## ANNEXURE A

## ACRONYMS

### Acronyms used in Annexure B

| | |
|---|---|
| BHN | Basic Human Needs |
| EIS | Ecological Importance and Sensitivity |
| EWR | Ecological Water Requirement |
| IUA | Integrated Unit of Analysis |
| NMAR | Natural Mean Annual Runoff |
| MCM | Million Cubic Metres |
| PES | Present Ecological Status |
| REC | Recommended Ecological Category |
| TEC | Target Ecological Category |

### SURFACE-WATER - QUANTITY COMPONENT FOR RIVERS

Proposed results for the Reserve determination and ecological categorisation for the Thukela catchment, where the Reserve amounts are expressed as a percentage of the NMAR for the respective catchments (cumulative) in terms of section (16)(1).

## ANNEXURE B

**Table 1: Reserve determination for the quantity component for the rivers which include the EWR & BHN for the priority sites.**

| EWR site | Quaternary catchment/ Sub-reach | River | PES | EI/ES | REC | TEC | NMAR (MCM)[1] | EWR % NMAR[2] | BHN Reserve[3] (%NMAR) | Total Reserve[4] (%NMAR) |
|---|---|---|---|---|---|---|---|---|---|---|
| THU_EWR23 | V31D-02370 | Upper Buffalo | C | High | C | C | 221.96 | 23.44 | 0.15 | 23.59 |
| May13_EWR2 | V31F-02600 | Horn | C | Low | C | C | 21.61 | 33.65 | 0.35 | 34.00 |
| THU_EWR19 | V31J-02487 | Ncandu | C | Very high | B | B/C | 50.83 | 29.36 | 1.025 | 30.39 |
| Ngagane_dsk | V31K-02516 | Ngagane | C | Moderate/ High | C | C/D | 160.12 | 19.44 | 0.74 | 20.18 |
| Thukela_EWR13 | V32F-02707 | Buffalo | D | Moderate | D | C/D | 695.05 | 17.36 | 0.001 | 17.361 |
| Thukela_EWR14 | V33B-03090 | Buffalo | B/C | High | B | C | 831.09 | 23.24 | 0.024 | 23.264 |
| Blood_dsk | V32H-02834 | Blood | C | High | B/C | C | 94.71 | 21.36 | 0.315 | 21.675 |
| THU_EWR7A | V60B-02826 | Sundays | C/D | High | C | C | 24.94 | 31.79 | 1.162 | 32.952 |
| Thukela_EWR7 | V60C-03031 | Sundays | B/C | Moderate | B/C | C/D | 90.28 | 19.71 | 0.124 | 19.834 |
| Thukela_EWR8 | V60F-03210 | Sundays | D | Moderate | D | D | 197.03 | 16.45 | 0.161 | 16.611 |
| THU_EWR20 | V20C-03919 | Nsonge | C | Very high / High | B/C | B/C | 27.13 | 28.99 | 0.015 | 29.005 |
| Thukela_EWR11 | V20E-03742 | Mooi | B/C | Moderate | B/C | B/C | 301.14 | 35.41 | 0.044 | 35.454 |
| THU_EWR21 | V20G-03853 | Mnyamvubu | C | High | B/C | C | 31.71 | 19.94 | 0.065 | 20.005 |
| THU_EWR12A | V20H-03500 | Mooi | C/D | High | C | C | 361.85 | 29.82 | 0.063 | 29.883 |
| Thukela_EWR5 | V70F-03548 | Bushmans | B/C | Moderate | B/C | C | 281.45 | 29.04 | 0.002 | 29.042 |
| THU_EWR6A | V70G-03515 | Bushmans | D | High | C | C/D | 298.37 | 40.62 | 0.053 | 40.673 |
| Thukela_EWR6 | V70G-03440 | Bushmans | B/C | High | B/C | C/D | 303.14 | 29.39 | 0.053 | 29.443 |

| EWR site | Quaternary catchment/ Sub-reach | River | PES | EI/ES | REC | TEC | NMAR (MCM)[1] | EWR % NMAR[2] | BHN Reserve[3] (%NMAR) | Total Reserve[4] (%NMAR) |
|---|---|---|---|---|---|---|---|---|---|---|
| Thukela_EWR1 | V11J-03301 | Thukela | D | Moderate | D | D | 705.42 | 17.31 | 0.01 | 17.32 |
| Thukela_EWR2 | V11M-03280 | Thukela | C | Moderate | C | C/D | 798.4 | 17.67 | 0.013 | 17.683 |
| Thukela_EWR3 | V13E-03362 | Little Thukela | C/D | Moderate | C/D | C/D | 285.2 | 24.71 | 0.020 | 24.73 |
| Thukela1_dsk | V14B-03296 | Thukela | B | High | B | C/D | 1145.20 | 18.33 | 0.010 | 18.34 |
| THU_EWR22 | V12A-03003 | Klip | C | High / Very high | B/C | C | 52.44 | 22.15 | 0.042 | 22.192 |
| Klip_dsk | V12G-03256 | Klip | C | High | B/C | C | 253.09 | 20.0 | 0.422 | 20.422 |
| Thukela_EWR4AThukela_EWR4B THU_EWR4C | V14E-03233 | Thukela | C | High | B/C | C | 1423.83 | 25.09 | 0.010 | 25.1 |
| Thukela_EWR15 | V40B-03429 | Thukela | C | High | C | C | 3424.00 | 21.98 | 0.005 | 21.985 |
| THU_EWR16 | V50C-03903 | Thukela | C | High / Moderate | C | C | 3679.97 | 37.83 | 0.0175 | 37.8475 |
| V11A_dsk | V11A-03277 | Thukela | B | High / Very high | B | B | 66.90 | 38.32 | 0.24 | 38.56 |
| V11B_dsk | V11B—3410 V11B-03470 | Sithene Thonyelana | B | Moderate/ High | B | B | 142.69 | 38.32 | 0.02 | 38.34 |
| V11G_dsk | V11G-03572 V11G-03582 | Mlambonja Mhlwazini | B | Moderate / High | B | B | 191.99 | 38.01 | 0.01 | 38.02 |
| V13A_dsk | V13A-03495 | Little Thukela | C | High/ Very high | B | B | 82.32 | 35.44 | 0.03 | 35.47 |
| V70A_dsk | V70A-03876 | Bushmans | B | High | B | B | 113.46 | 40.524 | 0.037 | 40.561 |
| V70B_dsk | V70B-03927 | Nsibidwana | B | High | B | B | 44.16 | 15.773 | 0.025 | 15.798 |

| EWR site | Quaternary catchment/ Sub-reach | River | PES | EI/ES | REC | TEC | NMAR (MCM)[1] | EWR % NMAR[2] | BHN Reserve[3] (%NMAR) | Total Reserve[4] (%NMAR) |
|---|---|---|---|---|---|---|---|---|---|---|
| V20A_dsk | V20A-04023 | Mooi | C | High | B | B | 42.90 | 34.51 | 0.004 | 34,54 |
| V20B_dsk | V20B-04034 | Little Mooi | C | High | B/C | B/C | 10.32 | 28.99 | 0.06 | 29.05 |
| THU_EWR17 | V50D-03903 | Thukela | C | High | C | C | 3690.53 | 37.38 | 0.0097 | 37.3897 |

1) NMAR is the Natural Mean Annual Runoff.
2) This amount represents the long-term mean based on the NMAR. If the NMAR changes, this volume will also change.
3) Represents the percentage of BHN.
4) The total Reserve amount accounts for both the Ecological Reserve and the Basic Human Needs Reserve (BHN).

## SURFACE-WATER - QUALITY COMPONENT FOR RIVERS

### Reserve determination for the Quality component at EWR sites

### Table 2.1: Water Quality Ecological Specifications: Upper Buffalo River

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V31A** | Wetland resource unit: Wakkerstroom | Quality | Nutrients | Orthophosphate as P | ≤0.01 mg/L (50th percentile) |
| | | | | Total Inorganic Nitrogen (TIN) | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤120 milligrams per Litre (mg/L) (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/100 mL) |
| | | Response variable | Fish | *Enteromius (Barbus) anoplus* (BANO)<br>*Amphilius natalensis* (ANAT)<br>*Anguilla mossambica* (AMOS) | FRAI EC = B ≥ 82%<br><br>BANO and ANAT ≥ 5 individuals per species. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI)<br><br>South African Scoring System (SASS)<br><br>(Baetidae 2 sp<br>Perlidae<br>Tricorythidae<br>Hydropsychidae 1 sp<br>Leptoceridae<br>Ancylidae<br>Psephenidae | At least 2 biotopes sampled: assemblages to be ≥ A abundances<br><br>South African Scoring System (SASS) 5 score ≥180<br><br>Average Score per Taxon (ASPT): ≥6.0<br><br>MIRAI EC = B ≥ 82% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Diatoms EC should be maintained at B<br>SPI: ≥15<br>PTV: 20% to < 40% |
| **V31A** | Zaaihoek Dam | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.01 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤120 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | pH range | ≥6.5 (5th percentile) and ≤9.0 (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| **V31B** | | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |

| Quaternary Catchment/E WR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | Buffalo and Slang | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤1 milligram per Litre (mg/L) ($50^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) ($95^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) ($95^{th}$ percentile) |
| | | | System variables | pH range | ≥6.5 ($5^{th}$ percentile) and ≤9.0 ($95^{th}$ percentile) |
| | | | Toxic substances | Ammonia as N | ≤0.07 milligrams per Litre (mg/L) |
| | | Biota | Fish | *Enteromius (Barbus) anoplus* (BANO)<br>*Amphilius natalensis* (ANAT)<br>*Anguilla mossambica* (AMOS)<br>*Labeo rubromaculatus* (LRUB) | FRAI EC = C<br>≥ 62%<br><br>BANO and ANAT ≥ 5 individuals per species. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index South African Scoring System (SASS)<br><br>Baetidae 2 sp<br>Perlidae<br>Heptageniidae<br>Hydropsychidae 2 sp<br>Elmidae<br>Leptophlebidae | At least 2 biotopes sampled: assemblages to be ≥ B abundances<br><br>South African Scoring System (SASS) 5 score: 145 – 200<br><br>Average Score per Taxon (ASPT): 6.0 – 7.6<br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C<br>SPI: 12 -14<br>PTV: 20% to < 40% |
| | | | Riparian habitat | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |
| **V31C, V31D**<br><br>**(THU_EWR23)** | Buffalo to confluence with Ngagane | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.5 mg/L ($50^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤1 milligram per Litre (mg/L) ($50^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) ($95^{th}$ percentile) |
| | | | | Sulphate | ≤80 milligrams per Litre (mg/L) ($95^{th}$ percentile) |
| | | | | Chloride | ≤30 milligrams per Litre (mg/L) ($95^{th}$ percentile) |
| | | | System variables | pH range | ≥6.5 ($5^{th}$ percentile) and ≤9.0 ($95^{th}$ percentile) |
| | | | | Alkalinity as mg/L $CaCO_3$ | ≤120 milligrams per Litre (mg/L) as $CaCO_3$ |
| | | | Toxic substances | Aluminium (Al) | ≤ 0.1 milligrams per Litre (mg/L) ($95^{th}$ percentile) |
| | | | | Manganese (Mn) | ≤ 0.2 milligrams per Litre (mg/L) ($95^{th}$ percentile) |

| Quaternary Catchment/E WR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | Cadmium (Cd) | ≤ 0.001 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Iron (Fe) | ≤ 0.1 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Lead (Pb) hard | ≤ 0.01 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Copper (Cu) hard | ≤ 0.007 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Nickel (Ni) | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Ammonia (as N) | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Enteromius (Barbus) anoplus* (BANO)<br>*Amphilius natalensis* (ANAT)<br>*Anguilla mossambica* (AMOS)<br>*Labeo rubromaculatus* (LRUB)<br>*Barbus (Enteromius) pallidus* (BPAL)<br>*Barbus (Enteromius) paludinosus* (BPAU) | FRAI EC = C ≥ 62%<br><br>BANO, BPAL, BPAU – habitat indicators; and ANAT ≥ 5 individuals per species |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and<br>South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 sp<br>Atyidae<br>Hydracarina<br>Heptageniidae<br>Leptophlebiidae<br>Ecnomidae<br>Elmidae<br>Tricorythidae | 3 biotopes sampled: assemblages to be ≥ B abundances.<br><br>SASS 5 scores: 120 – 200<br><br>Average Score per Taxon (ASPT): 5.5 – 6.5<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Natural flow pattern must be maintained in C Ecological Category.<br>SPI: 12 - 14<br>PTV: 20% to <40% |
| | | | Riparian habitat | Vegetation Response Assessment Index (VEGRAI)<br>Index of Habitat Integrity (IHI): Riparian | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |

