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Observation dug well station -wise groundwater level data in the study area (2016)

Sample Code	Latitude (North)	Longitude (East)	Elevation (m)	Pre-monsoon DTW (mbgl)	Post-monsoon DTW (mbgl)	WLF
DW-1	24°10'14.3"	82°36'21.4"	473.9	5.79	2.65	3.14
DW-2	24°06'15.2"	82°35'02.0"	308.9	10.36	7.51	2.85
DW-3	24°06'27.6"	82°35'14.1"	309.9	5.79	3.69	2.1
DW-4	24°06'54.2"	82°35'39.5'	311.7	8.66	7.50	1.16
DW-5	24°06'57.9"	82°34'41.3"	314.1	9.62	7.78	1.84
DW-6	24°05'46.6"	82°33'34.2"	296.0	7.09	3.10	3.99
DW-7	24°07'25.7"	82°46'05.2"	270.4	5.02	3.23	1.79
DW-8	24°07'50.5"	82°46'23.1"	275.6	7.95	7.17	0.78
DW-9	24°08'05.3"	82°46'44.6"	278.0	5.82	8.95	-3.13
DW 10	24°10'06.7"	82°46'03.7"	272.8	7.34	6.18	1.16
DW-11	24°08'17.9"	82°41'24.0"	362.3	5.91	4.49	1.42
DW-12	24°12'00.7"	82°46'38.0"	289.0	7.16	6.42	0.74
DW 13	24°10'52.3"	82°40'55.9"	411.6	14.63	13.71	0.92
DW-14	24°09'59.4"	82°41'27.3"	389.8	10.92	10.30	0.62
DW-15	24°11'56.2"	82°41'19.9"	364.0	7.92	7.25	0.67
DW-16	24°05'41.7"	82°39'08.4"	286.6	6.48	5.07	1.41
DW-17	24°06'16.3"	82°39'27.1"	292.6	4.97	2.90	2.07
DW-18	24°06'46.7"	82°39'58.5"	295.1	6.43	4.12	2.31
DW-19	24°11'29.4"	82°39'01.6"	389.7	9.81	8.47	1.34
DW-20	24°11'27.9"	82°39'03.6"	387.5	7.64	6.27	1.37
DW-21	24°11'26.9"	82°39'23.5"	378.3	10.99	9.04	1.95
DW-22	24°07'16.7"	82°38'47.6"	307.7	4.16	2.55	1.61
DW-23	24°11'55.4"	82°41'53.0"	392.0	17.62	16.40	1.22
DW-24	24°13'42.7"	82°41'49.3"	391.0	7.03	4.95	2.08
DW-25	24°11'52.6"	82°40'48.0"	369.4	5.11	3.86	1.25
DW-26	24°13'29.0"	82°42'37.2"	422.7	5.78	2.97	2.81
DW-27	24°14'46.2"	82°42'17.7"	345.7	20.85	21.55	-0.7
DW-28	24°14'43.7"	82°40'57.0"	338.8	12.54	10.25	2.29
DW-29	24°13'27.0"	82°40'13.8"	354.2	16.80	15.10	1.70
DW-30	24°12'51.1"	82°41'16.2"	361.8	5.69	3.17	2.52
DW-31	24°13'05.6"	82°42'10.6"	386.5	5.31	3.81	1.50
DW-32	24°12'38.4"	82°40'18.1"	394.9	3.05	2.64	0.41
DW-33	24°12'24.7"	82°39'58.9"	383.4	13.67	13.79	-0.12
DW-34	24°12'14.7"	82°40'54.6"	368.2	7.32	5.84	1.48
DW-35	24°12'45.9"	82°39'45.5"	383.6	10.05	8.63	1.42
DW-36	24°12'39.7"	82°41'21.6"	367.8	6.11	4.27	1.84
DW-37	24°13'28.2"	82°43'45.0"	365.2	8.88	5.39	3.49
DW-38	24°12'19.2"	82°45'23.4"	295.2	2.87	1.65	1.22
DW-39	24°10'51.7"	82°46'15.1"	280.1	10.98	7.84	3.14
DW-40	24°11'14.2"	82°46'18.1"	285.0	11.48	12.27	-0.79
DW-41	24°10'21.7"	82°46'0.10"	275.3	9.43	8.05	1.38
DW-42	24°10'52.6"	82°46'10.6"	280.0	13.04	11.01	2.03
DW-43	24°12'09.8"	82°46'00.0"	298.5	10.74	9.59	1.15

