RAND WATER

# Quarterly Water Quality Status of the Vaal Dam Reservoir Catchment

1 January 2016 - 31 December 2016

| Sample Points | Sample Point Description | Ammonia | Chloride | Fluoride | M-Alkalinity | Nitrate | Phosphate | Sulphate | Chemical Oxygen Demand | Conductivity | pH | *E. coli* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VSS | Sandspruit below Vaal River @ Kliplaatsdrift 27°12'30.82"S 29°26'12.83"E | 0.78 | 9 | 0.42 | 72 | 1.30 | 0.28 | 44 | 18 | 53 | 6.02 | |
| | | 0.41 | 10 | 0.52 | 193 | 0.29 | <0.1 | 43 | 18 | 48 | 8.48 | |
| | | 0.91 | 21 | 0.40 | 218 | 0.57 | 0.13 | 61 | 19 | 52 | 8.67 | |
| | | <0.2 | 6 | 0.30 | 91 | 0.40 | <0.1 | 33 | 26 | 30 | 7.53 | |
| KB | Klip River @ Barnardskop 27°28'12.33"S 29°36'1.76"E | 0.46 | 5 | 0.28 | 54 | 0.36 | 0.20 | 18 | 20 | 21 | 7.50 | |
| | | 1.30 | 5 | 0.28 | 59 | 0.43 | <0.1 | 17 | 13 | 17 | 7.61 | |
| | | <0.2 | 6 | 0.23 | 90 | <0.1 | <0.1 | 8 | 12 | 23 | 7.66 | |
| | | <0.2 | 7 | 0.27 | 43 | 0.18 | <0.1 | 18 | 34 | 17 | 7.56 | |
| KW | Klip @ Winkelhaak 27°14'41.55"S 29°23'59.91"E | <0.2 | 19 | 0.45 | 63 | 1.20 | <0.2 | 58 | 18 | 29 | 7.63 | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | <0.2 | 7 | 0.20 | 44 | 0.30 | <0.1 | 21 | 28 | 21 | 7.12 | |
| KD | Klip River @ De Langesdrift 27°10'57.77"S 29°14'5.54"E | 0.33 | 7 | 0.38 | 90 | 0.31 | 0.22 | 25 | 17 | 26 | 7.65 | |
| | | 0.52 | 15 | 0.33 | 115 | 0.42 | <0.1 | 22 | 19 | 26 | 7.85 | |
| | | <0.2 | 11 | 0.33 | 183 | <0.1 | 0.11 | 21 | 13 | 45 | 8.06 | |
| | | <0.2 | 9 | 0.32 | 117 | 0.24 | <0.1 | 22 | 22 | 29 | 7.49 | |
| KSV | Spruitsonderdrift downstream of Vrede 27°21'8.15"S 29°10'16.87"E | 1.40 | 19 | 0.40 | 161 | 0.83 | 0.53 | 34 | 28 | 56 | 8.33 | |
| | | 1.72 | 40 | 0.43 | 277 | 0.93 | 0.40 | 42 | 31 | 69 | 8.62 | |
| | | 0.48 | 43 | 0.36 | 212 | 2.67 | 0.91 | 72 | 36 | 71 | 8.09 | |
| | | 0.96 | 29 | 0.45 | 203 | 1.11 | 1.4 | 35 | 34 | 55 | 7.66 | |
| VDS | Vaal River downstream of Standerton 27° 0'55.97"S 29° 1'29.30"E | <0.2 | 7 | 0.35 | 56 | 0.28 | 0.20 | 23 | 23 | 26 | 7.36 | |
| | | 8.15 | 33 | 0.46 | 127 | 0.37 | 0.39 | 44 | 22 | 36 | 7.82 | |
| | | <0.2 | 25 | 0.43 | 132 | <0.1 | 0.20 | 36 | 19 | 37 | 8.00 | |
| | | 1.20 | 16 | 0.34 | 98 | 0.45 | 0.14 | 33 | 25 | 31 | 7.42 | |
| VGB | Gladdedrift Bridge @ Villiers 26°59'31.24"S 28°43'47.18"E | <0.2 | 27 | 0.33 | 66 | 1.85 | <0.2 | 42 | 33 | 29 | 7.48 | |
| | | <0.2 | 10 | 0.40 | 94 | 0.43 | 0.10 | 26 | 28 | 27 | 7.88 | |
| | | <0.2 | 13 | 0.27 | 147 | <0.1 | <0.1 | 29 | 22 | 42 | 8.46 | |
