Walgett Shire Council
Walgett Waste Depot

DECCW
Licence 12466
Groundwater

Test Results
May 2024
Arthur Street
Walgett NSW 2832

82 Plain Street
TAMWORTH NSW 2340
Phone: 02 6762 1733
Fax: 02 6765 9109
Email: admin@eastwestonline.com.au
Website: www.eastwestonline.com.au
ABN 52 655 947 827

This report does not provide a complete assessment of the environmental integrity of the site and is limited to the scope defined herein. Should any reader require that other matters be considered apart from those considered within this report, they should then make their own investigations and form their own conclusions.

This report has been prepared by:

Stephanie Cameron
Independent consultant for agriculture & the environment
(B.App.Sc)

Ref.: EW241065
Envirolab COA 351654

Figure 1: Map of Environmental Monitoring Points located at Walgett Waste Depot Arthur St Walgett NSW 2832

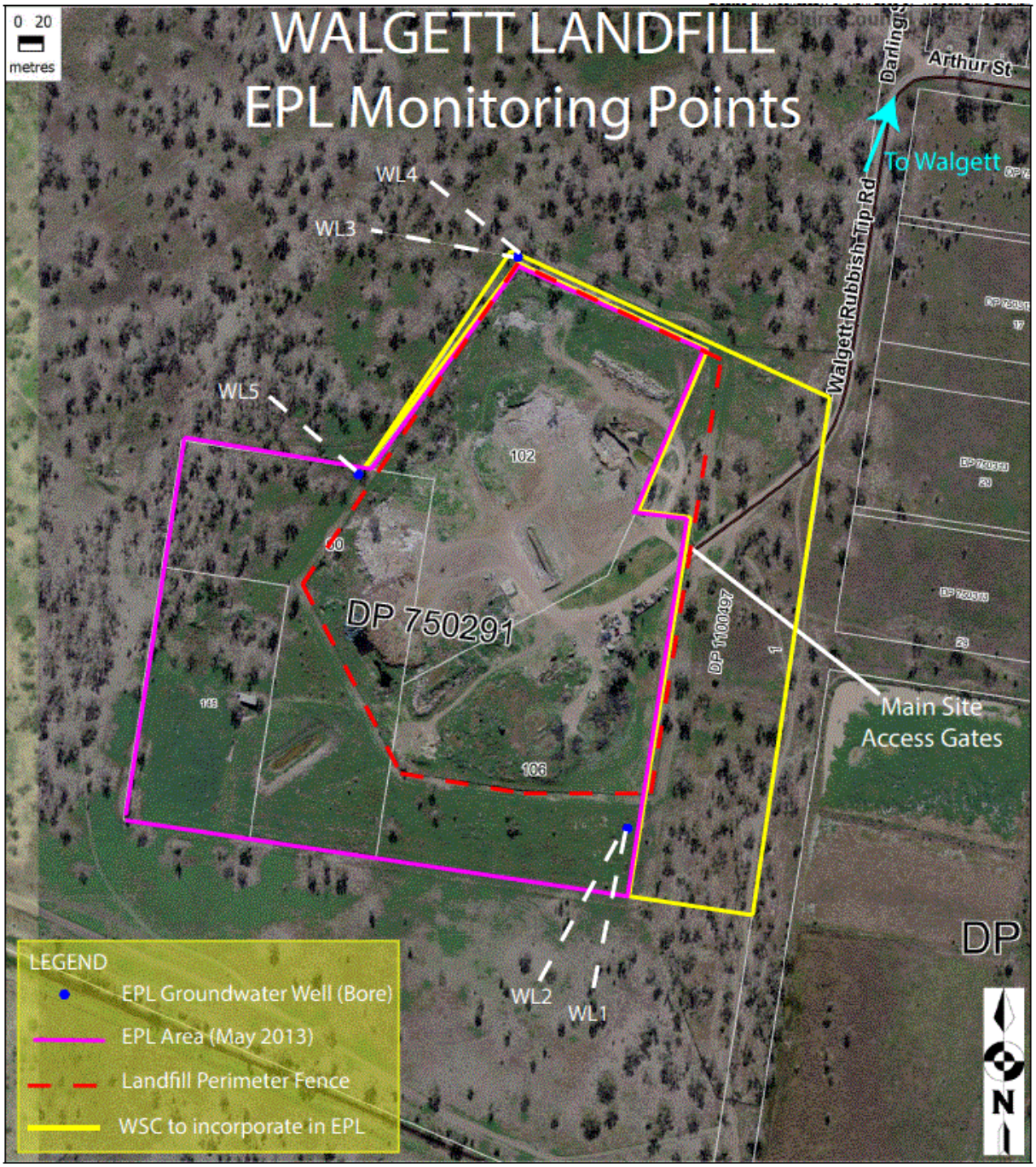

Table 2: Walgett Shire Council Waste Depot Groundwater Monitoring Points 1-5

Sample ID		Pt 1	Pt 2								Pt 3								Pt 4	Pt 5	Guidelines Aquatic Ecosystems	Guidelines Irrigation	Guidelines Drinking
		WL1	WL 2								WL 3								WL 4	WL 5			
Analyte	Units	No Sample	2214744	2221963	2307682	2310153	2314193	**2318903**	**2404623**	**2410652**	2214743	2221962	2307681	2310152	2314192	**2318902**	**2404622**	**2410653**	No Sample	No Sample			
			17/8/2022	20/12/2022	14/3/2023	02/05/2023	28/07/2023	**26/10/2023**	8/02/2024	16/05/2024	17/8/2022	20/12/2022	14/3/2023	02/05/2023	28/07/2023	**26/10/2023**	8/02/2024	16/05/2024					
Alkalinity (as $CaCO_3$)	mg/L	NS	490	480	480	530	560	570	560	**530**	380	380	380	370	370	360	380	**370**	NS	NS	*Na*	*Na*	*<200*
Aluminium	mg/L	NS	<0.01	<0.01	<0.01	0.11	0.02	<0.01	<0.01	**<0.01**	0.09	0.02	<0.01	0.01	0.02	<0.01	<0.01	**<0.01**	NS	NS	*<0.06*	*<5-20*	*<0.1*