## Table 2.2: Water Quality Ecological Specifications: Ngagane River

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V31E** | Upper Ngagane to Ntshingwayo Dam | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤ 0.05 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen (TIN$^-$) as Nitrogen | ≤ 1 milligram per Litre (mg/L) (50$^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤ 350 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | System variables | pH range | ≥6.5 (5$^{th}$ percentile) and ≤9.0 (95$^{th}$ percentile) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Enteromius (Barbus) anoplus* (BANO)<br>*Amphilius natalensis* (ANAT)<br>*Labeo rubromaculatus* (LRUB)<br>*Barbus (Enteromius) pallidus* (BPAL)<br>*Barbus (Enteromius) paludinosus* (BPAU) | FRAI EC = C ≥ 62%<br><br>BANO, BPAL, BPAU – habitat indicators; and ANAT ≥ 5 individuals per species |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae >2 spp<br>Atyidae<br>Heptageniidae<br>Leptophlebiidae<br>Hydropsychidae >1 spp | At least 2 biotopes sampled; assemblages to be ≥ B abundances<br><br>SASS 5 scores: 120 – 200<br><br>Average Score per Taxon (ASPT): 5.5 – 6.5<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as B.<br>SPI: 15 - 17<br>PTV: 20% to <40% |
| | | | Riparian habitat | Vegetation Response Assessment Index (VEGRAI)<br><br>Index of Habitat Integrity (IHI): Riparian | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |
| **V31E** | Ntshingwayo Dam | Quality | Nutrients | Total Inorganic Nitrogen (TIN) | ≤1.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.05 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤120 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | System variables | pH | 6.5 (5$^{th}$ percentile) and 9.0 (95$^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | Biota | Riparian vegetation Health | 80% riparian vegetation cover | |
| **V31F**<br><br>**(May 13_ EWR 2)** | Horn to confluence with Ngagane | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤ 0.02 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen (TIN$^-$) as Nitrogen | ≤1.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤ 350 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | | Sulphate | ≤ 165 milligrams per Litre (mg/L) (95$^{th}$ percentile) |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | Chloride | ≤ 120 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | System variables | pH range | ≥6.5 (5$^{th}$ percentile) and ≤9.0 (95$^{th}$ percentile) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | | Aluminium (Al) | ≤ 0.10 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | | Manganese (Mn) | ≤ 0.15 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | | Iron (Fe) | ≤ 0.1 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | | Lead (Pb) hard | ≤ 0.001 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | | Copper (Cu) hard | ≤ 0.007 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | | Nickel (Ni) | ≤ 0.07 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | | Cobalt (Co) | ≤ 0.05 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | | Zinc (Zn) | ≤ 0.002 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) (95$^{th}$ percentile) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Enteromius (Barbus) anoplus* (BANO)<br>*Amphilius natalensis* (ANAT)<br>*Anguilla mossambica* (AMOS)<br>*Labeo rubromaculatus* (LRUB)<br>*Barbus (Enteromius) pallidus* (BPAL)<br>*Labeobarbus natalensis* (BNAT) | Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category.<br><br>FRAI EC = C ≥ 62%<br><br>During survey in all flow habitat classes all species present (BANO, ANAT, AMOS, LRUB, BPAL and BNAT).<br><br>BANO, BPAL – habitat indicators; and ANAT ≥ 5 individuals per species |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 spp<br>Leptophlebiidae<br>Tricorythidae<br>Leptoceridae<br>Perlidae<br>Hydropsychidae >2spp | 3 biotopes sampled: assemblages to be ≥ B abundances.<br><br>SASS 5 scores: ≥213<br><br>Average Score per taxon (ASPT) score: ≥7.2<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12-14<br>PTV: 20% to < 40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥62% |
| **V31H, V31J**<br><br>**(THU_EWR19)** | Ncandu to confluence with Ngagane | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.05 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤1 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Sulphate | ≤ 165 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Chloride | ≤ 120 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | pH range | ≥6.5 (5th percentile) and ≤9.0 (95th percentile) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Aluminium (Al) | ≤ 0.10 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Manganese (Mn) | ≤ 0.15 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Cadmium (Cd) | ≤ 0.001 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Iron (Fe) | ≤ 0.1 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Lead (Pb) hard | ≤ 0.001 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Copper (Cu) hard | ≤ 0.007 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Nickel (Ni) | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | Cobalt (Co) | ≤ 0.05 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Zinc (Zn) | ≤ 0.002 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | | | Benzene | ≤0.01 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Toluene | ≤0.7 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Oil and grease | 2.5 milligrams per Litre (mg/L) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) (95th percentile) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI).<br><br>*Amphilius natalensis* (ANAT)<br>*Anguilla mossambica* (AMOS)<br>*Labeo rubromaculatus* (LRUB)<br>*Barbus (Enteromius) paludinosus* (BPAU)<br>*Labeobarbus natalensis* (BNAT)<br>*Barbus (Enteromius) viviparus* (BVIV) | FRAI Ecological Category = B/C ≥ 72%<br><br>BVIV, BNAT, BPAU – habitat indicators; and ANAT ≥ 5 individuals per species |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae >2 spp<br>Heptageniidae<br>Leptophlebiidae<br>Tricorythidae<br>Leptoceridae<br>Perlidae<br>Hydropsychidae >1spp<br>Elmidae<br>Psephenidae<br>Dixidae | 3 biotopes sampled: assemblages to be ≥ B abundances.<br><br>SASS 5 scores: ≥190<br><br>Average Score per Taxon (ASPT) score: ≥6.0<br><br>MIRAI Ecological Category = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as B.<br>SPI: 15 - 17<br>PTV: < 20% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI Ecological Category = C ≥ 62% |
| **V31G, V31K** | Ngagane from | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.05 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤ 2.0 milligrams per Litre (mg/L) (50th percentile) |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| (May 13_ EWR3) | Ntshingwayo Dam to confluence with Buffalo | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | pH range | ≥6.5 (5th percentile) and ≤9.0 (95th percentile) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Aluminium (Al) | ≤ 0.1 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Cadmium (Cd) soft | ≤ 0.001 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Manganese (Mn) | ≤ 0.15 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Iron (Fe) | ≤ 0.1 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Lead (Pb) hard | ≤ 0.01 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Copper (Cu) hard | ≤ 0.007 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Nickel (Ni) | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Cobalt (Co) | ≤ 0.05 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Zinc (Zn) | ≤ 0.002 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | | | Oil and grease | 2.5 milligrams per Litre (mg/L) |
| | | | | Benzene | ≤0.01 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Toluene | ≤0.7 milligrams per Litre (mg/L) (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) (95th percentile) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Amphilius natalensis* (ANAT)<br>*Barbus (Enteromius) paludinosus* (BPAU)<br>*Labeobarbus natalensis* (BNAT)<br>*Barbus (Enteromius) pallidus* (BPAL)<br>*Enteromius (Barbus) anoplus* (BANO) | FRAI EC = C/D ≥ 42%<br><br>BNAT, BPAL and BANO – 2 of 3 *spp* present as habitat indicators; and ANAT ≥ 3 individuals per species |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae >2 spp<br>Heptageniidae | 3 biotopes sampled: assemblages to be ≥ B abundances<br><br>SASS 5 scores: ≥213 |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | Leptophlebiidae<br>Tricorythidae<br>Leptoceridae<br>Hydropsychidae >1spp<br>Elmidae<br>Economidae | Average Score per Taxon (ASPT): ≥7.2<br><br>MIRAI EC = C/D ≥ 52% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br>PTV: 20% to <40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI)<br><br>Index of Habitat Integrity (IHI): Riparian | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |

## Table 2.3: Water Quality Ecological Specifications: Middle Buffalo River

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V32A, B** | Dorps (including Kweek and Wasbankspruit) to confluence with Buffalo River | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤ 0.02 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤ 1.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤200 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) (95$^{th}$ percentile) |
| **V32C, D** | Tiyna, Eersteling-Quaternary catchment | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.02 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($NO_3$) as Nitrogen | ≤ 1.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤200 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | | Sulphate | ≤ 165 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | System variables | pH range | ≥6.5 (5$^{th}$ percentile) and ≤9.0 (95$^{th}$ percentile) |
| | | | | Turbidity | A 10% variation from background concentration. Limits must be determined. |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | Biota | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br>PTV: 20% to <40% |
| **V32E** | Mzinyashana including Sterkstroom and Sandspruit | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤ 0.02 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤ 1.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤200 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) (95$^{th}$ percentile) |
| **V32B, V32C, V32D, V32E and V32F**<br><br>**(Thukela_EWR 13)** | Buffalo from Ngagane to Blood River confluence | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.1 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br>*Labeo rubromaculatus* (LRUB)<br>*Barbus (Enteromius) paludinosus* (BPAU)<br>*Labeobarbus natalensis*<br>(BNAT)<br>*Barbus (Enteromius) pallidus* (BPAL)<br>*Enteromius (Barbus) anoplus* (BANO) | FRAI Ecological Category = C/D ≥ 52%<br>BNAT, BPAL and BANO – 2 of 3 spp present as habitat indicators; and LRUB ≥ 3 individuals per species. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br>Baetidae >2 spp<br>Hydropsychidae >1spp | 3 biotopes sampled: assemblages to be ≥ B abundances.<br>SASS 5 scores: 77 - 180<br>Average Score per Taxon (ASPT): 5.5 – 7.0 |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | Elmidae<br>Hydracarina | MIRAI Ecological Category = C/D ≥ 52% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 – 14<br>%PTV: 20% to <40% |
| | | | Riparian habitat | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br>VEGRAI ≥C/D ≥ 52% |

## Table 2.4: Water Quality Ecological Specifications: Lower Buffalo River

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V33A, V33B, V33C and V33D**<br>**(Thukela_EWR 14)** | Buffalo from Blood to Thukela confluence | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.1 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | System variables | pH range | ≥6.5 (5$^{th}$ percentile) and ≤9.0 (95$^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br>*Labeobarbus natalensis* (BNAT)<br>*Labeo molybdinus* (LMOL) | <br>FRAI EC = C ≥ 62%<br>Ensure all flow habitat classes are present for the following species: BNAT, BANO – |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | *Enteromius (Barbus) anoplus* (BANO) | 2 of 3 spp present as habitat indicators; and LMOL ≥ 3 individuals per species. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br>Atyidae<br>Baetidae >2 spp<br>Tricorythidae<br>Heptageniidae<br>Hydropsychidae >1spp<br>Elmidae | At least 2 biotopes sampled: assemblages to be ≥ B abundances.<br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 – 14<br>%PTV: 20% to <40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br>VEGRAI EC = C ≥ 62% |

## Table 2.5: Water Quality Ecological Specifications: Blood River

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V32G** | Wetland RU: Blood River | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.02 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤1.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤200 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | Biota | Fish | *Enteromius (Barbus) anoplus* (BANO)<br>*Amphilius natalensis* (ANAT)<br>*Anguilla mossambica* (AMOS) | FRAI EC = B ≥ 82%<br>BANO and ANAT ≥ 5 individuals per species |
| | | | Aquatic invertebrates | Baetidae 2 sp<br>Perlidae<br>Tricorythidae<br>Hydropsychidae 1 sp<br>Leptoceridae<br>Ancyidae<br>Psephenidae | At least 2 biotopes sampled: assemblages to be ≥ A abundances<br>MIRAI EC = B ≥ 82% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as B.<br>SPI ≥15<br>%PTV: 20% to < 40% |
| **V32H** | Blood River from outlet of V32G to confluence | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.06 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (50$^{th}$ percentile) |

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | with the **V32H** Buffalo River | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (95$^{th}$ percentile) |
| | | | System variables | pH range | ≥6.5 (5$^{th}$ percentile) and ≤9.0 (95$^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeo rubromaculatus* (LRUB)<br>*Labeobarbus natalensis* (BNAT)<br>*Tilapia sparrmanii* (TSPA) | Ensure all flow habitat classes are present for the following species: BNAT, BANO and TSPA – 2 of 3 spp present as habitat indicators; and LRUB ≥ 3 individuals per species.<br><br>FRAI Ecological Category: C (≥ 62%) |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br>Atyidae<br>Baetidae >1 spp<br>Tricorythidae<br>Heptageniidae<br>Perlidae<br>Pyralida<br>Hydropsychidae >1spp<br>Elmidae<br>Psephenidae | 3 biotopes to be sampled; assemblages to be A to B abundances.<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C. |

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | | SPI: 12 – 14<br><br>%PTV: 20% to <40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |

## Table 2.6: Water Quality Ecological Specifications: Sundays River

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V60B** | Nkunzi to confluence with Sundays | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.06 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) ($95^{th}$ percentile) |
| | | | System variables | pH range | ≥6.5 ($5^{th}$ percentile) and ≤9.0 ($95^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeo rubromaculatus* (LRUB)<br>*Labeobarbus natalensis* (BNAT)<br>*Tilapia sparrmanii* (TSPA)<br>*Amphilius natalensis* (ANAT) | FRAI EC = C ≥ 62%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO and TSPA – 2 of 3 spp present as habitat indicators; and LRUB ≥ 3 individuals per species. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 spp<br>Tricorythidae<br>Heptageniidae<br>Hydropsychidae 2spp<br>Economidae<br>Psephenidae | 3 biotopes to be sampled: assemblages to be A to B abundances.<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br>%PTV: 20% to <40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years. |

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | | VEGRAI EC = C ≥ 62% |
| **V60A, V60B, V60C**<br><br>**(Thukela_ EWR7)** | Sundays from source to confluence with Wasbank | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.06 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤1.0 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤200 milligrams per Litre (mg/L) (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | System variables | pH range | ≥6.5 (5th percentile) and ≤9.0 (95th percentile) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeo rubromaculatus* (LRUB)<br>*Labeobarbus natalensis* (BNAT)<br>*Tilapia sparrmanii* (TSPA)<br>*Amphilius natalensis* (ANAT) | FRAI EC = C/D ≥ 52%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO and TSPA – 2 of 3 spp present as habitat indicators; and LRUB ≥ 3 individuals. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 spp<br>Heptageniidae<br>Hydropsychidae 2spp<br>Elmidae<br>Hydracarina<br>Leptophlebiidae<br>Aeshnidae<br>Athericidae | 3 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: 117 - 180<br><br>Average Score per Taxon (ASPT): 5.6 – 6.5<br><br>MIRAI EC = C/D ≥ 52% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 – 14<br><br>%PTV: 20% to <40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI)<br><br>Index of Habitat Integrity (IHI): Riparian | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C/D ≥ 52% |
| **V60D, V60E** | Wasbank to confluence with Sundays | Quality | Nutrients | Orthophosphate as P | ≤0.01 mg/L (50th percentile) |
| | | | | Total Inorganic Nitrogen as TIN | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤ 500 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Sulphate | ≤ 250 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Chloride | ≤ 120 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | pH range | ≥6.5 (5th percentile) and ≤9.0 (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | Toxic substances | Aluminium (Al) | ≤ 0.10 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Manganese (Mn) | ≤ 0.15 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Cadmium (Cd) soft | ≤ 0.001 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Iron (Fe) | ≤ 0.1 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Lead (Pb) hard | ≤ 0.01 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Copper (Cu) hard | ≤ 0.007 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Cobalt (Co) | ≤ 0.05 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Nickel (Ni) | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Zinc (Zn) | ≤ 0.002 milligrams per Litre (mg/L) (95th percentile) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Tilapia sparrmanii* (TSPA) | Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C/D ecological category.<br><br>FRAI EC = C/D ≥ 52%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO and TSPA – 2 of 3 spp. present as habitat indicators |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 spp<br>Heptageniidae<br>Hydropsychidae 2spp<br>Elmidae<br>Leptophlebiidae<br>Trichorythidae<br>Lestidae<br>Psephenidae | At least 2 biotopes to be sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥80 - 100<br><br>Average Score per Taxon (ASPT): ≥4.5<br><br>MIRAI EC = C/D ≥ 52% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% to <40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years. |