| | | <0.2 | 26 | 0.50 | 127 | 6.80 | <0.1 | 70 | 25 | 40 | 7.70 | |
| VV | Vaal @ Villiers 27° 1'20.13"S 28°36'0.32"E | <0.2 | 13 | 0.43 | 100 | 0.96 | 0.18 | 34 | 30 | 31 | 7.93 | 507 |
| | | 0.30 | 12 | 0.25 | 93 | 0.53 | 0.12 | 29 | 26 | 29 | 7.90 | 1709 |
| | | <0.2 | 19 | 0.24 | 127 | <0.1 | <0.1 | 44 | 22 | 40 | 8.28 | 48 |
| | | 1.80 | 15 | 0.35 | 94 | 1.10 | 0.25 | 35 | 29 | 32 | 7.53 | 2790 |
| VD4I | Vaal Dam 4 Integrated - Vaal River upstream of Vaal Marina 26°53'27.99"S 28°15'0.16"E | <0.2 | 13 | 0.40 | 113 | 0.19 | 0.23 | 21 | 17 | 31 | 8.07 | 125 |
| | | 0.26 | 10 | 0.41 | 86 | 1.04 | 0.14 | 29 | 20 | 26 | 7.94 | 4 |
| | | 0.71 | 15 | 0.31 | 96 | 1.01 | 6.55 | 31 | 22 | 27 | 8.16 | 44 |
| | | <0.2 | 10 | 0.36 | 86 | 1.26 | <0.1 | 33 | 17 | 27 | 7.75 | 65 |
| WF | Wilge River @ Frankfort 27°16'18.00"S 28°29'28.41"E | <0.2 | 3 | 0.33 | 51 | 0.64 | 0.30 | 8 | 25 | 14 | 7.46 | 634 |
| | | 0.26 | 2 | <0.15 | 42 | 0.88 | 0.10 | 6 | 14 | 11 | 7.58 | 4056 |
| | | 0.71 | 7 | 0.20 | 40 | 1.16 | 0.24 | 9 | 26 | 11 | 7.57 | 573 |
| | | <0.2 | 9 | 0.24 | 44 | 0.29 | <0.1 | 16 | 21 | 13 | 7.46 | 290 |
| VD3I | Vaal Dam 3 Integrated - Wilge River downstream of Oranjeville 26°59'1.64"S 28°13'25.08"E | 0.29 | 2 | 0.23 | 53 | 0.16 | 0.28 | 15 | 16 | 15 | 7.89 | 233 |
| | | 0.23 | 5 | 0.49 | 49 | 0.46 | <0.1 | 9 | 15 | 13 | 7.98 | 1 |
| | | <0.2 | 2 | 0.22 | 52 | 0.77 | 0.28 | 18 | 12 | 14 | 7.84 | 4 |
| | | <0.2 | 13 | 0.21 | 42 | 0.49 | <0.1 | 8 | 13 | 12 | 7.53 | 32 |
| VD2I | Vaal Dam 2 Integrated - Confluence of Vaal & Wilge 26°53'48.81"S 28°11'9.92"E | 0.41 | 4 | 0.27 | 64 | 0.37 | 0.26 | 9 | 11 | 18 | 7.90 | 109 |
| | | <0.2 | 6 | 0.40 | 62 | 0.45 | <0.1 | 10 | 11 | 16 | 7.93 | 1 |
| | | <0.2 | 13 | 0.24 | 49 | 2.76 | 0.19 | 25 | 15 | 13 | 7.62 | 8 |
| | | <0.2 | 3 | 0.20 | 47 | 0.58 | <0.1 | 10 | 14 | 22 | 7.30 | 3 |
| VD1I | Vaal Dam 1 Integrated @ RW intake 26°53'0.26"S 28° 7'14.35"E | 0.34 | 6 | 0.30 | 66 | 1.03 | 0.41 | 11 | 14 | 19 | 7.93 | 611 |
| | | 0.44 | 5 | 1.87 | 66 | 0.39 | 0.17 | 13 | 14 | 20 | 7.91 | 8 |
| | | 8.90 | 23 | 0.30 | 57 | 1.23 | 0.77 | 32 | 11 | 19 | 7.34 | 16 |
| | | <0.2 | 3 | 0.20 | 52 | 0.28 | <0.1 | 12 | 12 | 17 | 7.68 | 13 |
| C-KLIPR_VDAM | Klip River inflow to VaalDam 27°07'43.93"S 28° 17'01.47"E | 1.45 | 15 | 0.49 | 183 | 1.66 | 0.54 | 22 | 34 | 49 | 7.97 | |
| | | 2.00 | 36 | 0.40 | 85 | 6.34 | 1.25 | 38 | 29 | 34 | 7.57 | |
| | | | | | | | | | | | | |
| | | 34.00 | 33 | 0.33 | 57 | 0.33 | 0.95 | 28 | 35 | 22 | 7.06 | |
