Table A.3-2-93 WATER QUALITY ANALYSIS REPORT

Grid Ref: TP 433218

Source: River bed, Vudzi School

Date Sampled: 12th Jan. 1983

Physical Characteristics

General Appearance: Traces of suspended matter
no sediment

Odour: faint earthy

Colour: brownish tinge

Chemical Examination (Expressed In Parts Per Million)

PH	8.8
Specific Conductivity at 20°C ($\mu s / cm^2$)	301.0
Sodium (Na^+)	39.0
Potassium (K^+)	4.6
Calcium (Ca^{2+})	25.2
Magnesium (Mg^{2+})	10.9
Total hardness (as $CaCO_3$)	26.0
Chloride (Cl^-)	19.8
Sulphate (SO_4^{2-})	2.5
Alkalinity to Methyl Orange (as $CaCO_3$)	159.0
Nitrate Nitrogen	0.05
Fluoride	1.2

T. Suzuki

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Table A.3-2-94 WATER QUALITY ANALYSIS REPORT

Grid Ref: TP 511185

Source: Bore hole, St. Therese Hospital

Date Sampled: 13th Jan. 1983

Physical Characteristics

General Appearance: no suspended matter

no sediment

Odour: odourless

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.4
Specific Conductivity at 20°C (μ^s/ cm^2)	242.0
Sodium (Na^+)	36.5
Potassium (K^+)	1.6
Calcium (Ca^{2+})	18.0
Magnesium (Mg^{2+})	10.9
Total hardness (as $CaCO_3$)	90.0
Chloride (Cl^-)	7.1
Sulphate (SO_4^{2-})	1.9
Alkalinity to Methyl Orange (as $CaCO_3$)	162.0
Nitrate Nitrogen	0.2
Fluoride	1.0

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Table A.3-2-95 WATER QUALITY ANALYSIS REPORT

Grid Ref: TP 551386

Source: River, Nyamatiki river

Date Sampled: 12th Jan. 1983

Physical Characteristics

General Appearance: considerable amount of suspended matter and sediment

Odour: earthy

Colour: brownish green

Chemical Examination (Expressed In Parts Per Million)

PH	7.5
Specific Conductivity at 20°C ($\mu s / cm^2$)	119.0
Sodium (Na^+)	18.0
Potassium (K^+)	2.4
Calcium (Ca^{2+})	6.4
Magnesium (Mg^{2+})	2.4
Total hardness (as $CaCO_3$)	108.0
Chloride (Cl^-)	6.7
Sulphate (SO_4^{2-})	2.7
Alkalinity to Methyl Orange (as $CaCO_3$)	56.2
Nitrate Nitrogen	0.43
Fluoride	< 0.2

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Table A.3-2-96 WATER QUALITY ANALYSIS REPORT

Grid Ref: TP 582402

Source: Bore hole, Chaka (Church School)

Date Sampled: 13th Jan. 1983

Physical Characteristics

General Appearance: no suspended matter

no sediment

Odour: faint earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.6
Specific Conductivity at 20°C (μ^s/ cm^2)	103.0
Sodium (Na^+)	15.2
Potassium (K^+)	0.6
Calcium (Ca^{2+})	7.6
Magnesium (Mg^{2+})	2.2
Total hardness (as $CaCO_3$)	28.0
Chloride (Cl^-)	4.2
Sulphate (SO_4^{2-})	0.6
Alkalinity to Methyl Orange (as $CaCO_3$)	55.2
Nitrate Nitrogen	0.19
Fluoride	1.15

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Table A.3-2-97 WATER QUALITY ANALYSIS REPORT

Grid Ref: TP 044072

Source: Well, Makotore Shool

Date Sampled: 21st January, 1983

Physical Characteristics

General Appearance: little suspended matter
considerable amount of sediment

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	6,7
Specific Conductivity at 20°C ($\mu s / cm^2$)	61,1
Sodium (Na^+)	9,4
Potassium (K^+)	1,9
Calcium (Ca^{2+})	2,0
Magnesium (Mg^{2+})	1,7
Total hardness (as $CaCO_3$)	12,0
Chloride (Cl^-)	6,4
Sulphate (SO_4^{2-})	1,1
Alkalinity to Methyl Orange (as $CaCO_3$)	16,1
Nitrate Nitrogen	2,6
Fluoride	<0,2

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Table A.3-2-98 WATER QUALITY ANALYSIS REPORT

Grid Ref: TP 035235

Source: Well, Hanke B.C.

Date Sampled: 24th January, 1983

Physical Characteristics

General Appearance: trace amount of suspended matter
no sediment

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	6,5
Specific Conductivity at 20°C ($\mu s / cm^2$)	180,0
Sodium (Na^+)	18,8
Potassium (K^+)	2,1
Calcium (Ca^{2+})	11,2
Magnesium (Mg^{2+})	6,8
Total hardness (as $CaCO_3$)	56,0
Chloride (Cl^-)	15,9
Sulphate (SO_4^{2-})	2,7
Alkalinity to Methyl Orange (as $CaCO_3$)	36,1
Nitrate Nitrogen	8,8
Fluoride	0,3

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Table A.3-2-99 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 057949

Source: Dam, Banga School

Date Sampled: 22nd January, 1983

Physical Characteristics

General Appearance: little suspended matter

little sediment

Odour: earthy

Colour: green

Chemical Examination (Expressed In Parts Per Million)

PH	7,2
Specific Conductivity at 20°C ($\mu s / cm^2$)	158,0
Sodium (Na^+)	19,0
Potassium (K^+)	2,7
Calcium (Ca^{2+})	10,0
Magnesium (Mg^{2+})	5,6
Total hardness (as $CaCO_3$)	48,0
Chloride (Cl^-)	8,5
Sulphate (SO_4^{2-})	1,1
Alkalinity to Methyl Orange (as $CaCO_3$)	76,3
Nitrate Nitrogen	0,36
Fluoride	$< 0,2$

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Table A.3-2-100 WATER QUALITY ANALYSIS REPORT

Grid Ref: SN 985776

Source: Borehole, Shiku School

Date Sampled: 17th January, 1983

Physical Characteristics

General Appearance: no suspended matter

no suspended

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7,2
Specific Conductivity at 20°C (μ^s/ cm^2)	629,0
Sodium (Na^+)	74,5
Potassium (K^+)	2,2
Calcium (Ca^{2+})	55,2
Magnesium (Mg^{2+})	27,2
Total hardness (as $CaCO_3$)	250,0
Chloride (Cl^-)	22,7
Sulphate (SO_4^{2-})	3,8
Alkalinity to Methyl Orange (as $CaCO_3$)	375,0
Nitrate Nitrogen	0,04
Fluoride	0.3

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Table A.3-2-101 WATER QUALITY ANALYSIS REPORT

Grid Ref: RH 030668

Source: Well, Hilpo

Date Sampled: 13th January, 1983

Physical Characteristics

General Appearance: little suspended matter
sediment

Odour: earthy

Colour: whitish tinge

Chemical Examination (Expressed In Parts Per Million)

PH	6.8
Specific Conductivity at 20°C ($\mu s / cm^2$)	115.0
Sodium (Na^+)	11.0
Potassium (K^+)	2.4
Calcium (Ca^{2+})	8.4
Magnesium (Mg^{2+})	3.9
Total hardness (as $CaCO_3$)	37.0
Chloride (Cl^-)	11.3
Sulphate (SO_4^{2-})	2.8
Alkalinity to Methyl Orange (as $CaCO_3$)	42.2
Nitrate Nitrogen	0.71
Fluoride	0.5

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Table A.3-2-102 WATER QUALITY ANALYSIS REPORT

Grid Ref: SN 973881

Source: Borehore V 3595, Hanawa School

Date Sampled: 17th January, 1983

Physical Characteristics

General Appearance: no suspended matter

no sediment

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7,1
Specific Conductivity at 20°C (μ^s/ cm^2)	629,0
Sodium (Na^+)	54,0
Potassium (K^+)	5,2
Calcium (Ca^{2+})	35,2
Magnesium (Mg^{2+})	41,3
Total hardness (as $CaCO_3$)	258,0
Chloride (Cl^-)	5,7
Sulphate (SO_4^{2-})	4,1
Alkalinity to Methyl Orange (as $CaCO_3$)	367,0
Nitrate Nitrogen	not detected
Fluoride	0,3

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Table A.3-2-103 WATER QUALITY ANALYSIS REPORT

Grid Ref: PH 049781

Source: Borehole V 2889, Mapanzure chinic

Date Sampled: 18th January, 1983

Physical Characteristics

General Appearance: no suspended matter

no sediment

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	8,3
Specific Conductivity at 20°C ($\mu s / cm^2$)	456,0
Sodium (Na^+)	38,5
Potassium (K^+)	4,1
Calcium (Ca^{2+})	10,0
Magnesium (Mg^{2+})	45,0
Total hardness (as $CaCO_3$)	210,0
Chloride (Cl^-)	13,4
Sulphate (SO_4^{2-})	1,8
Alkalinity to Methyl Orange (as $CaCO_3$)	271,0
Nitrate Nitrogen	1,5
Fluoride	0,2

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Table A.3-2-104 WATER QUALITY ANALYSIS REPORT

Grid Ref: SN 886591

Source: Borehole V 3345, Lunde clinic

Date Sampled:

Physical Characteristics

General Appearance: no suspended matter
no sediment

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7,7
Specific Conductivity at 20°C (μ^S/ cm^2)	424,0
Sodium (Na^+)	32,0
Potassium (K^+)	1,7
Calcium (Ca^{2+})	21,6
Magnesium (Mg^{2+})	39,9
Total hardness (as $CaCO_3$)	218,0
Chloride (Cl^-)	14,9
Sulphate (SO_4^{2-})	3,1
Alkalinity to Methyl Orange (as $CaCO_3$)	249,0
Nitrate Nitrogen	4,2
Fluoride	0,6

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Table A.3-2-105 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 170345

Source: Dam, Matanbi Clinic

Date Sampled: 19th january, 1983

Physical Characteristics

General Appearance: considerable amount of suspended matter

little sediment

Odour: earthy

Colour: slight brownish tinge

Chemical Examination (Expressed In Parts Per Million)

PH	8,0
Specific Conductivity at 20°C (μ^s/ cm^2)	444,0
Sodium (Na^+)	63,0
Potassium (K^+)	11,1
Calcium (Ca^{2+})	22,0
Magnesium (Mg^{2+})	13,4
Total hardness (as $CaCO_3$)	110,0
Chloride (Cl^-)	55,2
Sulphate (SO_4^{2-})	2,9
Alkalinity to Methyl Orange (as $CaCO_3$)	177,0
Nitrate Nitrogen	0,51
Fluoride	3,3

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Table A.3-2-106 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 273287

Source: Well, Murowa School

Date Sampled: 20th January, 1983

Physical Characteristics

General Appearance: considerable amount of suspend matter

considerable amount of sediment

Odour: earthy

Colour: whitish tinge

Chemical Examination (Expressed In Parts Per Million)

PH	6,1
Specific Conductivity at 20°C ($\mu s / cm^2$)	86,8
Sodium (Na^+)	9,8
Potassium (K^+)	6,3
Calcium (Ca^{2+})	1,6
Magnesium (Mg^{2+})	2,4
Total hardness (as $CaCO_3$)	14,0
Chloride (Cl^-)	14,2
Sulphate (SO_4^{2-})	1,3
Alkalinity to Methyl Orange (as $CaCO_3$)	15,1
Nitrate Nitrogen	1,18
Fluoride	0,6

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Table A.3-2-107 WATER QUALITY ANALYSIS REPORT

Grid Ref: QG 856 818

Source: Shallow well, Bvumbura School

Date Sampled: 15th Feb. 1983

Physical Characteristics

General Appearance: no suspension

no sediment

Odour: faint earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.0
Specific Conductivity at 20°C ($\mu s / cm^2$)	588.0
Sodium (Na^+)	34.5
Potassium (K^+)	1.1
Calcium (Ca^{2+})	49.6
Magnesium (Mg^{2+})	40.3
Total hardness (as $CaCO_3$)	290.0
Chloride (Cl^-)	28.3
Sulphate (SO_4^{2-})	3.7
Alkalinity to Methyl Orange (as $CaCO_3$)	296.0
Nitrate Nitrogen	7.4
Fluoride	0.6

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Table A.3-2-108 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 114010

Source: Shallow well, Toms store

Date Sampled: 14th Feb. 1983

Physical Characteristics

General Appearance: no suspension
no sediment

Odour: faint earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.1
Specific Conductivity at 20°C ($\mu s / cm^2$)	801.0
Sodium (Na^+)	43.5
Potassium (K^+)	2.8
Calcium (Ca^{2+})	51.6
Magnesium (Mg^{2+})	74.4
Total hardness (as $CaCO_3$)	435.0
Chloride (Cl^-)	24.1
Sulphate (SO_4^{2-})	39.2
Alkalinity to Methyl Orange (as $CaCO_3$)	422.0
Nitrate Nitrogen	7.0
Fluoride	0.7

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Table A.3-2-109 WATER QUALITY ANALYSIS REPORT

Grid Ref: QH 918113

Source: Bore hole: V3622, Bvute School

Date Sampled: 15th Feb. 1983

Physical Characteristics

General Appearance: no suspended matter

no sediment

Odour: earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.0
Specific Conductivity at 20°C ($\mu s / cm^2$)	958.0
Sodium (Na^+)	122.0
Potassium (K^+)	9.6
Calcium (Ca^{2+})	50.8
Magnesium (Mg^{2+})	46.9
Total hardness (as $CaCO_3$)	320.0
Chloride (Cl^-)	52.4
Sulphate (SO_4^{2-})	13.2
Alkalinity to Methyl Orange (as $CaCO_3$)	472.0
Nitrate Nitrogen	11.6
Fluoride	0.9

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Table A.3-2-110 WATER QUALITY ANALYSIS REPORT

Grid Ref: QH 945114

Source: Bore hole; V680, Near Bvute Dam

Date Sampled: 15th Feb. 1983

Physical Characteristics

General Appearance: no suspended matter

no sediment

Odour: earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	8.3
Specific Conductivity at 20°C ($\mu s / cm^2$)	860.0
Sodium (Na^+)	85.0
Potassium (K^+)	6.2
Calcium (Ca^{2+})	55.2
Magnesium (Mg^{2+})	56.4
Total nardness (as $CaCO_3$)	370.0
Chloride (Cl^-)	25.5
Sulphate (SO_4^{2-})	19.4
Alkalinity to Methyl Orange (as $CaCO_3$)	502.0
Nitrate Nitrogen	2.1
Fluoride	0.7

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Table A.3-2-111 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 286 169

Source: Bore hole : V2911, Buchwa Mine

Date Sampled: 16th Feb. 1983

Physical Characteristics

General Appearance: no suspended matter

no sediment

Odour: earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.0
Specific Conductivity at 20°C ($\mu s / cm^2$)	734.0
Sodium (Na^+)	30.0
Potassium (K^+)	1.4
Calcium (Ca^{2+})	46.8
Magnesium (Mg^{2+})	76.1
Total hardness (as $CaCO_3$)	430.0
Chloride (Cl^-)	41.1
Sulphate (SO_4^{2-})	7.0
Alkalinity to Methyl Orange (as $CaCO_3$)	392.0
Nitrate Nitrogen	4.3
Fluoride	0.2

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Table A.3-2-112 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 270242

Source: Bore hole; J 177, Near Mahombe School

Date Sampled: 16th Feb. 1983

Physical Characteristics

General Appearance: no suspended matter

no sediment

Odour: earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.0
Specific Conductivity at 20°C ($\mu s / cm^2$)	967.0
Sodium (Na^+)	44.0
Potassium (K^+)	2.7
Calcium (Ca^{2+})	48.0
Magnesium (Mg^{2+})	86.3
Total hardness (as $CaCO_3$)	475.0
Chloride (Cl^-)	26.9
Sulphate (SO_4^{2-})	6.3
Alkalinity to Methyl Orange (as $CaCO_3$)	512.0
Nitrate Nitrogen	3.64
Fluoride	0.6

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Table A.3-2-113 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 083175

Source: Shallow well, Mbirashava School

Date Sampled: 19th Feb. 1983

Physical Characteristics

General Appearance: no suspension
little amount of sediment

Odour: earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	6.0
Specific Conductivity at 20°C ($\mu s / cm^2$)	91.8
Sodium (Na^+)	10.4
Potassium (K^+)	0.9
Calcium (Ca^{2+})	2.8
Magnesium (Mg^{2+})	1.2
Total hardness (as $CaCO_3$)	12.0
Chloride (Cl^-)	6.4
Sulphate (SO_4^{2-})	1.2
Alkalinity to Methyl Orange (as $CaCO_3$)	22.1
Nitrate Nitrogen	2.45
Fluoride	< 0.2

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Table A.3-2-114 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 227109

Source: Bore hole: V 3473, Masvingo School

Date Sampled: 16th Feb. 1983

Physical Characteristics

General Appearance: no suspended matter

no sediment

Odour: faint earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	6.7
Specific Conductivity at 20°C ($\mu s / cm^2$)	378.0
Sodium (Na^+)	23.0
Potassium (K^+)	4.8
Calcium (Ca^{2+})	29.2
Magnesium (Mg^{2+})	24.8
Total hardness (as $CaCO_3$)	175.0
Chloride (Cl^-)	11.3
Sulphate (SO_4^{2-})	1.8
Alkalinity to Methyl Orange (as $CaCO_3$)	205.0
Nitrate Nitrogen	not detected
Fluoride	0.5

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Table A.3-2-115 WATER QUALITY ANALYSIS REPORT

Grid Ref: TM 167967

Source: Bore hole: V 551, Matedzi School

Date Sampled: 16th Feb. 1983

Physical Characteristics

General Appearance: no suspended matter

no sediment

Odour: earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	6.7
Specific Conductivity at 20°C ($\mu s / cm^2$)	1204.0
Sodium (Na^+)	156.0
Potassium (K^+)	2.0
Calcium (Ca^{2+})	74.0
Magnesium (Mg^{2+})	42.5
Total hardness (as $CaCO_3$)	360.0
Chloride (Cl^-)	209.0
Sulphate (SO_4^{2-})	9.7
Alkalinity to Methyl Orange (as $CaCO_3$)	382.0
Nitrate Nitrogen	14.4
Fluoride	2.8

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Table A.3-2-116 WATER QUALITY ANALYSIS REPORT

Grid Ref: TM 269973

Source: Bore hole: 1100, Near Ngungubane School

Date Sampled: 14th Feb. 1983

Physical Characteristics

General Appearance: little suspended matter

no sediment

Odour: earthy

Colour: brownish tinge

Chemical Examination (Expressed In Parts Per Million)

PH	7.2
Specific Conductivity at 20°C ($\mu S / cm^2$)	6927.0
Sodium (Na^+)	1120.0
Potassium (K^+)	5.6
Calcium (Ca^{2+})	150.0
Magnesium (Mg^{2+})	290.0
Total nardness (as $CaCO_3$)	1570.0
Chloride (Cl^-)	2480.0
Sulphate (SO_4^{2-})	29.4
Alkalinity to Methyl Orange (as $CaCO_3$)	708.0
Nitrate Nitrogen	18.8
Fluoride	2.0

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Table A.3-2-117 WATER QUALITY ANALYSIS REPORT

Grid Ref: TM 072 807

Source: Bore hole: 853, Near Rhonda

Date Sampled: 22nd Feb. 1983

Physical Characteristics

General Appearance: no suspended matter

no sediment

Odour: earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	6.9
Specific Conductivity at 20°C ($\mu s / cm^2$)	600.0
Sodium (Na^+)	75.0
Potassium (K^+)	2.0
Calcium (Ca^{2+})	27.6
Magnesium (Mg^{2+})	29.9
Total hardness (as $CaCO_3$)	192.0
Chloride (Cl^-)	63.7
Sulphate (SO_4^{2-})	4.3
Alkalinity to Methyl Orange (as $CaCO_3$)	216.0
Nitrate Nitrogen	16.0
Fluoride	1.4

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Table A.3-2-118 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 065713

Source: Borehole JP 5424, Chigwikwi School

Date Sampled: 4th February, 1983

Physical Characteristics

General Appearance: no suspension
no sediment

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7,3
Specific Conductivity at 20°C (μ^s/ cm^2)	1090,0
Sodium (Na^+)	110,0
Potassium (K^+)	1,9
Calcium (Ca^{2+})	74,4
Magnesium (Mg^{2+})	68,5
Total hardness (as $CaCO_3$)	468,0
Chloride (Cl^-)	88,5
Sulphate (SO_4^{2-})	7,2
Alkalinity to Methyl Orange (as $CaCO_3$)	552,0
Nitrate Nitrogen	7,5
Fluoride	0,8

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Table A.3-2-119 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 249576

Source: Borehole, Belln School

Date Sampled: 26th January, 1983

Physical Characteristics

General Appearance: no suspension

no sediment

Odour: faint earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	6,5
Specific Conductivity at 20°C ($\mu s / cm^2$)	2040,0
Sodium (Na^+)	265,0
Potassium (K^+)	12,1
Calcium (Ca^{2+})	88,0
Magnesium (Mg^{2+})	62,0
Total hardness (as $CaCO_3$)	220,0
Chloride (Cl^-)	202,0
Sulphate (SO_4^{2-})	56,0
Alkalinity to Methyl Orange (as $CaCO_3$)	663,0
Nitrate Nitrogen	32,5
Fluoride	1,2

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Table A.3-2-120 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 231447

Source: Borehole JP 5420, Chiware

Date Sampled: 29th January, 1983

Physical Characteristics

General Appearance: no suspension
no sediment

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	6.5
Specific Conductivity at 20°C ($\mu s / cm^2$)	2960.0
Sodium (Na^+)	246.0
Potassium (K^+)	4.9
Calcium (Ca^{2+})	230.0
Magnesium (Mg^{2+})	140.0
Total hardness (as $CaCO_3$)	1150.0
Chloride (Cl^-)	867.0
Sulphate (SO_4^{2-})	18.2
Alkalinity to Methyl Orange (as $CaCO_3$)	482.0
Nitrate Nitrogen	5.0
Fluoride	1.0

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Table A.3-2-121 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 136656

Source: Borehole, Madzivadondo B.C.