Ammonia as N	mg/L	NS	2.2	2.3	0.13	0.029	0.038	0.043	0.020	**1.9**	0.2	<0.005	<0.005	<0.005	<0.005	0.55	0.013	**0.03**	NS	NS	*<0.9-2.3*	*Na*	*<0.5*
Arsenic	mg/L	NS	0.002	0.005	0.007	0.004	0.007	0.005	0.003	**0.015**	0.003	0.003	0.004	0.003	0.004	0.004	0.002	**0.004**	NS	NS	*<0.24-0.36*	*<0.1-2.0*	*<0.007*
BOD	mg/L	NS	8	33	16	<10	<10	<5	6	**80**	<5	35	18	<10	<10	<5	30	**<5**	NS	NS	*Na*	*Na*	*Na*
Barium	mg/L	NS	0.04	0.039	0.045	0.043	0.037	0.036	0.032	**0.028**	0.041	0.038	0.039	0.040	0.036	0.036	0.036	**0.033**	NS	NS	*Na*	*Na*	*<0.7*
Benzene	mg/L	NS	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**	NS	NS	*<0.95-2.0*	*Na*	*<0.001*
Cadmium	mg/L	NS	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	**<0.0001**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	**<0.0001**	NS	NS	*<0.0002*	*<0.01-0.05*	*<0.002*
Calcium	mg/L	NS	220	230	250	240	280	300	260	**270**	35	28	35	32	33	40	32	**29**	NS	NS	*Na*	*<1000*	*Na*
Chloride	mg/L	NS	4300	4800	4500	5400	5500	5900	5000	**5500**	980	1100	1100	1000	950	1000	870	**1000**	NS	NS	*Na*	*<175-370*	*<250*
Chromium (hexavalent)	mg/L	NS	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**<0.005**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**<0.005**	NS	NS	*<0.001-0.04*	*Na*	*<0.05*
Chromium	mg/L	NS	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	**<0.001**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**	NS	NS	*Na*	*<0.1-1.0*	*Na*
Conductivity	µS/cm	NS	15000	16000	16000	18000	18000	18000	18000	**17,000**	4200	4700	4500	4400	4400	4200	4400	**4,400**	NS	NS	*200-300*	*1300-2900*	*<900*
Copper	mg/L	NS	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	**<0.001**	NS	NS	*<0.001-0.003*	*<0.2-5.0*	*<1.0-2.0*