| S-ST_NEW | Standerton Sewage Works 26°58'24.60"S 29°13'52.87"E | 11.43 | 49 | 0.35 | 117 | 1.50 | 1.97 | 62 | 58 | 52 | 7.49 | 20897 |
| | | 18.60 | 70 | 0.36 | 200 | 1.41 | 4.40 | 59 | 68 | 76 | 7.39 | 810 |
| | | 16.53 | 60 | 0.25 | 170 | 4.60 | 3.03 | 67 | 50 | 72 | 7.15 | 80663 |
| | | 25.33 | 50 | 0.27 | 235 | 1.93 | 3.00 | 119 | 67 | 77 | 7.16 | 562000 |
| S-DENEYSVILLE | Final Effluent of Deneysville WWTW 26°53'06.29"S 28°06'42.35"E | 3.11 | 29 | 0.26 | 77 | 9.22 | 2.63 | 39 | 42 | 43 | 7.18 | 4910 |
| | | 7.08 | 28 | 0.19 | 79 | 11.10 | 2.48 | 30 | 57 | 43 | 7.16 | 14936 |
| | | 10.53 | 27 | 0.23 | 94 | 9.65 | 2.57 | 31 | 43 | 44 | 7.14 | 119053 |
| | | 11.05 | 30 | 0.16 | 101 | 5.42 | 2.52 | 31 | 60 | 46 | 7.52 | 80435 |
| S-FRANKF_NAMAHA | Final Effluent of Frankfort Namadi 27°15'41.58"S 28°29'29.22"E | 10.40 | 32 | 0.17 | 101 | 4.33 | 3.36 | 41 | 27 | 44 | 7.40 | 138120 |
| | | 11.65 | 46 | 0.34 | 115 | 6.12 | 3.30 | 32 | 50 | 52 | 7.45 | 96 |
| | | 15.60 | 41 | 0.33 | 122 | 8.72 | 3.84 | 39 | 42 | 54 | 7.49 | 860 |
| | | 17.34 | 36 | 0.34 | 149 | 3.85 | 3.46 | 35 | 54 | 57 | 7.83 | 192 |
| S-FRANKF_OXI_P | Final Effluent of Frankfort Oxidation Ponds 27°17'27.44"S 28°29'16.83"E | <0.2 | 96 | 0.41 | 92 | <0.1 | 4.10 | 11 | 43 | 69 | 8.34 | 461 |
| | | 0.47 | 100 | 0.31 | 154 | 0.21 | 2.90 | 17 | 104 | 66 | 7.68 | 1557 |
| | | 2.48 | 83 | 0.27 | 185 | 1.13 | 3.54 | 28 | 62 | 68 | 8.27 | 1111 |
| | | | | | | | | | | | | |
| S-ORANJEVILLE | Final Effluent of Oranjeville WWTW 26°58'47.06"S 28°12'35.72"E | 8.38 | 28 | 0.19 | 87 | 6.87 | 3.12 | 26 | 35 | 41 | 7.53 | 306842 |
| | | 12.47 | 29 | 0.32 | 111 | 6.58 | 3.33 | 26 | 38 | 46 | 7.26 | 275577 |
| | | 15.40 | 26 | 0.30 | 99 | 7.20 | 3.94 | 23 | 28 | 44 | 7.15 | 242246 |
| | | 10.92 | 26 | 0.19 | 133 | 8.66 | 3.07 | 25 | 62 | 62 | 7.30 | 759469 |
| S-VAAL_MARINA | Final Effluent of Vaal Marina WWTW 26°53'19.35"S 28°12'50.50"E | <0.5 | 32 | 0.26 | 70 | 16.47 | 2.53 | 36 | 24 | 48 | 7.57 | 33 |
| | | 0.10 | 32 | 0.18 | 74 | 13.00 | 3.10 | 49 | 30 | 56 | 7.30 | 9 |
| | | 0.21 | 33 | 0.23 | 46 | 4.00 | 3.40 | 44 | 18 | 49 | 7.20 | 1130 |
| | | <0.2 | 32 | 0.20 | 68 | 12.87 | 2.97 | 39 | 19 | 40 | 7.44 | 2028 |
| S-VILLIERS | Final Effluent of Villiers WWTW 27°01'54.43"S 28°35'21.89"E | 23.40 | 83 | 0.44 | 246 | 5.09 | 4.00 | 51 | 89 | 86 | 7.40 | 651420 |
| | | 26.17 | 75 | 0.41 | 267 | 2.42 | 4.48 | 52 | 158 | 95 | 7.34 | 1541443 |
| | | 32.17 | 96 | 0.34 | 300 | 0.12 | 2.85 | 60 | 191 | 108 | 7.37 | 132340 |
| | | 20.38 | 68 | 0.36 | 225 | 1.14 | 2.90 | 49 | 106 | 80 | 7.43 | 90947 |