**Appendix A.1**

DW-44	24°07'01.9"	82°45'46.0"	267.7	4.90	4.14	0.76
DW-45	24°06'43.0"	82°38'28.0"	306.5	4.12	2.48	1.64
DW-46	24°07'05.0"	82°45'09.6"	279.4	2.38	1.90	0.48
DW-47	24°06'42.8"	82°43'17.8"	332.1	5.65	4.65	1.00
DW-48	24°06'41.1"	82°43'38.6"	324.5	1.37	1.35	0.02
DW-49	24°06'57.1"	82°42'22.8"	298.3	4.11	3.03	1.08
DW-50	24°12'49.4"	82°38'30.9"	360.3	7.53	4.85	2.68
DW-51	24°12'27.5"	82°36'57.9"	385.6	3.64	2.17	1.47
DW-52	24°12'44.1"	82°34'58.3"	395.4	5.30	4.25	1.05
DW-53	24°12'57.1"	82°33'52.2"	388.3	4.07	3.04	1.03
DW-54	24°12'11.4"	82°34'50.0"	400.3	14.20	13.38	0.82
DW-55	24°12'35.4"	82°34'06.0"	384.9	6.86	5.65	1.21
DW-56	24°12'29.0"	82°33'33.2"	381.4	9.13	7.76	1.37
DW-57	24°12'24.6"	82°33'33.2"	381.0	7.68	6.70	0.98
DW-58	24°13'29.6"	82°32'36.8"	389.8	10.63	10.28	0.35
DW-59	24°12'35.4"	82°37'33.0"	389.7	0.82	1.40	-0.58
DW-60	24°12'41.7"	82°35'36.4"	410.9	4.37	3.35	1.02
DW-61	24°11'59.7"	82°34'18.0"	393.4	11.98	10.76	1.22
DW-62	24°09'33.1"	82°35'22.5"	489.7	17.19	17.32	-0.13
DW-63	24°09'59.8"	82°35'13.0"	475.1	24.75	24.62	0.13
DW-64	24°10'14.8"	82°35'35.4"	475.0	22.74	21.70	1.04
DW-65	24°04'32.3"	82°36'33.3"	280.9	7.25	5.15	2.1
DW-66	24°04'49.0"	82°38'22.3"	288.7	5.77	4.45	1.32
DW-67	24°05'45.1"	82°37'13.7"	291.3	3.63	1.80	1.83
DW-68	24°11'04.6"	82°38'47.0"	398.5	10.34	7.92	2.42
DW-69	24°04'59.5"	82°36'07.3"	286.9	6.43	4.10	2.33
DW-70	24°05'23.0"	82°35'22.2"	295.1	11.04	11.95	-0.91
DW-71	24°06'10.8"	82°35'15.1"	306.8	6.97	8.35	-1.38
DW-72	24°10'23.3"	82°38'06.5"	422.2	10.48	13.35	-2.57
DW-73	24°05'59.0"	82°38'00.0"	295.3	3.35	2.10	1.25
DW-74	24°06'18.0"	82°38'00.7"	301.5	3.34	1.76	1.58
DW-75	24°10'42.6"	82°38'06.7"	416.5	16.32	15.52	0.80
DW-76	24°05'10.0"	82°33'30.0"	294.4	6.67	4.40	2.27
DW-77	24°06'02.0"	82°37'31.7"	299.2	10.77	4.64	6.13
DW-78	24°06'54.3"	82°31'21.1"	314.6	9.10	8.80	0.30
DW-79	24°06'55.6"	82°31'44.0"	307.9	11.33	8.21	3.12
DW-80	24°03'49.5"	82°35'08.1"	282.7	8.48	6.14	2.34
DW-81	24°04'46.6"	82°34'48.9"	286.7	10.39	10.40	-0.01
DW-82	24°03'57.7"	82°32'51.4"	303.0	6.64	5.62	1.02
DW-83	24°04'25.7"	82°31'57.2"	304.0	3.78	1.90	1.88
DW-84	24°04'23.7"	82°31'15.7"	320.6	3.92	3.77	0.15
DW-85	24°03'44.6"	82°31'20.7"	323.0	4.95	4.45	0.50
DW-86	24°05'10.5"	82°33'30.4"	294.5	6.65	6.75	-0.10
		Minimum	267.7	0.8	1.4	-3.1
		Maximum	489.7	24.8	24.6	6.1
		Average	340.6	8.3	7.1	1.3