Date Sampled: 26th January, 1983

Physical Characteristics

General Appearance: no suspension
no sediment

Odour: faint earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7,6
Specific Conductivity at 20°C ($\mu S / cm^2$)	455,0
Sodium (Na^+)	85,0
Potassium (K^+)	1,1
Calcium (Ca^{2+})	17,6
Magnesium (Mg^{2+})	15,1
Total hardness (as $CaCO_3$)	106,0
Chloride (Cl^-)	11,3
Sulphate (SO_4^{2-})	4,3
Alkalinity to Methyl Orange (as $CaCO_3$)	289,0
Nitrate Nitrogen	0,01
Fluoride	1,2

T. Suzuki

Certified Measurer of Environment
Laboratory of Chemical Analysis in Tokyo

Table A.3-2-122 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 166841

Source: Borehole, Mukatoshi School

Date Sampled: 8th February, 1983

Physical Characteristics

General Appearance: no suspension

no sediment

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.0
Specific Conductivity at 20°C ($\mu s / cm^2$)	1175.0
Sodium (Na^+)	273.0
Potassium (K^+)	1.7
Calcium (Ca^{2+})	43.2
Magnesium (Mg^{2+})	17.0
Total hardness (as $CaCO_3$)	178.0
Chloride (Cl^-)	149.0
Sulphate (SO_4^{2-})	5.8
Alkalinity to Methyl Orange (as $CaCO_3$)	552.0
Nitrate Nitrogen	0.75
Fluoride	1.0

T. Suzuki

Certified Measurer of Environment
Laboratory of Chemical Analysis in Tokyo

Table A.3-2-123 WATER QUALITY ANALYSIS REPORT

Grid Ref: TM 709986

Source: Borehole, Ngundu B.C.

Date Sampled: 2nd February, 1983

Physical Characteristics

General Appearance: no suspension

no sediment

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.2
Specific Conductivity at 20°C (μ^S/ cm^2)	1045.0
Sodium (Na^+)	76.0
Potassium (K^+)	1.5
Calcium (Ca^{2+})	58.4
Magnesium (Mg^{2+})	56.9
Total hardness (as $CaCO_3$)	450.0
Chloride (Cl^-)	117.0
Sulphate (SO_4^{2-})	12.8
Alkalinity to Methyl Orange (as $CaCO_3$)	345.0
Nitrate Nitrogen	7.4
Fluoride	0.7

T. Suzuki

Certified Measurer of Environment
Laboratory of Chemical Analysis in Tokyo

Table A.3-2-124 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 300592

Source: Borehole, Near Chigapa School

Date Sampled: 3rd February, 1983

Physical Characteristics

General Appearance: no suspension
no sediment

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	6.7
Specific Conductivity at 20°C ($\mu s / cm^2$)	2936.0
Sodium (Na^+)	230.0
Potassium (K^+)	4.1
Calcium (Ca^{2+})	302.0
Magnesium (Mg^{2+})	106.0
Total hardness (as $CaCO_3$)	1190.0
Chloride (Cl^-)	849.0
Sulphate (SO_4^{2-})	10.9
Alkalinity to Methyl Orange (as $CaCO_3$)	552.0
Nitrate Nitrogen	0.05
Fluoride	3.0

T. Suzuki

Certified Measurer of Environment
Laboratory of Chemical Analysis in Tokyo

Table A.3-2-125 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 277751

Source: Bore hole : V2339, Up stream of Denga Dam

Date Sampled: 5th Feb. 1983

Physical Characteristics

General Appearance: no suspension
no sediment

Odour: earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.3
Specific Conductivity at 20°C ($\mu s / cm^2$)	739.0
Sodium (Na^+)	69.3
Potassium (K^+)	1.8
Calcium (Ca^{2+})	75.2
Magnesium (Mg^{2+})	34.5
Total hardness (as $CaCO_3$)	330.0
Chloride (Cl^-)	21.9
Sulphate (SO_4^{2-})	9.3
Alkalinity to Methyl Orange (as $CaCO_3$)	422.0
Nitrate Nitrogen	3.0
Fluoride	0.9

T. Suzuki

Certified Measurer of Environment
Laboratory of Chemical Analysis in Tokyo

Table A.3-2-126 WATER QUALITY ANALYSIS REPORT

Grid Ref: TN 694073

Source: Bore hole, Makungubwe

Date Sampled: 14th Feb. 1983

Physical Characteristics

General Appearance: no suspension

no sediment

Odour: earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.2
Specific Conductivity at 20°C ($\mu s / cm^2$)	1645.0
Sodium (Na^+)	295.0
Potassium (K^+)	4.3
Calcium (Ca^{2+})	51.2
Magnesium (Mg^{2+})	78.2
Total hardness (as $CaCO_3$)	450.0
Chloride (Cl^-)	248.0
Sulphate (SO_4^{2-})	8.9
Alkalinity to Methyl Orange (as $CaCO_3$)	658.0
Nitrate Nitrogen	8.8
Fluoride	0.8

T. Suzuki

Certified Measurer of Environment
Laboratory of Chemical Analysis in Tokyo

Table A.3-2-127 WATER QUALITY ANALYSIS REPORT

Grid Ref: TM 449835

Source: Borehole, Near Matedzi Dip

Date Sampled: 10th February, 1983

Physical Characteristics

General Appearance: no suspension
no sediment

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	6.6
Specific Conductivity at 20°C ($\mu s / cm^2$)	524.0
Sodium (Na^+)	35.5
Potassium (K^+)	1.5
Calcium (Ca^{2+})	35.2
Magnesium (Mg^{2+})	36.0
Total hardness (as $CaCO_3$)	236.0
Chloride (Cl^-)	26.9
Sulphate (SO_4^{2-})	5.8
Alkalinity to Methyl Orange (as $CaCO_3$)	236.0
Nitrate Nitrogen	9.6
Fluoride	1.3

T. Suzuki

Certified Measurer of Environment
Laboratory of Chemical Analysis in Tokyo

Table A.3-2-128 WATER QUALITY ANALYSIS REPORT

Grid Ref: TM 492678

Source: Borehole V 937, Mushava Clinic

Date Sampled: 10th February, 1983

Physical Characteristics

General Appearance: no suspension
no sediment

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7,9
Specific Conductivity at 20°C ($\mu s / cm^2$)	2671,0
Sodium (Na^+)	410,0
Potassium (K^+)	1,6
Calcium (Ca^{2+})	68,0
Magnesium (Mg^{2+})	82,6
Total hardness (as $CaCO_3$)	510,0
Chloride (Cl^-)	504,0
Sulphate (SO_4^{2-})	23,5
Alkalinity to Methyl Orange (as $CaCO_3$)	703,0
Nitrate Nitrogen	3,0
Fluoride	2,4

T. Suzuki

Certified Measurer of Environment
Laboratory of Chemical Analysis in Tokyo

Table A.3-2-129 WATER QUALITY ANALYSIS REPORT

Grid Ref: TM 625832

Source: Borehole, Chipukuswi

Date Sampled: 16th February, 1983

Physical Characteristics

General Appearance: no suspension

no sediment

Odour: earthy

Colour: clear, colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.3
Specific Conductivity at 20°C ($\mu s / cm^2$)	990.0
Sodium (Na^+)	108.0
Potassium (K^+)	1.5
Calcium (Ca^{2+})	88.8
Magnesium (Mg^{2+})	22.6
Total hardness (as $CaCO_3$)	315.0
Chloride (Cl^-)	86.7
Sulphate (SO_4^{2-})	12.0
Alkalinity to Methyl Orange (as $CaCO_3$)	402.0
Nitrate Nitrogen	0.04
Fluoride	0.7

T. Suzuki

Certified Measurer of Environment
Laboratory of Chemical Analysis in Tokyo

Table A.3-2-130 WATER QUALITY ANALYSIS REPORT

Grid Ref: TM 296605

Source: Bore hole : 5466, Dengenya School

Date Sampled: 12th Feb. 1983

Physical Characteristics

General Appearance: no suspension
no sediment

Odour: earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	6.8
Specific Conductivity at 20°C (μ^s/ cm^2)	1007.0
Sodium (Na^+)	92.0
Potassium (K^+)	0.8
Calcium (Ca^{2+})	38.0
Magnesium (Mg^{2+})	69.3
Total hardness (as $CaCO_3$)	380
Chloride (Cl^-)	70.8
Sulphate (SO_4^{2-})	21.3
Alkalinity to Methyl Orange (as $CaCO_3$)	467.0
Nitrate Nitrogen	0.2
Fluoride	1.8

T. Suzuki

Certified Measurer of Environment
Laboratory of Chemical Analysis in Tokyo

Table A.3-2-131 WATER QUALITY ANALYSIS REPORT

Grid Ref: TM 187647

Source: Bore hole : 5428, Near Furidzi School

Date Sampled: 16th Feb. 1983

Physical Characteristics

General Appearance: no suspension

no sediment

Odour: earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.2
Specific Conductivity at 20°C ($\mu s / cm^2$)	2587.0
Sodium (Na^+)	455.0
Potassium (K^+)	3.0
Calcium (Ca^{2+})	98.0
Magnesium (Mg^{2+})	96.0
Total hardness (as $CaCO_3$)	640.0
Chloride (Cl^-)	743.0
Sulphate (SO_4^{2-})	12.8
Alkalinity to Methyl Orange (as $CaCO_3$)	602.0
Nitrate Nitrogen	24.0
Fluoride	2.0

T. Suzuki

Certified Measurer of Environment
Laboratory of Chemical Analysis in Tokyo

Table A.3-2-132 WATER QUALITY ANALYSIS REPORT

Grid Ref: TM 066627

Source: Bore hole : V3562, Cherindi B.C.

Date Sampled: 16th Feb. 1983

Physical Characteristics

General Appearance: no suspension
no sediment

Odour: earthy

Colour: colourless

Chemical Examination (Expressed In Parts Per Million)

PH	7.0
Specific Conductivity at 20°C ($\mu s / cm^2$)	7349.0
Sodium (Na^+)	940.0
Potassium (K^+)	5.3
Calcium (Ca^{2+})	400.0
Magnesium (Mg^{2+})	559.0
Total hardness (as $CaCO_3$)	3300.0
Chloride (Cl^-)	3540.0
Sulphate (SO_4^{2-})	42.3
Alkalinity to Methyl Orange (as $CaCO_3$)	612.0
Nitrate Nitrogen	not detected
Fluoride	7.6

T. Suzuki

Certified Measurer of Environment
Laboratory of Chemical Analysis in Tokyo

VF/954

PLEASE QUOTE: V/AM/1/A/106/190

DIVISION OF WATER DEVELOPMENT
P.O. BOX 250
FORT VICTORIA

Table A.3-2-153 (1)

DATE: 4th February, 1983

Government Analyst Laboratory
Mazoe Street/North Avenue
P.O. Box 8042
CAUSEWAY

BOREHOLE WATER ANALYSIS : NYAMATIKI RIVER

Please carry out a chemical analysis of the water submitted herewith:

Details are:

1.		For Provincial Water Engineer, P.O. Box 250, Fort Victoria		
2.	(a)	Analysis of a new borehole supply to determine its suitability for human consumption.		
	(b)	Borehole reference	:	No. 1
	(c)	Map reference	:	TP 551 386
3.		Sample taken from the test pump		
4.		Source	:	~~borehole~~ River Bed
5.		Untreated	:	
6.	(a)	Depth	:	
	(b)	Uncovered	:	
	(c)	Just completed	:	
	(d)		:	Testing for Japanese Study Team.
	(e)	No apparent sources of pollution	:	
	(f)	No visible signs of pollution	:	
	(g)		:	
7.		Sample taken on	:	12.1.83
		Despatched	:	

Please submit a duplicate report to Chief Hydrological Engineer, P.O. Box 8132, Causeway.

D.S. DURHAM
for: PROVINCIAL WATER ENGINEER
DSD/ypw

Table A.3-2-133 (2)

Government Analyst's Laboratory
P O Box 8042
Causeway
~~Salisbury~~ Harare
28 February 1983

WATER ANALYSIS REPORT

Mr M G Lotter
Provincial Water Engineer
P O Box 250
Masvingo

Borehole Water: NYAMITIKI

Lab. No. 77/83 — Your Reference: V/AM/I IA/106/190

Sample(s) received: 7-2-83 — Sample(s) taken: 12-1-83

Particulars:

Test for potability.

Results of Analysis (parts per million) - See table(s) attached.

Remarks:-

The water is soft. Soft waters are poor is mineral nutrient and have, in some cases, been associated with cardiovascular diseases. The water is potentially corrosive to piping systems.

Yours faithfully

P T MUCHENJE (Miss)
for: GOVERNMENT ANALYST

PTM/ECS

Table A.3-2-133 (3)

parts per million

Odour		earthy
Colour		brownish green
General Appearance		considerable amount
Suspended matter		considerable amount
Sediment		
pH		7.3
Specific Conductivity at 20°C. ($\times 10^{4}$).		1.3×10^{-4}
Approx. Dissolved Salines determined from above		73
Alyalinity to Methyl Orange (as $CaCO_3$).		51
Total hardness (as $CaCO_3$)		30
Lime hardness ($CaCO_3$)		15
Chloride radicle (Cl).		7
Sulphate radicle (SO_4).		5
Nitrate Nitrogen.		0.32
Nitrite Nitrogen		
Ammoniacal Nitrogen		
Albuminoid Nitrogen		
Oxygen absorbed from $KMnO_4$ (4 hours at 27°C.).		
Calcium (Ca)		6
Magnesium (Mg)		4
Total Iron (Fe)		1.3
Zinc (Zn)		
Arsenic	less than	0.05
Fluoride		0.9
Hypothetical Salines		
Calcium Carbonate		15
Magnesium Carbonate		13
Sodium Carbonate		22
Sodium Chloride		12
Sodium Sulphate		7
Sodium Nitrate		2
		71

VF/954

V/AM/1/A/106/191
PLEASE QUOTE:

DIVISION OF WATER DEVELOPMENT
P.O. BOX 250
FORT VICTORIA
4th February, 1983
DATE:.....

Table A.3-2-134 (1)

Government Analyst Laboratory
Mazoe Street/North Avenue
P.O. Box 8042
CAUSEWAY

BOREHOLE WATER ANALYSIS : VUDZI B.C.

Please carry out a chemical analysis of the water submitted herewith:

Details are:

1.		For Provincial Water Engineer, P.O. Box 250, Fort Victoria		
2.	(a)	Analysis of a new borehole supply to determine its suitability for human consumption.		
	(b)	Borehole reference	:	No. 2
	(c)	Map reference	:	TP 433 218
3.		Sample taken from the test pump		
4.		Source	:	Borehole River Bed
5.		Untreated	:	
6.	(a)	Depth	:	
	(b)	Uncovered	:	
	(c)	Just completed	:	
	(d)		:	Testing for Japanese Study Team.
	(e)	No apparent sources of pollution	:	
	(f)	No visible signs of pollution	:	
	(g)		:	
7.		Sample taken on	:	12.1.83
		Despatched	:	

Please submit a duplicate report to Chief Hydrological Engineer, P.O. Box 8132, Causeway.

D.S. DURHAM
for: PROVINCIAL WATER ENGINEER
DSD/ypw

Table A.3-2-134 (2)

Mr M G Lotter
Provincial Water Engineer
P O Box 250
Masvingo

Government Analyst Laboratory
P O Box 8042
CAUSEWAY
Harare
4 March 1983

WATER ANALYSIS REPORT

VUDZI B.C.

Lab. No. 91/83

Your Reference: V/AM/L/A/106/191

Sample (s) received 7-2-83

Sample (s) taken: 12-1-83

Test for potability

Results of Analysis (parts per million) - See table(s) attached.

Remarks:-

The iron content exceeds the maximum permissible value of 1 mg/l. High levels of iron give the water an objectionable taste and has staining effects on plumbing fixtures and spots washed items. This makes such water unsuitable for domestic purposes.

Yours faithfully

P T MUCHENJE (Miss)
for: GOVERNMENT ANALYST

PTM/ECS

MINISTRY OF WATER DEVELOPMENT
Phone 2951
11 MAR 1983
P.O. Box 260
FORT VICTORIA

Table A.3-2-134 (3)

parts per million.

Odour	faint earthy
Colour	brownish
General Appearance	traces of suspended matter no sediment
pH	6.9
Specific Conductivity at 20°C. (x 10^4).	3.6×10^{-4}
Approx. Dissolved Salines deduced from above.	211
Alyalinity to Methyl Orange (as $CaCO_3$).	151
Total hardness (as $CaCO_3$)	144
Lime hardness ($CaCO_3$)	77
Chloride radicle (Cl').	20
Sulphate radicle (SO_4'').	20
Nitrate Nitrogen.	1.26
Nitrite Nitrogen.	
Ammoniacal Nitrogen.	
Albuminoid Nitrogen.	
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.).	
Calcium Ca	30.8
Magnesium (Mg)	16
Total iron (Fe)	3
Arsenic ..... less than	0.05
Fluoride	0.9
Hypothetical Salines	
Calcium Carbonate	77
Magnesium Carbonate	57
Sodium Carbonate	7
Sodium Chloride	33
Sodium Sulphate	30
Sodium Nitrate	8
	212

VF/954

PLEASE QUOTE: V/H/M/1/A/106/193

DIVISION OF WATER DEVELOPMENT
P.O. BOX 250
FORT VICTORIA

Table A.3-2-135 (1)

DATE: 4th February 1983

Government Analyst Laboratory
Mazoe Street/North Avenue
P.O. Box 8942
CAUSEWAY

BOREHOLE WATER ANALYSIS : CHAKA CHARCH

Please carry out a chemical analysis of the water submitted herewith:

Details are:

1.		For Provincial Water Engineer, P.O. Box 250, Fort Victoria		
2.	(a)	Analysis of a new borehole supply to determine its suitability for human consumption.		
	(b)	Borehole reference	:	No. 4
	(c)	Map reference	:	TP 562 402
3.		Sample taken from the test pump		
4.		Source	:	Borehole
5.		Untreated	:	
6.	(a)	Depth	:	
	(b)	Uncovered	:	
	(c)	Just completed	:	
	(d)		:	Testing for Japanese Study Team
	(e)	No apparent sources of pollution	:	
	(f)	No visible signs of pollution	:	
	(g)		:	
7.		Sample taken on	:	13.1.83
		Despatched	:	

Please submit a duplicate report to Chief Hydrological Engineer, P.O. Box 8132, Causeway.

for

D.S. DURHAM
for: PROVINCIAL WATER ENGINEER
DSD/ypw

Table A.3-2-135 (2)

Government Analyst's Laboratory
P O Box 8042
Causeway
~~Salisbury~~ Harare
7 March 1983

WATER ANALYSIS REPORT

Mr M G Lotter
Provincial Water Engineer
P O Box 250
Masvingo

CHAKA CHURCH

Lab. No. 78/83 Your Reference: V/A/M/1/A/106/193

Sample(s) received: 7-2-83 Sample(s) taken: 13-1-83

Particulars:

Test for potability

TN 592 L52

Results of Analysis (parts per million) - See table(s) attached.

Remarks:-

The water is extremely soft and therefore potentially corrosive to piping systems. Soft waters are poor in mineral nutrients and have, in some cases, been associated with cardiovascular diseases.

Yours faithfully

P T MUCHENJE (miss)
for: GOVERNMENT ANALYST

PTM/ECS

Table A.3-2-135 (3)

parts per million.

Odour	faint earthy
Colour	brownish tinge
General Appearance	no suspended matter little sediment
pH	7.8
Specific Conductivity at 20°C. (x 10^4).	1.1×10^{-4}
Approx. Dissolved Salines deduced from above.	62
Alyalinity to Methyl Orange (as $CaCO_3$).	43
Total hardness (as $CaCO_3$)	28
Lime hardness ($caCO_3$)	17
Chloride radicle (Cl').	6
Sulphate radicle (SO_4'').	5
Nitrate Nitrogen.	0.25
Nitrite Nitrogen.	
Ammoniacal Nitrogen.	
Albuminoid Nitrogen.	
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.).	
Calcium (Ca)	7
Magnesium (Mg)	3
Total iron (Fe)	0.9
Arsenic ..... less than	0.05
Fluoride	0.3

Hypothetical Salines

Calcium Carbonate	17
Magnesium Carbonate	9
Sodium Carbonate	16
Sodium Chloride	8
Sodium Sulphate	7
Sodium Nitrate	2
	59

VF/954

PLEASE QUOTE: V/AM/1/A/106/194

DIVISION OF WATER DEVELOPMENT
P.O. BOX 250
FORT VICTORIA

Table A.3-2-136 (1)

DATE: 4th February, 1983

Government Analyst Laboratory
Mazoe Street/North Avenue
P.O. Box 8042
CAUSEWAY

BOREHOLE WATER ANALYSIS : PUMP C.A.