Sample ID		Pt 1	Pt 2								Pt 3								Pt 4	Pt 5	Guidelines Aquatic Ecosystems	Guidelines Irrigation	Guidelines Drinking
		WL1	WL 2								WL 3								WL 4	WL 5			
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			17/8/2022	20/12/2022	14/3/2023	02/05/2023	28/07/2023	**26/10/2023**	8/02/2024	16/05/2024	17/8/2022	20/12/2022	14/3/2023	02/05/2023	28/07/2023	**26/10/2023**	8/02/2024	16/05/2024					
Ethyl Benzene	mg/L	NS	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**	NS	NS	*Na*	*Na*	*<0.003-0.3*
Fluoride	mg/L	NS	0.1	0.2	0.1	0.2	0.1	0.2	0.1	**0.2**	0.1	0.1	<0.1	0.1	0.1	0.1	0.1	**0.1**	NS	NS	*Na*	*<1-2*	*<1.5*
Iron	mg/L	NS	0.03	0.26	<0.01	<0.01	0.50	0.84	0.25	**1.1**	0.08	0.04	0.06	<0.01	<0.01	0.06	0.010	**0.02**	NS	NS	*<0.37*	*<0.2-10.0*	*<0.3*
Lead	mg/L	NS	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**	NS	NS	*<0.003-0.009*	*<2.0-5.0*	*<0.01*
Magnesium	mg/L	NS	200	210	210	220	240	240	300	**260**	29	31	32	29	31	29	33	**29**	NS	NS	*Na*	*<1000*	*Na*
Manganese	mg/L	NS	0.36	0.93	0.66	0.58	0.25	0.67	0.52	**0.40**	0.12	0.023	0.024	<0.005	0.008	0.078	0.011	**<0.005**	NS	NS	*<1.9-3.6*	*<0.2-10.0*	*<0.1-0.5*
Mercury	mg/L	NS	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	**<0.00005**	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	**<0.00005**	NS	NS	*<0.0006-0.005*	*<0.002*	*<0.001*
Nitrate as N	mg/L	NS	0.040	<0.005	0.16	0.12	0.74	0.29	0.15	**0.03**	0.020	0.067	0.066	0.03	0.04	0.05	0.061	**0.23**	NS	NS	*0.7-17*	*<5-125*	*<11-22*
Organo-chlorines	mg/L	NS	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	**<0.0002**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	**<0.0002**	NS	NS	*<0.0001*	*<0.001*	*<0.001*
Phenols Total	mg/L	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**<0.05**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**<0.05**	NS	NS	*<0.16*	*<0.32 NEPM 2010*	
Phosphorus Total	mg//L	NS	0.07	0.8	0.4	0.3	0.3	0.1	0.2	**0.8**	0.2	0.1	0.09	0.06	0.1	0.08	0.08	**0.1**	NS	NS	*<0.01*	*0.8-12.0*	*Na*
Polychlorinated Biphenyls	mg//L	NS	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	**<0.002**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	**<0.002**	NS	NS	*<0.0001*	*<2.0*	*<0.0006 NEPM*
Poly Aromatic Hydrocarbons	mg//L	NS	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**	NS	NS	*<0.016*	*Na*	*<0.00001*
Potassium	mg//L	NS	5.5	8.2	6.8	7.0	6.1	6.0	5.8	**7.2**	4.0	5.0	5.0	4.0	4.0	4.0	3.0	**4.0**	NS	NS	*Na*	*Na*	*Na*
Sodium	mg/L	NS	2900	3300	3,000	3100	3600	3500	3500	**3,500**	1000	900	820	720	780	740	730	**900**	NS	NS	*Na*	*<240-460*	*<180*

