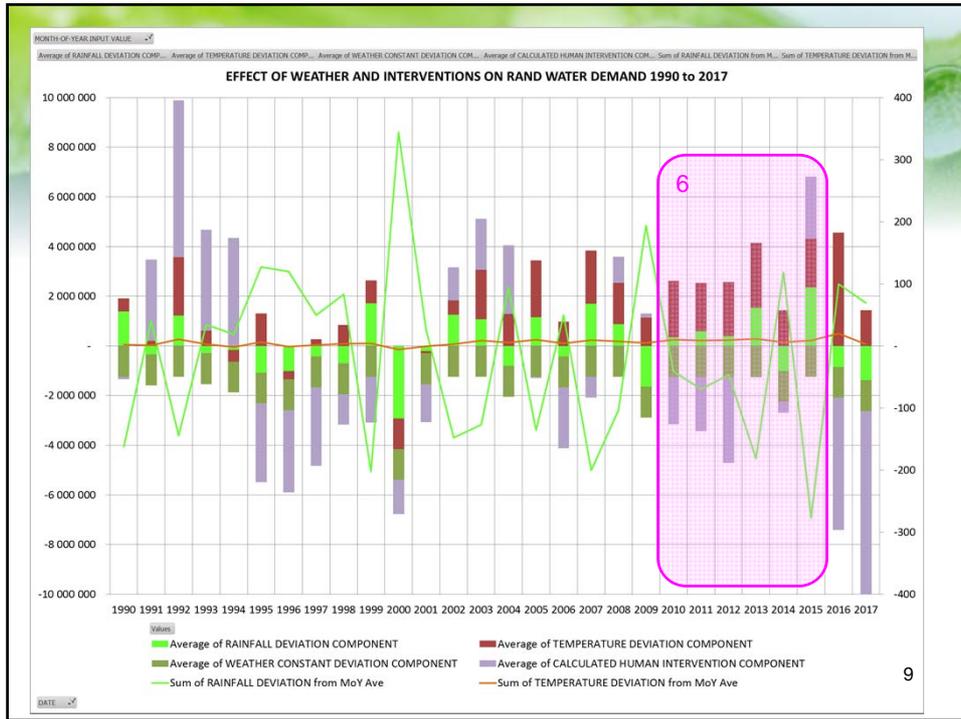
## Background

- The recent water shortages in the Vaal River System led to Rand Water developing an algorithm that enabled it to separate the effect of weather (rain & temp) from long-term growth, seasonal variation and other factors such as human interventions (restrictions)
- The historical weather data from 1901 to 2017 was analysed to determine long-term trends and averages and month-of-year deviations from the averages
- The total Rand Water potable water sales for the period 1990 to 2017 was analysed to determine long-term trends and averages and month-of-year deviations from the averages
- The consumption and weather data deviations from the long-term trend were then correlated and the results shown on the graph the next slides
- These deviations are then discussed, summarised and conclusions drawn









## Summary

R E F	PERIO D	WEATHE R	EFFECT of WEATHER	HUMAN INTERVENTI ON	EFFECT OF HUMAN INTERVENSIO N	COMMENT
1	1991 - 94	Dry, hot	Increased cons; Reduced inflow	No intervention	Increased cons	Dams dropping
2	1995	Dry, hot & then wet	Reduced cons; Reduced inflow & then flooding	30% Restrictions; Penalty tariffs; Lifted	Reduced cons	Medium-term effect (see 1995-98)
3	1995 - 1998	Wet, cool	Reduced cons; Increased inflow	No intervention	Reduced cons	After-effects of restrictions
4	2000	Wet, cool	Increased inflow & then flooding	No intervention	Reduced cons	
5	2002 - 2009	Average, variable	Average, variable cons	No intervention	Average, variable cons	
6	2010 - 2015	Dry, very hot	Increased cons; Reduced inflow	No intervention	Average, variable cons	Dams dropping
7	2016 - 2017	Wet, very hot	Increased cons; Increased inflow	15% Restrictions	Reduced cons	Dams very low to spilling

## Conclusion

- **Effect on demand**
  - The weather has a moderate effect on the demand (hot & dry = high demand) +7% to -7%
  - Human interventions such as restrictions had a -7% effect on demand. Some interventions such as awareness have a longer lasting effect
  - The combined effect of restrictions and the weather can result in a 0% to -14% effect on demand
  - Restrictions have been implemented at a late stage of each drought which limited its impact on total demand
  - To date restrictions were only required for less than a year at a time and the effect on demand has never exceeded -15%
- **Effect on supply**
  - The reduction of demand due to restrictions has had a moderate effect on the volume of water in storage (-15% for 1 year = +2.5% of FSC)
  - The reduction of demand due to the weather has had a small effect on the volume of water in storage (+7% of for 1 year = +1.3% of FSC)
  - The weather can have a large effect on water in storage due to high<sup>12</sup> rainfalls (+50% of IVRS FSC within one season)

## Recommendations

- Restrictions should rather be implemented at an earlier stage of a drought to allow for slow implementation
- Restrictions should rather be lifted at a later stage to allow the system to fill up first
- The effect of the weather on demand should not be under-estimated
- Due to its unpredictability, less dependence should be placed on the weather to bring sudden relief after a few years of drought
- It would be more prudent to reduce unnecessary demand in a sustainable manner than to rely on restrictions and floods (-15% demand for 10 years = 25% of FSC, which is much more than the effect of restrictions, but will be less disruptive)

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**THANK YOU**

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