Please carry out a chemical analysis of the water submitted herewith:

Details are:

1.		For Provincial Water Engineer, P.O. Box 250, Fort Victoria		
2.	(a)	Analysis of a new borehole supply to determine its suitability for human consumption.		
	(b)	Borehole reference	:	No. 5
	(c)	Map reference	:	SN 886 591
3.		Sample taken from the test pump		
4.		Source	:	Borehole
5.		Untreated	:	
6.	(a)	Depth	:	
	(b)	Uncovered	:	
	(c)	Just completed	:	
	(d)		:	Testing for Japanese Study Team.
	(e)	No apparent sources of pollution	:	
	(f)	No visible signs of pollution	:	
	(g)		:	
7.		Sample taken on	:	14.1.83
		Despatched	:	

Please submit a duplicate report to Chief Hydrological Engineer, P.O. Box 8132, Causeway.

for

D.S. DURHAM
for: PROVINCIAL WATER ENGINEER
DSD/ypw

Table A.3-2-136 (2)

Mr G Lotter
Provincial Water Engineer
P O Box 250
Masvingo

Government Analyst Laboratory
P O Box 8042
CAUSEWAY
Harare

4 March 1983

WATER ANALYSIS REPORT

RUNDE C.A.

Lab. No. 83/83 Your Reference: V/AM/1/A/106/194

Sample (s) received 7-2-83 Sample (s) taken: 14-1-83

Test for potability

Results of Analysis (parts per million) - See table(s) attached.

Remarks:-

The water is chemically suitable for drinking.

Yours faithfully

P T MUCHENJE (Miss)
for: GOVERNMENT ANALYST

PTM/BOS

MINISTRY OF WATER DEVELOPMENT
Phone 2951
11 MAR 1983
P.O. Box 35
FORT VICTORIA

Table A.3-2-136 (3)

parts per million.

Odour	brown/greenish tinge
Colour	
General Appearance	no suspended matter no sediment
pH	7.7
Specific Conductivity at 20°C. (x 10^4).	4.9×10^{-4}
Approx. Dissolved Salines deduced from above.	290
Alyalinity to Methyl Orange (as $CaCO_3$).	245
Total hardness (as $CaCO_3$)	224
Lime hardness (as $CaCO_3$)	64
Chloride radicle (Cl').	15
Sulphate radicle (SO_4'').	20
Nitrate Nitrogen.	0.96
Nitrite Nitrogen.	
Ammoniacal Nitrogen.	
Albuminoid Nitrogen.	
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.).	
Calcium (Ca)	26
Magnesium (Mg)	39
Total iron (Fe)	0.96
Arsenic ..... less than	0.05
Fluoride	0.5

Hypothetical Salines

Calcium Carbonate	64
Magnesium Carbonate	135
Sodium Carbonate	22
Sodium Chloride	25
Sodium Sulphate	30
Sodium Nitrate	6
	282

VF/954

PLEASE QUOTE: V/AE/1/A/106/197

DIVISION OF WATER DEVELOPMENT
P.O. BOX 250
FORT VICTORIA

Table A.3-2-137 (1)

DATE: 4th February, 1983

Government Analyst Laboratory
Mazoe Street/North Avenue
P.O. Box 8042
CAUSEWAY

BOREHOLE WATER ANALYSIS : SCHIKU SCHOOL

Please carry out a chemical analysis of the water submitted herewith.

Details are:

1.		For Provincial Water Engineer, P.O. Box 250, Fort Victoria	
2.	(a)	Analysis of a new borehole supply to determine its suitability for human consumption.	
	(b)	Borehole reference	: No. 8
	(c)	Map reference	: SN 985 776
3.		Sample taken from the test pump	
4.		Source	: Borehole
5.		Untreated	:
6.	(a)	Depth	:
	(b)	Uncovered	:
	(c)	Just completed	:
	(d)		: Testing for Japanese Study Team
	(e)	No apparent sources of pollution	:
	(f)	No visible signs of pollution	:
	(g)		:
7.		Sample taken on	: 17.1.83
		Despatched	:

Please submit a duplicate report to Chief Hydrological Engineer, P.O. Box 8132, Causeway.

for

D.S. DURHAM
for: PROVINCIAL WATER ENGINEER
DSD/ypw

Table A.3-2-137 (2)

Government Analyst's Laboratory
P O Box 8042
Causeway
Salisbury Harare
28 February 1983

WATER ANALYSIS REPORT

Mr M G Lotter
Provincial Water Engineer
P O Box 250
Masvingo

SCHIKU SCHOOL

Lab. No. 96/83 Your Reference: V/AM/1/A/106/197

Sample(s) received: 7-2-83 Sample(s) taken: 17-1-83

Particulars:

Test for potability

Results of Analysis (parts per million) - See table(s) attached.

Remarks:-

The water is chemically suitable for drinking.

Yours faithfully

P T MUCHENJE (Miss)
for: GOVERNMENT ANALYST

PTM/ECS

MINISTRY OF WATER DEVELOPMENT
Phone 255
[illegible] 1983
P.O. Box 259
FORT VICTORIA, [illegible]

Table A.3-2-137 (3)

parts per million

Odour	earthy
Colour	colourless
General Appearance	
Suspended matter	none
Sediment	none
pH	7.2
Specific Conductivity at 20°C. ($\times 10^4$).	7.2×10^{-4}
Approx. Dissolved Salines obtained from above	398
Alyalinity to Methyl Orange (as $CaCO_3$).	378
Total hardness (as $CaCO_3$)	297
Lime hardness ($CaCO_3$)	167
Chloride radicle (Cl).	20
Sulphate radicle SO_4).	10
Nitrate Nitrogen.	0.06
Nitrite Nitrogen	
Ammoniacal Nitrogen	
Albuminoid Nitrogen	
Oxygen absorbed from $KMnO_4$ (4 hours at 27°C.).	
Calcium (Ca)	67
Magnesium (Mg)	82
Total iron (Fe)	0.2
Zinc (Zn)	
Arsenic less than	0.05
Fluoride	not detected

Hypothetical Salines

Calcium Carbonate	167
Magnesium Carbonate	110
Sodium Carbonate	86
Sodium Sulphate	15
Sodium Chloride	33
	411

VF/954

PLEASE QUOTE: VTTL/CHIBI/30

DIVISION OF WATER DEVELOPMENT
P.O. BOX 250
FORT VICTORIA

Table A.3-2-138 (1)

DATE: 16.2.83

Government Analyst Laboratory
Mazoe Street/North Avenue
P.O. Box 8042
CAUSEWAY

~~BOREHOLE WATER ANALYSIS - CHIBI C.L.~~

Please carry out a chemical analysis of the water submitted herewith:

Details are:

1.		For Provincial Water Engineer, P.O. Box 250, Fort Victoria		
2.	(a)	Analysis of a new borehole supply to determine its suitability for human consumption.		
	(b)	Borehole reference	:	Bella school No. 16
	(c)	Map reference	:	TN 249 576
3.		Sample taken from the test pump		
4.		Source	:	Borehole
5.		Untreated	:	
6.	(a)	Depth	:	
	(b)	Uncovered	:	
	(c)	Just completed	:	
	(d)		:	
	(e)	No apparent sources of pollution	:	
	(f)	No visible signs of pollution	:	
	(g)		:	
7.		Sample taken on	:	26.1.83
		Despatched	:	

Please submit a duplicate report to Chief Hydrological Engineer, P.O. Box 8132, Causeway.

P.P. [signature]

D.S. DURHAM
for: PROVINCIAL WATER ENGINEER
DSD/ypw

Table A.3-2-138 (2)

Division of Water Development,
P.O. Box 250,
MASVINGO.

(Att: D.S. Durham)

Government Analyst's Laboratory
P O Box 8042
Causeway
Salisbury

16th March, 1983

WATER ANALYSIS REPORT

Borehole Water Chibi C.L.

Lab. No. 144 / 83

Your Reference: WDL/CHIBI/301

Sample(s) received: 18/2/83

Sample(s) taken: 26/1/83

Particulars:

Chemical analysis required Bella School

Results of Analysis (parts per million) - See table(s) attached.

Remarks:-

The water is rather hard, the maximum permissible value for total hardness being 500mg/l. This might cause some gastrointestinal irritation.

P.T. MUCHEMWE (Miss)
for: GOVERNMENT ANALYST

cc Chief Hydrological Engineer, P.O. Box 8132, Causeway.

MINISTRY OF WATER DEVELOPMENT
PROJECT
23 MAR 1983
P.O. Box 250
FORT VICTORIA.

Table A.3-2-138 (3)

parts per million.

Odour	odourless
Colour	slight brownish tinge
General Appearance	no suspensio, no sediment
pH	7.5
Specific Conductivity at 20°C. (x 10^4).	2.05 x 10^{-4} (1 in 10)
Approx. Dissolved Salines deduced from above.	1139
Alyalinity to Methyl Orange (as $CaCO_3$).	630
Total hardness (as $CaCO_3$)	517
Lime hardness ($CaCO_3$)	417
Chloride radicle (Cl').	311
Sulphate radicle (SO_4'').	85
Nitrate Nitrogen.	0.74
Nitrite Nitrogen.	
Ammoniacal Nitrogen.	
Albuminoid Nitrogen.	
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.).	
Calcium (Ca)	167
Magnesium (Mg)	21
Total iron (Fe)	0.2
Arsenic	less than 0.05
Fluoride	0.8

Hypothetical Salines

Calcium carbonate	417
Magnesium carbonate	84
Sodium carbonate	120
Sodium chloride	348
Sodium sulphate	132
Sodium nitrate	4
	1105

VF/954

PLEASE QUOTE: VTEL/CHIPI/314

DIVISION OF WATER DEVELOPMENT
P.O. BOX 250
FORT VICTORIA

Table A.3-2-139 (1)

DATE: ....15.2.83.....

Government Analyst Laboratory
Mazoe Street/North Avenue
P.O. Box 8042
CAUSEWAY

BOREHOLE WATER ANALYSIS : CHIPI C.L.

Please carry out a chemical analysis of the water submitted herewith:

Details are:

1.		For Provincial Water Engineer, P.O. Box 250, Fort Victoria		
2.	(a)	Analysis of a new borehole supply to determine its suitability for human consumption.		
	(b)	Borehole reference	:	Madzivadondo B.C. No.17
	(c)	Map reference	:	TN 1B6 656
3.		Sample taken from the test pump		
4.		Source	:	Borehole
5.		Untreated	:	
6.	(a)	Depth	:	
	(b)	Uncovered	:	
	(c)	Just completed	:	
	(d)		:	
	(e)	No apparent sources of pollution	:	
	(f)	No visible signs of pollution	:	
	(g)		:	
7.		Sample taken on	:	26. 1.83
		Despatched	:	

Please submit a duplicate report to Chief Hydrological Engineer, P.O. Box 8132, Causeway.

P.P.

D.S. DURHAM
for: PROVINCIAL WATER ENGINEER
DSD/ypw

Table A.3-2-139 (2)

ision of Water Development,
.C. Box 250,
.ASVINGO

(Att: D.S. Durham)

Government Analyst's Laboratory
P O Box 8042
Causeway
Salisbury

16th March, 1983

WATER ANALYSIS REPORT

BOREHOLE WATER CHIBI C.L.

Lab. No. 146 / 83

Your Reference: VWTL/CHIBI/314

Sample(s) received: 18/2/83

Sample(s) taken: 26/1/83

Particulars:

Chemical analysis required.

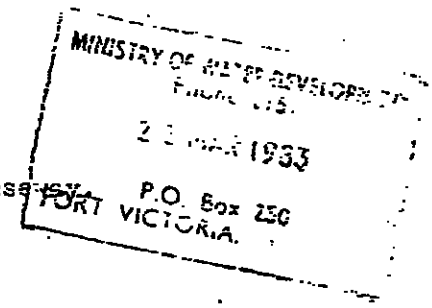
[redacted]

Results of Analysis (parts per million) - See table(s) attached.

Remarks:-

With reference to the above analysis, The water is chemically suitable for human consumption.

P.F. ROCHENJE (Miss)
for: GOVERNMENT ANALYST



cc Chief Hydrological Engineer, P.O. Box 8132, Causeway

Table A.3-2-139 (3)

parts per million.

Odour	odourless
Colour	brownish tinge
General Appearance	no sediment, no suspension
pH	7.9
Specific Conductivity at 20°C. (x 10^4).	5.16 X 10^{-4}
Approx. Dissolved Salines deduced from above.	305
Alyalinity to Methyl Orange (as $CaCO_3$).	286
Total hardness (as $CaCO_3$)	127
Lime hardness ($CaCO_3$)	53
Chloride radicle (Cl').	6
Sulphate radicle (SO_4'').	5
Nitrate Nitrogen.	0.1
Nitrite Nitrogen.	
Ammoniacal Nitrogen.	
Albuminoid Nitrogen.	
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.).	
Calcium (Ca)	21
Magnesium (Mg)	16
Total iron (Fe)	0.2
Arsenic	less than 0.05
Fluoride	0.8

Hypothetical Salines

Calcium carbonate	53
Magnesium carbonate	62
Sodium carbonate	169
Sodium chloride	10
Sodium sulphate	6
Sodium nitrate	1

VF/954

PLEASE QUOTE: VETL/CHIBI/307

DIVISION OF WATER DEVELOPMENT
P.O. BOX 250
FORT VICTORIA

DATE: 15.2.83

Table A.3-2-140 (1)

Government Analyst Laboratory
Mazoe Street/North Avenue
P.O. Box 8042
CAUSEWAY

BOREHOLE WATER ANALYSIS : CHIBI C.L.

Please carry out a chemical analysis of the water submitted herewith:

Details are:

1.		For Provincial Water Engineer, P.O. Box 250, Fort Victoria	
2.	(a)	Analysis of a new borehole supply to determine its suitability for human consumption.	
	(b)	Borehole reference	: Ngundu Service Centre No. 18
	(c)	Map reference	: TM 709 986
3.		Sample taken from the test pump	
4.		Source	: Borehole
5.		Untreated	:
6.	(a)	Depth	:
	(b)	Uncovered	:
	(c)	Just completed	:
	(d)		:
	(e)	No apparent sources of pollution	:
	(f)	No visible signs of pollution	:
	(g)		:
7.		Sample taken on	: 2.2.83
		Despatched	:

Please submit a duplicate report to Chief Hydrological Engineer, P.O. Box 8132, Causeway.

P.P.

D.S. DURHAM
for: PROVINCIAL WATER ENGINEER
DSD/ypw

Table A.3-2-140 (2)

Division of Water Development,
P.O. Box 250,
MASVINGO.

Att: D.S. Durham)

Government Analyst's Laboratory
P O Box 8042
Causeway
Salisbury

16th March, 1983

WATER ANALYSIS REPORT

BOREHOLE WATER CHIBI C.L.

Lab. No. 147 / 83

Your Reference: WDL/CHIBI/307

Sample(s) received: 15/2/83

Sample(s) taken: 2/2/83

Particulars:

Chemical analysis required.

Results of Analysis (parts per million) :- See table(s) attached.

Remarks:-

With reference to the above analysis, the water is chemically suitable for human consumption.

P.M. MUCHEMWA (Miss)
for: GOVERNMENT ANALYST

MINISTRY OF WATER DEVELOPMENT
Phone 245
23 MAR 1983
P.O. Box 250
FORT VICTORIA.

cc Chief hydrological Engineer, P.C. Box 8132, Causeway.

Table A.3-2-140 (3)

parts per million.

Odour	odourless
Colour	colourless
General Appearance	no suspension, no sediment
pH	7.5
Specific Conductivity at 20°C. (x 10^4)	11.6 X 10^{-4}
Approx. Dissolved Salines deduced from above	640
Alyalinity to Methyl Orange (as $CaCO_3$)	362
Total hardness (as $CaCO_3$)	450
Lime hardness ($CaCO_3$)	310
Chloride radicle (Cl')	123
Sulphate radicle (SO_4'')	30
Nitrate Nitrogen	5
Nitrite Nitrogen	
Ammoniacal Nitrogen	
Albuminoid Nitrogen	
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.)	
Calcium (Ca)	124
Magnesium (Mg)	34
Total iron (Fe)	0.4
Arsenic	less than 0.05
Fluoride	0.4

Hypothetical Salines

Calcium carbonate	310
Magnesium carbonate	44
Magnesium sulphate	38
Magnesium chloride,	54
Sodium chloride	135
Sodium nitrate	30
	611

VF/954

PLEASE QUOTE: VTTL/CHIBI/306

DIVISION OF WATER DEVELOPMENT
P.O. BOX 250
FORT VICTORIA

DATE: 16.2.83

Table A.3-2-141 (1)

Government Analyst Laboratory
Mazoe Street/North Avenue
P.O. Box 8942
CAUSEWAY

BOREHOLE WATER ANALYSIS : CHIBI C.L.

Please carry out a chemical analysis of the water submitted herewith:

Details are:

1.		For Provincial Water Engineer, P.O. Box 250, Fort Victoria		
2.	(a)	Analysis of a new borehole supply to determine its suitability for human consumption.		
	(b)	Borehole reference	:	Chigapa school No. 19
	(c)	Map reference	:	TN 300 592
3.		Sample taken from the test pump		
4.		Source	:	Borehole
5.		Untreated	:	
6.	(a)	Depth	:	
	(b)	Uncovered	:	
	(c)	Just completed	:	
	(d)		:	
	(e)	No apparent sources of pollution	:	
	(f)	No visible signs of pollution	:	
	(g)		:	
7.		Sample taken on	:	3.2.83
		Despatched	:	

Please submit a duplicate report to Chief Hydrological Engineer, P.O. Box 8132, Causeway.

pp.

D.S. DURHAM
for: PROVINCIAL WATER ENGINEER
DSD/ypw

Table A.3-2-141 (2)

Government Analyst's Laboratory
P O Box 8042
Causeway
Salisbury

16th March, 1983

Division of Water Development,
P.O. Box 250,
MASVINGO

(Att: D.S. Durham) WATER ANALYSIS REPORT

BOREHOLE WATER CHIBI C.L.

Lab. No. 145 / 83

Your Reference: DWD/CHIBI/306

Sample(s) received: 18/2/83

Sample(s) taken: 3/2/83

Particulars:

Chemical analysis required

Results of Analysis (parts per million) - See table(s) attached.

Remarks:-

The dissolved salines, total hardness, lime hardness and chloride radicle values are extremely high. These factors combine to produce an unpalatable taste and gastrointestinal irritation to the consumer. High levels of chloride cause corrosion to hot water systems.

P.M. MUCHENJE (Miss)
for: GOVERNMENT ANALYST

MINISTRY OF WATER DEVELOPMENT
RECEIVED
23 MAR 1983
P.O Box 250
FORT VICTORIA.

cc Chief Hydrological Engineer, P.O. Box 8132, Causeway.

Table A.3-2-141 (3)

parts per million.

Odour	
Colour	brownish tinge
General Appearance	considerable amount of suspend matter, traces of sediment
pH	6.9
Specific Conductivity at 20°C. (x 10^4).	4.00×10^{-4} (1in 10)
Approx. Dissolved Salines deduced from above.	2094
Alyalinity to Methyl Orange (as $CaCO_3$).	513
Total hardness (as$CaCO_3$)	1401
Lime hardness ($CaCO_3$)	908
Chloride radicle (Cl').	1049
Sulphate radicle (SO_4'').	.3
Nitrate Nitrogen.	0.42
Nitrite Nitrogen.	
Ammoniacal Nitrogen.	
Albuminoid Nitrogen.	
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.).	
Calcium (Ca)	364
Magnesium (Mg)	120
Total iron (Fe)	0.8
Arsenic	less than 0.05
Fluoride	0.5

Hypothetical salines

Calcium carbonate	513
Calcium sulphate	21
Calcium chloride	573
Magnesium chloride	465
Sodium chloride	540
Sodium nitrate	3
	2115

VF/954

PLEASE QUOTE: VTTL/CHIBI/309

DIVISION OF WATER DEVELOPMENT
P.O. BOX 250
FORT VICTORIA

DATE: 16.2.83

Table A.3-2-142 (1)

Government Analyst Laboratory
Mazoe Street/North Avenue
P.O. Box 8042
CAUSEWAY

BOREHOLW WATER ANALYSIS : CHIBI C.L.

Please carry out a chemical analysis of the water submitted herewith:

Details are:

1.		For Provincial Water Engineer, P.O. Box 250, Fort Victoria		
2.	(a)	Analysis of a new borehole supply to determine its suitability for human consumption.		
	(b)	Borehole reference	:	Chigwihwe school No. 20
	(c)	Map reference	:	TN 064 713
3.		Sample taken from the test pump		
4.		Source	:	Borehole
5.		Untreated	:	
6.	(a)	Depth	:	
	(b)	Uncovered	:	
	(c)	Just completed	:	
	(d)		:	
	(e)	No apparent sources of pollution	:	
	(f)	No visible signs of pollution	:	
	(g)		:	
7.		Sample taken on	:	4.2.83
		Despatched	:	

Please submit a duplicate report to Chief Hydrological Engineer, P.O. Box 8132, Causeway.