\* DW-Dug well, DTW-Depth to water level, WLF-Water level Fluctuation,

**Appendix A.2**

Physicochemical and heavy metals analysis of groundwater samples in Singrauli coalfield area

Sample Code	Physico-chemical Parameters													Heavy Metals						
	pH	EC	TDS	Ca <sup>+2</sup>	Mg <sup>+2</sup>	Na <sup>+</sup>	K <sup>+</sup>	F <sup>-</sup>	Cl <sup>-</sup>	NO <sub>3</sub> <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup>	HCO <sub>3</sub> <sup>-</sup>	TH	Fe	Cu	Pb	Cd	Cr	Ni	Zn
<b>GW-1</b>	7.08	436	218	17.48	51.18	63.35	5.20	0.33	75.64	5.84	35.67	32.12	253.52	1.21	1.13	0.33	0.17	0.00	0.15	3.14
<b>GW-2</b>	6.75	50	25	5.00	1.66	4.00	0.63	0.27	2.18	0.00	0.60	16.57	19.31	1.19	1.18	0.18	0.10	0.01	0.12	3.43
<b>GW-3</b>	7.88	245	122	15.84	9.34	23.16	1.70	0.47	23.52	6.39	9.54	47.54	77.88	1.31	1.39	0.28	0.11	0.06	0.27	5.17
<b>GW-4</b>	7.46	195	97	14.04	9.27	14.04	1.78	0.31	12.85	44.09	3.89	35.31	73.09	1.48	1.53	0.25	0.18	0.06	0.29	3.72
<b>GW-5</b>	7.71	474	237	49.26	8.90	21.45	1.27	0.57	10.97	2.10	18.06	116.58	159.62	0.97	1.35	0.12	0.07	0.01	0.12	3.04
<b>GW-6</b>	7.92	265	141	29.78	7.11	23.54	0.45	1.63	10.36	0.00	0.00	76.41	103.59	0.91	1.63	0.13	0.10	0.01	0.13	3.19
<b>GW-7</b>	7.65	380	190	59.96	4.48	18.70	0.32	1.74	10.42	6.18	24.94	68.67	168.27	0.85	1.13	0.12	0.06	0.00	0.28	1.78
<b>GW-8</b>	6.73	60	30	4.61	1.17	5.03	19.39	0.31	5.26	1.50	0.72	19.06	16.31	0.87	1.15	0.11	0.05	0.01	0.14	1.83
<b>GW-9</b>	7.69	470	235	51.26	18.52	29.43	17.61	0.52	7.66	0.00	3.01	109.25	204.08	1.43	1.26	0.13	0.06	0.04	0.09	2.39
<b>GW-10</b>	7.58	670	335	88.51	13.65	44.27	3.05	0.79	58.73	0.00	42.10	73.91	277.22	0.95	1.55	0.12	0.18	0.02	0.12	5.26
<b>GW-11</b>	7.67	584	290	92.77	13.54	31.84	1.05	0.64	50.60	3.88	52.63	58.74	287.45	0.92	1.36	0.13	0.18	0.00	0.15	5.13
<b>GW-12</b>	7.49	956	478	87.55	22.42	71.90	4.62	0.61	146.82	24.11	128.79	121.35	310.81	0.87	1.37	0.14	0.03	0.01	0.17	3.89
<b>GW-13</b>	7.62	603	302	44.33	56.73	54.90	0.69	1.79	22.42	7.60	37.15	89.62	343.43	0.81	1.26	0.12	0.07	0.00	0.11	3.75
<b>GW-14</b>	7.55	319	160	29.72	16.69	17.11	4.18	0.54	26.30	38.58	5.25	35.42	142.71	0.91	1.40	0.14	0.01	0.01	0.13	3.91
<b>GW-15</b>	7.8	839	419	27.03	10.86	175.15	17.29	0.57	59.74	0.00	74.61	63.82	112.11	0.86	1.43	0.17	0.05	0.00	0.28	5.01
<b>GW-16</b>	7.58	842	422	22.63	25.56	192.09	18.88	0.43	51.77	1.59	44.15	73.51	161.36	1.12	1.35	0.13	0.07	0.02	0.27	2.75
<b>GW-17</b>	7.42	613	307	71.31	18.50	18.36	2.10	0.63	28.89	24.71	0.00	132.04	254.11	1.09	1.26	0.18	0.02	0.01	0.17	2.85
<b>GW-18</b>	7.6	531	266	48.14	17.88	46.63	20.76	0.40	49.39	11.56	65.04	38.84	193.64	1.17	1.16	0.26	0.07	0.00	0.16	3.17
<b>GW-19</b>	7.67	467	234	60.25	18.39	19.86	4.26	0.56	22.56	0.49	23.79	82.63	226.02	0.92	1.27	0.19	0.12	0.01	0.16	2.74
<b>GW-20</b>	7.66	517	259	53.37	61.50	19.01	2.37	0.74	29.59	0.00	11.42	75.06	385.60	0.98	1.25	0.12	0.18	0.01	0.18	2.49