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | | VEGRAI EC = C/D ≥ 52% |
| **V60F**<br><br>**(Thukela_ EWR8)** | Sundays from Wasbank to Thukela confluence, including Nhlanyanga | Quality | System variables | pH range | ≥6.5 (5th percentile) and ≤9.0 (95th percentile) |
| | | | | Electrical Conductivity | ≤ 55 milli Siemens per metre (mS/m) (95th percentile) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeo rubromaculatus* (LRUB)<br>*Labeobarbus natalensis* (BNAT)<br>*Tilapia sparrmanii* (TSPA)<br>*Labeo molybdinus* (LMOL) | FRAI EC = C ≥ 62%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO and TSPA – 2 of 3 spp present as habitat indicators; and LRUB and/ or LMOL ≥ 3 individuals per spp. |
| | | | Aquatic invertebrates | South African Scoring System Version 5 (SASS5) (not measured within this RU but to be achieved)<br>Macroinvertebrate Response Assessment Index (MIRAI)<br><br>Baetidae 2 spp<br>Heptageniidae<br>Hydropsychidae 2spp<br>Leptophlebiidae<br>Tricorythidae | At least 2 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥120<br>Average Score per Taxon (ASPT): ≥4.8<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% to <40% |

## Table 2.7: Water Quality Ecological Specifications: Upper Mooi River

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| V20B | Klein - Mooi from source to Mooi confluence V20B (lower portion), V20D | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.01 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤ 120 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | pH | 6.5 (5th percentile) and 9.0 (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT) | FRAI EC = C ≥ 62% |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 spp<br>Heptageniidae<br>Hydropsychidae 2spp<br>Leptophlebiiidae<br>Trichorythidae<br>Psephenidae<br>Perlidae<br>Oligoneuridae<br>Polymitarcyidae<br>Prosopistomatidae<br>Pyralidae | 3 biotopes sampled; assemblages to be A to B abundances<br><br>SASS 5 score: ≥120<br>Average Score per Taxon (ASPT): ≥4.8<br><br>MIRAI EC = C ≥62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% to <40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years<br><br>VEGRAI EC = C ≥ 62% |
| **V20C**<br><br>**(THU_ECOLOGICAL WATER REQUIREMENTS (EWR) 20)** | Nsonge tributary catchment | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.01 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤120 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | pH | 6.5 (5th percentile) and 9.0 (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT) | FRAI EC = C ≥ 62% |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5) | 3 biotopes sampled: assemblages to be A to B abundances. |

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | Baetidae 2 spp<br>Leptophlebiidae<br>Trichorythida | SASS 5 score: 90 - 220<br>Average Score per Taxon (ASPT): 6.4 – 7.5<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as B.<br>SPI: 15 - 17<br>%PTV: <20% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = B/C ≥ 72% |
| **V20A (lower portion), V20D (upper)** | Mooi upstream of Spring Grove Dam | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.01 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤120 milligrams per Litre (mg/L) (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | Toxic substances | Ammonia as N | ≤ 0.0725 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis*<br>(BNAT) | FRAI EC = C ≥ 62%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 spp<br>Leptophlebiidae<br>Trichorythidae<br>Heptageniidae<br>Hydropsychidae 2spp. | 3 biotopes sampled: assemblages to be A to B abundances<br><br>SASS 5 score: ≥120<br>Average Score per Taxon (ASPT): ≥4.8<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br>%PTV: 20% to <40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |
| **V20D** | | Quality | Nutrients | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.01 milligrams per Litre (mg/L) (50th percentile) |

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | Spring Grove Dam/ Means Weir | | Salts | Total Dissolved Solids | ≤100 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | pH | 6.5 – 9.0 (5th and 95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | Biota | Periphyton/ phytoplankton | Chlorophyll-*a* | 11-20 micrograms per Litre (µg/L) (50th percentile) |
| **V20D (lower) and V20E, portion of V20G (Thukela_ EWR11)** | Downstream Spring Grove Dam to outlet of V20G<br><br>*(Note: *Current before Umkomaas transfer)* | Quality | Nutrients | Orthophosphate as P | ≤0.01 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen as TIN | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | pH | 6.5 (5th percentile) – 9.0 (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Labeo molybdinus* (LMOL) | FRAI EC = C/D ≥ 52% |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 spp<br>Leptophlebiidae<br>Heptageniidae<br>Hydropsychidae 2spp<br>Elmidae | 3 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥80 – 100<br><br>Average Score per Taxon (ASPT): ≥4.5<br><br>MIRAI EC = C/D ≥ 52% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br>%PTV: 20% to <40% |
| | | | Riparian habitat | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C/D ≥ 52% |
| **V20D (lower) and V20E, portion of V20G<br><br>(Thukela_ EWR11)** | Downstream Spring Grove Dam to outlet of V20G<br><br>*(Note: **long term, after* | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.06 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤250 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | pH | 6.5 (5th percentile) and 9.0 (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | Toxic substances | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | *Umkomaas transfer is implemented and transfers out of the system are reduced*) | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Anguilla mossambica* (AMOS)<br>*Anguilla bengalensis* (ALAB)<br>*Barbus (Enteromius) viviparus* (BVIV)<br>*Labeo rubromaculatus* (LRUB)<br>*Labeo molybdinus* (LMOL)<br>*Barbus (Enteromius) pallidus* (BPAL) | FRAI EC = B/C ≥ 72%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO, BVIV, BPAL – 3 of the 4 vegetation/ cover representatives.<br>1 of following AMOS, ALAB, LRUB as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 spp<br>Leptophlebiidae<br>Trichorythidae<br>Heptageniidae<br>Hydropsychidae 2spp<br>Elmidae<br>Psephenidae<br>Perlidae<br>Oligoneuridae | 3 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥150<br>Average Score per Taxon (ASPT): ≥5.5<br><br>MIRAI EC = B/C ≥ 72% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as B.<br>SPI: 15 - 17<br>%PTV: <20% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = B/C ≥ 72% |
| **V20E** | Joubertsvlei to confluence with Mooi | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.02 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤1.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤195 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | Toxic substances | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | Biota | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as D.<br>SPI: 8 - 10<br><br>%PTV: 40% - 60% |

## Table 2.8: Water Quality Ecological Specifications: Middle/ Lower Mooi River

| Quaternary Catchment/E WR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V20F** | Craigieburn Dam | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.02 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤1.0 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤195 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | Ph | ≥6.5 (5th percentile) and ≤9.0 (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | Biota | Periphyton/ phytoplankton | Chlorophyll-*a* | 11-20 micrograms per Litre (µg/L) (50th percentile) |
| **V20G**<br><br>**(THU_EWR21)** | Mnyamvubu downstream dam to confluence with Mooi | Quality | Nutrients | Ortho-phosphate as P | ≤0.01 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen as TIN | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤120 milligrams per Litre (mg/L) (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Anguilla mossambica* (AMOS)<br>*Labeo molybdinus* (LMOL)<br>*Barbus (Enteromius) pallidus* (BPAL)<br>*Tilapia sparrmanii* (TSPA) | FRAI EC = C ≥ 62%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO, BVIV, BPAL – 3 of the 4 vegetation/ cover representatives.<br><br>1 of following AMOS, ALAB, LRUB as flow dependent and depth class representatives |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae >2 spp<br>Leptophlebiidae<br>Trichorythidae<br>Hydropsychidae >2spp<br>Atydae<br>Hydracarina | 3 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥120<br>Average Score per Taxon (ASPT): ≥4.8<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as B.<br>SPI: 15 - 17<br>%PTV: <20% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |
| | | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.02 milligrams per Litre (mg/L) (50th percentile) |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V20H, J (THU_EWR 12A)** | Mooi from Mnyamvubu to Thukela confluence | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤1.0 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | pH | 6.5 (5th percentile) and 9.0 (95th percentile) |
| | | | Toxic substances | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Labeobarbus natalensis* (BNAT)<br>*Barbus (Enteromius) viviparus* (BVIV)<br>*Clarias gariepinus* (CGAR)<br>*Labeo molybdinus* (LMOL)<br>*Barbus (Enteromius) pallidus* (BPAL)<br>*Tilapia sparrmanii* (TSPA)<br>*Amphilius natalensis* (ANAT) | FRAI EC = C ≥ 62%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BVIV, BPAL and TSPA – 3 of the 4 vegetation/ cover representatives.<br><br>1 of following AMOS, and LMOL as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae >2 spp<br>Leptophlebiidae<br>Atydae<br>Aeshnidae<br>Hydropsychidae >2spp | 3 biotopes sampled: assemblages to be A to B abundances<br><br>SASS 5 score: 124 - 200<br>Average Score per Taxon (ASPT): 5.4 - 7.5<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian habitat | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |

## Table 2.9: Water Quality Ecological Specifications: Middle/ Lower Bushman's River

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V70C** | Wagendrift Dam | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.01 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤1.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | Biota | Periphyton/ phytoplankton | Chlorophyll-*a* | 11-20 micrograms per Litre (µg/L) (50$^{th}$ percentile) |
| **V70D** | Little Bushman's to confluence with Bushman's | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.06 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 mg/L (50$^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤300 mg/L (95$^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | System variables | pH range | ≥6.5 (5$^{th}$ percentile) and ≤9.0 (95$^{th}$ percentile) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT) | Fish Response Assessment Index (FRAI) should be conducted annually to monitor against the prescribed C ecological category<br><br>FRAI EC = C ≥ 62%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO – 5 specimens of each.<br><br>AMOS, 1 -2 specimens as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 spp<br>Leptophlebiiidae<br>Hydropsychidae 2spp<br>Heptageniidae<br>Elmidae | 3 biotopes sampled: assemblages to be A to B abundances<br><br>SASS 5 score: ≥120<br>Average Score per Taxon (ASPT): ≥4.8<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br>%PTV: 20% - < 40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |
| **V70E, V70F, (Upper** | Bushman's from Wagendrif | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.06 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| portion) V70G | t Dam to confluence with Rens-burgspruit downstream of Estcourt | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | System variables | pH range | ≥6.5 (5th percentile) and ≤9.0 (95th percentile) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| **V70F (lower) (Thukela_ EWR 5)** | Bushman's from Rensburg spruit Dam to outlet of V70F | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.058 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | pH range | ≥6.5 (5th percentile) and ≤9.0 (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>– *Barbus (Enteromius) trimaculatus* (BTRI)<br>*Barbus (Enteromius) viviparus* (BVIV)<br>*Anguilla mossambica* (AMOS)<br>*Labeo rubromaculatus* (LRUB)<br>*Tilapia sparrmanii* (TSPA) | FRAI EC = C ≥ 62%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BVIV, BANO and TSPA – 3 of the 4 vegetation/ cover representatives.<br><br>1 of following AMOS, and LRUB as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 spp<br>Leptophlebiidae<br>Heptageniidae<br>Hydropsychidae 2spp<br>Perlidae*<br>Elmidae*<br>Trichorythidae* | 3 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥120<br><br>Average Score per Taxon (ASPT): ≥4.8<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian habitat | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years. |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | | VEGRAI EC = C ≥62% |
| **V70G (THU_EWR 6A)** | Bushman's from outlet of V70F to confluence with Thukela | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.06 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | pH range | ≥6.5 (5th percentile) and ≤9.0 (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | Toxic substances | Ammonia s N | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Barbus (Enteromius) trimaculatus* (BTRI)<br>*Barbus (Enteromius) viviparus* (BVIV)<br>*Clarias gariepinus* (CGAR)<br>*Labeo molybdinus* (LMOL)<br>*Barbus (Enteromius) pallidus* (BPAL)<br>*Tilapia sparrmanii* (TSPA)<br>*Amphilius natalensis* (ANAT) | FRAI EC = C/D ≥ 52%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BVIV, BPAL and TSPA – 3 of the 4 vegetation/ cover representatives.<br><br>1 of following AMOS, and LMOL as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae >2 spp<br>Leptophlebiidae<br>Heptageniidae<br>Hydropsychidae 2spp | At least 2 biotopes sampled: assemblages to be A to B abundances<br><br>SASS 5 score: 80 - 180<br>Average Score per Taxon (ASPT): 5.7 - 7.5<br><br>MIRAI EC = C/D ≥ 52% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian habitat | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C/D ≥52% |