P.P.

D.S. DURHAM
for: PROVINCIAL WATER ENGINEER
DSD/ypw

Table A.3-2-142 (2)

Division of Water Development,
P.O. Box 250,
MASVINGO.

Att: D.S. Durham)

Government Analyst's Laboratory
P O Box 8042
Causeway
Salisbury

16th March, 1983

WATER ANALYSIS REPORT

Borehole water Chibi C.L.

Lab. No. 148 / 83

Your Reference: VCTL/CHIBI/309

Sample(s) received: 18/2/83

Sample(s) taken: 4/2/83

Particulars:

Chemical analysis required.

CHEMISTRY SECTION

Results of Analysis (parts per million) - See table(s) attached.

Remarks:-

With reference to the above analysis, the water is chemically suitable for human consumption.

P.T. MUCHENJE (Miss)
for: GOVERNMENT ANALYST

cc Chief Hydrological Engineer, P.O. Box 8132, Causeway

MINISTRY OF WATER DEVELOPMENT
Phone 2.5.
23 MAR 1983
P.O. Box 250
FORT VICTORIA.

Table A.3-2-142 (3)

parts per million.

Odour	odourless
Colour	slight brownish tinge
General Appearance	no sediment, no suspension
pH	7.3
Specific Conductivity at 20°C. (x 10^4).	11.6 $\times 10^{-4}$
Approx. Dissolved Salines deduced from above	674
Alyalinity to Methyl Orange (as $CaCO_3$)	533
Total hardness (as $CaCO_3$)	485
Lime hardness ($CaCO_3$)	321
Chloride radicle (Cl')	74
Sulphate radicle (SO_4'')	10
Nitrate Nitrogen	5.2
Nitrite Nitrogen	
Ammoniacal Nitrogen	
Albuminoid Nitrogen	
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.)	
Calcium (Ca)	129
Magnesium (Mg)	40
Total iron (Fe)	0.6
Arsenic	less than 0.05
Fluoride	0.4

Hypothetical Salines

Calcium carbonate	321
Magnesium carbonate	138
Sodium carbonate	51
Sodium chloride	122
Sodium sulphate	13
Sodium nitrate	32
	677

Table A.3-2-143 (1)

Government Analyst Laboratory
P O Box 8042
CAUSEWAY
Harare
16 March 1983

Attention: D S Durham

Division of Water Development
P O Box 250
Masvingo

WATER ANALYSIS REPORT

BOREHOLE WATER :- SHURUGWI

Lab. No. 149/83

Your Reference: VTTL/SHURUGWEI/ 310

Sample (s) received 18-2-83

Sample (s) taken: 24-1-83

Chemical analysis required

Results of Analysis (parts per million) - See table(s) attached.

Remarks:-

With reference to the above analysis, the water is chemically suitable for human consumption.

P T MUCHENJE (Miss)
for: GOVERNMENT ANALYST

c.c. Chief Hydrological Engineer, Box 8132, Causeway.

PTM/ECS

Table A.3-2-143 (2)

parts per million.

Odour	odourless
Colour	colorless
General Appearance	no suspension, few traces of sediments.
pH	6.6
Specific Conductivity at 20°C. (x 10^4)	1.7 $X10^{-4}$
Approx. Dissolved Salines deduced from above.	99
Alyalinity to Methyl Orange (as $CaCO_3$)	28
Total hardness (as $CaCO_3$)	45
Lime hardness ($CaCO_3$)	30
Chloride radicle (Cl')	15
Sulphate radicle (SO_4'')	5
Nitrate Nitrogen	6
Nitrite Nitrogen.	
Ammoniacal Nitrogen.	
Albuminoid Nitrogen.	
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.).	
Calcium (Ca)	12
Magnesium (Mg)	4
Total iron (Fe)	0.5
Arsenic	not detected
Fluoride	0.2

Hypothetical Salines

Calcium carbonate	28
Magnesium carbonate	3
Magnesium sulphate	5
Magnesium chloride	10
Sodium nitrate	36
Sodium chloride	12
	94

Table A.3-2-144 (1)

Government Analyst's Laboratory
P O Box 8042
Causeway
Salisbury Harare
22 April 1983

WATER ANALYSIS REPORT

Div of Water Development
P O Box 250
Masvingo

Attention: D S Durham

BOREHOLE WATERS

Lab. No. 273/83 Your Reference: Japanese Study Team

Sample(s) received: 1-3-83 Sample(s) taken:

Particulars:

Chemical analysis requested.

Results of Analysis (parts per million) - See table(s) attached.

Remarks:-

See below

Table A.3-2-144 (2)

Sample No.	B/H Ref	Your Ref.	Date Sampled	Date Received	Conclusion
21	Denga Dam	V/AM/1/A/106/468	5-2-83	55-2-83	Suitable
22	Chipukuawi	V/AM/1/A/106/469	7-2-83	1-3-83	Suitable
23	Mukotosi	V/AM/1/A/106/470	8-2-83	"	Suitable
24	Matedzi Dip	V/AM/1/A/106/473	10-2-83	"	Suitable
25	Mushawa Cl	V/AM/1/A/106/471	11-2-83	"	Suitalbe
26	Dengenya	V/AM/1/A/106/472	12-2-83	"	Suitable
27	Noungabane	V/AM/1/A/106/483	14-2-83	"	Unsuitabble
28		V/AM/1/A/106/484	14-2-83	"	Unsuitable
29	Tome Store	V/AM/1/A/106/485	14-2-83	"	Suitable
30	Buuta School	V/AM/1/A/106/486	15-2-83	"	Suitable
31	Bvumbura Sch	V/AM/1/A/106/487	15-2-83	"	Suitable
32	Bvute Dam	V/AM/1/A/106/488	15-2-83	"	Suitable
33	Mahombe Sch	V/AM/1/A/106/489	16-2-83	"	Suitable
34	Buchwa Mine	V/AM/1/A/106/491	16-2-83	"	Suitable
35	Masvingo Sch	V/AM/1/A/106/492	16-2-83	"	Unsuitable
36	Matenzi Sch	V/AM/1/A/106/493	16-2-83	"	Unsuitable
37	Rusha Sch	V/AM/1/A/106/494	16-2-83	"	Unsuitable
38	Furiozi Sch	V/AM/1/A/106/495	16-2-83	"	Unsuitable
39	Mbirashava	V/AM/1/A/106/495	19-2-83	"	Unsuitable
40	Rhonde	V/AM/1/A/106/496	22-2-83	"	Suitable
41	Mwembe B.C.	V/AM/1/A/106/497	19-2-83	"	Unsuitable

Conclusions

Borehole waters 21, 22, 23, 24, 25, 26, 29, 31, 32, 33, 34, and 40 are chemically suitable for human consumption.

Samples 27, and 37

The total dissolved solids, nitrate nitrogen, iron, fluoride and total hardness values are higher than the maximum permissible values for drinking water. Too hard a water produces an unpolatable taste and can also cause gastrointestinal irritations. High values of nitrate nitrogen can easily be reduced to the more toxic nitrite ion which causes cyanosis and high values of fluoride have been known to produce dental metting and bone and joint disorders.

Samples 39 and 41

The waters are too soft. Soft waters are poor in mineral nutrients and would therefore, be unsuitable for drinking.

Samples 30, 35, 36 and 38

These waters are high in iron, fluoride (36) nitrate nitrogen (30) and chloride (38) conos. They are therefore, unsuitable for drinking for reasons mentioned above.

P T MUCHENJE (Miss)
for: GOVERNMENT ANALYST

PTM/ECS

9

Table A.3-2-144 (4)

parts per million.

	21	22
Odour	non-perceptible	non-perceptible
Colour	colourless	colourless
General Appearance	no suspended matter no sediment	no suspended matter no sediment
pH	8.0	7.5
Specific Conductivity ..... at 20°C. (x 10^4).	0.93×10^{-4}	1.00×10^{-4} (1 in 10 dil)
Approx. Dissolved Salines deduced from above.	516	541
Alyalinity to Methyl Orange (as $CaCO_3$).	491	385
Total hardness (as $CaCO_3$)	441	312
Lime hardness ($CaCO_3$)	185	22
Chloride radicle (Cl').	19	86
Sulphate radicle (SO_4'').	3	5
Nitrate Nitrogen.	0.65	0.16
Nitrite Nitrogen.		
Ammoniacal Nitrogen.		
Albuminoid Nitrogen.		
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.).		
Total iron (Fe)	0.1	less than 0.05
Arsenic ..... less than	0.01	" " 0.01
Fluoride	0.4	" " 0.1
Hypothetical Salines		
Calcium Carbonate	185	29.09
Magnesium Carbonate	216	306.83
Sodium Carbonate	53	78.01
Sodium Sulphate	4	7.4
Sodium Chloride	31	141.47
Sodium Nitrate	1	0.97
	491	556.95

Table A.3-2-144 (5)

parts per million.

	23	24
Odour	non perceptible	non perceptible
Colour	colourless	colourless
General Appearance	no suspended matter no sediment	no suspended matter no sediment
pH	7.6	7.1
Specific Conductivity at 20°C. (x 10^4).	1.48 & 10 (1 in 10 dilution)	0.61 x 10^{-4} (1 in 10)
Approx. Dissolved Salines deduced from above.	812	354
Alyalinity to Methyl Orange (as $CaCO_3$).	562	237
Total hardness (as CaCO3)	206	239
Lime hardness (as $CaCO_3$)	121	91
Chloride radicle (Cl').	150	27
Sulphate radicle (SO_4'').	6	6
Nitrate Nitrogen.	0.9	10
Nitrite Nitrogen.		
Ammoniacal Nitrogen.		
Albuminoid Nitrogen.		
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.).		
Total iron (Fe) ...less.than.....	0.05	0.3
Arsenic less than ..".. "	0.01	0.01
Fluoride	0.7	0.8
Hypothetical Salines		
Calcium Carbonate	120.51	91.42
Magnesium Carbonate	72.46	122.49
Sodium Carbonate	276.44	2.60
Sodium Sulphate	8.88	5.80
Sodium Chloride	248.19	43.84
Sodium Nitrate	5.46	63.13
	831.94	329.28

Table A.3-2-144 (6)

parts per million.

	25	26
Odour	earthy	earthy
Colour	colourless	colourless
General Appearance	no suspended matter no sediment	no suspended matter no sediment
pH	8.1	7.2
Specific Conductivity, at 20°C. (x 10^4).	3.29×10^{-4} (1 in 5 dil)	2.36×10^{-4} (1 in 10 dil)
Approx. Dissolved Salines deduced from above.	1437	674
Alyalinity to Methyl Orange (as $CaCO_3$).	688	531
Total hardness (as $CaCO_3$)	389	449
Lime hardness (as $CaCO_3$)	91	162
Chloride radicle (Cl').	261	63
Sulphate radicle (SO_4'').	40	42
Nitrate Nitrogen.	0.3	0.28
Nitrite Nitrogen.		
Ammoniacal Nitrogen.		
Albuminoid Nitrogen.		
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.).		
Total iron (Fe)	0.3	0.1
Arsenic .....less than ...	0.01	less than ..0.01
Fluoride	0.8	0.4
Hypothetical Salines		
Calcium Carbonate	91	162
Magnesium Carbonate	251	242
Sodium Carbonate	317	87
Sodium Chloride	761	104
Sodium Sulphate	59	62
Sodium Nitrate	2	2
	1481	659

Table A.3-2-144 (7)

parts per million.

	27		28
Odour	faint earthy		faint earthy
Colour	colourless		colourless
General Appearance	no suspended matter no sediment		no suspended matter no sediment
pH	7.4		7.5
Specific Conductivity at 20°C. (x 10^4).	1.93 x 10^{-4} (1 in 50 dil)		1.93 x 10^{-4} (1in10 dil
Approx. Dissolved Salines deduced from above.	[illegible]		1051
Alyalinity to Methyl Orange (as $CaCO_3$).	705		657
Total hardness (as $CaCO_3$)	1700		575
Lime hardness (as $CaCO_3$)	441		191
Chloride radicle (Cl').	[illegible]		222
Sulphate radicle (SO_4'').	5		18
Nitrate Nitrogen.	[illegible]		1.65
Nitrite Nitrogen.			
Ammoniacal Nitrogen.			
Albuminoid Nitrogen.			
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.).			
Total iron (Fe)	[illegible]	less than	0.05
Arsenic ..... less than ..	0.01	less than	0.01
Fluoride	[illegible]		0.4
Hypothetical Salines			
Calcium Carbonate	441		222
Magnesium Carbonate	223		298
Magnesium Sulphate	6	Sodium Carbonate	67
Magnesium chloride	934	Sodium Sulphate	27
Sodium Chloride	2935		366
Sodium Nitrate	75		10
	4614		1010

Table A.3-2-144 (8)

parts per million.

	29	30
Odour	earthy	[illegible]
Colour	colourless	brownish tinge
General Appearance	no suspended matter no sediment	no suspended matter no sediment
pH	7.4	7.4
Specific Conductivity at 20°C. (x 10^4)	2.38×10^{-4} (1 in 4 dil)	1.03×10^{-4} (1 in 10 dil)
Approx. Dissolved Salines deduced from above.	562	680
Alyalinity to Methyl Orange (as $CaCO_3$).	466	468
Total hardness (as $CaCO_3$)	433	372
Lime hardness (as $CaCO_3$)	162	129
Chloride radicle (Cl').	22	4
Sulphate radicle (SO_4'').	63	32
Nitrate Nitrogen.	5	[illegible]5.7
Nitrite Nitrogen.		
Ammoniacal Nitrogen.		
Albuminoid Nitrogen.		
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.).		
Total Iron (Fe) ...less than...	0.05	less than . 0.05
Arsenic .....less than ..	0.01	less than 0.01
Fluoride	0.3	0.4
Hypothetical Salines		
Calcium Carbonate	162	129
Magnesium Carbonate	229	205
Sodium Carbonate	35	102
Sodium Chloride	36	7
Sodium Sulphate	93	47
Sodium Nitrate	30	91
	585	561

Table A.3-2-144 (9)

parts per million.

	31	32
Odour	faint earthy	faint earthy
Colour	brownish tinge	colourless
General Appearance	no suspended matter no sediment	nofsuspended matter no sediment
pH	8.0	8.2
Specific Conductivity at 20°C. (x 10^4).	6.08×10^{-4}	2.44×10^{-4}(lint dil)
Approx. Dissolved Salines deduced from above.	364	562
Alyalinity to Methyl Orange (as $CaCO_3$).	295	506
Total hardness (as $CaCO_3$)	354	405
Lime hardness ($CaCO_3$)	175	183
Chloride radicle (Cl').	23	23
Sulphate radicle (SO_4'').	5	20
Nitrate Nitrogen.	7	3
Nitrite Nitrogen.		
Ammoniacal Nitrogen.		
Albuminoid Nitrogen.		
Oxygen absorbed from $KMnO_4$ (4 hours at 27° C.).		
Total iron (Fe)	0.05	less than 0.05
Arsenic .....less than	0.01	less than 0.01
Fluoride ....less than	0.1	0.4
Hypotheticel Salines		
Calcium Carbonate	175	183
Magnesium Carbonate	101	187
Magnesium Sulphate	6	Sodium Carbonate 107
Magnesium Chloride	31	Sodium Chloride 38
Magnesium Nitrate	33	Sodium Sulphate 30
Sodium Nitrate	8	20
	354	565

Table A.3-2-144 (10)

parts per million.

	33	34
Odour	faint earthy	faint earthy
Colour	brownish tinge	brownish tinge
General Appearance	no suspended matter no sediment	no suspended matter no sediment

P.H.9.

pH	8.2	8.2
Specific Conductivity at 20°C. (x 10^4).	4.26×10^{-4} (1 in 2 dil)	3.85×10^{-4} (1 in 2 dil)
Approx. Dissolved Salines deduced from above.	494	452
Alkalinity to Methyl Orange (as $CaCO_3$).	504	375
Total Hardness (as $CaCO_3$).	478	417
Lime Hardness (as $CaCO_3$) ..	173	154
Chloride radicle (Cl').	20	35
Sulphate radicle (SO_4'').	5	15
Nitrate Nitrogen.	3	10
Nitrite Nitrogen.		
Ammoniacal Nitrogen.		
Albuminoid Nitrogen.		
Oxygen absorbed from $KMnO_4$ (4 hours at 27°C.).		
Total iron (Fe) .less.than .	0.05	less than ... 0.05
Arsenic .....less than .	0.01	less than ... 0.01
Fluoride ..... less than .	1	0.4

Hypothetical Salines			
Calcium Carbonate	173		154
Magnesium Carbonate	257		186
Sodium Carbonate	28	Magnesium Sulphate	19
Sodium Chloride	33	Magnesium Chloride	24
Sodium Sulphate	7	Sodium Chloride	28
Sodium Nitrate	16		61
pH.	514	3-266	472

G.P. & S. 11691—3,000—31-5-63.

Table A.3-2-144 (11)

parts per million.

	35	36
Odour		faint earthy
Colour		clear
General Appearance	no suspended matter no sediment	no suspended matter no sediment
pH	7.5	7.5
Specific Conductivity at 20°C. (x 10^4).	3.73×10^{-4}	0.84×10^{-4} (1 in 20 dil)
Approx. Dissolved Salines deduced from above.	214	916
Alkalinity to Methyl Orange (as $CaCO_3$).	199	318
Total Hardness (as $CaCO_3$).	194	378
Lime Hardness (as $CaCO_3$)	73	237
Chloride radicle (Cl').	16	258
Sulphate radicle (SO_4'').	not detected	10
Nitrate Nitrogen.	0.08	7
Nitrite Nitrogen.		
Ammoniacal Nitrogen.		
Albuminoid Nitrogen.		
Oxygen absorbed from $KMnO_4$ (4 hours at 27°C.)		
Total iron (Fe)	[illegible]	0.2
Arsenic	less than	0.01
Fluoride		[illegible]
Hypothetical Salines		
Calcium Carbonate		237.07
Magnesium Carbonate		67.80
Magnesium Sulphate		169.04
Magnesium Chloride		123.35
Sodium Chloride		274.35
Sodium Nitrate		43.7
pH.		915.08

P.H.9.

G.P.& S. 11691—3,000—31-5-63.

Table A.3-2-144 (12)

parts per million.

	37		38
Odour	earthy		slightly earthy
Colour	clear		clear
General Appearance	considerable amount of suspended matter		no suspended matteer
	slight brown sediment		no sediment
pH	7.1		7.6
Specific Conductivity at 20°C. (x 10^4).	6.0×10^{-4} (1 in 21 dil)		2.08×10^{-4} (1 in 20 dil)
Approx. Dissolved Salines deduced from above.	~~7293~~		2942
Alkalinity to Methyl Orange (as $CaCO_3$).	598		648
Total Hardness (as $CaCO_3$).	~~3448~~		768
Lime Hardness ($CaCO_3$)	986		292
Chloride radicle (Cl').	~~5416~~		~~1517~~
Sulphate radicle (SO_4'').	75		45
Nitrate Nitrogen.	0.06		0.7
Nitrite Nitrogen.			
Ammoniacal Nitrogen.			
Albuminoid Nitrogen.			
Oxygen absorbed from $KMnO_4$ (4 hours at 27°C.).			
Total iron (Fe)	~~3.91~~	less than	0.05
Arsenic ..... less than	0.01	less than	0.01
Fluoride	~~1.8~~		0.7
Hypothetical Salines			
Calcium Carbonate	5975		291.54
Calcium Sulphate	528.44	Mag Carbonate	300.07
Magnesium Sulphate	2954.54		144.44
Magnesium Chloride	2616.85		69.36
Sodium Chloride	2432.66		2087.78
Sodium Nitrate	0.36		4.25
	9130.35		2697.44
pH.			

G.P.& S. 11691—3,000—31-5-63.

Table A.3-2-144 (13)

parts per million.

	39	40
Odour	pondy	slightly earthy
Colour	milky	clear
General Appearance	no suspended matter no sediment	no suspended matter no sediment
pH	7.3	7.25
Specific Conductivity at 20°C. (x 10^4).	0.93 x 10^{-4}	6.5 x 10^{-4}
Approx. Dissolved Salines deduced from above.	51	376
Alkalinity to Methyl Orange (as $CaCO_3$).	23	214
Total Hardness (as $CaCO_3$).	24	207
Lime Hardness (as $CaCO_3$)	11	87
Chloride radicle (Cl').	15	58
Sulphate radicle (SO_4'').	5.0	56
Nitrate Nitrogen.	0.02	1.8
Nitrite Nitrogen.		
Ammoniacal Nitrogen.		
Albuminoid Nitrogen.		
Oxygen absorbed from $KMnO_4$ (4 hours at 27°C.).		
Total iron (Fe)	less than 0.05	0.3
Arsenic	less than 0.01	0.9
Fluoride	not detected	0.4
Hypothetical Salines		
Calcium Carbonate	10.49	87.27
Magnesium Carbonate	10.12	101.0
Magnesium Sulphate	1.96	97.39
Sodium Sulphate	5.04	53.28
Sodium Chloride	25.20	96.03
Sodium Nitrate	0.12	10.93
	52.97	356.0
pH.		

F.H.9.
G.P. & S. 11691—3,000—31-5-63.