Sample ID		Pt 1	Pt 2								Pt 3								Pt 4	Pt 5	Guidelines Aquatic Ecosystems	Guidelines Irrigation	Guidelines Drinking
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Standing Water Level	m	NS	13.5	13.4	13.2	13.4	13.2	13.1	13.0	**13.1**	12.6	12.6	12.4	12.3	12.2	12.23	12.2	**12.3**	NS	NS	*Na*	*Na*	*Na*
Sulphate as S	mg/L	NS	1300	1400	1300	1500	1400	1900	1900	**1800**	400	400	380	450	430	420	380	**390**	NS	NS	*Na*	*<1000*	*<250-500*
Toluene	mg/L	NS	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.001**	NS	NS	*Na*	*Na*	*<0.025-0.8*
Total Dissolved Solids	mg/L	NS	10000	9500	9200	10000	11000	12000	12000	**12,000**	2600	2500	2500	2500	2800	2600	2400	**2,500**	NS	NS	*<125-188*	*<800-1800*	*<600*
Total Organic Carbon	mg/L	NS	2	10	3	2	2	2	2	**5**	2	2	2	2	2	2	3	**2**	NS	NS	*Na*	*Na*	*Na*
Total Petroleum Hydrocarbons C6-C10	mg/L	NS	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	**<0.010**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	**<0.010**	NS	NS	*C6-C10 <1.0*		
Total Petroleum Hydrocarbons C10-C40	mg/L	NS	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	**3.4**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.05**	NS	NS	**Groundwater HSLs for vapour intrusion (mg/L)** *NEPM 2013 <1.0*		
Xylene	mg/L	NS	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	**<0.002**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	**<0.002**	NS	NS	*<0.2-0.35*	*Na*	*<0.02-0.6*
Zinc	mg/L	NS	0.004	0.006	0.017	0.013	0.007	0.075	0.018	**0.002**	0.008	0.012	0.023	0.027	0.008	0.008	0.009	**0.003**	NS	NS	*<0.008-0.03*	*<2.0-5.0*	*<3.0*
pH Value	pH Units	NS	7.3	7.3	7.9	7.3	7.4	7.4	7.2	**7**	7.7	7.8	8.2	7.6	7.7	7.8	7.6	**7.6**	NS	NS	*6.0-8.0*	*6.0-8.5*	*6.5-8.5*

Guidelines: Depending on the beneficial reuse of the groundwater supplies whether it is irrigation, drinking, stock or environmental flows for aquatic ecosystems. For this site the irrigation guidelines will be referred to as the most likely reuse option. The highlighted figures are the most recent set of results.

1. ANZECC (2000) Australian & New Zealand Guidelines for Fresh & Marine Waters for Aquatic Ecosystems (95% - 80% protection) for Up-land and Low-land Rivers.
2. ANZECC (2000) Australian & New Zealand Guidelines for Fresh & Marine Waters for Primary Industries. DECCW (2004) Environmental Guidelines: Use of Effluent by Irrigation.
3. ANZECC (2011, rev2018) Australian& New Zealand Guidelines for Drinking Water.
4. NEPM (2013) Schedule B1 Guideline on Investigation Levels for Soil & Groundwater.

NS ~ Sample could not be collected
NT ~ Testing not required
Na ~ Not applicable

eastwest
geo ag enviro
Part of the Geotechnical Services Group

82 Plain Street Tamworth NSW 2340
e admin@eastwestonline.com.au
t 02 6762 1733
f 02 6765 9109
abn 52 655 947 827

eastwestonline.com.au

31st May 2024

Director of Engineering/Technical Services
Walgett Shire Council
PO Box 31
Walgett NSW 2832
Email: admin@walgett.nsw.gov.au

To whom it may concern,

The results obtained from the groundwater samples collected on 16th May 2024 at Walgett Waste Depot have been studied and the following comment made:

1. Groundwater is considered protected if the existing or potential beneficial use of the water is not impaired by any activity (ANZECC, 1992). These monitoring bores are not sources for drinking water so guideline values for aquatic protection and human consumption are not entirely relevant. The most beneficial reuse of this water would be for irrigation if required so these are the guidelines that will be referred to in the following report.
2. **EC (Electrical Conductivity)** quantifies the number of dissolved ions in water. At point 2 the EC remains elevated at 17,000µS/cm. Point 3 also shows an elevated EC and has stayed consistent over the past year. This means both groundwaters would not be suitable for irrigating any crops and pastures.
3. **TDS** stands for **Total Dissolved Solids** and represents the total concentration of dissolved substances in water. TDS is made up of inorganic salts, as well as a small amount of organic matter. The amount of TDS at Point's 2 and 3 is elevated and this means both waters would not be suitable for irrigating any crops and pastures.
4. **pH** is a measure of the concentration of hydrogen ion, which determines how acidic or alkaline the water is and these moderately alkaline groundwaters are within the guideline range for irrigation.
5. **Alkalinity** is the quantitative capacity of water to neutralise an acid. Most natural waters have an alkalinity in the range of 10 to 500 mg/L. Both points have a moderate amount of alkalinity as calcium carbonate ($CaCO_3$), with Point 2 at higher levels of 530 mg/L.
6. **Total Organic Carbon** (TOC) is a term used to describe the measurement of organic (carbon based) contaminants in a water system. Organic contamination can come from a variety of sources, since "organics" are compounds such as sugar, sucrose, alcohol, petroleum, PVC cement, plastic based derivatives, etc. The Guidelines do not specify a threshold for TOC. Typical levels for TOC in naturally occurring waters according to APHA are 0.1 to 25mg/L and for industrial water greater than 100mg/L. The TOC at Point 2 and Point 3 has remained steady at 5 and 2mg/L respectively.

7. **BOD (Biological Oxygen Demand)** is a measure of the oxygen used by microorganisms to decompose waste. If there is a large quantity of organic waste in the water body, there will also be bacteria present working to decompose this waste. The demand for oxygen will be high (due to all the bacteria) where the BOD level is high. As the waste is consumed, dispersed through water or diluted by rainwater/fresh run-off, BOD levels will be low. BOD levels at both points have fluctuated over the previous 2 years with Point 2 being elevated at 80mg/L. The Guidelines do not specify a threshold for BOD.
8. **Nitrate** and **Ammonia** are present in both monitoring wells. Nitrate is reasonably water soluble and therefore leachable. It moves easily from the land surface through the aerated zone above the water table to the saturated zone, which is the groundwater reservoir. Excess nutrients, especially nitrate, become contaminants that are diluted in the saturated zone. Ammonia in water is an indicator of possible bacterial, sewage and animal waste pollution. Point 2 and Point 3 both have levels of NO_3 and NH_3 acceptable for irrigation.
9. Soil fixes and immobilizes **phosphorus** within a few hours. Phosphorus is reasonably insoluble in water and rarely moves with percolating water to groundwater. However, phosphorus can pass through clean, clay-free sand. Phosphorus is typically a threat to surface water quality because clay-bound phosphorus will move with eroding soil. Total Phosphorus levels are acceptable for irrigation.
10. **Sulphate** is a naturally occurring substance that contains sulphur and oxygen. It is present in various mineral salts that are found in soil. Sulphate forms salts with a variety of elements including barium, calcium, magnesium, potassium, and sodium. Sulphate in water may be a result of leaching from the soil, decaying plant, and animal matter, from chemical products including ammonium sulphate fertilizers and from the water treatment process. Sulphate-S has remained elevated at 1800mg/L at Point 2 which is above irrigation guideline thresholds.
11. **Calcium** and **magnesium** are acceptable, and all figures are within the guideline thresholds for irrigation. **Potassium** at Point 2 has and Point 3 has remained steady.
12. All groundwater contains some **sodium** and **chloride** because most rocks and soils contain sodium chloride compounds from which sodium and chloride is easily dissolved. Both groundwater monitoring points are exhibiting elevated sodium and chloride levels and careful consideration using salt tolerant species would be needed when using this water for irrigation. Sodium chloride is a very soluble salt and will build up in groundwater. Sodium and chloride have remained at stable elevated levels over the past few years.
13. Both points were tested for the following metals: **aluminium, arsenic, barium, cadmium, chromium (total & hexavalent), copper, iron, lead, manganese, mercury, and zinc**. All points recorded levels for metals acceptable for irrigation. **Manganese** at Point 2 has fluctuated seasonally over the past year. Elevated manganese levels can result in a black precipitate which blocks pipes and irrigation equipment. **Iron** has fluctuated seasonally at Point 2 and Point 3 and currently iron is at acceptable levels for irrigation at both points.