## Table 2.10: Water Quality Ecological Specifications: Upper Thukela River

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V11A (lower portion), V11C, V11D** | Thukela, Putterill, Majaneni, Khombe tributary catchments | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.1 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) (50th percentile) |
| | | | System variables | pH range | ≥6.5 (5th percentile) and ≤9.0 (95th percentile) |
| | | | | Electrical Conductivity | ≤ 55 milli Siemens per metre (mS/m) (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | Toxic substances | Ammonia as N | ≤ 0.0725 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Amphilius natalensis* (ANAT)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Labeo rubromaculatus* (LRUB) | FRAI EC = B/C ≥ 72%<br><br>Ensure all flow habitat classes are present for the following species: ANAT, BANO and BNAT – 2 of the 3 vegetation/ cover representatives.<br><br>1 of the following AMOS, mature BNAT and LRUB as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 spp<br>Leptophlebiidae<br>Heptageniidae<br>Hydropsychidae 2spp<br>Psephidae | At least 2 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS5: ≥150<br><br>Average Score per Taxon (ASPT): ≥15.5<br><br>MIRAI EC = B/C ≥ 72% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 – 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = B/C ≥ 72% |
| **V11D, V11E** | Woodstock Dam | Quality | Nutrients | Total Inorganic Nitrogen as TIN | ≤0.7 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Ortho-phosphate as P | ≤0.010 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤100 milligrams per Litre (mg/L) (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | Biota | Periphyton/ phytoplankton | Chlorophyll-*a* | 11-20 micrograms per Litre (µg/L)<br>50th percentile |
| **V11F** | Sandspruit tributary catchment | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.06 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤1.0 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) ($95^{th}$ percentile) |
| | | | System variables | pH range≥ | ≥6.5 ($5^{th}$ percentile) and ≤9.0 ($95^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) ($95^{th}$ percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Amphilius natalensis* (ANAT)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT) | FRAI EC = C ≥ 62%<br><br>Ensure all flow habitat classes are present for the following species: ANAT, BANO and BNAT – 2 of the 3 vegetation/ cover representatives.<br><br>1 of the following AMOS and mature BNAT as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | South African Scoring System 5 (SASS5) (not measured within this RU but to be achieved)<br>Macroinvertebrate Response Assessment Index (MIRAI)<br><br>Baetidae 2 spp<br>Leptophlebiidae<br>Heptageniidae<br>Hydropsychidae 2spp<br>Elmidae | At least 2 biotopes sampled; assemblages to be A to B abundances<br><br>SASS 5 score: ≥120<br><br>Average Score per Taxon (ASPT): ≥4.8<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI C Ecological Category (≥ 62%) |
| **V11L** | Spioenkop Dam | Quality | Nutrients | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤0.7 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.01 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | Biota | Periphyton/ phytoplankton | Chlorophyll-*a* | 11-20 micrograms per Litre (µg/L) (50th percentile) |
| **V11M**<br><br>**EWR 2** | Spioenkop Dam to Little Thukela confluence | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.02 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤1.0 milligrams per Litre (mg/L) (50th percentile) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Labeo rubromaculatus* (LRUB)<br>*Oreochromis mossambicus* (OMOS) | FRAI EC = C/D ≥ 52%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO and OMOS – 2 of the 3 vegetation/ cover representatives.<br><br>1 of the following AMOS, and LRUB as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | South African Scoring System 5 (SASS5) (not measured within this RU but to be achieved)<br>Macroinvertebrate Response Assessment Index (MIRAI)<br><br>Baetidae 2 spp<br>Leptophlebiidae<br>Heptageniidae<br>Hydropsychidae 2spp | At least 2 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥80 – 100<br><br>Average Score per Taxon (ASPT): ≥4.5<br><br>MIRAI EC = C/D ≥ 52% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI)<br>Index of Habitat Integrity (IHI): Riparian | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C/D ≥ 52% |
| **V13B, V13D** | Sterkspruit, Situlwane tributary catchment | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.02 milligrams per Litres (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤1.0 milligrams per Litres (mg/L) (50th percentile) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litres (mg/L) (95th percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litres (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litres (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litres (mg/L) |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Clarias gariepinus* (CGAR)<br>*Labeo rubromaculatus* (LRUB)<br>*Oreochromis mossambicus* (OMOS)<br>*Amphilius natalensis* (ANAT) | FRAI EC = B/C ≥ 72%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO, OMOS and ANAT – 3 of the 4 vegetation/ cover representatives.<br><br>CGAR present.<br><br>2 of the following AMOS, mature BNAT and LRUB as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | South African Scoring System 5 (SASS5) (not measured within this RU but to be achieved)<br>Macroinvertebrate Response Assessment Index (MIRAI)<br><br>Baetidae >2 spp<br>Leptophlebiidae<br>Heptageniidae<br>Tricorythidae<br>Hydropsychidae 2spp<br>Elmidae<br>Psepheniidae<br>Dixidae | 3 biotopes to be sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥150<br><br>Average Score per Taxon (ASPT): ≥5.5<br><br>MIRAI EC = B/C ≥ 72% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = B/C ≥ 72% |
| **V13A (lower portion), V13C, V13E** | Little Tugela from IUA14 outlet to confluence with Thukela River | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.02 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) ($95^{th}$ percentile) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) ($95^{th}$ percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **(Thukela_ EWR 3)** | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Labeo rubromaculatus* (LRUB)<br>*Amphilius natalensis* (ANAT)<br>*Labeo molybdinus* (LMOL) | FRAI EC = C/D ≥ 52%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO and ANAT – 2 of the 3 vegetation/ cover representatives.<br><br>1 of the following AMOS, mature BNAT and LMOL as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | South African Scoring System 5 (SASS5) (not measured within this RU but to be achieved)<br>Macroinvertebrate Response Assessment Index (MIRAI)<br><br>Baetidae >2 spp<br>Leptophlebiiidae<br>Heptageniidae<br>Oligoneuridae<br>Tricorythidae<br>Hydropsychidae 1spp<br>Polycentropodidae<br>Elmidae<br>Psephenidae | At least 2 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥80 - 100<br><br>Average Score per Taxon (ASPT): ≥4.5<br><br>MIRAI EC = C/D ≥ 52% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C/D ≥ 52% |
| **V14A, V14B** | Tugela from Little Tugela confluence to proposed Jana Dam/ Klip River confluence | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.10 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) ($95^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) ($95^{th}$ percentile) |
| | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Labeo rubromaculatus* (LRUB)<br>*Amphilius natalensis* (ANAT) | FRAI EC = C/D ≥ 52%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO and ANAT – 2 of the 3 vegetation/ cover representatives.<br><br>1 of the following AMOS, mature BNAT and LRUB as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | South African Scoring System 5 (SASS5) (not measured within this RU but to be achieved)<br>Macroinvertebrate Response Assessment Index (MIRAI)<br><br>Baetidae >2 spp<br>Leptophlebiidae<br>Heptageniidae<br>Oligoneuridae<br>Tricorythidae<br>Hydropsychidae 1spp<br>Polycentropodidae<br>Elmidae<br>Psephenidae | At least 2 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥80 - 100<br><br>Average Score per Taxon (ASPT): ≥4.5<br><br>MIRAI EC = C/D ≥ 52% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C/D ≥ 52% |

## Table 2.11: Water Quality Ecological Specifications: Klip River

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V12D, V12E and V12F** | Sandspruit and tributaries | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.058 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) ($95^{th}$ percentile) |

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Labeo rubromaculatus* (LRUB)<br>*Clarias gariepinus* (CGAR)<br>*Amphilius natalensis* (ANAT) | FRAI EC = C/D ≥ 52%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO, CGAR (juvenile) and ANAT – 3 of the 4 vegetation/ cover representatives.<br><br>2 of the following AMOS, mature BNAT and LRUB as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | SASS 5 (not measured within this RU but to be achieved)<br><br>MIRAI<br><br>Baetidae 2 spp<br>Leptophlebiidae<br>Heptageniidae<br>Tricorythidae<br>Elmidae | At least 2 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥80 – 100<br><br>Average Score per Taxon (ASPT): ≥4.5<br><br>MIRAI EC = C/D ≥ 52% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C/D≥ 52% |
| **V12A, V12B, V12C (THU_ EWR 22)** | Klip, Braamhoek, Tatana, Ngoga, | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.06 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) ($50^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) ($95^{th}$ percentile) |

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | Mhlwane, catchments | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Labeo rubromaculatus* (LRUB)<br>*Clarias gariepinus* (CGAR)<br>*Amphilius natalensis* (ANAT) | FRAI EC = C ≥ 62%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, ANAT, BANO and juvenile CGAR – 3 of the 4 vegetation/ cover representatives.<br><br>2 of the following AMOS, mature BNAT, mature CGAR and LRUB as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Hydracarina<br>Perlidae<br>Baetidae > 2 sp<br>Heptageniidae<br>Leptophlebiidae<br>Aeshnidae<br>Crambidae<br>Ecnomidae<br>Elmidae<br>Psephenidae | 3 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: 213 – 220<br><br>Average Score per Taxon (ASPT): 5.9 - 7.5<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |
| **V12G** | Klip from Ladysmith to confluence with Thukela | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.06 milligrams per Litre (mg/L) (50th percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) (50th percentile) |
| | | | Salts | Total Dissolved Solids | ≤500 milligrams per Litre (mg/L) (95th percentile) |
| | | | System variables | pH range | ≥6.5 (5th percentile) and ≤9.0 (95th percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | Aluminium (Al) | ≤ 0.1 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Cadmium (Cd) soft | ≤ 0.001 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Manganese (Mn) | ≤ 0.2 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Iron (Fe) | ≤ 0.1 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Lead (Pb) hard | ≤ 0.009 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Copper (Cu) hard | ≤ 0.007 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Nickel (Ni) | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Cobalt (Co) | ≤ 0.05 milligrams per Litre (mg/L) (95th percentile) |
| | | | | Zinc (Zn) | ≤ 0.002 milligrams per Litre (mg/L) (95th percentile) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Labeo rubromaculatus* (LRUB)<br>*Clarias gariepinus* (CGAR)<br>*Amphilius natalensis* (ANAT) | FRAI EC = C ≥ 62%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BANO, ANAT and juvenile CGAR – 3 of the 4 vegetation/ cover representatives.<br><br>2of following AMOS, mature CGAR, mature BNAT and LRUB as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 spp<br>Leptophlebiidae<br>Heptageniidae<br>Hydropsychidae 2spp<br>Elmidae | At least 2 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥120<br><br>Average Score per Taxon (ASPT): ≥4.8<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |

## Table 2.12: Water Quality Ecological Specifications: Middle Thukela River

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V14E (Thukela_ EWR 4B)** | Thukela From Klip confluence to Bushman's confluence | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Amphilius natalensis* (ANAT)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Labeo molybdinus* (LMOL)<br>*Labeo rubromaculatus* (LRUB)<br>*Clarias gariepinus* (CGAR)<br>*Barbus (Enteromius) trimaculatus* (BTRI)<br>*Barbus (Enteromius) viviparus* (BVIV)<br>*Pseudocrenilabrus philander* (PPHI) | FRAI EC = C ≥ 62%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BVIV, BANO, BTRI and PPHI – 4 of the 5 vegetation/ cover representatives.<br><br>4 of the following AMOS, ANAT, mature BNAT, CGAR, LRUB and LMOL as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Atyidae<br>Baetidae > 2 sp<br>Heptageniidae<br>Leptophlebiidae<br>Chlorocyphidae<br>Crambidae<br>Elmidae | 3 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: 145 - 200<br><br>Average Score per Taxon (ASPT): 6.0 – 7.6<br><br>MIRAI EC = C ≥ 62% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as B.<br>SPI: 15 – 17<br><br>%PTV: < 20% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |
| **V60G, V60H, V60J, V60K**<br><br>**(Thukela _EWR 9)** | Thukela from Bushman's confluence to d/s Mooi confluence | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.1 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤500 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | System variables | pH range | ≥6.5 (5$^{th}$ percentile) and ≤9.0 (95$^{th}$ percentile) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) (95$^{th}$ percentile) |

| Quaternary Catchment/ EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Amphilius natalensis* (ANAT)<br>*Enteromius (Barbus) anoplus* (BANO)<br>*Labeobarbus natalensis* (BNAT)<br>*Labeo molybdinus* (LMOL)<br>*Clarias gariepinus* (CGAR)<br>*Barbus (Enteromius) trimaculatus* (BTRI)<br>*Tilapia sparrmanii* (TSPA) | FRAI EC = D ≥ 42%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BTRI, juvenile CGAR and TSPA – 3 of the 4 vegetation/ cover representatives.<br><br>1 of following AMOS, mature CGAR and LMOL as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae >2 spp<br>Leptophlebiiidae<br>Heptageniidae<br>Elmidae<br>Psephenidae | At least 2 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥60<br><br>Average Score per Taxon (ASPT): ≥4.0<br><br>MIRAI EC = D ≥ 42% |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 – 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = D ≥ 42% |

## Table 2.13: Water Quality Ecological Specifications: Lower Thukela River

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V40A, V40B**<br><br>**(Thukela_ EWR 15)** | Thukela from d/s Mooi confluence to Middeldrift transfer | Quality | Nutrients | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.06 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | System variables | pH range | ≥6.5 (5$^{th}$ percentile) and ≤9.0 (95$^{th}$ percentile) |
| | | | Toxic substances | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) (95$^{th}$ percentile) |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Labeobarbus natalensis* (BNAT)<br>*Barbus (Enteromius) trimaculatus* (BTRI)<br>*Barbus (Enteromius) viviparus* (BVIV)<br>*Clarias gariepinus* (CGAR)<br>*Labeo molybdinus* (LMOL)<br>*Tilapia sparrmanii* (TSPA)<br>*Amphilius natalensis* (ANAT) | FRAI EC = C ≥ 62%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BVIV, juvenile CGAR, and TSPA – 3 of the 4 vegetation/ cover representatives.<br><br>1 of the following AMOS, CGAR and LMOL as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Baetidae 2 spp<br>Leptophlebiiidae<br>Heptageniidae<br>Perlidae<br>Elmidae<br>Psephenidae<br>Hydropsychidae 2spp | At least 2 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥120<br><br>Average Score per Taxon (ASPT): ≥4.8<br><br>MIRAI EC = C/D ≥ 62% |
| | | | Riparian habitat | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |
| **V40E, V50A, V59B, V50C, V50D (upper reach)**<br><br>**(THU_ EWR 16)** | Thukela from Middeldrift to Mandini Transfer (Mgeni) weir in V50D | Quality | Salts | Total Dissolved Solids | ≤350 milligrams per Litre (mg/L) (95th percentile) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla mossambica* (AMOS)<br>*Labeobarbus natalensis* (BNAT)<br>*Barbus (Enteromius) trimaculatus* (BTRI)<br>*Clarias gariepinus* (CGAR)<br>*Labeo molybdinus* (LMOL)<br>*Labeo rubromaculatus* (LRUB) | FRAI EC = C ≥ 62%<br><br>Ensure all flow habitat classes are present for the following species: BNAT, BTRI and juvenile CGAR – 2 of the 3 vegetation/ cover representatives.<br><br>2 of the following AMOS, LRUB and LMOL as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI)<br>South African Scoring System Version 5 (SASS5)<br><br>Baetidae >2 spp<br>Heptageniidae<br>Perlidae<br>Oligoneuridae<br>Tricorythidae | At least 2 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: ≥120<br><br>Average Score per Taxon (ASPT): ≥4.8<br><br>MIRAI EC = C ≥ 62% |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | Prosopistomatidae<br>Elmidae<br>Hydropsychidae 2spp | |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 – 14<br><br>%PTV: 20% - < 40% |
| | | | Riparian | Vegetation Response Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% |