Table A.3-2-144 (14)

parts per million.

41

Odour	earthy
Colour	clear
General Appearance	moderate amount of suspended matter slight brown sediment

P.H.9.

pH	6.65
Specific Conductivity at 20°C. (x 10^4).	0.48 x 10^{-4}
Approx. Dissolved Salines deduced from above.	26
Alkalinity to Methyl Orange (as $CaCO_3$).	15
Total Hardness (as $CaCO_3$).	12
Lime Hardness ($CaCO_3$)	6
Chloride radicle (Cl').	2
Sulphate radicle (SO_4'').	5
Nitrate Nitrogen.	0.03
Nitrite Nitrogen.	
Ammoniacal Nitrogen.	
Albuminoid Nitrogen.	
Oxygen absorbed from $KMnO_4$ (4 hours at 27°C.).	
Total iron (Fe)	1.9
Arsenic ..... less than ...	0.01
Fluoride	1.5

Hypothetical Salines

Calcium Carbonate	6.29
Magnesium Carbonate	4.86
Sodium Carbonate	3.12
Sodium Sulphate	7.4
Sodium Chloride	3.15
Sodium Nitrate	0.18

P. & S. 11691—3,000—31-5-63.

3-3 Agriculture

Source : Economic Review of the Agricultural Industry of Zimbabwe

Table A.3-3-1 Food and Non-food Production in Zimbabwe

(Unit : million tons)

		1978	1979	1980
Food	Plant Products			
	Grains	2.05	1.53	2.00
	Roots	0.04	0.04	0.04
	Vegetables/Fruit/Pulses	0.39	0.38	0.40
	Oilseeds	0.30	0.27	0.26
	Sugar	0.31	0.30	0.34
	Sub-total	3.09	2.52	3.04
	Animal Products			
	Dairy/Eggs	0.31	0.28	0.28
	Meat	0.20	0.18	0.16
	Sub-total	0.51	0.46	0.44
Beverage Non-food	Coffee/Tea	0.01	0.02	0.02
	Tabacco	0.08	0.10	0.12
	Cotton lint	0.06	0.06	0.06
	Seed	0.02	0.02	0.02
	Meals	0.01	0.01	0.01
	Hides and Tallow	0.03	0.02	0.02
	Sub-total	0.21	0.23	0.25
	Grand-total	3.81	3.21	3.73

Table A.3-3-2 Large Scale Sector Cropping Area by Commodity Type(1)

(Unit : '000 hectares)

Year	Summer Crops				Perennial Crops (3)	Winter Grain	Vegetables Pulses	Total
	Grains	Oilseed	Industrial	Fodder(2)				
1960	147	5	85	73	5	1	8	324
1965	180	8	103	43	31	2	6	373
1970	258	21	106	37	31	14	9	476
1975	245	26	153	19	41	34	6	524
1979	198	45	146	14	38	39	6	486
1980	225	47	148	12	45	37	5	519

Note : (1) Excludes Pastures
(2) Fodder and Green Manure
(3) Tea, Coffee, Fruit, Sugar

Source : C.S.O.

Table A.3-3-3 Value of Commercial Agricultural Output by Commodity

Items	1965		1975		1980	
	$m	%	$m	%	$m	%
Tobacco	71	57	59	17	99	17
Cotton	1	1	32	9	56	10
Sugar	12	10	55	16	91	15
Coffee	-	-	4	-	12	2
Maize	10	8	59	17	82	14
Wheat	-	-	13	4	21	4
Soybeans	-	-	3	1	14	2
Beef	19	15	60	17	88	16
Pigs	3	2	5	2	7	1
Milk	5	4	14	4	27	5
Other	3	3	45	13	82	14
Total	124	100	349	100	579	100

Note : - Insignificant (less than 0.5 percent)

Source : C.S.O.

Table A.3-3-4 Value of Agricultural Output by Sector

(Unit : $ million)

Year	C.F.A. Sector			L.S.S.	National Total
	Sales to Marketing Agencies	Production for own Consumption	Total		
1976	28	80	108	401	509
1977	22	84	106	393	499
1978	23	52	75	418	493
1979	17	85	102	439	541
1980	29	117	146	592	738

Source : C.S.O.

Table A.3-3-5 Gross Fixed Capital Investment in Agriculture

(Unit : $ million)

Category	1970	1975	1977	1978	1979	1980
Buildings	3	4	5	4	6	13
Civil Engineering	10	24	16	17	15	15
Transport Equipment	6	10	8	6	9	9
Plant/Machinery	4	15	16	15	14	23
Total	23	53	45	42	44	60

Source : C.S.O.

Table A.3-3-6 Agricultural Employees and Earnings

Category	1970	1975	1977	1978	1979	1980
Employees (000)	298	364	348	341	335	327
Earnings ($ million)	53	93	112	120	138	150

Table A.3-3-7 Agricultural Commodity Trade Patterns

Commodity	1965		1970		1975		1979		1980	
	000t	$m	000t	$m	000t	$m	000t	$m	000t	$m
Tabacco	119	93	47	22	56	65	60	80	93	118
Cotton	-	-	36	14	33	19	49	46	54	57
Sugar (1)	277	8	97	5	157	43	245	21	166	47
Coffee/Tea	1	...	3	2	8	7	12	18	9	13
Maize	8	1	397	16	842	47	219	17	63	7
Meat (2)	16	8	38	15	41	24	45	33	13	14
Hides	6	1	7	2	9	2	13	10	7	3
Oilseed (3)	-	-	17	1	15	2	3	1	2	1
Total	427	111	642	77	1,161	209	646	226	407	260
Value $/t		260		120		180		350		636

Note : (1) Sugar raws and refined
(2) fresh, frozen, chilled
(3) cottonseed, soybeans, groundnuts

... less than $1m

Source : C.S.O.

Table A.3-3-8 Mean Rainfall by Cropping Area

(Unit : mm)

Season	Hunyani	Sanyati	Mazoe	Total Zimbabwe
1975/76	848	787	880	737
1976/77	798	807	757	748
1977/78	765	740	795	980
1978/79	592	550	577	556
1979/80	765	751	626	644

Source : Department of Meteorological Services

3-4 Present Rural Water Supply

Table A.3-4-1 Water Sold in Large Urban Centres (as at June 1980)

Town	Water Sold m^3/day	Population	Pre Capita Consumption m^3/day
Salisbury	211,000	1,000,000	0.21
Bulawayo	93,000	373,000	0.25
Gwelu	23,000	72,000	0.31
Umtali	20,000	64,000	0.31
Que Que	61,000	52,000	0.86(1)
Redoliff		19,000	
Gatooma	8,100	33,000	0.25
Wankie	13,000	33,000	0.39
Sinoia	11,000	27,000	0.40
Fort Victoria	8,100	25,000	0.33
Marandellas	5,600	23,000	0.24
Shabani	8,000	21,000	0.38
Bindura	3,600	18,000	0.20
Hartley	5,300	15,000	
Total	470,700	1,775,000	0.27

Note : (1) Includes major industrial use.

(2) Source : Government Zimbabwe in Domestic Water Use 1980

Table A.3-4-2 Water Consumed in Zimbabwe (as at June 1980)

Category	Water Sold m^3/day	Population	Pre Capita Consumption m^3/day
14 Main Towns	470,000	1,775,000	0.27
Division of Water Development Stations	42,000	193,000	0.22
Other Small Towns	20,000	60,000	0.33
Business Centres in T.T.L. (1)	20,000	200,000	0.10
Mining and Isolated Industry (2)	30,000	200,000	0.15
Commercial Farming	50,000	1,000,000	0.05
Rural Population in T.T.L.	117,000	3,900,000	0.03
Other	3,000	32,000	0.10
Total	752,000	7,360,000	0.10

Note : (1) T.T.L. = Tribal Trust Land

(2) Domestic use only. Excludes water used for mining and industrial purposes.
Excludes Wankie which is included in main towns.

(3) Source : Coverment Zimbabwe Domestic Water Use in 1980

Table A.3-4-3 No. of Huts and Population Density

Communal Land	Borehole	Main River	Miscellaneous	Total	Population (1982)	Density
Chilimanzi	1,554	251	3,944	5,749	42,140	7.33
Shurugwi	1,154	-	5,458	6,612	41,720	6.31
Runde	1,317	752	1,992	4,061	37,400	9.21
Mazvihwa	212	578	1,150	1,940	17,820	9.18
Mberengwa	4,676	1,944	8,048	14,668	150,780	10.28
Chibi	4,056	1,728	6,968	12,752	137,710	10.80
Matibi No.1	1,787	343	1,508	3,638	39,840	10.95
Maranda	878	278	1,995	3,151	33,490	10.63
Total	15,634	5,874	31,063	52,571	500,900	9.53

Note : Density = Population/Total Hut Numbers.

Table A.3-4-4 LIST OF HOSPITAL (Hp)/CLINIC (Cl)/HAMLET (A or B)

Chilimanzi C.L.

No.	Name	Grid Ref.	Kind	W. R 1/	
1	Chilimanzi Cl.	TP 56 39	Cl.	B/H	
2	St. Theresa Hp	TP 51 18	Hp	B/H	
3	Debwe T/S	TP 36 24	A	B/H	
4	Ngezi M.	TP 35 15	A	Mis	
5	Chaka Store	TP 58 40	B	B/H	
6	Chief Chilimanzi	TP 53 39	B	Mis	
7	Banya	TP 43 38	B	Mis	
8	Holy Cross M.	TP 45 34	A	B/H	
9	Humbadunya	TP 56 31	B	Mis	
10	Mbedzi Camp	TP 49 21	B	B/H	
11	Moyomusante M	TP 38 21	A	B/H	
12	Store	TP 40 14	B	B/H	
13	Store	TP 45 05	A	B/H	
14	Matizira Store	TP 43 08	B	B/H	

Shurugwi C.L.

No.	Name	Grid Ref.	Kind	W.R.	
1	Clinic	SP 99 08	Cl.	B/H	
2	Nhema Clinic	TP 06 29	Cl.	Mis	
3	Clinic	Unknown	Cl.		
4	Clinic	Unknown	Cl.		
5	Clinic	Unknown	Cl.		
6	Clinic	Unknown	Cl.		
7	Store	TP 16 06	B	B/H	
8	St. Francis M.	TP 093298	A	B/H	
9	Shayamavudzi	TP 005235	B	Mis	
10	Chingegoma	TP 050215	B	Mis	
11	Wida	TP 00 15	B	Mis	
12	New Market	TP 07 15	B	B/H	
13	Donga T/S	SP 98 09	A	B/H	

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous

Table A.3-4-5 LIST OF HOSPITAL (Hp)/CLINIC (Cl)/HAMLET (A or B)

Runde C.L.

No.	Name	Grid Ref.	Kind	W. R. 1/	
1	Masunda Ward.	Unknown	Cl.		
2	Chavangwa	SN 87 56	A	Mis	

Mazvihwa C.L.

No.	Name	Grid Ref.	Kind	W.R.	
1	Vugwe Siding	TN 04 33	A	Mis	
2	Biltong Store	TN 03 31	B	Mis	

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous

Table A.3-4-6 LIST OF HOSPITAL (Hp)/CLINIC (Cl)/HAMLET (A or B)

Mberengwa C.L.

No.	Name	Grid Ref.	Kind	W. R. 1/	
1	Mupanjani Cl.	TN 27 07	Cl.	Mis	
2	Negobe Clinic	TN 23 10	Cl.	B/H	
3	Clinic	Unknown	Cl.		
4	"	"	"		
5	"	"	"		
6	"	"	"		
7	"	"	"		
8	"	"	"		
9	"	"	"		
10	"	"	"		
11	"	"	"		
12	"	"	"		
13	"	"	"		
14	"	"	"		
15	"	"	"		
16	Masase M.	QG 77 77	A	B/H	
17	Chegato M.	RG 06 93	A	B/H	
18	Zeus	RG 04 84	A	Mis	
19	Mataruse Office	TN 12 12	A	Mis	
20	Mapedza M.	TN 18 28	A	Mis	

Mberengwa C.L.

No.	Name	Grid Ref.	Kind	W.R.	
21	Ingezi Station	TN 28 22	A	Riv	
22	Buhwa Siding	TN 28 20	B	Riv	
23	Iron Ore Juct.	TN 31 19	B	Riv	
24	Store	TN 29 16	B	B/H	
25	Negobe Council	TN 23 10	A	B/H	
26		TN 17 04	B	B/H	
27	Matibi M.	TN 38 03	A	Mis	
28	Toms Store	TN 11 01	B	B/H	
29	Mutzukwe Store	SM 93 97	B	Riv	
30	Don Bosco M.	SM 93 98	B	Riv	
31	Mataka Council	TM 07 92	A	B/H	
32	Inyala	TM 05 86	A	B/H	
33	Musume M.	TM 12 86	A	B/H	
34	Rogerd Store	SM 95 80	B	B/H	
35	Rhonda	TM 07 79	A	B/H	
36	Ngungubane	TN 33 01	B	B/H	
37	Store	QG 73 87	A	Mis	

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous

Table A.3-4-7 LIST OF HOSPITAL (Hp)/CLINIC (Cl)/HAMLET (A or B)

Chibi C.L.

No.	Name	Grid Ref.	Kind	W. R. 1/	
1	Tokwe Clinic		Cl.	B/H	
2	Takawarasha		Cl.	B/H	
3	Clinic	Unknown	Cl.		
4	"	"	Cl.		
5	"	"	Cl.		
6	Store	TN 31 77	A	B/H	
7	Store	TN 23 62	B	Mis	
8	Store	TN 16 60	B	B/H	
9	Store	TN 22 56	B	Mis	
10	Store	TN 30 58	B	Mis	
11	Store	TN 25 42	B	Mis	
12	Berejena M.	TN 47 16	A	Mis	
13	Store	TN 70 05	B	B/H	
14	Store	TN 71 05	B	B/H	
15	Nyambirayi	TN 83 02	B	Riv	
16	Ngundu Halt	TN 70 98	A	B/H	

Matibi No.1 C.L.

No.	Name	Grid Ref.	Kind	W.R.	
1	Neshuro Clinic	TN 55 83	Cl.	B/H	
2	Clinic	Unknown			
3	Silver Store	TM 35 88	B	B/H	
4	Mutuvi M.	TM 28 84	B	B/H	
5	Lundi M.	TM 69 87	A	B/H	
6	Makwi Store	TM 66 82	B	B/H	
7	Matibi Mission	TN 38 03	A	Mis	

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous

Table A.3-4-8 LIST OF HOSPITAL (Hp)/CLINIC (Cl)/HAMLET (A or B)

Maranda C.L.						C.L.					
No.	Name	Grid Ref.	Kind	W. 1/ R.		No.	Name	Grid Ref.			
1	Dinhe Clinic	TM 44 55	Cl.	Riv.							
2	Clinic	Unknown									
3	"	"									
4	"	"									
5	"	"									
6	"	"									

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous

Table A.3-4-9 LIST OF SERVICE CENTER (S.C.)/BUSINESS CENTER (B.C.)

Chilimanzi C.L. (1 of 1)

No.	Name	Grid Ref.	Kind	W. R. 1/		No.	Name	Grid Ref.			
1	Charandura	TP 517190	SC	OK							
2	Chaka	TP 58 40	SC	B/H							
3	Chamisa	TP 46 05	SC	B/H							
4	Chizhou	TP 37 38	SC	B/H							
5	Holy Cross	TP 45 35	SC	B/H							
6	Siva hokwe	TP 36 24	SC	B/H							
7	Muwani	TP 540385	BC	B/H							
8	Vudzi	TP 435217	BC	Mis							
9	Mawurunge	TP 516155	BC	B/H							
10	Unknown	Unknown									
11	-ditto-	-ditto-									
12	-ditto-	-ditto-									
	Total 12										

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Miscellaneous

Table A.3-4-10 LIST OF SERVICE CENTER (S.C.)/BUSINESS CENTER (B.C.)

Shurugwi C.L. (1 of 1)

No.	Name	Grid Ref.	Kind	W. R. 1/	No.	Name	Grid Ref.
1	Tongogara	TP 073172	SC	OK	20	Unknown	Unknown
2	Chikato	TP 17 06	SC	B/H	21		
3	Donga	SP 98 09	SC	B/H			
4	Zhobolingo	TP 08 29	SC	B/H			
5	Makonde	SN 98 97	SC	B/H			
6	Mufiri	TN 14 90	SC	B/H			
7	Zaroto	TP 07 35	SC	B/H			
8	Magwanyika	TP 102329	BC	Mis			
9	Hanke	TP 036234	BC	Mis			
10	Tobayiwe	TP 016230	BC	Mis			
11	Mazivisa	TP 105086	BC	Mis			
12	Shamba	TP 109025	BC	B/H			
13	Guangura	SP 941003	BC	Mis			
14	Mulanbanba	TP 062008	BC	Mis			
15	Goae	SP 961048	BC	Mis			
16	B.C.	TP 006043	BC	Mis			
17	Unknown	Unknown					
18							
19						Total 21	

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous

Table A.3-4-11 LIST OF SERVICE CENTER (S.C.)/BUSINESS CENTER (B.C.)

Runde C.L. (1 of 1)

No.	Name	Grid Ref.	Kind	W. R. 1/		No.	Name	Grid Ref.			
1	Mabasa	SN 958696	SC	OK							
2	Matenda	SN 92 86	SC	B/H							
3	Musipani	RH 06 65	SC	B/H							
4	Mapanzure	RH 05 74	SC	B/H							
5	Nyama	RH 067685	BC	Mis							
6	Mbirashava	RH 107627	BC	B/H							
7	Pakati	SN 995837	BC	Mis							
8	Marira	SN 980784	BC	B/H							
9	Unknown	Unknown									
10	"	"									
	Total 10										

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous

Table A.3-4-12 LIST OF SERVICE CENTER (S.C.)/BUSINESS CENTER (B.C.)

Mazvihwa C.L. (1 of 1)

No.	Name	Grid Ref.	Kind	W. R. 1/		No.	Name	Grid Ref.			
1	Mutambe	TN 16 35	SC	B/H							
2	Murovwe	TN 27 28	SC	B/H							
3	Vugwe siding	TN 05 34	SC	B/H							
4	Gundekunde	TN 320260	BC	Mis							
5	Unknown	Unknown									
	Total 5										

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous

Table A.3-4-13 LIST OF SERVICE CENTER (S.C.)/BUSINESS CENTER (B.C.)

Mberengwa C.L. (1 of 1)

No.	Name	Grid Ref.	Kind	W. R. 1/		No.	Name	Grid Ref.	Kind	W.R.	
1	Mataka	TM 080925	SC	OK		21	Chaza	RH 108067	BC	Mis	
2	Bonda	TM 30 90	SC	B/H		22	Mangaba	QG 743929	BC	B/H	
3	Chegato	RG 05 92	SC	B/H		23	Keyara	QG 783855	BC	B/H	
4	Chindembeko	RH 01 06	SC	B/H		24	Kotokwe	QG 646765	BC	B/H	
5	Chirovandobo	TM 20 79	SC	B/H		25	Tembo	QH 901006	BC	Mis	
6	Danga	SM 91 96	SC	B/H		26	Masarira	RG 060937	BC	B/H	
7	Fumbany	QG 83 86	SC	B/H		27	Jeka	RG 051924	BC	B/H	
8	Makuva	SM 95 88	SC	B/H		28	Chingechuru	RG 016875	BC	Mis	
9	Masase	QG 78 79	SC	B/H		29	Mutsine	QG 980855	BC	Mis	
10	Masvingo	TN 24 11	SC	B/H		30	Chongwe	QG 918786	BC	Mis	
11	Mataruse	TN 30 16	SC	B/H		31	Unknown	Unknown			
12	Mavorovondo	QG 90 85	SC	B/H							
13	Mupanda Shango	TN 01 00	SC	B/H							
14	Mwembe	TN 01 16	SC	B/H							
15	Mwanezi	QH 81 03	SC	B/H							
16	Chamawanga	SN 899009	BC	Mis							
17	Mashazhu	TM 052876	BC	B/H							
18	Musume	TM 118846	BC	B/H							
19	Gwavamutangwi	TM 047825	BC	Mis							
20	Rumida	SM 919973	BC	Mis			Total 70				

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous

Table A.3-4-14 LIST OF SERVICE CENTER (S.C.)/BUSINESS CENTER (B.C.)

Chibi C.L. (1 of 1)

No.	Name	Grid Ref.	Kind	W. R. 1/		No.	Name	Grid Ref.	Kind	W.R.	
1	Chibi	TN 393523	SC	OK		21	Madzivadondo	TN 136656	BC	B/H	
2	Ngundu	TM 71 99	SC	B/H		22	Vuravi	TN 336607	BC	Mis	
3	Mandamabwe	TN 25 74	SC	B/H		23	Madhlangove	TN 392524	BC	B/H	
4	Berejena	TN 49 15	SC	B/H		24	Nyamakwe	TN 513487	BC	Mis	
5	Takavarasha	TN 19 49	SC	B/H		25	Chishawa	TN 440390	BC	Mis	
6	Razi	TN 55 08	SC	B/H		26	Gwitima	TN 515379	BC	Mis	
7	Sese	TN 58 33	SC	B/H		27	Taru	TN 320540	BC	Mis	
8	Chirogwe	TN 476309	BC	B/H		28	Davira	TN 319359	BC	Mis	
9	Sese	TN 572284	BC	Mis		29	Masunire	TN 256425	BC	Mis	
10	Chikofa	TN 443258	BC	B/H		30	Chigwikwi	TN 045725	BC	Mis	
11	Maringire	TN 609194	BC	Mis		31	Unknown	Unknown			
12	Nemavuzhe	TN 549189	BC	B/H							
13	Zivuku	TN 647137	BC	B/H							
14	Chomuruvati	TN 423114	BC	B/H							
15	Chasiyatende	TN 605038	BC	B/H							
16	Gororo	TN 818025	BC	Mis							
17	Madzivire	TM 731945	BC	Mis							
18	Lundi	TM 685888	BC	Riv							
19	Nadangombe	TN 200814	BC	Mis							
20	Chitowa	TN 182689	BC	B/H			Total 58				

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous

Table A.3-4-15 LIST OF SERVICE CENTER (S.C.)/BUSINESS CENTER (B.C.)