14. **Fluoride** is an element that is naturally found in all water sources, including fresh and sea water. Fluoride is also found naturally in a wide range of food items including tea, fish and rice. The National Medical Health and Research Council and the World Health Organisation have both specified a **guideline** value of 1.5mg/L for fluoride in drinking water. These two samples have a very low level of Fluoride.
15. **Total petroleum hydrocarbons** (TPH) is a term used to describe a large family of several hundred chemical compounds that originally come from crude oil. TPH is a mixture of chemicals, but they are all made mainly from hydrogen and carbon, called hydrocarbons. TPH are divided into groups of petroleum hydrocarbons that act alike in soil or water. These groups are called petroleum hydrocarbon fractions. Each fraction contains many individual chemicals. Some chemicals that may be found in TPH are hexane, jet fuels, mineral oils, benzene, toluene, xylenes, naphthalene, and fluorene, as well as other petroleum products and gasoline components. TPH fractions have measured below the instrument's limit of detection at Point 3 is beneath the Guideline thresholds. Point 2 has recorded an elevated level of TPH of C10-C40 of 3.4mg/L in May 2024.
16. The chemicals **benzene**, **toluene**, **ethylbenzene,** and **xylene** together are commonly named BTEX. These compounds occur naturally in crude oil and the primary man-made releases of BTEX compounds are through emissions from motor vehicles and aircrafts, and cigarette smoke. BTEX compounds are created and used during the processing of petroleum products and during the production of consumer goods such as paints and lacquers, thinners, rubber products, adhesives, inks, cosmetics, and pharmaceutical products. At both points sampled the BTEX levels are below the instrument's level of detection and are also below the Drinking Water Guidelines.
17. **Organo-chlorines** are chemicals that contain carbon and chlorine atoms joined together. Harmful organo-chlorines are those that do not break down easily and stay in the environment and in our bodies for a long time. A range of organo-chlorines have been tested for and these include chlorinated pesticides that are toxic, such as dieldrin and DDT and the industrial chemical **polychlorinated biphenyls** (PCBs). All organo-chlorines tested were below the instrument's level of detection and the thresholds specified in the Guidelines.
18. Total **phenol** is used to measure the multitude of phenol compounds which can be present in water. Point's 2 & 3 have total phenols measuring less than 0.05mg/L which is below Guideline thresholds.
19. The **polycyclic aromatic hydrocarbons** (PAHs) are a large group of organic compounds with two or more fused aromatic rings. PAHs can be found throughout the environment and are formed naturally in forest fires, or through the combustion of fossil fuels, and are present in emissions from industrial and man-made processes. The principal PAHs include phenanthrene, fluoranthene, pyrene, anthracene, benzo(a)pyrene (BaP), benzofluoranthene, chrysene, anthanthrene and naphthalene. Both points tested for PAHs tested below the limit of detection of instruments as well as being beneath the Guidelines.

Overall Impressions:

The groundwater sample collected from Point 2 (WL2) from the Walgett Waste Depot contains an elevated level of salinity due to calcium, magnesium, sulphate, sodium, and chloride contained in the water. Conductivity and total dissolved solids are a measure of salts and they too are elevated in direct proportion to the elevated salinity. Sulphate is above the Guidelines threshold and alkalinity is now above the upper threshold for the Guidelines. Testing and study of historical data currently shows levels of salinity are fluctuating seasonally. All other parameters are within the threshold values taken from the Guidelines except for Point 2 which has recorded an elevated level of TPH of C10-C40 of 3.4mg/L in May 2024.

The groundwater sample collected from Point 3 (WL3) from the Walgett Waste Depot contains a slightly elevated level of sodium, chloride, TDS, and EC. All other parameters are within the threshold values taken from the Guidelines.

Please let us know if you would like further comment.

Yours faithfully,

Stephanie Cameron
Independent consultant for agriculture & the environment
(B.App.Sc)