## Appendix A.2

<b>GW-21</b>	7.69	521	260	16.86	34.01	20.70	3.70	0.55	10.21	0.00	1.93	152.36	181.58	0.91	1.33	0.14	0.02	0.01	0.14	2.24
<b>GW-22</b>	7.75	325	162	45.73	9.87	15.50	1.59	1.58	15.83	1.32	24.19	42.26	154.76	0.92	1.13	0.13	0.04	0.01	0.12	1.76
<b>GW-23</b>	7.69	558	279	40.98	53.21	34.41	7.16	0.51	5.68	0.00	4.73	113.42	320.62	0.86	1.25	0.12	0.02	0.00	0.16	1.83
<b>GW-24</b>	7.73	632	316	42.17	31.85	28.26	5.75	0.57	34.25	5.42	32.41	128.74	236.02	0.93	1.36	0.15	0.02	0.01	0.13	1.94
<b>GW-25</b>	6.78	432	216	14.61	18.17	16.74	16.39	0.33	7.26	3.50	19.26	109.58	111.01	0.91	1.11	0.11	0.01	0.00	0.13	1.85
<b>GW-26</b>	7.56	476	238	18.78	22.64	24.79	2.85	0.45	16.25	7.36	34.15	107.94	139.77	0.84	1.13	0.15	0.04	0.01	0.15	1.92
<b>GW-27</b>	7.62	512	266	23.30	13.30	19.55	5.25	0.52	26.59	5.29	26.14	132.87	112.76	0.75	1.43	0.14	0.16	0.01	0.29	2.15
<b>GW-28</b>	7.69	548	294	26.47	7.84	34.58	1.27	0.46	32.71	11.37	36.48	138.43	98.31	0.82	1.36	0.13	0.13	0.01	0.17	1.74
<b>GW-29</b>	7.59	606	303	48.55	21.24	44.71	0.79	0.71	24.72	9.59	42.63	103.12	208.45	0.95	1.26	0.11	0.03	0.00	0.12	4.16
<b>GW-30</b>	7.49	546	273	48.29	26.14	46.22	4.30	0.66	17.25	3.46	54.25	63.35	227.91	0.87	1.33	0.12	0.07	0.01	0.29	5.32
<b>GW-31</b>	7.71	584	292	52.12	19.59	29.51	3.53	0.58	42.13	4.72	32.85	101.05	210.62	0.93	1.28	0.16	0.06	0.00	0.27	3.97
<b>GW-32</b>	7.13	482	241	26.74	23.76	42.95	3.53	0.39	62.37	4.30	31.75	58.13	164.27	1.28	1.32	0.25	0.09	0.01	0.19	3.51
<b>GW-33</b>	7.67	434	217	35.75	19.65	38.80	4.53	0.38	72.12	7.15	28.75	57.10	169.95	1.34	1.29	0.19	0.14	0.01	0.18	3.29
<b>GW-34</b>	7.54	496	248	29.52	9.52	18.35	2.59	0.53	54.94	13.14	14.85	87.24	112.84	1.21	1.26	0.16	0.07	0.01	0.16	3.43