| Sewage Works Compliance (where applicable) to General Standard (GN 1191 Oct 1999) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Points | Sample Point Description | Ammonia | Chloride | Fluoride | M-Alkalinity | Nitrate | Phosphate | | Chemical Oxygen Demand | Conductivity | pH | *E. coli* |
| S-ST_NEW | Standerton Sewage Works 26°58'24.60"S 29°13'52.87"E | 11.43 | 49 | 0.35 | 117 | 1.5 | 1.97 | 62 | 58 | 52 | 7.49 | 20897 |
| | | 18.60 | 70 | 0.36 | 200 | 1.4 | 4.40 | 59 | 68 | 76 | 7.39 | 810 |
| | | 16.53 | 60 | 0.25 | 170 | 4.6 | 3.03 | 67 | 50 | 72 | 7.15 | 80663 |
| | | 25.33 | 50 | 0.27 | 235 | 1.9 | 3.00 | 119 | 67 | 77 | 7.16 | 562000 |
| S-DENEYSVILLE | Final Effluent of Deneysville WWTW 26°53'06.29"S 28°06'42.35"E | 3.11 | 29 | 0.26 | 77 | 9.2 | 2.63 | 39 | 42 | 43 | 7.18 | 4910 |
| | | 7.08 | 28 | 0.19 | 79 | 11.1 | 2.48 | 30 | 57 | 43 | 7.16 | 14936 |
| | | 10.53 | 27 | 0.23 | 94 | 9.7 | 2.57 | 31 | 43 | 44 | 7.14 | 119053 |
| | | 11.05 | 30 | 0.16 | 101 | 5.4 | 2.52 | 31 | 60 | 46 | 7.52 | 80435 |
| S-FRANKF_NAMAHA | Final Effluent of Frankfort Namadi 27°15'41.58"S 28°29'29.22"E | 10.40 | 32 | 0.17 | 101 | 4.3 | 3.36 | 41 | 27 | 44 | 7.40 | 138120 |
| | | 11.65 | 46 | 0.34 | 115 | 6.1 | 3.30 | 32 | 50 | 52 | 7.45 | 96 |
| | | 15.60 | 41 | 0.33 | 122 | 8.7 | 3.84 | 39 | 42 | 54 | 7.49 | 860 |
| | | 17.34 | 36 | 0.34 | 149 | 3.8 | 3.46 | 35 | 54 | 57 | 7.83 | 192 |
| S-FRANKF_OXI_P | Final Effluent of Frankfort Oxidation Ponds 27°17'27.44"S 28°29'16.83"E | <0.2 | 96 | 0.41 | 92 | <0.1 | 4.10 | 11 | 43 | 69 | 8.34 | 461 |
| | | 0.47 | 100 | 0.31 | 154 | 0.2 | 2.90 | 17 | 104 | 66 | 7.68 | 1557 |
| | | 2.48 | 83 | 0.27 | 185 | 1.1 | 3.54 | 28 | 62 | 68 | 8.27 | 1111 |
| | | | | | | | | | | | | |
| S-ORANJEVILLE | Final Effluent of Oranjeville WWTW 26°58'47.06"S 28°12'35.72"E | 8.38 | 28 | 0.19 | 87 | 6.9 | 3.12 | 26 | 35 | 41 | 7.53 | 306842 |
| | | 12.47 | 29 | 0.32 | 111 | 6.6 | 3.33 | 26 | 38 | 46 | 7.26 | 275577 |
| | | 15.40 | 26 | 0.30 | 99 | 7.2 | 3.94 | 23 | 28 | 44 | 7.15 | 242246 |
| | | 10.92 | 26 | 0.19 | 133 | 8.7 | 3.07 | 25 | 62 | 62 | 7.30 | 759469 |
| S-VAAL_MARINA | Final Effluent of Vaal Marina WWTW 26°53'19.35"S 28°12'50.50"E | <0.5 | 32 | 0.26 | 70 | 16.5 | 2.53 | 36 | 24 | 48 | 7.57 | 33 |
| | | 0.10 | 32 | 0.18 | 74 | 13.0 | 3.10 | 49 | 30 | 56 | 7.30 | 9 |
| | | 0.21 | 33 | 0.23 | 46 | 4.0 | 3.40 | 44 | 18 | 49 | 7.20 | 1130 |
| | | <0.2 | 32 | 0.20 | 68 | 12.9 | 2.97 | 39 | 19 | 40 | 7.44 | 2028 |
| S-VILLIERS | Final Effluent of Villiers WWTW 27°01'54.43"S 28°35'21.89"E | 23.40 | 83 | 0.44 | 246 | 5.1 | 4.00 | 51 | 89 | 86 | 7.40 | 651420 |
| | | 26.17 | 75 | 0.41 | 267 | 2.4 | 4.48 | 52 | 158 | 95 | 7.34 | 1541443 |
| | | 32.17 | 96 | 0.34 | 300 | 0.1 | 2.85 | 60 | 191 | 108 | 7.37 | 132340 |
| | | 20.38 | 68 | 0.36 | 225 | 1.1 | 2.90 | 49 | 106 | 80 | 7.43 | 90947 |