## Table 2.14: Water Quality Ecological Specifications: Thukela Estuary and Upstream Thukela

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| **V50D (Upper Portions Quaternary catchment V50D)**<br><br>**(EWR 17)** | Thukela from Mandini Transfer (Mngeni) weir to upstream Estuary, including Mandini Stream | Quality | Nutrients | Orthophosphate ($PO_4^-$) as Phosphorus | ≤0.1 milligrams per Litre (mg/L) (50th percentile) (Thukela River only) |
| | | | | | ≤0.1 milligrams per Litre (mg/L) (50th percentile) (Mandini Stream only) |
| | | | | Total Inorganic Nitrogen (TIN) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) (percentile) (Thukela River and Mandini Stream) |
| | | | Salts | Total Dissolved Solids | ≤500 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream) |
| | | | | Chloride | ≤175 milligrams per Litre (mg/L) (95th percentile) Mandini Stream |
| | | | | Sodium | ≤115 milligrams per Litre (mg/L) (95th percentile) (Mandini Stream only) |
| | | | Pathogens | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) (Thukela River and Mandini Stream) |
| | | | System variables | pH | 6.5 – 8.9 with <5% of measurements outside of this during a given year (Thukela River and Mandini Stream) |
| | | | | Temperature | 17°C (10th percentile) and 30°C (90th percentile) with <5% of measurements outside of this range within a given year (Thukela River and Mandini Stream) |
| | | | | Dissolved oxygen | ≥ 6 milligrams per Litre (mg/L) (Thukela River and Mandini Stream) |
| | | | Toxic substances | Ammonia as N | ≤ 0.1 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream) |
| | | | | Aluminium (Al) | ≤ 0.10 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream) |
| | | | | Manganese (Mn) | ≤ 0.2 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream) |
| | | | | Iron (Fe) | ≤ 0.1 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream) |
| | | | | Lead (Pb) hard | ≤ 0.009 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream) |

| Quaternary Catchment/EWR Site | River | Component | Sub-component | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|
| | | | | Copper (Cu) hard | ≤ 0.007 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream) |
| | | | | Nickel (Ni) | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream) |
| | | | | Cobalt (Co) | ≤ 0.05 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream) |
| | | | | Zinc (Zn) | ≤ 0.002 milligrams per Litre (mg/L) (95th percentile) (Thukela River and Mandini Stream) |
| | | Biota | Fish | Fish Response Assessment Index (FRAI)<br><br>*Anguilla spp.*<br>*Glossogobius spp.*<br>*Awaous aeneofuscus* (AAEN)<br>*Barbus (Enteromius) trimaculatus* (BTRI)<br>*Labeobarbus natalensis* (BNAT)<br>*Labeo molybdinus* (LMOL)<br>*Labeo rubromaculatus* (LRUB)<br>*Oreochromis mossambicus* (OMOS) | FRAI EC = C ≥ 62% (Thukela River)<br><br>Ensure all flow habitat classes are present for the following species: *Glossogobius spp.*, BNAT, BTRI and juvenile OMOS – 3 of the 4 vegetation/ cover representatives.<br><br>2 of the following *Anguilla spp.* (elvers), mature BNAT, LMOL and LRUB as flow dependent and depth class representatives. |
| | | | Aquatic invertebrates | Macroinvertebrate Response Assessment Index (MIRAI) and South African Scoring System Version 5 (SASS5)<br><br>Perlidae<br>Baetidae > 2 sp<br>Heptageniidae<br>Leptophlebiidae<br>Oligoneuridae<br>Prosopistomatidae<br>Elmidae<br>Hydropsychidae 2spp | 3 biotopes sampled: assemblages to be A to B abundances.<br><br>SASS 5 score: 100 – 120<br><br>Average Score per Taxon (ASPT): 5.5 - 6.5<br><br>MIRAI EC = C ≥ 62% (Thukela River) |
| | | | Diatoms | Specific Pollution Sensitivity Index (SPI)<br>Percentage pollution tolerant values (%PTV) | Ecological category should be maintained as C.<br>SPI: 12 - 14<br><br>%PTV: 20% - < 40% (Thukela River) |
| | | | Riparian | Vegetation Response<br><br>Assessment Index (VEGRAI) | VEGRAI survey every 5 years.<br><br>VEGRAI EC = C ≥ 62% (Thukela River) |

## Table 2.15: Water Quality and Ecological Specifications for Priority Wetland Clusters and Systems in the Thukela Catchments

| IUA | Wetland Name | Wetland Type | Ecological Condition | | | Component prioritised | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|---|---|---|
| | | | PES | EIS | REC | | | |
| 1: Upper Buffalo River | Wakkerstroom | Unchannelled valley bottom (Peatland) | C | Very High | B | Quality | Ortho-phosphate as P | ≤0.01 milligrams per Litre (mg/L) (50th percentile) |
| | | | | | | | Total Inorganic Nitrogen (TIN) | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |
| | | | | | | | | ≤120 milligrams per Litre (mg/L) (95th percentile) |
| | | | | | | | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | | | | Habitat | Present Ecological State (PES) Category | PES score above 70% |
| | | | | | | | Peat depth and humification | Less than 10% reduction in peat profile depth and quality/humification from the baseline measurements at each sampling site. |
| | | | | | | Biota | SABAP 2 reporting rates for aquatic/wetland dependent Red Data bird species:<br>• White-Winged Flufftail<br>• Grey Crowned Crane<br>• African Marsh Harrier<br>• African Grass Owl<br>• Blue Crane<br>• Maccoa Duck<br>• Greater Flamingo<br>• Lesser Flamingo<br>• Half-Collared Kingfisher<br>• Greater Painted Snipe | Over the next 5 years the reporting rate for each species must not decline from the SABAP2 reporting rates (as at 15 April 2021):<br>• White-Winged Flufftail (~0.3%)<br>• Grey Crowned Crane (~59.6%)<br>• African Marsh Harrier (~49.1%)<br>• African Grass Owl (~0.5%)<br>• Blue Crane (~12.2%)<br>• Maccoa Duck (~1.6%)<br>• Greater Flamingo (~1.1%)<br>• Lesser Flamingo (~0.3%)<br>• Half-Collared Kingfisher (~4.5%)<br>• Greater Painted Snipe (~0.1%) |
| | Groenvlei | Channelled valley bottom and Floodplain | C | High | B/C | Quality | Ortho-phosphate as P | ≤0.01 milligrams per Litre (mg/L) (50th percentile) |
| | | | | | | | Total Inorganic Nitrogen (TIN) | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |
| | | | | | | | Total Dissolved Solids | ≤120 milligrams per Litre (mg/L) (95th percentile) |
| | | | | | | | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | | | | Habitat | Present Ecological State (PES) Category | PES score above 70% |
| 3: Middle Buffalo River | Boschoffsvlei | Floodplain | B/C | High | B | Quality | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤ 0.02 milligrams per Litre (mg/L) (50th percentile) |
| | | | | | | | Total Inorganic Nitrogen (TIN) | ≤1.0 milligrams per Litre (mg/L) (50th percentile) |
| | | | | | | | Total Dissolved Solids | ≤200 milligrams per Litre (mg/L) (95th percentile) |

| IUA | Wetland Name | Wetland Type | Ecological Condition | | | Component prioritised | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|---|---|---|
| | | | PES | EIS | REC | | | |
| | | | | | | | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) (95$^{th}$ percentile) |
| | | | | | | Habitat | Present Ecological State (PES) Category | PES score above 75% |
| | Boschoffsvlei pan complex | Depressions / Pans | A | Very High | A | Quality | pH, Electrical Conductivity, Total Dissolved Solids, Total Alkalinity as CaCO3, Sodium, Calcium, Magnesium, Sulphate, Iron, Chloride, Potassium, Magnesium, Manganese, Aluminium, Phosphorous, Silica, Fluoride Ammonia, Nitrate and Fluoride. | Maintain the water chemistry pan type applicable for each pan. |
| | | Seeps | B | | | | | |
| | | | | | | Habitat | Present Ecological State (PES) Category | PES score above 85% for each pan. |
| 5: Blood River | Upper Blood River | Seeps and Channelled valley bottom | A | High | A | Habitat | Present Ecological State (PES) Category - | PES score above 90% for the northern cluster and above 80% for the southern cluster. |
| | | Unchannelled valley bottom | B | | A/B | | | |
| | Blood River Vlei | Unchannelled valley bottom and Floodplain | C | Very High | B | Quality | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.02 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | | | | Total Inorganic Nitrogen (TIN) | ≤1.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | | | | Total Dissolved Solids | ≤200 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | | | | Habitat | Present Ecological State (PES) Category | PES score above 70% north of R34 crossing and PES score above 55% south of R34 crossing. |
| 6: Sunday River | Boschbergvlei | Floodplain | B/C | High | B | Quality | Ortho-phosphate ($PO_4^-$) as Phosphorus | ≤0.06 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | | | | Total Inorganic Nitrogen ($TIN^-$) as Nitrogen | ≤1.0 milligrams per Litre (mg/L) (50$^{th}$ percentile) |
| | | | | | | | Total Dissolved Solids | ≤200 milligrams per Litre (mg/L) (95$^{th}$ percentile) |
| | | | | | | | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | | | | | pH range | ≥6.5 (5$^{th}$ percentile) and ≤9.0 (95$^{th}$ percentile) |
| | | | | | | | Turbidity | A 10% variation from background concentration. Limits must be determined. |
| | | | | | | Habitat | Present Ecological State (PES) Category | PES score above 75% |
| | Paddavlei | Unchannelled and Channelled valley bottom | C | High | B/C | Habitat | Present Ecological State (PES) Category | PES score above 70% |
| | | | | | | Biota | Presence of Critically Endangered Wattled Crane. | Continued presence of Wattled Crane. |

| IUA | Wetland Name | Wetland Type | Ecological Condition | | | Component prioritised | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|---|---|---|
| | | | PES | EIS | REC | | | |
| 7: Upper Mooi River (and portion of 14: Escarpment) | Hlatikulu | Channelled and Unchannelled valley bottom | C | Very High | B | Quality | Ortho-phosphate (PO4-) as Phosphorus | ≤0.01 milligrams per Litre (mg/L) (50th percentile) |
| | | | | | | | Total Inorganic Nitrogen (TIN-) as Nitrogen | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |
| | | | | | | | Total Dissolved Solids | ≤120 milligrams per Litre (mg/L) (95th percentile) |
| | | | | | | | pH | 6.5 (5th percentile) and 9.0 (95th percentile) |
| | | | | | | | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | | | | | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | | | | Atrazine | ≤0.078 milligrams per Litre (mg/L) |
| | | | | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | | | | | Habitat | Present Ecological State (PES) Category | PES score above 65% |
| | | | | | | Biota | South African Bird Atlas Project 2 (SABAP 2) reporting rates for aquatic/wetland dependent Red Data bird species:<br>• Wattled Crane<br>• Grey Crowned Crane<br>• African Marsh Harrier<br>• African Grass Owl<br>• Blue Crane<br>• Half-Collared Kingfisher<br><br>Verify from monitoring records and recorded sightings from available avifaunal reporting data. | Over the next 5 years the reporting rate for each species must not decline from the SABAP2 reporting rates (as at 15 April 2021):<br>• Wattled Crane (~19.6%)<br>• Grey Crowned Crane (~43.5%)<br>• African Marsh Harrier (~15.2%)<br>• African Grass Owl (~2.2%)<br>• Blue Crane (~21.7%)<br>• Half-Collared Kingfisher (~13.0%). |
| | Stillerust | Channelled valley bottom and Floodplain | A | Very High | A | Quality | Ortho-phosphate (PO4-) as Phosphorus | ≤0.01 milligrams per Litre (mg/L) (50th percentile) |
| | | | | | | | Total Inorganic Nitrogen (TIN-) as Nitrogen | ≤0.5 milligrams per Litre (mg/L) (50th percentile) |
| | | | | | | | Total Dissolved Solids | ≤120 milligrams per Litre (mg/L) (95th percentile) |
| | | | | | | | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | | | | | Ammonia as N | ≤ 0.07 milligrams per Litre (mg/L) (95th percentile) |
| | | | | | | | Atrazine | ≤0.08 milligrams per Litre (mg/L) |
| | | | | | | | Mancozeb | ≤0.009 milligrams per Litre (mg/L) |
| | | | | | | | Glyphosate | ≤0.7 milligrams per Litre (mg/L) |
| | | | | | | Habitat | Present Ecological State (PES) Category | PES score above 90% |

| IUA | Wetland Name | Wetland Type | Ecological Condition | | | Component prioritised | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|---|---|---|
| | | | PES | EIS | REC | | | |
| | | | | | | Biota | South African Bird Atlas Project 2 (SABAP 2) reporting rates for aquatic/wetland dependent Red Data bird species:<br>• Wattled Crane<br>• Grey Crowned Crane<br>• African Marsh Harrier<br>• Blue Crane<br><br>Verify from monitoring records and recorded sightings from available avifaunal reporting data. | Over the next 5 years the reporting rate for each species must not decline from the SABAP2 reporting rates (as at 15 April 2021):<br>• Wattled Crane (~27.6%)<br>• Grey Crowned Crane (~37.9%)<br>• African Marsh Harrier (~6.9%)<br>• Blue Crane (~3.4%). |
| | | | | | | | The continued presence of breeding Wattled Cranes.<br>Wattled Crane monitoring, including breeding success monitoring | At least 1 breeding pair of Wattled Cranes |
| 8: Middle/ Lower Mooi River | Melmoth | Channelled valley bottom | **A** | **Very High** | **A** | Habitat | Present Ecological State (PES) Category | PES score above 90% |
| | | | | | | Biota | South African Bird Atlas Project 2 (SABAP 2) reporting rates for aquatic/wetland dependent Red Data bird species:<br>• Wattled Crane<br>• Grey Crowned Crane<br>• African Marsh Harrier<br>• Blue Crane<br><br>Verify from monitoring records and recorded sightings from available avifaunal reporting data. | Over the next 5 years the reporting rate for each species must not decline from the SABAP2 reporting rates (as at 15 April 2021):<br>• Wattled Crane (~21.1%)<br>• Grey Crowned Crane (~28.9%)<br>• African Marsh Harrier (~7.9%)<br>• Blue Crane (~34.2%). |
| | Dartmoor | Unchannelled Valley Bottom and Channelled Valley Bottom | **A** | **Very High** | **A** | Habitat | Present Ecological State (PES) Category | PES score above 90% |
| | | | | | | Biota | South African Bird Atlas Project 2 (SABAP 2) reporting rates for aquatic/wetland dependent Red Data bird species:<br>• Wattled Crane<br>• Grey Crowned Crane<br>• African Marsh Harrier<br>• Blue Crane<br><br>Verify from monitoring records and recorded sightings from available avifaunal reporting data. | Over the next 5 years the reporting rate for each species must not decline from the SABAP2 reporting rates (as at 15 April 2021):<br>• Wattled Crane (~21.1%)<br>• Grey Crowned Crane (~28.9%)<br>• African Marsh Harrier (~7.9%)<br>• Blue Crane (~34.2%). |
| | Scawby | | **B/C** | | **A/B** | Habitat | Present Ecological State (PES) Category | PES score above 75% |