<b>GW-35</b>	6.69	876	438	58.46	21.35	52.18	3.46	0.59	178.24	34.26	112.95	136.90	233.69	1.36	1.37	0.14	0.05	0.02	0.17	3.72
<b>GW-36</b>	7.12	934	467	44.52	19.57	44.86	3.87	0.45	134.97	29.73	109.75	62.34	191.54	1.24	1.29	0.13	0.07	0.01	0.16	3.51
<b>GW-37</b>	7.42	572	286	36.48	9.53	29.97	2.43	0.58	27.60	13.85	36.65	82.53	130.27	0.82	1.26	0.12	0.03	0.01	0.17	1.58
<b>GW-38</b>	7.58	484	242	29.74	11.85	17.58	1.83	0.43	35.95	7.37	29.85	102.10	122.92	0.73	1.26	0.13	0.06	0.01	0.27	1.39
<b>GW-39</b>	7.53	568	284	79.73	8.56	32.74	1.36	1.53	62.81	4.52	46.16	68.12	234.44	1.17	1.34	0.13	0.10	0.01	0.17	3.73
<b>GW-40</b>	7.26	862	431	53.75	21.35	36.15	1.99	0.55	79.36	34.85	112.37	92.10	221.91	1.23	1.55	0.24	0.04	0.02	0.18	3.82
<b>GW-41</b>	6.89	846	423	57.59	13.42	42.16	0.75	0.33	53.86	11.59	92.64	144.75	198.99	1.34	1.67	0.30	0.15	0.02	0.19	3.91
<b>GW-42</b>	7.19	912	456	49.36	8.71	53.15	0.26	0.48	59.98	9.38	78.52	181.10	159.13	1.29	1.43	0.18	0.20	0.01	0.20	5.06
<b>GW-43</b>	7.37	734	368	64.83	19.86	66.45	0.60	0.75	71.32	48.71	103.49	102.46	243.52	0.85	1.25	0.14	0.16	0.01	0.17	3.94
<b>GW-44</b>	7.36	1181	592	118.09	59.77	105.02	0.96	0.62	224.85	144.85	212.81	241.20	540.29	0.78	1.12	0.14	0.07	0.00	0.29	3.87
<b>GW-45</b>	7.62	933	467	90.86	18.85	116.45	1.85	0.50	191.43	13.43	95.15	82.43	304.42	0.71	1.14	0.12	0.07	0.01	0.25	2.62
<b>GW-46</b>	7.29	1331	667	114.88	24.02	82.41	2.99	0.52	444.92	66.82	170.48	192.50	385.66	0.83	1.30	0.14	0.14	0.02	0.17	2.51

\*All the water quality parameters are in mg/L except pH, EC ( $\mu\text{S}/\text{cm}$ ).

## LIST OF PUBLICATIONS

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