**Key**

| | | | | |
|---|---|---|---|---|
| VD1I | Vaal Dam 1 Integrated @ RW intake | 0.12 | - | 1 Jan 16 - 31 Mar 16 |
| | | 0.12 | - | 1 Apr 16 - 30 Jun 16 |
| | | 0.12 | - | 1 July 16 - 30 Sept 16 |
| | | 0.12 | - | 1 Oct 2016 - 31 Dec 2016 |

**Water Quality Guidelines**

| | | |
|---|---|---|
| | - | Ideal |
| | - | Acceptable |
| | - | Tolerable |
| | - | Unacceptable |
| | - | No sample or result available |

**In-stream Water Quality Guidelines for the Vaal Dam Catchment**

| Variables | Measured as | Ideal Catchment Background | Acceptable Management Target | Tolerable Interim Target | Unacceptable |
|---|---|---|---|---|---|
| **Physical** | | | | | |
| Conductivity | mS/m | < 10 | 10 - 30 | 30 - 45 | > 45 |
| pH | pH units | 6.5 - 8.5 | | | < 6.5; > 8.5 |
| **Organic** | | | | | |
| Chemical Oxygen Demand (COD) | mg/l | < 10 | 10 - 15 | 15 - 20 | > 20 |
| **Macro Elements** | | | | | |
| Ammonia ($NH_4$) | mg/l | < 0.2 | 0.2 - 0.5 | 0.5 - 1.0 | > 1 |
| Chloride (Cl) | mg/l | < 25 | 25 - 50 | 50 - 75 | > 75 |
| Fluoride (F) | mg/l | < 0.05 | 0.05 - 0.20 | 0.2 - 0.4 | > 0.4 |
| Alkalinity | CaCO3 mg/l | < 40 | 40 - 75 | 75 - 120 | > 120 |
| Nitrate ($NO_3$) | mg/l | < 0.1 | 0.1 - 0.2 | 0.2 - 0.3 | > 0.3 |
| Phosphate ($PO_4$) | mg/l | <0.05 | 0.05 - 0.25 | 0.25 - 0.50 | > 0.5 |
| Sulphate ($SO_4$) | mg/l | < 20 | 20 - 45 | 45 - 70 | > 70 |
| **Bacteriological** | | | | | |
| *Faecal coliforms* | counts/100ml | < 10 | 10 - 60 | 60 - 120 | > 120 |

**Sewage Works Compliance to General Standard (GN 1191 Oct 1999)**

| Variables | Measured as | Acceptable Management Target | Unacceptable |
|---|---|---|---|
| **Physical** | | | |
| Conductivity | mS/m | <150 | >=150 |
| pH | pH units | 5.5 - 9.5 | < 5.5; >9.5 |
| **Organic** | | | |
| Chemical Oxygen Demand (COD)** | mg/l | <75 | >=75 |
| **Macro Elements** | | | |
| Ammonia ($NH_4$) | mg/l | <3 | >=3 |
| Fluoride (F) | mg/l | <1 | >=1 |
| Nitrate ($NO_3$) | mg/l | <15 | >=15 |
| Phosphate ($PO_4$) | mg/l | <10 | >10 |
| **Bacteriological** | | | |
| *Faecal coliforms* | counts/100ml | <1000 | >=1000 |

** After removal of algae