Matibi No.1 C.L. (1 of 1)

No.	Name	Grid Ref.	Kind	W. R. 1/		No.	Name	Grid Ref.	Kind	W.R.	
1	Neshuro	TM 551825	SC	OK		21	Unknown	Unknown			
2	Sarahuru	TM 45 77	SC	B/H		22	-				
3	Masvosva	TM 50 95	SC	B/H							
4	Chizumba	TM 47 60	SC	B/H							
5	Chimbudgi	TM 40 82	SC	B/H							
6	Negari	TM 520903	BC	B/H							
7	Mushava	TM 488675	BC	B/H							
8	Mwanezana	TM 440638	BC	B/H							
9	Galonya	TM 478604	BC	Mis							
10	Unknown	Unknown									
11	Shamba	TM 260713	BC	Riv							
12	Murove	TM 352709	BC	Mis							
13	Unknown	Unknown									
14											
15											
16											
17											
18											
19											
20							Total 22				

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous

Table A.3-4-16 LIST OF SERVICE CENTER (S.C.)/BUSINESS CENTER (B.C.)

Maranda C.L. (1 of 1)

No.	Name	Grid Ref.	Kind	W. R. 1/		No.	Name	Grid Ref.			
1	Maranda	TM 21 59	SC	B/H							
2	Chirindi	TM 07 62	SC	B/H							
3	Mazatese	TM 201698	BC	Mis							
4	Furidzi	TM 193655	BC	B/H							
5	Chipwe	TM 160631	BC	B/H							
6	Chehoma	TM 318625	BC	Mis							
7	Gondama	TM 390554	BC	Mis							
8	Marinda	TM 302533	BC	Mis							
9	Dinhe	TM 164507	BC	Mis							
10	Vinga	TM 113649	BC	B/H							
11	Marimuka	TM 038534	BC	B/H							
12	Rushumbe	SM 993589	BC	Mis							
13	Mhamande	SM 953562	BC	B/H							
14	Unknown	Unknown									
15											
16											
	Total 16										

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous

Table A.3-4-17 LIST OF SCHOOL (Sch)

Chilimanzi C.L. (1 of 1)

No.	Name	Grid Ref.	W. R. 1/		No.	Name	Grid Ref.	W.R
1	Mapiravana	TP 356451	B/H		21	Mazvinba	TP 556335	Riv
2	Mavaire	TP 510128	B/H		22	Gambiza	TP 496339	Mis
3	Rupepwe	TP 569129	Riv		23	Rutunga	TP 410305	Mis
4	Mhende	TP 390120	B/H		24	Nyamandi	TP 532306	Mis
5	Maware	TP 467112	B/H		25	Jwata	TP 481296	Mis
6	Chizvinire	TP 405070	Mis	New B/H	26	Nyautonge	TP 569265	Mis
7	Mashamba	TP 503063	Mis	New B/H	27	Maponda	TP 426248	Mis
8	Shase	TP 561055	Riv		28	Chapwanya	TP 500239	B/H
9	Chinyuni	TP 461049	Mis		29	Vudzi	TP 474215	Mis
10	St. Michael's	TP 324416	Mis		30	Govere	TP 560192	Mis
11	St. Ignatio	TP 366407	B/H		31	Chilimanzi	TP 416187	Mis
12	Nhomdoka	TP 363362	B/H		32	Mutya	TP 451163	Mis
13	St. Thomas	TP 327356	Mis		33	Debwe	TP 366246	B/H
14	Guramatunhu	TP 343276	Mis					
15	Chiwozho	TP 365195	Mis					
16	Chiwashe	TP 441413	Mis					
17	Makanya	TP 501402	Mis					
18	Chaka	TP 575398	B/H					
19	Muwani	TP 542370	B/H					
20	Muzoza	TP 397367	B/H			Total 33		

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous)

Table A.3-4-18 LIST OF SCHOOL (Sch)

Shurugwi C.L. (1 of 1)

No.	Name	Grid Ref.	W. R. 1/	No.	Name	Grid Ref.	W.R
1	Chirorise	TP 041355	B/H	21	New Gato	TN 160914	Mis
2	St. Michael's	TP 081345	Mis	22	Chikato	TP 165061	B/H
3	Donbwe	TP 029319	Mis	23	Musasa	TP 165050	B/H
4	St. Peter's	TP 105242	B/H	24	Unknown	Unknown	
5	Tumba	TP 092193	Mis	25	Unknown	Unknown	
6	St. Boniface	TP 061145	Mis	26	- do -	- do -	
7	St. Jhon's	TP 123363	Mis				
8	Wida	SP 993138	Mis				
9	Vungwe	TP 000106	B/H				
10	Makandire	TP 074090	Mis				
11	Mhangami	SP 963072	Mis				
12	Mazivisa	TP 109076	Mis				
13	Makotore	TP 045065	Mis				
14	Ndaora	SP 991039	Mis				
15	Shamba	TP 103031	B/H				
16	Guangura	SP 939006	Mis				
17	Rusike	TN 001981	Mis				
18	Chekenyu	TN 046989	Mis				
19	Makonde	SN 965967	B/H				
20	Banga	TN 053945	Mis		Total 26		

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous)

Table A.3-4-19 LIST OF SCHOOL (Sch)

Runde C.L. (1 of 1)

No.	Name	Grid Ref.	W. 1/ R.	No.	Name	Grid Ref.	W.R
1	Enxa	RH 109579	B/H	21	Marovanidze	SN 985657	Riv
2	Zvezona	RH 100531	B/H	22	Wereze	SN 967617	B/H
3	Runde	RH 130841	Riv	23	St. Faiths	SN 972586	Mis
4	Chinami	RH 071785	Mis	24	Hanawa	SN 964883	B/H
5	Ruvanda	RH 072745	Mis	25	Mueshe	SN 884910	Mis
6	Fizho	RH 120731	Mis	26	Dukutu	SN 880889	Mis
7	Chivanga	RH 042702	Mis	27	Unknown	Unknown	
8	Sharawande	RH 095690	Mis				
9	Illupo	RH 033671	Mis				
10	Musipari	RH 059641	Mis				
11	Rusvinge	RH 016637	Mis				
12	Mbirashava	RH 120608	B/H				
13	Siboza	SN 874575	B/H				
14	Tomchibi	SN 996826	B/H				
15	Chamhini	SN 889779	Riv				
16	Shiku	SN 976778	B/H				
17	Danga	TN 020737	Mis				
18	Benge	SN 963739	B/H				
19	Danga	TN 002721	B/H				
20	Rernhofu	SN 915714	B/H		Total 27		

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous)

Table A.3-4-20 LIST OF SCHOOL (Sch)

Mazvihwa C.L. (1 of 1)

No.	Name	Grid Ref.	W. 1/ R.		No.	Name	Grid Ref.	W.R	
1	Murowa	TN 274286	Mis						
2	Matoti	TN 176436	Mis						
3	Gudo	TN 109464	B/H						
4	St. Edwards	TN 069415	Mis						
5	Gwehgombe	TN 129386	B/H						
6	Gwamadluve	TN 045370	B/H						

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous)

Table A.3-4-21 LIST OF SCHOOL (Sch)

Mberengwa C.L. (1 of 2)

No.	Name	Grid Ref.	W. 1/ R.		No.	Name	Grid Ref.	W.R	
1	Gwehanga	TN 063028	B/H		21	Chingezi Sec.	QH 933083	Mis	
2	Mudzidzi	TN 105025	B/H		22	Shamagange	QG 808973	Mis	
3	Mupandaschamgo	TN 012000	Mis		23	Chiedza	QG 777897	Mis	
4	Chavora	TM 093977	Mis		24	Mushiningira	QG 795838	B/H	
5	Zishava	TM 065927	Mis		25	Vuguwi	QG 695821	B/H	
6	Chamakudo	TM 126923	Mis		26	Mvumbura	QG 856818	Mis	
7	Makwava	TM 008877	B/H		27	Matabo	QG 662784	Mis	
8	Gwavamutangwi	TM 055832	Mis		28	Jarobani	QG 825773	B/H	
9	Svibu	TM 006789	B/H		29	Cheshanga	QH 933026	Mis	
10	Makawerere	TM 124771	B/H		30	Zverenge	QG 870989	Mis	
11	Vumukwane	SM 978947	Mis		31	Garuro	RG 051976	Mis	
12	Makereni	SM 914935	B/H		32	Ruvuzhe	RG 117964	Mis	
13	Makuva	SM 943878	B/H		33	Marozva	QG 866922	Mis	
14	Chavaroyi	SM 947812	B/H		34	Ruvabvu	RG 023919	Mis	
15	Pumushana	RH 069092	Mis		35	Chavengwa	QG 949907	Mis	
16	Chaza	RH 107049	Mis		36	Magavakava	RG 111905	Mis	
17	Mabika	RH 023050	Mis		37	Nyororo	QG 864885	Mis	
18	Bvute	QH 927119	B/H		38	Chingechuru	RG 021872	Mis	
19	Rupange	QH 967089	Mis		39	Mavorondo	QG 927850	Mis	
20	Chingezi	QH 904078	Mis		40	Machingwe	RG 113850	Riv	

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous)

Table A.3-4-22 LIST OF SCHOOL (Sch)

Mberengwa C.L. (2 of 2)

No.	Name	Grid Ref.	W. 1/ R.		No.	Name	Grid Ref.	W.R	
41	Mutsine	QG 975844	Mis		61	Mahonbe	TN 270142	B/H	
42	Gaha	QG 927797	Mis		62	Supwi	TN 316132	B/H	
43	Mawani	SN 926089	Mis		63	Masvingo	TN 242108	B/H	
44	Rengwe	TN 012079	Mis		64	Runde	TN 358110	Riv	
45	Mapunya	TN 102073	Mis		65	Chipinda	TN 154096	Mis	
46	Chomunyaka	TN 067065	Mis		66	Muponjani	TN 292068	Mis	
47	Rusinge	SN 937032	Mis		67	Nenga	TN 344050	Mis.	
48	Ngungubane	TM 295999	Mis		68	Gomututu	TN 165038	B/H	
49	Jena	TM 244982	Mis		69	Chiwara	TN 239037	Mis	
50	Matedzi	TM 176972	B/H		70	Chivumba	TN 086253	Riv	
51	Bonda	TM 327921	B/H		71	Svita	TN 152218	Mis	
52	Remati	TM 259917	Mis		72	Murongwe	TN 109194	Mis	
53	Garirenyama	TM 211880	B/H		73	Mbirashava	TN 083175	Mis	
54	Chengwe	TM 287855	Mis		74	Mwembe	TN 014152	Mis	
55	Manyene	TM 231823	B/H		75	Chembwire	TN 115135	Mis	
56	Manyanga	TM 318783	B/H		76	Unknown	Unknown		
57	Ngezi	TN 210222	B/H						
58	Mahindi	TN 303206	Riv						
59	Murongwe	TN 142200	B/H						
60	Buhwa	TN 225168	Mis			Total 69			

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous)

Table A.3-4-23 LIST OF SCHOOL (Sch)

Chibi C.L. (1 of 2)

No.	Name	Grid Ref.	W. R. 1/		No.	Name	Grid Ref.	W.R	
1	Zifunzi	TN 711093	B/H		21	Gororo	TN 819021	Mis	
2	Zunga	TN 754052	Mis		22	Dare	TM 780987	Mis	
3	Chirogwe	TN 468302	B/H		23	Madzivire	TM 701975	B/H	
4	Chikore	TN 543296	Mis		24	Sadzamgwena	TM 803941	Mis	
5	Makamure	TN 497262	Mis		25	Shindi	TM 756920	Mis	
6	Mandiva	TN 587240	B/H		26	Old Gato	TN 128855	Mis	
7	Rungai	TN 542233	Mis		27	Mukotosi	TN 166841	B/H	
8	Chikofa	TN 451217	Mis		28	Befure	TN 222840	Mis	
9	Maringire	TN 611190	Mis		29	Bwanya	TN 282833	Riv	
10	Nemavuzhe	TN 540176	B/H		30	Madangombe	TN 193785	Mis	
11	Mupagamuri	TN 407167	B/H		31	Bvute	TN 142774	B/H	
12	Mawadzi	TN 438136	B/H		32	Masunda	TN 277778	B/H	
13	Magwari	TN 619124	B/H		33	Sukwe	TN 180737	Mis	
14	St. May	TN 530128	B/H		34	Denga	TN 294704	Mis	
15	Makovere	TN 553081	Mis		35	Mudadisi	TN 135690	Mis	
16	Musvovi	TN 476083	Mis		36	Maramda	TN 223684	B/H	
17	Chomuruvati	TN 438050	Riv		37	Jenya	TN 266687	Mis	
18	Chasiyatende	TN 598032	B/H		38	Gondo	TN 345678	Riv	
19	Mutote	TM 643962	Mis		39	Makovere	TN 306660	Mis	
20	Runesu	TM 634899	Mis		40	Vuravi	TN 355617	Mis	

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous)

Table A.3-4-24 LIST OF SCHOOL (Sch)

Chibi C.L. (2 of 2)

No.	Name	Grid Ref.	W. R. 1/		No.	Name	Grid Ref.	W.R	
41	Nievedzanai	TN 408606	Mis		61	Chisenga	TN 264508	B/H	
42	Jochoni	TN 458605	B/H		62	Takawarasha	TN 187494	B/H	
43	Mazorodze	TN 432533	B/H		63	Mapuvire	TN 344497	B/H	
44	Muvundusi	TN 481539	B/H		64	Mapaike	TN 383464	Mis	
45	Donbo	TN 466498	Mis		65	Chiware	TN 231445	B/H	
46	Chasiya	TN 543485	Mis		66	Madya	TN 338444	Mis	
47	Mhatiwa	TN 493475	Mis		67	Bara	TN 302386	Mis	
48	Dewe	TN 424435	Mis		68	Davira	TN 356319	Mis	
49	Masunda	TN 536432	Mis		69	Shunba	TN 089835	Mis	
50	St. Simon's	TN 577402	B/H		70	Badza	TN 067802	Mis	
51	Gwitima	TN 535377	B/H		71	Bvute	TN 112772	Mis	
52	Dzimati	TN 412360	Mis		72	Chigwikwi	TN 062716	B/H	
53	Jaka	TN 571361	B/H		73	Gomo	TN 040670	B/H	
54	Muzorwi	TN 480358	Mis		74	Unknown	Unknown		
55	Zihwa	TN 385301	B/H						
56	Chidyamakono	TN 197584	Mis						
57	Chigapa	TN 294587	Mis						
58	Mangwana	TN 354579	B/H						
59	Bella	TN 249578	Mis						
60	Cheteni	TN 152552	Mis			Total 77			

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous)

Table A.3-4-25 LIST OF SCHOOL (Sch)

Matibi No.1 C.L. (1 of 1)

No.	Name	Grid Ref.	W. R. 1/		No.	Name	Grid Ref.	W.R	
1	Shazhanme	TN 464939	B/H		21	Unknown	Unknown		
2	Rata	TN 538902	B/H		22				
3	Matanda	TN 596883	Riv		23				
4	Makawie	TN 436837	B/H		24				
5	Masogwe	TN 590831	Mis						
6	Chingumi	TN 525824	B/H						
7	Chitanga	TM 685858	Mis						
8	New Pambe	TM 400894	Mis						
9	Sarahuru	TM 477745	B/H						
10	Gwamatenga	TM 419714	B/H						
11	Mushava	TM 491679	B/H						
12	Mwanezana	TM 434633	B/H						
13	Galonya	TM 502556	B/H						
14	Mabara	TM 356726	B/H						
15	Unknown	Unknown							
16									
17									
18									
19									
20						Total 24			

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous)

Table A.3-4-26 LIST OF SCHOOL (Sch)

Maranda C.L. (1 of 1)

No.	Name	Grid Ref.	W. 1/ R.	No.	Name	Grid Ref.	W.R
1	Mazatese	TM 201701	Riv	21	Unknown	Unknown	
2	Munyamany	TM 252709	Riv				
3	Rafi	TM 197644	B/H				
4	Dengenya	TM 299605	B/H				
5	Bangwe	TM 185560	Mis				
6	Marinda	TM 300520	Mis				
7	Vinga	TM 111656	B/H				
8	Rasha	TM 056622	B/H				
9	Mangwerune	TM 039548	B/H				
10	Rushumbe	SM 991589	Mis				
11	Mhike	SM 995583	Mis				
12	Mlelezi	SM 945492	Mis				
13	Unknown	Unknown					
14							
15							
16							
17							
18							
19							
20					Total 32		

Note; 1/ W.R.; Water Resource (B/H = Borehole Riv = Main River Mis = Misceraneous)

APPENDIX IV THE PROJECT

APPENDIX IV THE PROJECT

Table A.4-2-1 Construction Costs for Alternatives

(Unit : Million $)