| IUA | Wetland Name | Wetland Type | Ecological Condition | | | Component prioritised | Indicator | Water Quality Ecological Specifications |
|---|---|---|---|---|---|---|---|---|
| | | | PES | EIS | REC | | | |
| | | Unchannelled Valley Bottom and Channelled Valley Bottom | | **Very High** | | Biota | South African Bird Atlas Project 2 (SABAP 2) reporting rates for aquatic/wetland dependent Red Data bird species:<br>• Wattled Crane<br>• Grey Crowned Crane<br>• African Marsh Harrier<br>• Blue Crane<br><br>Verify from monitoring records and recorded sightings from available avifaunal reporting data. | Over the next 5 years the reporting rate for each species must not decline from the SABAP2 reporting rates (as at 15 April 2021):<br>• Wattled Crane (~21.1%)<br>• Grey Crowned Crane (~28.9%)<br>• African Marsh Harrier (~7.9%)<br>• Blue Crane (~34.2%). |
| 9: Middle/ Lower Bushman's River | Ntabamhlope | Floodplain, Channelled and Unchannelled valley bottom | **C** | **Very High** | **B** | Quality | Ortho-phosphate (PO4-) as Phosphorus | ≤0.06 milligrams per Litre (mg/L) (50th percentile) |
| | | | | | | | Total Inorganic Nitrogen (TIN-) as Nitrogen | ≤2.0 milligrams per Litre (mg/L) (50th percentile) |
| | | | | | | | Total Dissolved Solids | ≤300 milligrams per Litre (mg/L) (95th percentile) |
| | | | | | | | *Escherichia coli* | ≤130 Counts per 100 millilitres (counts/ 100 mL) |
| | | | | | | | pH range | ≥6.5 (5th percentile) and ≤9.0 (95th percentile) |
| | | | | | | Habitat | Present Ecological State (PES) Category | PES score above 70% |
| 14: Escarpment | Highmoor | Channelled valley bottom | **A** | **High** | **A** | Habitat | Present Ecological State (PES) Category | PES score above 90% for southern cluster and PES score above 75% for northern cluster. |
| | | Unchannelled valley bottom | **C** | | **B/C** | Biota | South Africa Bird Atlas Project 2 (SABAP 2) reporting rates for aquatic/wetland dependent Red Data bird species:<br>• Wattled Crane<br>• Grey Crowned Crane<br>• African Marsh Harrier<br>• Blue Crane<br><br>Verify from monitoring records and recorded sightings from available avifaunal reporting data. | Over the next 5 years the reporting rate for each species must not decline from the SABAP2 reporting rates (as at 15 April 2021):<br>• Wattled Crane (~17.9%)<br>• Grey Crowned Crane (~10.7%)<br>• African Marsh Harrier (~3.69%)<br>• Blue Crane (~10.7%). |

## GROUNDWATER - QUANTITY COMPONENT

### GROUNDWATER RESERVE – WATER QUANTITY COMPONENT

The groundwater quantity component was determined using values (Recharge and groundwater Baseflow) obtained during the determination of a high confidence groundwater Reserve study in the Thukela Water Management Area (WMA) (DWS 2009). There are 88 quaternary catchments within the Thukela catchment and Resource Units were delineated and classified taking into consideration the topography, Recharge, geology, and groundwater use (and stress). Population values were obtained from the Directorate Water Services dataset and were adjusted from the 1996 census.

**Table 3.1. Determination of the Groundwater Reserve for the Thukela Catchment.**

The Thukela catchment consists of 88 quaternary catchments delineated and grouped into 25 resource units **(A - Y)**. The resource units are made up of one or several quaternary catchments, based on geological and hydrogeological characteristics.

| Resource Unit | Quaternary | Recharge | | | Reserve | | | GW Use $Mm^3/a$ |
|---|---|---|---|---|---|---|---|---|
| | | Total Area $Km^2$ | Effective Area $Km^2$ | Recharge $Mm^3/a$ | Baseflow $Mm^3/a$ | Population | BHN $Mm^3/a$ | |
| A | V11A | 206.9 | 206.9 | 13.45 | 1.21 | 18360 | 0.17 | 0.05 |
| | V11B | 252.6 | 252.6 | 23.997 | 2.65 | 1710 | 0.02 | 0.01 |
| | V11E | 192.6 | 192.6 | 12.52 | 0.92 | 15970 | 0.14 | 0.04 |
| | V11G | 313.5 | 313.5 | 29.78 | 4.81 | 7700 | 0.07 | 0.02 |
| | V11H | 132.9 | 132.9 | 8.64 | 0.17 | 14020 | 0.13 | 0.04 |
| B | V13A | 231.7 | 231.7 | 15.07 | 1.22 | 50 | 0.001 | 0 |
| | V13B | 293.8 | 293.8 | 13.22 | 0.81 | 183 | 0.002 | 0.03 |
| | V13C | 255.6 | 255.6 | 8.179 | 0.48 | 34900 | 0.31 | 0.06 |
| | V13D | 283.4 | 283.4 | 12.75 | 0.55 | 30520 | 0.28 | 0.1 |
| C | V11C | 252.4 | 252.4 | 16.41 | 1.43 | 19660 | 0.18 | 0.04 |
| | V11D | 265.9 | 265.9 | 17.25 | 0.57 | 50290 | 0.45 | 0.18 |
| D | V11F | 160.7 | 160.7 | 7.599 | 0.12 | 8900 | 0.08 | 0.12 |
| | V11J | 144.0 | 144 | 6.48 | 0.18 | 7740 | 0.07 | 0.01 |
| E | V11K | 246.8 | 246.8 | 13.93 | 0.31 | 8210 | 0.07 | 0.08 |
| | V11L | 311.7 | 311.7 | 13.96 | 0.37 | 7850 | 0.07 | 0.11 |
| F | V11M | 154.3 | 154.3 | 4.94 | 0.09 | 3903.79 | 0.04 | 0.02 |
| | V13E | 280.9 | 280.9 | 8.98 | 0.26 | 5200 | 0.05 | 0.01 |
| | V14A | 223.9 | 223.9 | 7.17 | 0.18 | 250 | 0.002 | 0.21 |
| G | V12A | 307.1 | 307.1 | 17.83 | 1.39 | 650 | 0.01 | 0.06 |
| | V12B | 293.3 | 293.3 | 17.57 | 1.16 | 28750 | 0.26 | 0.12 |

| Resource Unit | Quaternary | Recharge | | | Reserve | | | GW Use $Mm^3/a$ |
|---|---|---|---|---|---|---|---|---|
| | | Total Area $Km^2$ | Effective Area $Km^2$ | Recharge $Mm^3/a$ | Baseflow $Mm^3/a$ | Population | BHN $Mm^3/a$ | |
| | V12C | 154.8 | 154.8 | 6.97 | 0.18 | 37558 | 0.34 | 0.18 |
| H | V12D | 236.0 | 236 | 15.34 | 0.89 | 200 | 0.002 | 0.03 |
| | V12E | 324.4 | 324.4 | 14.598 | 0.79 | 2700 | 0.02 | 0.12 |
| | V12F | 332.4 | 332.4 | 10.64 | 0.77 | 764.52 | 0.01 | 0.09 |
| I | V12G | 505.9 | 505.9 | 16.19 | 1.72 | 107330 | 0.97 | 0.09 |
| | V14B | 170.1 | 170.1 | 5.44 | 0.18 | 16945 | 0.15 | 0.06 |
| | V14E | 286.6 | 286.6 | 9.17 | 0.53 | 25250 | 0.23 | 0.02 |
| J | V14C | 195.2 | 195.2 | 6.25 | 0.30 | 11420 | 0.10 | 0.02 |
| | V14D | 631.8 | 631.8 | 20.22 | 2.59 | 6810 | 0.06 | 0.05 |
| K | V60A | 106.8 | 106.8 | 6.27 | 0.07 | 2000 | 0.02 | 0.1 |
| | V60B | 551.7 | 551.7 | 24.83 | 3.87 | 26700 | 0.24 | 0.67 |
| | V60C | 360.6 | 360.6 | 11.54 | 0.91 | 9800 | 0.09 | 0.08 |
| L | V60D | 307.9 | 307.9 | 13.86 | 1.22 | 200 | 0.002 | 0.02 |
| | V60E | 747.2 | 747.2 | 23.91 | 3.88 | 90950 | 0.82 | 0.15 |
| M | V20H | 603.4 | 603.4 | 19.31 | 2.38 | 13250 | 0.12 | 0.14 |
| | V20J | 314.0 | 314 | 10.05 | 0.61 | 12880 | 0.12 | 0.05 |
| | V60F | 406.0 | 406 | 12.92 | 0.98 | 24200 | 0.22 | 0.1 |
| | V60G | 461.4 | 461.4 | 14.77 | 1.21 | 22020 | 0.20 | 0.22 |
| | V60H | 354.9 | 354.9 | 11.36 | 0.62 | 20270 | 0.18 | 0.17 |
| | V60J | 185.9 | 185.9 | 5.95 | 0.21 | 7590 | 0.07 | 0.12 |
| | V60K | 228.0 | 228 | 7.296 | 0.33 | 21450 | 0.19 | 0.04 |
| N | V70A | 280.2 | 280.2 | 26.62 | 2.39 | 9000 | 0.08 | 0.03 |
| | V70B | 121.2 | 121.2 | 11.51 | 0.17 | 6800 | 0.06 | 0.03 |
| | V70C | 341.5 | 341.5 | 15.37 | 2.10 | 35936 | 0.32 | 0.05 |
| | V70D | 198.4 | 198.4 | 8.93 | 0.38 | 88850 | 0.80 | 0.31 |
| | V70E | 105.3 | 105.3 | 4.30 | 0.05 | 160 | 0.001 | 0 |
| O | V20A | 267.1 | 267.1 | 22.95 | 1.64 | 1265 | 0.011 | 0.01 |
| | V20B | 190.3 | 190.3 | 12.37 | 0.50 | 437.69 | 0.004 | 0 |
| | V20C | 187.9 | 187.9 | 12.21 | 0.44 | 432.17 | 0.004 | 0.01 |
| | V20D | 299.2 | 299.2 | 14.81 | 1.33 | 400 | 0.004 | 0.01 |
| P | V70F | 364.5 | 364.5 | 11.50 | 0.83 | 14170 | 0.13 | 0.01 |
| | V70G | 504.5 | 504.5 | 16.14 | 1.47 | 4250 | 0.04 | 0.01 |
| Q | V20E | 598.7 | 598.7 | 19.16 | 2.81 | 16712 | 0.15 | 0.03 |
| | V20F | 153.9 | 153.9 | 6.93 | 0.22 | 50 | 0.001 | 0.02 |
| | V20G | 253.6 | 253.6 | 8.12 | 0.46 | 50 | 0.001 | 0.02 |
| R | V31A | 621.7 | 621.7 | 36.53 | 4.29 | 9050 | 0.08 | 0.04 |
| | V31B | 505.3 | 505.3 | 22.74 | 2.56 | 50265 | 0.45 | 0.12 |
| | V31C | 395.9 | 395.9 | 17.82 | 1.53 | 13923 | 0.13 | 0.11 |

| Resource Unit | Quaternary | Recharge | | | Reserve | | | GW Use $Mm^3/a$ |
|---|---|---|---|---|---|---|---|---|
| | | Total Area $Km^2$ | Effective Area $Km^2$ | Recharge $Mm^3/a$ | Baseflow $Mm^3/a$ | Population | BHN $Mm^3/a$ | |
| | V31D | 467.1 | 467.1 | 21.86 | 1.30 | 30361.5 | 0.27 | 0.04 |
| | V31E | 833.9 | 833.9 | 42.42 | 5.91 | 7215 | 0.07 | 0.12 |
| | V31F | 155.6 | 155.6 | 8.54 | 0.21 | 7771 | 0.07 | 0.11 |
| | V31G | 254.7 | 254.7 | 10.21 | 0.47 | 13455 | 0.12 | 0.08 |
| | V31H | 128.5 | 128.5 | 8.35 | 0.14 | 8416.75 | 0.08 | 0.01 |
| | V31J | 357.9 | 357.9 | 19.26 | 1.08 | 46000 | 0.41 | 0.04 |
| | V31K | 226.7 | 226.7 | 9.75 | 0.38 | 120058 | 1.08 | 0.15 |
| | V32A | 194.7 | 194.7 | 8.76 | 0.33 | 12752.85 | 0.12 | 0.01 |
| S | V32B | 556.9 | 556.9 | 24.80 | 2.19 | 42100 | 0.38 | 0.14 |
| | V32C | 629.9 | 629.9 | 22.11 | 2.58 | 158492 | 1.43 | 0.22 |
| | V32D | 589.9 | 589.9 | 18.88 | 2.33 | 36350 | 0.33 | 0.21 |
| | V32E | 783.3 | 783.3 | 25.07 | 3.81 | 44570 | 0.40 | 0.09 |
| | V32F | 201.4 | 201.4 | 6.45 | 0.24 | 250 | 0.002 | 0.04 |
| T | V32G | 544.3 | 544.3 | 24.49 | 2.09 | 50 | 0.001 | 0.02 |
| | V32H | 517.4 | 517.4 | 16.56 | 1.58 | 45250 | 0.41 | 0.16 |
| U | V33A | 576.9 | 576.9 | 18.46 | 2.16 | 52574 | 0.47 | 0.23 |
| | V33B | 406.6 | 406.6 | 13.01 | 1.05 | 24550 | 0.22 | 0.11 |
| | V33C | 398.1 | 398.1 | 12.74 | 1.05 | 7250 | 0.07 | 0.06 |
| | V33D | 455.2 | 455.2 | 14.57 | 1.29 | 8400 | 0.08 | 0.17 |
| V | V40A | 372.2 | 372.2 | 11.91 | 1.70 | 13950 | 0.13 | 0.09 |
| | V40B | 292.3 | 292.3 | 9.35 | 0.94 | 7750 | 0.07 | 0.11 |
| | V40E | 300.9 | 300.9 | 9.63 | 0.93 | 5550 | 0.05 | 0.09 |
| W | V40C | 454.9 | 454.9 | 20.47 | 2.40 | 14700 | 0.13 | 0.23 |
| | V40D | 333.3 | 333.3 | 13.84 | 1.29 | 5950 | 0.05 | 0.14 |
| X | V50A | 408.9 | 408.9 | 13.99 | 2.34 | 12550 | 0.11 | 0.11 |
| | V50B | 383.8 | 383.8 | 17.27 | 2.63 | 31600 | 0.28 | 0.05 |
| | V50C | 409.1 | 409.1 | 26.59 | 4.88 | 33282 | 0.30 | 0.29 |
| Y | V50D | 146.8 | 146.8 | 9.542 | 0.25 | 11800 | 0.11 | 0.12 |

## GROUNDWATER RESERVE – WATER QUALITY COMPONENT

The water quality Reserve in the Thukela catchment is determined on a preliminary basis, to be defined by the minimum quality specifications in Table 4.1. In preliminary determinations of the quality component the ambient groundwater quality is compared to the Class 1 potability value (SANS 241:1 2011). The lowest or more conservative value of the two is selected. In instances where the ambient value is selected, it is increased by 10 per cent. The overall water quality of the resource units is well within the drinking water quality guidelines.