Description	Unit Cost	1984	1985	1986	1987	1988	Sub-total	1989	1990	1991	1992	1993	Sub-total	1994	1995	1996	1997	1998	Sub-total	1999	2000	2001	2002	2003	Sub-total	Total
20 Years																										
1. No. of Boreholes	1	192	192	193	192	192	961	192	192	193	192	192	961	192	192	193	192	192	961	192	192	193	192	192	961	3,844
2. Costs of Boreholes	4.7×10^3	0.90	0.90	0.91	0.90	0.90	4.52	0.90	-	-	-	-	4.52	0.90	0.90	0.91	0.90	0.90	4.52	0.90	0.90	0.91	0.90	0.90	4.52	18.07
3. No. of Drilling Rigs	1	3	-	-	-	-	3	3	-	-	-	-	3	3	-	-	-	-	3	3	-	-	-	-	3	12
4. Costs of Drilling Rigs	448×10^3	1.34	-	-	-	-	1.34	1.34	-	-	-	-	1.34	1.34	-	-	-	-	1.34	1.34	-	-	-	-	1.34	5.38
5. No. of Required Maintenance	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6. Maintenance Costs	75×10^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Construction Costs	-	2.24	0.90	0.91	0.90	0.90	5.86	2.24	0.90	0.91	0.90	0.90	5.85	2.24	0.90	0.91	0.90	0.90	5.86	2.24	0.90	0.91	0.90	0.90	5.86	23.45
8. Escalated Costs	-	2.26	1.21	1.42	1.63	1.89	8.75	5.44	2.54	2.98	3.42	3.97	18.35	11.45	5.34	6.26	7.18	8.33	38.56	24.06	11.21	13.16	15.09	17.51	81.03	146.69
							0.0091						0.0191						0.0401						0.0845	0.0382
15 Years																										
1. No. of Boreholes	1	211	211	210	211	211	1,054	211	211	210	211	211	1,054	211	211	210	211	211	1,054	127	131	137	140	147	682	3,844
2. Costs of Boreholes	4.7×10^3	0.99	0.99	0.99	0.99	0.99	4.95	0.99	0.99	0.99	0.99	0.99	4.95	0.99	0.99	0.99	0.99	0.99	4.95	0.60	0.62	0.64	0.66	0.69	3.21	18.07
3. No. of Drilling Rigs	1	3	-	-	-	-	3	3	-	-	-	-	3	3	-	-	-	-	3	2	-	-	-	-	2	12
4. Costs of Drilling Rigs	448×10^3	1.34	-	-	-	0.45	1.79	1.34	-	-	-	-	1.34	1.34	-	-	-	-	1.34	0.90	-	-	-	-	0.90	5.38
5. No. of Required Maintenance	1	-	-	-	-	-	-	1	1	1	1	-	4	-	1	1	1	1	4	-	-	-	-	-	-	8
6. Maintenance Costs	7.5×10^3	-	-	-	-	-	-	0.08	0.08	0.08	0.08	-	0.30	-	-	-	-	-	0.30	-	-	-	-	-	-	0.60
7. Construction Costs	-	2.33	0.99	0.99	0.99	1.44	6.74	2.41	1.07	1.07	1.07	0.99	6.59	2.33	1.07	1.07	1.07	1.07	6.59	1.50	0.62	0.64	0.66	0.69	4.11	24.05
8. Escalated Costs	-	2.70	1.33	1.54	1.79	3.02	10.38	5.86	3.02	3.50	4.07	4.37	20.82	11.91	6.35	7.36	8.54	9.91	44.07	16.11	7.73	9.25	11.07	13.43	57.59	132.86
							0.0098						0.0198						0.0418						0.0844	0.0346
10 Years																										
1. No. of Boreholes	1	259	259	259	259	259	1,295	259	259	259	259	259	1,295	106	110	115	118	123	572	127	131	137	140	147	682	3,844
2. Costs of Boreholes	4.7×10^3	1.22	1.22	1.22	1.22	1.22	6.09	1.22	1.22	1.22	1.22	1.22	6.09	0.50	0.52	0.54	0.55	0.58	2.69	0.60	0.62	0.64	0.66	0.69	3.21	18.07
3. No. of Drilling Rigs	1	4	-	-	-	-	4	4	-	-	-	-	4	1	1	-	-	-	2	2	-	-	-	-	2	12
4. Costs of Drilling Rigs	448×10^3	1.79	-	-	-	-	1.79	1.79	-	-	-	-	1.79	0.45	0.45	-	-	-	0.90	0.90	-	-	-	-	0.90	5.38
5. No. of Required Maintenance	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6. Maintenance Costs	7.5×10^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Construction Costs	-	3.01	1.22	1.22	1.22	1.22	7.88	3.01	1.22	1.22	1.22	1.22	7.88	0.95	0.97	0.54	0.55	0.58	3.59	1.50	0.62	0.64	0.66	0.69	4.11	23.45
8. Escalated Costs	-	3.49	1.63	1.90	2.21	2.56	11.79	7.31	3.44	3.99	4.64	5.38	24.76	4.85	5.75	3.72	4.39	5.37	24.08	16.11	7.73	9.25	11.07	13.43	57.59	118.22
							0.0091						0.0191						0.0421						0.0844	0.0308
7 Years																										
1. No. of Boreholes	1	327	328	327	328	327	1,637	328	327	96	99	103	953	106	110	115	118	123	572	127	131	137	140	147	682	3,844
2. Costs of Boreholes	4.7×10^3	1.54	1.54	1.54	1.54	1.54	7.69	1.54	1.54	0.45	0.47	0.48	4.48	0.50	0.52	0.54	0.55	0.58	2.69	0.60	0.62	0.64	0.66	0.69	3.21	18.07
3. No. of Drilling Rigs	1	5	-	-	-	-	5	5	-	-	-	-	5	-	-	-	-	-	-	2	-	-	-	-	2	12
4. Costs of Drilling Rigs	448×10^3	2.24	-	-	-	-	2.24	2.24	-	-	-	-	2.24	-	-	-	-	-	-	0.90	-	-	-	-	0.90	5.38
5. No. of Required Maintenance	1	-	-	-	-	-	-	-	-	3	3	4	10	2	2	1	1	1	7	-	-	-	-	-	-	17
6. Maintenance Costs	7.5×10^3	-	-	-	-	-	-	-	-	0.23	0.23	0.30	0.75	0.15	0.15	0.08	0.08	0.08	0.53	-	-	-	-	-	-	1.28
7. Construction Costs	-	3.78	1.54	1.54	1.54	1.54	9.93	3.78	1.54	0.68	0.70	0.78	7.47	0.65	0.67	0.62	0.63	0.66	3.22	1.50	0.62	0.64	0.66	0.69	4.11	24.73
8. Escalated Costs	-	4.38	2.06	2.40	2.79	3.23	14.86	9.19	4.34	2.22	2.66	3.44	21.85	3.32	3.97	4.27	5.03	6.11	22.70	16.11	7.73	9.25	11.07	13.43	57.59	117.00
							0.0091						0.0229						0.0397							0.0304
5 Years																										
1. No. of Boreholes	1	422	422	422	422	422	2,110	90	93	95	99	103	480	106	110	115	118	123	572	127	131	137	140	147	682	3,844
2. Costs of Boreholes	4.7×10^3	1.98	1.98	1.98	1.98	1.98	9.92	0.42	0.44	0.45	0.47	0.48	2.26	0.50	0.52	0.54	0.55	0.58	2.69	0.60	0.62	0.64	0.66	0.69	3.21	18.07
3. No. of Drilling Rigs	1	6	-	-	1	-	7	1	-	-	-	-	1	1	1	-	-	-	2	2	-	-	-	-	2	12
4. Costs of Drilling Rigs	448×10^3	2.69	-	-	0.45	-	3.14	0.45	-	-	-	-	0.45	0.45	0.45	-	-	-	0.90	0.90	-	-	-	-	0.90	5.38
5. No. of Machinery Maintenance	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6. Maintenance Costs	75×10^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7. Construction Costs	-	4.67	1.98	1.98	2.43	1.98	13.06	0.87	0.44	0.45	0.47	0.48	2.71	0.95	0.97	0.54	0.55	0.58	3.59	1.50	0.62	0.64	0.66	0.69	4.11	23.45
8. Escalated Costs	-	5.42	2.65	3.09	4.40	4.16	19.72	2.11	1.24	1.47	1.79	2.12	8.73	4.85	5.75	3.72	4.39	5.37	24.08	16.11	7.73	9.25	11.07	13.43	57.59	110.12
							0.0093						0.0182						0.0421						0.0844	0.0286
3 Years																										
1. No. of Boreholes	1	647	647	647	83	86	2,110	90	93	95	99	103	480	106	110	115	118	123	572	127	131	137	140	147	682	3,844
2. Costs of Boreholes	4.7×10^3	3.04	3.04	3.04	0.39	0.40	9.92	0.42	0.44	0.45	0.47	0.48	2.26	0.50	0.52	0.54	0.55	0.58	2.69	0.60	0.62	0.64	0.66	0.69	3.21	18.07
3. No. of Drilling Rigs	1	10	-	-	-	-	10	-	-	-	-	-	-	-	-	-	1	-	1	2	-	-	-	-	2	13
4. Costs of Drilling Rigs	448×10^3	4.48	-	-	-	-	4.48	-	-	-	-	-	-	-	-	-	0.45	-	0.45	0.90	-	-	-	-	0.90	5.82
5. No. of Machinery Maintenance	1	-	-	-	8	8	16	6	6	5	4	4	25	3	3	1	-	-	7	-	-	-	-	-	-	48
6. Maintenance Costs	75×10^3	-	-	-	0.60	0.60	1.20	0.60	0.60	0.38	0.30	0.30	1.88	0.23	0.23	0.08	-	-	0.53	-	-	-	-	-	-	3.60
7. Construction Costs	-	7.52	3.04	3.04	0.99	1.00	15.60	1.02	1.04	0.83	0.77	0.78	4.14	0.73	0.75	0.62	1.00	0.58	3.67	1.50	0.62	0.64	0.66	0.69	4.11	27.49
8. Escalated Costs	-	8.72	4.07	4.74	1.79	2.10	21.42	2.48	2.93	2.71	2.93	3.44	14.49	3.73	4.45	4.27	7.98	5.37	25.80	16.11	7.73	9.25	11.07	13.43	57.59	119.30
							0.0100						0.0302						0.0451						0.0844	0.0310
Escalate Ratio	0.16	1.16	1.34	1.56	1.81	2.10		2.43	2.82	3.27	3.80	4.41		5.11	5.93	6.88	7.98	9.26		10.74	12.46	14.46	16.77	19.46		

Table A.4-4-2-1 Project Cost (1)

(Unit: Z$ '000)

Description	Project Cost 9.5 Years B/II No.2590			I Stage 3.5 Years B/II No.1036			II Stage 3 Years B/II No.777			III Stage 3 Years B/H No.777		
	Total	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency
I Civil Work												
(1) Drilling	2,941	1,931	1,010	1,177	773	404	882	579	303	882	579	303
(2) Casing, Screen Pump & Others	7,138	1,278	5,860	2,854	510	2,344	2,142	384	1,758	2,142	384	1,758
(3) Miscellaneous	5,030	609	2,421	1,212	243	969	909	183	726	909	183	726
Sub-total	13,109	3,818	9,291	5,243	1,526	3,717	3,933	1,146	2,787	3,933	1,146	2,787
II Procurement of Equipment												
Drilling Rig	2,786	2,508	278	1,393	1,254	139	1,393	1,254	139	-	-	-
Sub-total (I + II)	15,895	6,326	9,569	6,636	2,780	3,856	5,326	2,400	2,926	3,933	1,146	2,787
III Operation & Maintenance	1,069	86	983	126	10	116	363	30	333	580	46	534
IV Administrative Expenditure	762	-	762	307	-	307	233	-	233	222	-	222
V Consulting Fee	2,497	1,778	719	1,019	724	295	759	542	217	719	512	207
Sub-total (I to V)	20,223	8,190	12,033	8,088	3,514	4,574	6,681	2,972	3,709	5,454	1,704	3,750
VI Contingency	2,025	821	1,204	810	352	458	669	298	371	546	171	375
Sub-total (I to VI)	22,248	9,011	13,237	8,898	3,866	5,032	7,350	3,270	4,080	6,000	1,875	4,125
VII Price Escalation	30,831	10,850	19,981	3,635	1,169	2,466	10,279	4,421	5,858	16,917	5,260	11,657
Grand Total	53,079	19,861	33,218	12,533	5,035	7,498	17,629	7,691	9,938	22,917	7,135	15,782

Table A.4-4-2-2 Project Cost (2)

(Unit: ZS '000)

Description	Project Cost			I-Stage											II-Stage									III-Stage								
				1983/84		1984/85 (B/H No.155)		1985/86 (B/H No.293)		1986/87 (B/H No.294)		1987/88 (B/H No.294)		Total				1988/89 (B/H No.259)		1989/90 (B/H No. 259)		1990/91 (B/H No.259)		Total			1991/92 (B/H No.259)		1992/93 (B/H No.259)		1993/94 (B/H No.259)		Total		
	Total	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Total	Foreign	Local		Foreign	Local	Foreign	Local	Foreign	Local	Total	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Total	Foreign	Local
I Civil Works																																		
(1) Drilling	2,941	1,931	1,010	-	-	116	60	219	114	219	115	219	115	1,177	773	404		193	101	193	101	193	101	882	579	303		193	101	193	101	193	101	882	579	303
(2) Cashing, Screen Pump & Others	7,138	1,278	5,860	-	-	76	351	144	663	145	665	145	665	2,854	510	2,344		128	586	128	586	128	586	2,142	384	1,758		128	586	128	586	128	586	2,142	384	1,758
(3) Miscellaneous	3,030	609	2,421	-	-	36	145	69	274	69	275	69	275	1,212	243	969		61	242	61	242	242	242	909	183	726		61	242	61	242	61	242	909	183	726
Sub-total	13,109	3,818	9,291	-	-	228	556	432	1,051	433	1,055	433	1,055	5,243	1,526	3,717		382	929	382	929	382	929	3,933	1,146	2,787		382	929	382	929	382	929	3,933	1,146	2,787
II Procurement of Equipment																																		
Drilling Rig	2,786	2,508	278	1,254	139	-	-	-	-	-	-	-	-	1,393	1,254	139		1,254	139	-	-	-	-	1,393	1,254	139		-	-	-	-	-	-	-	-	-
Sub-total(I + II)	15,895	6,326	9,569	1,254	139	228	556	432	1,051	433	1,055	433	1,055	6,636	2,780	3,856		1,636	1,068	382	929	382	929	5,326	2,400	2,926		382	929	382	929	382	929	3,933	1,146	2,787
III Operation & Maintenance	1,069	86	983	-	-	-	-	1	13	3	39	6	64	126	10	116		8	89	10	111	12	133	363	30	333		14	156	15	178	17	200	580	46	534
IV Administrative Expenditure	762	-	762	-	11	-	44	-	84	-	84	-	84	307	-	307		-	85	-	74	-	74	233	-	233		-	74	-	74	-	74	222	-	222
V Consulting Fee	2,497	1,778	719	89	17	168	66	175	87	175	76	117	49	1,019	724	295		233	93	177	76	132	48	759	542	217		214	81	152	92	146	34	719	512	207
Sub-total (I to V)	20,223	8,190	12,033	1,343	167	396	666	608	1,235	611	1,254	556	1,252	8,088	3,514	4,574		1,877	1,335	569	1,190	526	1,184	6,681	2,972	3,709		610	1,240	549	1,273	545	1,237	5,454	1,704	3,750
VI Contingency	2,025	821	1,204	134	17	40	67	61	124	61	125	56	125	810	352	458		188	134	57	119	53	118	669	298	371		61	124	55	127	55	124	546	171	375
Sub-total (I to VI)	22,248	9,011	13,237	1,477	184	436	733	669	1,359	672	1,379	612	1,377	8,898	3,866	5,032		2,065	1,469	626	1,309	579	1,302	7,350	3,270	4,080		671	1,364	604	1,400	600	1,361	6,000	1,875	4,125
VII Price Escalation	30,831	10,850	19,981	0	0	70	117	227	462	376	772	496	1,115	3,635	1,169	2,466		2,272	1,616	895	1,877	1,054	2,370	10,279	4,421	5,858		1,523	3,096	1,691	3,920	2,046	4,641	16,917	5,260	11,657
Grand Total	53,079	19,861	33,218	1,477	184	506	850	896	1,821	1,048	2,151	1,108	2,492	12,533	5,035	7,498		4,337	3,085	1,521	3,181	1,633	3,672	17,629	7,691	9,938		2,194	4,460	2,295	5,320	2,646	6,002	22,917	7,135	15,782

Table A.4-4-2-3 Construction Cost per Borehole

Unit: Z$

Description	Unit Cost
1. Drilling	1,136
2. Logging	120
3. Casing & Screen	953
4. Pump Test	307
5. Installation of Pump	837
6. Delivery of Drilling & Water Samplings	40
7. Erection, Dismantle Removal & Others	500
8. Miscellaneous	1,170
Sub-total	5,063
9. Drilling Rig (One Unit)	348,250
10. Quantity	No. of B/H 2590, No. of Rigs 8
11. Construction Cost	5,063 x 2590 + 348,250 x 8 = 15,899,170 ≒ 15,900,000 Z$
12. Construction Cost of One Borehole	= 15,900,000 ÷ 2590 = 6,139 ≒ 6,100 Z$

Note : 1. Minor difference may be occurred.
Any minor discrepancies between totals and sums of components are due to rounding up.

2. For back data see Table A.4-4-2-4 & 5.

Table A.4-4-2-4 Break Down of Unit Cost of Borehole (1)

Description	Unit Cost	Foreign Currency %	Foreign Currency Z$	Local Currency %	Local Currency Z$
I Drilling					
1-1 Personal Expenses	307	0	0	100	307
1-2 Consumptional Material	478	90	430	10	48
1-3 Fuel Lubricate	351	90	316	10	35
Total	1,136		746		390
II Cashing, Pump & Others					
(1) Logging					
1-1 Personal Expenses	84	-	-	100	84
1-2 Consumptional Material	28	20	6	80	22
1-3 Depreciation	8	20	2	80	6
Sub-total	120		8		112
(2) Casing					
2-1 Personal Expenses	137	-	-	100	137
2-2 Material	785	17	134	83	651
2-3 Depreciation	31	20	6	80	25
Sub-total	953		140		813
(3) Pumping Test					
3-1 Personal Expenses	106	-	-	100	106
3-2 Consumption Material	15	20	3	80	12
3-3 Fuel Lubricate	50	90	45	10	5
3-4 Depreciation	136	90	122	10	14
Sub-total	307		170		137
(4) Installation of Pump					
4-1 Personal Expenses	55	-	-	100	55
4-2 Material	782	20	156	80	626
Sub-total	837		156		681
(5) Delivery of Drilling Sample & Water Samples	40	10	4	90	36
(6) Erection Dismantle Removal & Others					
6-1 Personal Expenses	420	0	-	100	420
6-2 Consumptional Material	80	20	16	80	64
Sub-total	500		16		484
Total	2,757		494		2,263

Table A.4-4-2-4 Break Down of Unit Cost of Borehole (2)

(Unit: Z$)

Description	Type 1	Type 2	Type 3	Average	Over-head (22%)	Wasted (10%)	Total (Unit Cost)
° Depth of Borehole	45 m	45 m	45 m	45 m			
° Depth of Casing	16.0 m						
° Depth of Sloted Casing	-						
° Drilling Time (hr.)	8.62	8.39	8.39	8.44			
° Ratio of No. (%)	20%	60%	20%				
1. Drilling Cost							
1-1 Personal Expense	233.35	227.12	227.12	228	50	28	307
1-2 Consumptional Material	359.63	355.87	355.87	357	78	43	478
1-3 Fuel Lubricate	268.65	259.67	259.67	261	58	32	351
2. Logging							
2-1 Personal Expense	62.31	62.31	62.31	62	14	8	84
2-2 Consumptional Material	20.60	20.60	20.60	21	5	3	28
2-3 Depreciation	6.00	6.00	6.00	6	1	1	8
3. Casing							
3-1 Personal Expense	60.69	89.04	182.11	102	22	13	137
3-2 Material	337.78	498.04	1093.10	585	127	73	785
3-3 Depreciation	13.69	20.08	41.07	23	5	3	31
4. Pumping Test							
4-1 Personal Expense	78.77	78.77	78.77	79	17	10	106
4-2 Consumptional Material	11.00	11.00	11.00	11	2	1	15
4-3 Fuel Lubricate	37.62	37.62	37.62	38	7	5	50
4-4 Depreciation	101.10	101.10	101.10	101	22	13	136
5. Installation of Pump							
5-1 Personal Expense	45.00	45.00	45.00	45	10	-	55
5-2 Material	641.00	641.00	641.00	641	141	-	782
6. Delivery of Sample	30.00	30.00	30.00	30	6		40
7. Erection, Dismantle Removal & Others							
7-1 Personal Expense	313.00	313.00	313.00	313	69	38	420
7-2 Consumptional Material	60.00	60.00	60.00	60	13	7	80

Table A.4-4-2-5 Break Down of Unit Cost of Miscellaneous (1)

Description	Cost (Z$)	Foreign Currency %	Foreign Currency Z$	Local Currency %	Local Currency Z$
1. Concrete Work					
Personal Expense	161	-	-	100	161
Materials	217	36	78	64	139
Fuel	4	90	3	10	1
Depreciation	2	20	0	80	2
Sub-total	384		81		303
2. Reinforcing Bar					
Personal Expense	13	-	-	100	13
Materials	9	20	2	80	7
Sub-total	22		2		20
3. Concrete Block					
Personal Expense	82	-	-	100	82
Materials	327	35	114	65	213
Sub-total	409		114		295
4. Fence Work					
Personal Expense	75	-	-	100	75
Materials	138	20	28	80	110
Sub-total	213		28		185
5. Mortar Work					
Personal Expense	0.3	-	-	100	0.3
Materials	0.7	35	0.2	65	0.5
Sub-total	1		0		1
6. Form Work					
Personal Expense	101	-	-	100	101
Materials	40	20	8	80	32
Sub-total	141		8		133
Total	1,170		233		937

Table A.4-4-2-5 Break Down of Unit Cost of Miscellaneous (2)

Description	Q'ty	Rate	Cost	Overhead	Total
1. Concrete Work	6.55			22%	
Personal Expense		20.19	132.24	29.09	161
Materials		27.16	177.90	39.14	217
Fuel		0.47	3.08	0.68	4
Depreciation		0.28	1.84	0.40	2
Sub-total					384
2. Reinforcing Bar	0.17				
Personal Expense		63.52	10.80	2.38	13
Materials		41.66	7.08	1.56	9
Sub-total					22
3. Concrete Block	32.76				
Personal Expense		2.06	67.49	14.85	82
Materials		8.17	267.64	58.88	327
Sub-total					409
4. Fence Work	43.00				
Personal Expense		1.43	61.49	13.53	75
Materials		2.64	113.52	24.97	138
Sub-total					213
5. Mortar Work	0.02				
Personal Expense		13.05	0.26	0.06	0.3
Materials		29.74	0.60	0.13	0.7
Sub-total					1.0
6. Form Work	19.30				
Personal Expense		4.28	82.65	18.18	101
Materials		1.68	32.43	7.13	40
Sub-total					141
Total					1,170

Table A.4-4-2-6 Operating Time of Drilling Rig

Type 1

Drilling Diameter (mm)	Depth of Drill (m)	Speed of Drill (m/h)	Operating Time	
φ270	2.0	9.0	0.22	
φ219	13.5	6.0	2.25	
φ150	29.5	4.8	6.15	8.62 hours

Type 2

Drilling Diameter (mm)	Depth of Drill (m)	Speed of Drill (m/h)	Operating Time	
φ270	2.0	9.0	0.22	
φ219	19.0	6.0	3.17	
φ150	24.0	4.8	5.00	8.39 hours

Type 3

Drilling Diameter (mm)	Depth of Drill (m)	Speed of Drill (m/h)	Operating Time	
φ270	2.0	9.0	0.22	
φ219	19.0	6.0	3.17	
φ150	24.0	4.8	5.00	8.39 hours

Speed of Drill	
Strongly Weathered Rock	9.0 m/hours
Soft Rock	6.0 m/hours
Hard Rock	4.8 m/hours

Table A.4-4-2-7 Computation of Consumptional Material for Drilling Rig

Item	Cost of Material	Ratio of Consumption	Type 1 Depth of Drill	Type 1 Quantity of Consumption	Type 1 Rate of Consumption (Z$)	Type 2 Depth of Drill	Type 2 Quantity of Consumption	Type 2 Rate of Consumption (Z$)	Type 3 Depth of Drill	Type 3 Quantity of Consumption	Type 3 Rate of Consumption (Z$)
Bit φ270m/m	5,765	0.0025	2.0 m	0.005 m	28.83	2.0 m	0.005 m	28.83	2.0 m	0.005 m	28.83
ditto φ219m/m	4,023	0.0014	13.5 m	0.019 m	76.44	19.0 m	0.027 m	108.62	19.0 m	0.027 m	108.62
ditto φ150m/m	1,822	0.002	29.5 m	0.059 m	107.50	24.0 m	0.048 m	87.46	24.0 m	0.048 m	87.46
Drill Hammer	13,975	0.001	8.62 h	0.009 h	125.78	8.39 h	0.008 h	111.80	8.39 h	0.008 h	111.80
Drill Rod	1,456	0.00125	8.62 h	0.011 h	16.02	8.39 h	0.010 h	14.56	8.39 h	0.010 h	14.56
Air horse	460	0.00125	8.62 h	0.011 h	5.06	8.39 h	0.010 h	4.60	8.39 h	0.010 h	4.60
					359.63			355.87			355.87

Life of Material

Item	Bit Life (m)	Bit Ratio	Hammer, Drill Life (h)	Hammer, Drill Ratio	Rod Life (h)	Rod Ratio	Air horse Life (h)	Air horse Ratio
Strongly Weathered Rock	400	0.0025	1,000	0.001	800	0.00125	800	0.00125
Soft Rock 1	700	0.0014	-ditto-	-ditto-	-ditto-	-ditto-	-ditto-	-ditto-
-ditto- 2	1,000	0.001	-ditto-	-ditto-	-ditto-	-ditto-	-ditto-	-ditto-
Hard Rock	500	0.002	-ditto-	-ditto-	-ditto-	-ditto-	-ditto-	-ditto-
Specially Hard Rock	300	0.003	-ditto-	-ditto-	-ditto-	-ditto-	-ditto-	-ditto-

Table A.4-4-2-8 Capacity of Drilling Rig

(1) Unworkable Days

° Sunday	52 days
° National Holiday	11 days
° Rainy & Preparation	14 days
Sub-total	77 days

(2) Workable Days

365 days - 77 days = 288 days

(3) One Process Days for Drilling and Casing

° Transportation & Erection of Drilling Rig	0.5 days
° Drilling & Casing and Others	3.0 days
° Dismantle & Removal of Drilling Rig	0.5 days
Total	4.0 days

(4) No. of Borehole Executed

No. of Executed Borehole Including No. of Unsuccessful Borehole (10%) = 288 ÷ 4 = 72 B/H per One Rig

(5) Standard Numbers of Completed B/H

72 ÷ 1.10 = 65 B/H (10% of Borehole may be not reach to required yield)

(6) Ability of Drilling Exceeding to Standard Number of Completed Boreholes

Standard Working Time	8 hours per day
Supposed Overworking Time	1 hours "
Total	9 hours "

One Process Days for Drilling and Casing = 4 days ÷ 8/9
= 3.56 days

Ability Number of Boreholes = 288 ÷ 3.56 = 80.9 Number of B/H

Maximum No. of B/H Executed per Year = 294 B/H x 1.1 = 323 B/H
(4 Rigs) < 80.9 x 4 = 324 O.K.