**Table 4.1: Physical and chemical water quality**

| Parameter | Target Water Quality Ranges [1] | | | | |
|---|---|---|---|---|---|
| | Units | Class 0 | Class I | Class II | Class III |
| pH | pH units | 6 – 9 | 5 – 6 & 9 – 9.5 | 4 – 5 & > 9.5 – 10 | <4 & > 10 |
| Electrical Conductivity | mS/m | < 70 | 70 - 150 | 150 – 370 | > 370 |
| Calcium as Ca | mg/l | < 80 | 80 - 150 | 150 – 300 | > 300 |
| Magnesium as Mg | mg/l | < 70 | 70 - 100 | 100 – 200 | > 200 |
| Sodium as Na | mg/l | < 100 | 100 - 200 | 200 – 400 | > 400 |
| Chloride as Cl | mg/l | < 100 | 100 - 200 | 200 – 600 | > 600 |
| Sulphate as $SO_4$ | mg/l | < 200 | 200 - 400 | 400 – 600 | > 600 |
| Nitrate as $NO_x$-N | mg/l | < 6 | 6 - 10 | 10 – 20 | > 20 |
| Fluoride as F | mg/l | <0.7 | 0.7 – 1.0 | 1.0 – 1.5 | > 1.5 |

1) Reference: Classification Systems in terms of – Water Research Commission: Quality of Domestic Water Supplies – Volume 1. Report No. TT 101/98, Second Edition, 1998.

**Note:**

**Class 0:** Water is classed as ideal drinking water, suitable for lifetime use. The values are essentially the same as the target water guideline in the South African Water Quality Guideline for Domestic Use.

**Class I:** Water is still safe for lifetime use; however, some mild health effects may, in very rare cases, occur. They may also be some aesthetic effects.

**Class II:** Water allowable for limited short term or emergency use. Health effects may be felt more commonly, as compared to Class I, especially by those who are long term users of the water. Therefore, it is not recommended that the water be used continuously for life. This is only class in the guideline which is not specific in terms of the exact duration that the water can be used for. It states that it can be used for short term use; but does not define what length of time "short term" refers to.

**Class III:** Class III water will cause serious health effects, particular in infants and elderly people. Use of this water is not recommended for drinking purposes.

The water quality for the following quaternary catchments were not assessed due to insufficient information (lack of representative groundwater quality data):

- V11A, V11B, V11C, V11E, V11F, V11G, V11H, V11J, V11K, V11L, V11M
- V12A, V12B, V12C, V12D, V12E, V12F
- V13A, V13B, V13C, V13D, V13E
- V14A, V14B, V14C, V14E
- V20A, V20B, V20C, V20D, V20F, V20G
- V31B, V31C, V31D, V31H
- V32A, V32D, V32F, V32G, V32H
- V33B, V33C, V33D
- V40C
- V50B, V50D
- V60A, V60C, V60D, V60E, V60F, V60G
- V70A, V70B, V70C, V70D, V70E, V70F, V70G

**Table 4.2. Groundwater Quality Reserve: Thukela Catchment**

| Chemical Parameter | Unit | Quaternary Catchments V12G, V31A, V31E, V32B | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Samples | | | | Ambient GW quality or median[1] | | | | BHN Reserve[2] | Groundwater Quality Reserve[3] | | | |
| | | V12G | V31A | V31E | V32B | V12G | V31A | V31E | V32B | | V12G | V31A | V31E | V32B |
| pH | | 11 | 11 | 27 | 49 | 8.12 | 7.36 | 8.16 | 7.93 | 5.0 – 9.5 | 8.93 | 8.10 | 8.98 | 8.72 |
| Electrical Conductivity | mS/m | 11 | 11 | 27 | 49 | 73.9 | 17.5 | 34.2 | 18.07 | <150 | 81.29 | 19.25 | 37.62 | 19.88 |
| Calcium as Ca | mg/l | 11 | 11 | 23 | 45 | 53.4 | 17.2 | 17.1 | 15.48 | <150 | 58.74 | 18.92 | 18.81 | 17.02 |
| Magnesium as Mg | mg/l | 11 | 11 | 23 | 44 | 36.4 | 6 | 6.38 | 5.14 | <100 | 40.4 | 6.6 | 7.02 | 5.66 |
| Sodium as Na | mg/l | 11 | 11 | 23 | 42 | 62.6 | 7.3 | 46.7 | 9.08 | <200 | 68.86 | 8.03 | 51.37 | 9.99 |
| Chloride as Cl | mg/l | 11 | 11 | 23 | 45 | 18.5 | 3.4 | 5 | 5 | <200 | 20.35 | 3.74 | 5.5 | 5.5 |
| Sulphate as $SO_4$ | mg/l | 11 | 11 | 23 | 45 | 24.6 | 7.5 | 4.6 | 3 | <400 | 27.06 | 8.25 | 5.06 | 3.3 |
| Nitrate as $NO_x$-N | mg/l | 11 | 11 | 23 | 44 | 1.14 | 0.02 | 0.04 | 0.18 | <10 | 1.25 | 0.02 | 0.04 | 0.19 |
| Fluoride as F | mg/l | 11 | 11 | 23 | 42 | 0.62 | 0.19 | 0.34 | 0.18 | <1.0 | 0.68 | 0.21 | 0.37 | 0.2 |
| **Chemical Parameter** | **Unit** | **Quaternary Catchments V32C, V40A, V40D, V40E** | | | | | | | | | | | | |
| | | No. of Samples | | | | Ambient GW quality or median[1] | | | | BHN Reserve[2] | Groundwater Quality Reserve[3] | | | |
| | | V32C | V40A | V40D | V40E | V32C | V40A | V40D | V40E | | V32C | V40A | V40D | V40E |
| pH | | 33 | 23 | 12 | 14 | 8.35 | 7.9 | 8.21 | 7.99 | 5.0 – 9.5 | 9.18 | 8.69 | 9.03 | 8.78 |
| Electrical Conductivity | mS/m | 33 | 23 | 12 | 14 | 50.80 | 64.7 | 115.8 | 124.25 | <150 | 55.88 | 71.17 | 127.38 | 136.68 |
| Calcium as Ca | mg/l | 33 | 23 | 12 | 14 | 38.42 | 49.1 | 51.8 | 59.75 | <150 | 42.27 | 54.01 | 56.98 | 65.73 |
| Magnesium as Mg | mg/l | 33 | 23 | 12 | 14 | 22.96 | 26.7 | 50.4 | 60.5 | <100 | 25.25 | 29.37 | 55.44 | 66.55 |
| Sodium as Na | mg/l | 27 | 23 | 12 | 14 | 43.3 | 51.7 | 114.3 | 119.95 | <200 | 47.63 | 56.87 | 125.73 | 131.95 |
| Chloride as Cl | mg/l | 18 | 23 | 12 | 14 | 12.49 | 25 | 54.4 | 84.35 | <200 | 13.74 | 27.5 | 59.84 | 96.09 |
| Sulphate as $SO_4$ | mg/l | 33 | 23 | 12 | 14 | 17.64 | 13.4 | 65.3 | 34.8 | <400 | 19.4 | 14.74 | 71.83 | 38.28 |
| Nitrate as $NO_x$-N | mg/l | 33 | 23 | 12 | 14 | 0.05 | 0.67 | 0.24 | 1.47 | <10 | 0.06 | 0.73 | 0.26 | 1.62 |
| Fluoride as F | mg/l | 31 | 23 | 12 | 14 | 0.25 | 0.36 | 1.02 | 0.73 | <1.0 | 0.24 | 0.4 | 1.12 | 0.8 |

[1] Based on long term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9).
[2] Upper limit of Class I water quality [Drinking] (WRC *et al.* 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10%. Where a difference in the water quality values for the ambient groundwater quality and basic human needs was found, the lesser or more protective value was selected for the groundwater quality Reserve. Where the ambient groundwater quality was selected as the groundwater quality Reserve, the value was scaled up by 10 per cent provided that the value does not exceed the BHN Reserve.

**Table 4.3. Groundwater Quality Reserve: Thukela Catchment**

| Chemical Parameter | Unit | Quaternary Catchments V11D, V14D, V20E, V31B | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Samples | | | | Ambient GW quality or median[1] | | | | BHN Reserve[2] | Groundwater Quality Reserve[3] | | | |
| | | V11D | V14D | V20E | V31B | V11D | V14D | V20E | V31B | | V11D | V14D | V20E | V31B |
| pH | | 14 | 12 | 9 | 10 | 7.99 | 8.3 | 8.53 | 8.01 | 5.0 – 9.5 | 8.79 | 9.13 | 9.39 | 8.81 |
| Electrical Conductivity | mS/m | 14 | 12 | 9 | 10 | 20.1 | 59.8 | 98.4 | 56.5 | <150 | 22.11 | 65.78 | 108.24 | 62.15 |
| Calcium as Ca | mg/l | 14 | 12 | 9 | 10 | 7.9 | 35.65 | 9.32 | 17.9 | <150 | 8.69 | 39.22 | 10.25 | 19.69 |
| Magnesium as Mg | mg/l | 14 | 12 | 9 | 10 | 1.97 | 19.6 | 2.18 | 6.05 | <100 | 2.17 | 21.56 | 2.4 | 6.66 |
| Sodium as Na | mg/l | 14 | 12 | 7 | 9 | 22.9 | 85.2 | **226.72** | 65.1 | <200 | 25.19 | 93.72 | **226.72** | 71.61 |
| Chloride as Cl | mg/l | 14 | 12 | 6 | 10 | 4.7 | 24.65 | 11.12 | 16.1 | <200 | 5.17 | 27.12 | 12.23 | 17.71 |
| Sulphate as $SO_4$ | mg/l | 14 | 12 | 9 | 9 | 3.24 | 17.7 | 130.57 | 10.6 | <400 | 3.57 | 19.47 | 143.63 | 11.66 |
| Nitrate as $NO_x$-N | mg/l | 14 | 12 | 9 | 10 | 0.87 | 0.06 | 0.27 | 0.24 | <10 | 0.96 | 0.06 | 0.3 | 0.26 |
| Fluoride as F | mg/l | 14 | 12 | 8 | 10 | 1.22 | 1.19 | 3.13 | 0.31 | <1.0 | 1.34 | 1.3 | 3.44 | 0.34 |
| **Chemical Parameter** | **Unit** | **Quaternary Catchments V31F, V31G, V31K, V33A** | | | | | | | | | | | | |
| | | No. of Samples | | | | Ambient GW quality or median[1] | | | | BHN Reserve[2] | Groundwater Quality Reserve[3] | | | |
| | | V31F | V31G | V31K | V33A | V31F | V31G | V31K | V33A | | V31F | V31G | V31K | V33A |
| pH | | 16 | 21 | 33 | 13 | 8.16 | 8.08 | 7.99 | 7.98 | 5.0 – 9.5 | 8.97 | 8.88 | 8.79 | 8.78 |
| Electrical Conductivity | mS/m | 16 | 21 | 33 | 13 | 18.94 | 56.7 | 32.31 | 41 | <150 | 20.83 | 62.37 | 35.54 | 45.1 |
| Calcium as Ca | mg/l | 16 | 21 | 32 | 13 | 12.8 | 46.17 | 21.1 | 20.9 | <150 | 14.08 | 50.79 | 23.21 | 22.99 |
| Magnesium as Mg | mg/l | 16 | 21 | 32 | 13 | 4.14 | 11.58 | 7.68 | 13.2 | <100 | 4.56 | 12.74 | 8.45 | 14.52 |
| Sodium as Na | mg/l | 14 | 18 | 24 | 13 | 18.39 | 67.01 | 40.39 | 39.8 | <200 | 20.23 | 73.71 | 44.43 | 43.78 |
| Chloride as Cl | mg/l | 11 | 16 | 22 | 13 | 1.31 | 13.03 | 6.03 | 8.3 | <200 | 1.44 | 14.34 | 6.64 | 9.13 |
| Sulphate as $SO_4$ | mg/l | 16 | 21 | 20 | 13 | 1.5 | 67.14 | 20.96 | 6.5 | <400 | 1.65 | 73.85 | 23.05 | 7.15 |
| Nitrate as $NO_x$-N | mg/l | 16 | 21 | 33 | 13 | 0.05 | 0.05 | 0.05 | 0.08 | <10 | 0.06 | 0.06 | 0.06 | 0.09 |
| Fluoride as F | mg/l | 14 | 19 | 31 | 13 | 0.25 | 0.41 | 0.34 | 0.26 | <1.0 | 0.27 | 0.45 | 0.37 | 0.29 |

[1] Based on long term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9).
[2] Upper limit of Class I water quality [Drinking] (WRC *et al.* 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10%. Where a difference in the water quality values for the ambient groundwater quality and basic human needs was found, the lesser or more protective value was selected for the groundwater quality Reserve. Where the ambient groundwater quality was selected as the groundwater quality Reserve, the value was scaled up by 10 per cent provided that the value does not exceed the BHN Reserve.

**Table 4.4. Groundwater Quality Reserve: Thukela Catchment**

| Chemical Parameter | Unit | Quaternary Catchments V31J, V32E | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | No. of Samples | | Ambient GW quality or median[1] | | BHN Reserve[2] | Groundwater Quality Reserve[3] | |
| | | V31J | V32E | V31J | V32E | | V31J | V32E |
| pH | | 58 | 257 | 7.69 | 8.32 | 5.0 – 9.5 | 8.45 | 9.15 |
| Electrical Conductivity | mS/m | 58 | 257 | 63.9 | 57.95 | <150 | 70.29 | 63.77 |
| Calcium as Ca | mg/l | 58 | 257 | 25.75 | 26.85 | <150 | 28.33 | 29.53 |
| Magnesium as Mg | mg/l | 58 | 256 | 10 | 14.29 | <100 | 11 | 15.71 |
| Sodium as Na | mg/l | 58 | 187 | 79.8 | 70.31 | <200 | 87.78 | 77.34 |
| Chloride as Cl | mg/l | 58 | 163 | 51.25 | 11.79 | <200 | 56.38 | 12.97 |
| Sulphate as $SO_4$ | mg/l | 58 | 256 | 15.5 | 4.77 | <400 | 17.05 | 5.24 |
| Nitrate as $NO_x$-N | mg/l | 58 | 256 | 0.04 | 0.05 | <10 | 0.04 | 0.06 |
| Fluoride as F | mg/l | 58 | 229 | 0.94 | 0.41 | <1.0 | 0.94 | 0.45 |

| Chemical Parameter | Unit | Quaternary Catchments V40B | | | |
|---|---|---|---|---|---|
| | | No. of Samples | Ambient GW quality or median[1] | BHN Reserve[2] | Groundwater Quality Reserve[3] |
| | | V40B | V40B | | V40B |
| pH | | 9 | 7.72 | 5.0 – 9.5 | 8.49 |
| Electrical Conductivity | mS/m | 9 | 33 | <150 | 36.3 |
| Calcium as Ca | mg/l | 9 | 26.8 | <150 | 29.48 |
| Magnesium as Mg | mg/l | 9 | 15.5 | <100 | 17.05 |
| Sodium as Na | mg/l | 9 | 15.9 | <200 | 17.49 |
| Chloride as Cl | mg/l | 9 | 12.2 | <200 | 13.42 |
| Sulphate as $SO_4$ | mg/l | 9 | 8.4 | <400 | 9.24 |
| Nitrate as $NO_x$-N | mg/l | 9 | 0.45 | <10 | 0.49 |
| Fluoride as F | mg/l | 9 | 0.23 | <1.0 | 0.25 |

[1] Based on long term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9).
[2] Upper limit of Class I water quality [Drinking] (WRC *et al.* 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10%. Where a difference in the water quality values for the ambient groundwater quality and basic human needs was found, the lesser or more protective value was selected for the groundwater quality Reserve. Where the ambient groundwater quality was selected as the groundwater quality Reserve, the value was scaled up by 10 per cent provided that the value does not exceed the BHN Reserve.

**Table 4.5. Groundwater Quality Reserve: Thukela Catchment**

| Chemical Parameter | Unit | Quaternary Catchments V50A, V50C | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | No. of Samples | | Ambient GW quality or median[1] | | BHN Reserve[2] | Groundwater Quality Reserve[3] | |
| | | V50A | V50C | V50A | V50C | | V50A | V50C |
| pH | | 34 | 15 | 8.24 | 7.6 | 5.0 – 9.5 | 9.06 | 8.36 |
| Electrical Conductivity | mS/m | 34 | 15 | **173** | 20.5 | <150 | **173** | 22.55 |
| Calcium as Ca | mg/l | 34 | 15 | 54.65 | 6.7 | <150 | 60.12 | 7.37 |
| Magnesium as Mg | mg/l | 34 | 15 | 67.3 | 3.8 | <100 | 74.03 | 4.18 |
| Sodium as Na | mg/l | 34 | 15 | **188.45** | 19.3 | <200 | **188.45** | 21.23 |
| Chloride as Cl | mg/l | 34 | 15 | **218.95** | 15 | <200 | **218.95** | 16.5 |
| Sulphate as $SO_4$ | mg/l | 34 | 15 | 7.4 | 7.1 | <400 | 49.72 | 8.14 |
| Nitrate as $NO_x$-N | mg/l | 34 | 15 | 2.32 | 0.8 | <10 | 2.55 | 0.88 |
| Fluoride as F | mg/l | 34 | 15 | 1.85 | 0.38 | <1.0 | 2.04 | 0.42 |
| **Chemical Parameter** | **Unit** | **Quaternary Catchments V60B, V60H** | | | | | | |
| | | **No. of Samples** | | **Ambient GW quality or median[1]** | | **BHN Reserve[2]** | **Groundwater Quality Reserve[3]** | |
| | | **V60B** | **V60H** | **V60B** | **V60H** | | **V60B** | **V60H** |
| pH | | 13 | 12 | 8.03 | 8.14 | 5.0 – 9.5 | 8.83 | 8.95 |
| Electrical Conductivity | mS/m | 13 | 12 | 36.2 | 65.75 | <150 | 39.68 | 72.33 |
| Calcium as Ca | mg/l | 13 | 12 | 27.9 | 42.1 | <150 | 30.69 | 46.31 |
| Magnesium as Mg | mg/l | 13 | 12 | 13.8 | 18.1 | <100 | 15.18 | 19.91 |
| Sodium as Na | mg/l | 13 | 12 | 32 | 77.85 | <200 | 35.2 | 85.69 |
| Chloride as Cl | mg/l | 13 | 12 | 5.9 | 25 | <200 | 6.49 | 27.5 |
| Sulphate as $SO_4$ | mg/l | 13 | 12 | 6.6 | 9.8 | <400 | 7.26 | 10.78 |
| Nitrate as $NO_x$-N | mg/l | 13 | 12 | 0.02 | 0.3 | <10 | 0.02 | 0.33 |
| Fluoride as F | mg/l | 13 | 12 | 0.28 | 0.59 | <1.0 | 0.31 | 0.64 |

[1] Based on long term groundwater quality datasets (DWS Water Management System). Minimum number of analyses used for the statistical evaluation is nine (9).
[2] Upper limit of Class I water quality [Drinking] (WRC *et al.* 2nd Edition, 1998, Volume 1: Assessment Guide); and
[3] Median value plus 10%. Where a difference in the water quality values for the ambient groundwater quality and basic human needs was found, the lesser or more protective value was selected for the groundwater quality Reserve. Where the ambient groundwater quality was selected as the groundwater quality Reserve, the value was scaled up by 10 per cent provided that the value does not exceed the BHN Reserve.

The delineated resource units and quaternary catchments making up the Thukela catchment are shown below in Figure 1 and Figure 2 respectively.

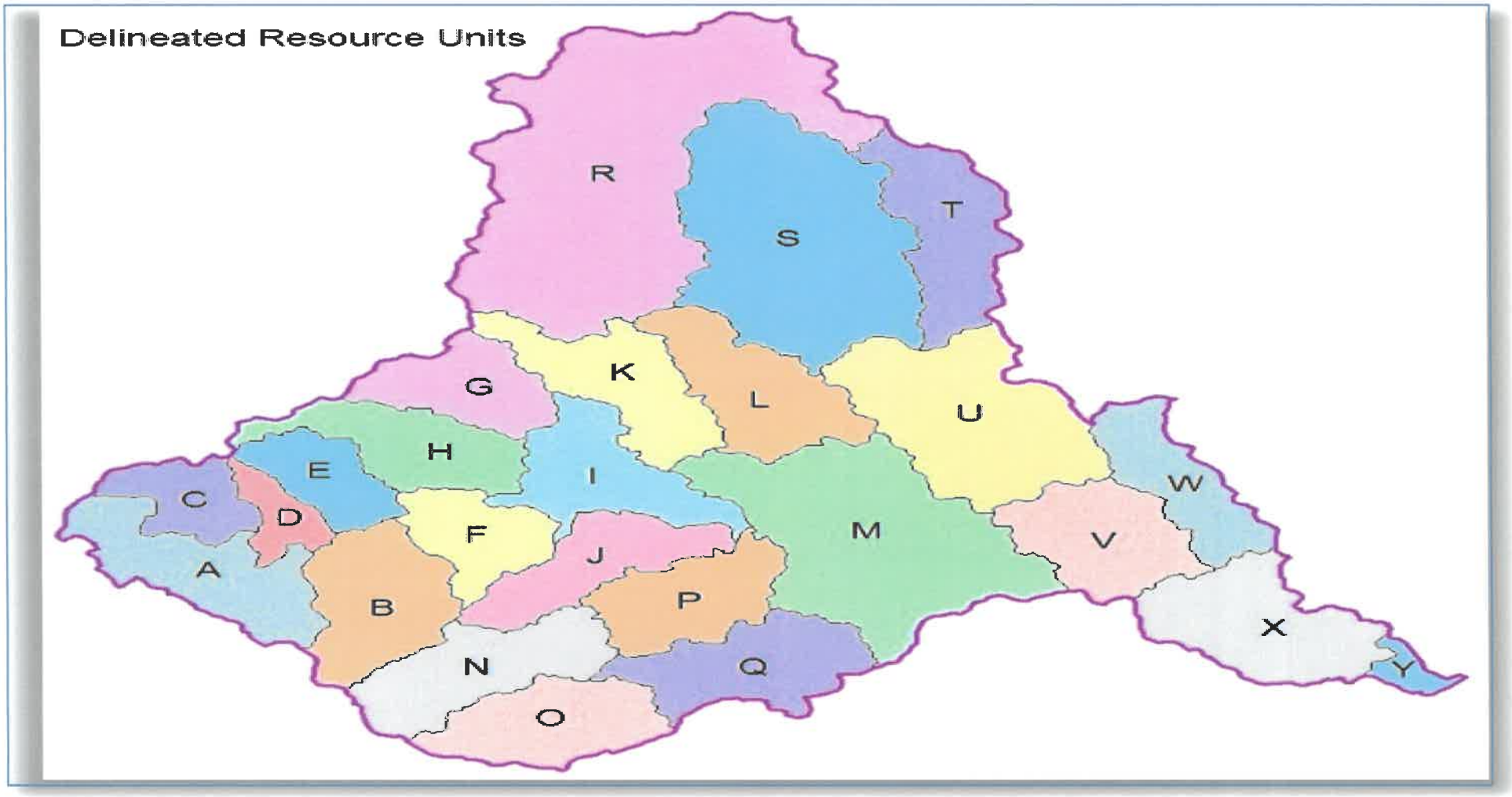


**Figure 1:** Delineated Resource Units

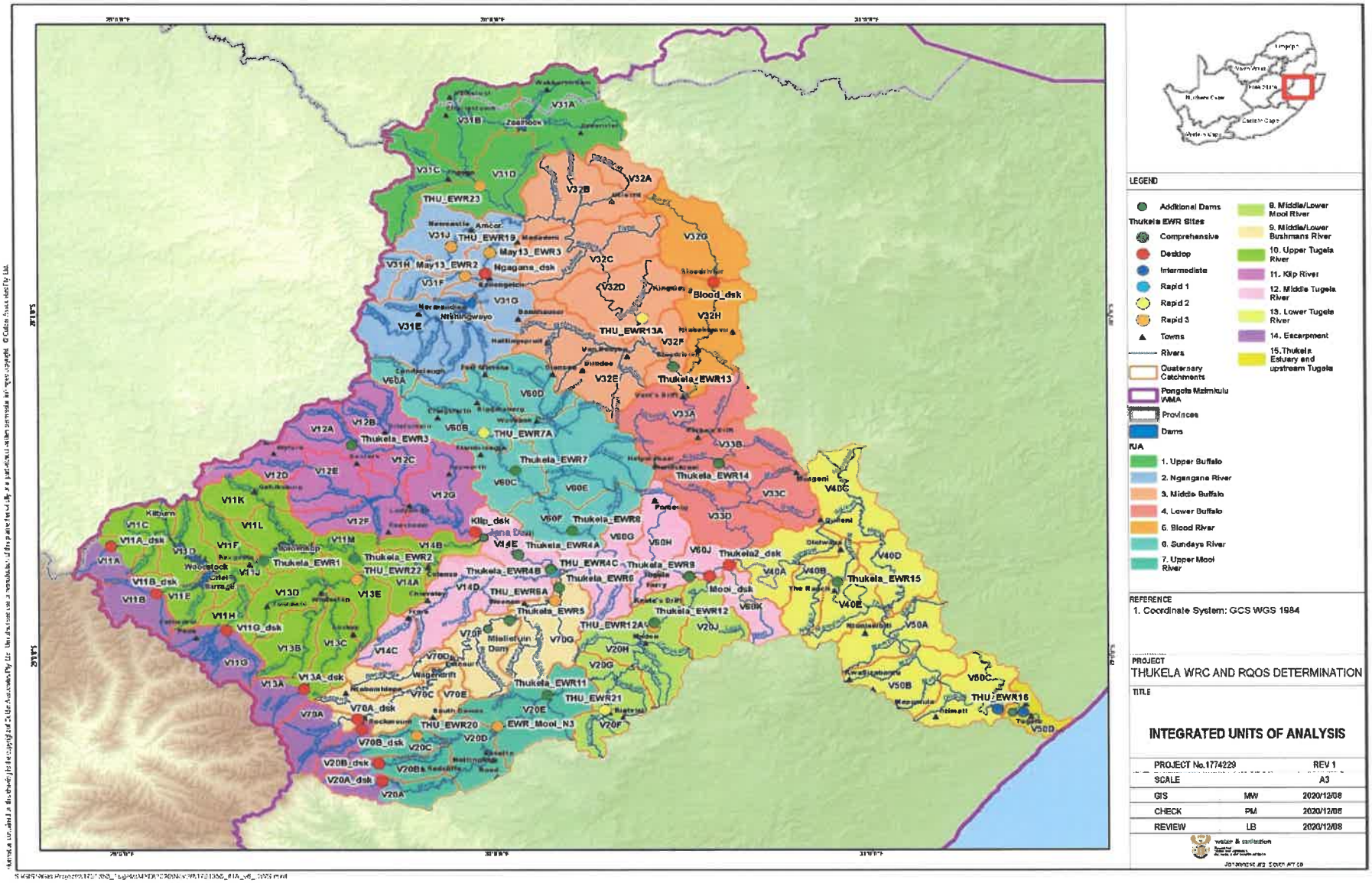


**Figure 2:** Locality map for the Thukela catchment showing IUAs with EWR sites and Quaternary Catchments.