Table A.4-4-2-9 Operation and Maintenance Cost (1)

The operation and maintenance cost of the executed boreholes is computed as follows:

Unit cost of maintenance for one borehole per year.

(1) Personal Expenditure

Executive Engineer	0.25 day	68.95 Z$	17.24
Mechanician	0.50	26.40	13.20
Driver	1.00	8.70	8.70
Labour	1.00	5.93	5.93
Sub-total			45.07

(2) Material

Foot Valve	1.00 piece	10.00	10.00
Miscellaneous			1.00
Sub-total			11.00

(3) Depreciation

Chain Block	0.50 day	1.04	0.53
Pick Up	0.50 day	40.00	20.00
Sub-total			20.53

(4) Overhead	((1)+(2)+(3))x (22%)	16.84
(5) Total		93.44

Table A.4-4-2-9 Operation and Maintenance Cost (2)

Year	No. of Executed B/H	No. of B/H Requiring Maintenance	Foreign Currency (7.47)	Local Currency (85.97)
1983/84	-	-	-	-
1984/85	155	-	-	-
1985/86	293	155	1,158	13,325
1986/87	294	448	3,347	38,515
1987/88	294	742	5,542	63,790
Sub-total	1,036		10,047	115,630
1988/89	259	1,036	7,734	89,065
1989/90	259	1,295	9,673	111,331
1990/91	259	1,554	11,608	133,597
Sub-total	1,813		29,015	333,993
1991/92	259	1,813	13,543	155,864
1992/93	259	2,072	15,478	178,130
1993/94	259	2,331	17,413	200,396
Sub-total	1,813		46,434	534,390
Total	2,590		85,496	984,013

I-Stage	Total Cost	126	Unit: Z$ '000
	Foreign Currency	10	
	Local Currency	116	
II-Stage	Total Cost	363	
	Foreign Currency	30	
	Local Currency	353	
III-Stage	Total Cost	580	
	Foreign Currency	46	
	Local Currency	534	

Table A.4-4-2-10 Cost Estimation of Consulting Services (1)

I. I-Stage	Quantity	Unit Cost (Z$)	Amount (Z$)
I-1 Foreign Currency			
Remuneration	78.5 M-M	6,500	510,250
Per diem Allowance	2,354 Days	50	117,750
International Trip	16 Times	4,600	73,600
Miscellaneous	50 Months	L.S.	22,400
Sub-total			724,000
I-2 Local Currency			
Remuneration	138 M-M	1,730	238,740
Miscellaneous	44 Months	L.S.	56,260
Sub-total			295,000
Total			1,019,000

II. II-Stage	Quantity	Unit Cost (Z$)	Amount (Z$)
II-1 Foreign Currency			
Remuneration	59.5 M-M	6,500	386,750
Per diem Allowance	1,785 Days	50	89,250
International Trip	11 Times	4,600	50,600
Miscellaneous	35 Months	L.S.	15,400
Sub-total			542,000
II-2 Local Currency			
Remuneration	104 M-M	1,730	179,920
Miscellaneous	34 Months	L.S.	37,080
Sub-total			217,000
Total			759,000

Table A.4-4-2-10 Cost Estimation of Consulting Services (2)

III.	III-Stage	Quantity	Unit Cost (Z$)	Amount (Z$)
III-1	Foreign Currency			
	Remuneration	57 M-M	6,500	370,500
	Per diem Allowance	1,710 Days	50	85,500
	International Trip	9 Times	4,600	41,400
	Miscellaneous	35 Months	L.S.	14,600
	Sub-total			512,000
III-2	Local Currency			
	Remuneration	104 M-M	1,730	179,920
	Miscellaneous	34 Months	L.S.	27,080
	Sub-total			207,000
	Total			719,000

Table A.4-4-2-11 Consulting Services Costs for 1983 to 1994

(Unit: '000Z$)

Description	Unit Cost /Month	1983/84 Man/ Month	1983/84 Cost	1984/85 Man/ Month	1984/85 Cost	1985/86 Man/ Month	1985/86 Cost	1986/87 Man/ Month	1986/87 Cost	1987/88 Man/ Month	1987/88 Cost	1988/89 Man/ Month	1988/89 Cost	1989/90 Man/ Month	1989/90 Cost	1990/91 Man/ Month	1990/91 Cost	1991/92 Man/ Month	1991/92 Cost	1992/93 Man/ Month	1992/93 Cost	1993/94 Man/ Month	1993/94 Cost
I. Foreign																							
1. Personal Expense																							
Team Leader	8.2	2.5	20.5	1	8.2	1	8.2	1	8.2	1	8.2	2.5	20.5	1	8.2	1	8.2	1	8.2	1	8.2	1	8.2
Engineer (Tendering)	7.25	1.5	10.9	2.5	27.2							1	7.3			1	7.3	1	7.3				
Construction Plan & Cost Engineer	6.2			4	24.8	12	74.4	12	74.4	12	74.4	11	68.2	12	74.4	12	74.4	12	68.2	12	74.4	12	74.4
Geologist	6.2	4	24.8	10	62.0	7	43.4	7	43.4			11	68.2	7	43.4			11	68.2	7	43.4		
Sub-total		8	56.2	17.5	122.2	20	126.0	20	126.0	13	82.6	25.6	164.2	20	126.0	14	89.9	24	151.9	20	126.0	13	82.6
2. Miscellaneous Expenses																							
Per Diem	1.5	8	12.0	17.5	26.3	20	30.0	13	30.0	13	19.5	25.5	38.3	20	30.0	14	21.0	24	36.0	20	30.0	13	19.5
Trip	4.6	4	18.4	4	18.4	3	13.8	3	13.8	2	9.2	5	23.0	3	13.8	3	13.8	4	18.4	3	13.8	2	9.2
Miscellaneous	L.S.(0.44)	4	2.1	10	1.6	12	5.3	12	5.3	12	5.3	11	7.0	12	7.5	12	7.5	11	8.1	12	8.6	12	34.9
Sub-total		16	32.5		46.3		49.1		49.1		34.0		68.3		51.3		42.3		62.5		25.4		63.6
Total		24	89		168		175		175		117		233		177		132		214		151		146
II. Local																							
Design Engineer	2.9			3	8.7					3						3							
Supervisor	1.65			3	5.0	12	19.8	12	19.8	11	18.2	11	18.2	12	19.8	11	18.2	11	18.2	12	19.8	10	16.5
Supervisor	1.65			3	5.0	12	19.8	12	19.8	11	18.2	11	18.2	12	19.8	11	18.2	11	18.2	12	19.8	8	13.2
Assist Geologist	1.86	4	7.4	10	18.6	7	13.0	7	13.0			11	20.5	7	13.0			11	20.5	7	13.0		
Assist Geologist	1.86	4	7.4	10	18.6	7	13.0	7	13.0			11	20.5	7	13.0			11	20.5	7	13.0		
Sub-total		8	14.8	29	55.9	38	65.6	38	65.6	25	36.4	44	77.4	38	65.6	22	36.4	44	77.4	38	65.6	18	29.7
Others			2.2		10.1		21.4		10.4		12.6		15.6		10.4		11.6		3.6		26.4		4.3
Total		8	17	29	66	38	87		76	25	49	44	93	38	76	22	48	44	81	38	92	18	34

Table A.4-4-2-12 Cost Estimation of Materials

	Items	Drilling Rig (Z$/Rig)	Poltland Cement (Z$/ton)	Diesel Oil (Z$/Kℓ)	Gasoline (Z$/Kℓ)	Other Materials
1	CIF Price at Durbun	321,510	45.00	5,400	6,300	-
2	Imported Duty	-	-	-	-	-
3	Transport & Handling	26,740	5.00	600	700	-
4	Project Site Price	348,250	50.00	6,000	7,000	-
5	Domestic Production Rate	2%				80%
6	Foreign Currency (1)/(4)x {1-(5)}	0.90	0.90	0.90	0.90	0.20

Price of Drilling Rig

Description

1. Drilling Rig	(Top head drive type, 150 mm x 100 m track mount & standard accessory)		187,480
2. Compressor	(21.0 m^3/min, 14kg/cm^2)		104,800
		Total	292,280
3. CIF Durbun	Durban		321,510
4. Durbun to the Site	"		348,250

Table A.4-4-2-13 List of Unit Cost (1)

No.	Description	Unit	Cost
1	Operation Cost of Drilling Rig	hour	58.02
	Personal Expense	hour	27.07
	Fuel Lubricate	hour	30.95
2	Logging	B/H	88.91
	Personal Expense	B/H	62.31
	Material	B/H	20.60
	Depreciation	B/H	6.00
3	Casing & Screen TYPE I (16 m)	B/H	412.15
	Personal Expense	B/H	60.69
	Material	B/H	337.78
	Depreciation	B/H	13.69
4	Casing & Screen TYPE II	B/H	607.16
	Personal Expense	B/H	89.04
	Material	B/H	498.04
	Depreciation	B/H	20.08
5	Casing & Screen TYPE III	B/H	1,316.28
	Personal Expense	B/H	182.11
	Material	B/H	1,693.10
	Depreciation	B/H	41.07
6	Pumping Test	Time	228.49
	Personal Expense	Time	78.77
	Material	Time	11.00
	Fuel	Time	37.62
	Depreciation	Time	101.10
7	Installation of Hand Pump	B/H	685.98
	Personal Expense	B/H	45.07
	Material	B/H	640.91

Table A.4-4-2-13 List of Unit Cost (2)

No.	Description	Unit	Cost
8	Concrete (Cement 335 kg)	m^3	48.10
	Personal Expense	m^3	20.19
	Material	m^3	27.16
	Fuel	m^3	0.47
	Depreciation	m^3	0.28
9	Reinforcing Bar	ton	105.18
	Personal Expense	ton	63.52
	Material	ton	41.66
10	Form Work	m^2	5.96
	Personal Expense	m^2	4.28
	Material	m^2	1.68
11	Concrete Block	m^2	10.23
	Personal Expense	m^2	2.06
	Material	m^2	8.17
12	Mortar	m^3	42.79
	Personal Expense	m^3	13.05
	Material	m^3	29.74
13	Fence	m	4.07
	Personal Expense	m	1.43
	Material	m	2.64

Table A.4-4-2-14 List of Wages

(Unit: Z$)

No.	Item	Remarks	Annual Salary	Monthly Salary	Daily Wages
1	Labour (Ungraded)	-	-	-	2.40
2	Labour (Graded)	Class IIIA	-	105 - 132	5.93
3	Driver	Class III Common Driver	-	147 - 159	7.65
4	"	Class II Operator for heavy Machine	-	165 - 183	8.70
5	Masonry	-	-	325 - 571	22.40
6	Mechanician	Driller	-	325 - 731	26.40
7	Form Worker	Concrete, Rain-forcing bar	-	380 - 653	25.83
8	Carpenter	-	-	380 - 740	28.00
9	Electrician	Welder	-	380 - 827	30.18
11	Technician	Class V	4,704 - 7,896	-	26.25
12	"	" IV	8,268 - 10,800	-	39.73
13	"	" III	6,792 - 12,096	-	39.35
14	"	" II	12,960 - 14,256	-	41.70
15	"	" I	15,120 - 16,068	-	64.98
16	Engineer	Class V	7,896 - 13,392	-	44.35
		" IV	14,256 - 15,120	-	61 20
		" III	16,068 - 17,028	-	68.95
		" II	18,468 - 18,948	-	77.95
		" I	19,908 - 20,700	-	84.60

Note : Daily Wage = Average Monthly Salary/20 days
= Average Annual Salary/(12 months x 20 days)

Table A.4-4-2-15 List of Material Costs (1)

No.	Item	Size		Unit	Unit Price
1	Reinforcing bar	round ℓ =12m	φ= 6mm	piece	0.11
2	Reinforcing bar		φ= 8mm	piece	0.17
3	Reinforcing bar		φ= 10mm	piece	0.26
4	Reinforcing bar		φ= 12mm	piece	0.52
5	Reinforcing bar		φ= 16mm	piece	0.89
6	Reinforcing bar		φ= 20mm	piece	0.98
7	Steel pipe		φ= 15mm	m	2.24
8	Steel pipe		φ= 20mm	m	2.81
9	Steel pipe		φ= 25mm	m	3.79
10	Steel pipe		φ= 32mm	m	4.86
11	Steel pipe		φ= 40mm	m	5.48
12	Steel pipe		φ= 50mm	m	7.82
13	Steel pipe		φ= 65mm	m	8.29
14	Steel pipe		φ= 80mm	m	11.96
15	Steel pipe		φ=100mm	m	16.17
16	Steel pipe		φ=150mm	m	32.68
17	Steel pipe		φ=200mm	m	48.67
18	Steel pipe		φ=250mm	m	67.21
19	Asbest pipe	Class 24	φ= 50mm	m	2.82
20	Asbest pipe	Class 12	φ= 75mm	m	3.61
21	Asbest pipe	Class 24	φ= 75mm	m	3.76
22	Asbest pipe	Class 12	φ=100mm	m	4.71
23	Asbest pipe	Class 24	φ=100mm	m	5.29
24	Asbest pipe	Class 12	φ=125mm	m	6.68
25	Asbest pipe	Class 18	φ=125mm	m	8.07
26	Asbest pipe	Class 24	φ=125mm	m	9.05
27	Asbest pipe	Class 12	φ=150mm	m	8.35
28	Asbest pipe	Class 18	φ=150mm	m	10.96
29	Asbest pipe	Class 24	φ=150mm	m	12.87

Table A.4-4-2-15 List of Material Costs (2)

No.	Item	Size		Unit	Unit Price
30	Concrete Pipe	ℓ= 1.22m	ϕ=250mm	piece	7.84
31	Concrete pipe		ϕ=300mm		11.88
32	Concrete pipe		ϕ=350mm		15.78
33	Brick (Common)	220 x 110 x 70		per 1000	3.48
34	Cement P.C.15	50 kg		per 50kg	2.42
35	Sand river			m^3	7.60
36	Sand pit			m^3	5.00
37	Stone 3/4			m^3	9.20
38	Timber local			m	1.33
39	Timber skirting	7/8" x 4"		each	1.73
40	Ceiling board			m^2	1.88
41	Doors wood-hollow case	13/4" x 2'8" x 6'8		each	1.73
42	Paint internal oil	5ℓ		each	14.74
43	Nails			25kg	1.18
44	Joint compound	Butumastic Expanding		30kg	25.90
45	Sluice valve		ϕ=300mm	each	885.00
46	Coal tar			ton	84.00
47	Water stops	190mm		m	8.44
48	Petrol (Blend)			ℓ	0.70
49	Light oil			ℓ	0.60
50	Structural steel	60x60x60mm	Angle	ton	334.00
51	Acetylene			kg	5.00
52	Oxigen			m^3	1.60
53	Welding stick	3.2 mm		kg	1.30
54	Casing	150mmx4.5mm	S/S	6.75m	125.30
55	Casing	200mmx4.5mm	P/E	6.75m	163.70
56	Casing	125mmx4.5mm		6.75m	
57	Bush pump head			unit	158.57
58	Pump cylinder	75x600x50x16		unit	74.86

Table A.4-4-2-15 List of Material Costs (3)

No.	Item	Size		Unit	Unit Price
59	Pump rods	ℓ=3.05m		length	4.79
60	50mm Pipe	ℓ=3.05m		length	17.58
61	PVC Pipe	Socheted	ϕ= 25mm	m	0.78
62	PVC Pipe	6m	ϕ= 50mm	m	1.59
63	PVC Pipe	Class 10	ϕ= 90mm	m	5.25
64	PVC Pipe	Class 10	ϕ=110mm	m	7.89
65	PVC Pipe	Class 10	ϕ=125mm	m	10.17
66	PVC Pipe	Class 10	ϕ=140mm	m	12.63
67	PVC Pipe	Class 10	ϕ=160mm	m	16.62
68	PVC Pipe	Class 10	ϕ=180mm	m	20.73
69	PVC Pipe	Class 10	ϕ=200mm	m	25.77

Table A.4-4-2-16 Building Materials Costs
(Average 1964 = 100)

Period	Bricks*	Cement* Aggregates and Allied Materials	Timber and Wood Products	Electrical Goods and Materials	Others	Total Materials
1964	100.0	100.0	100.0	100.0	100.0	100.0
1965	100.0	103.7	103.5	102.1	101.7	102.6
1966	100.7	104.9	106.8	107.5	104.9	106.3
1967	101.8	105.9	110.9	108.7	107.1	109.3
1968	104.8	109.3	117.4	111.4	109.2	112.6
1969	115.0	113.2	124.0	114.3	110.8	116.7
1970	116.3	115.5	129.2	119.6	113.8	121.8
1971	121.0	117.6	136.7	117.3	116.5	125.6
1972	128.5	120.0	146.0	117.4	123.8	129.8
1973	130.6	127.3	159.5	129.1	127.4	138.8
1974	133.1	140.8	199.8	159.4	141.7	161.5
1975	142.3	168.4	229.9	164.5	161.5	184.6
1976	156.2	184.9	237.6	187.0	208.3	203.9
1977	199.0	214.3	275.9	201.4	247.1	237.6
1978	219.7	250.1	320.9	211.3	279.4	266.8
1979	260.4	288.5	420.7	231.9	320.0	319.1
1980	299.5	317.4	560.2	250.4	396.6	385.4
1981	409.1	390.9	733.5	278.3	461.2	484.3
1979 March	243.9	274.8	373.4	222.8	299.1	294.8
June	250.9	279.7	385.7	226.0	308.7	301.7
September	267.6	296.3	467.2	238.8	317.4	335.1
December	279.1	303.3	457.0	240.0	354.9	340.6
1980 March	279.1	311.1	634.0	250.8	379.5	369.6
June	278.6	305.8	515.3	243.4	388.0	363.7
September	312.6	312.5	601.9	252.8	405.3	400.2
December	327.7	340.0	601.9	254.4	413.7	410.7
1981 March	381.0	365.2	708.3	263.5	429.6	455.8
June	401.6	366.8	711.6	267.5	454.8	469.0
September	417.4	401.4	745.1	284.9	475.6	496.1
December	436.4	430.3	769.0	297.4	484.9	516.1
1982 March	440.4	446.8	776.0	298.4	484.9	521.6
June	473.1	453.2	798.3	303.6	489.0	543.1
September	485.9	487.3	824.4	321.4	508.5	570.8

Note : * Includes delivery charges to site.
Source : Monthly Digest of Statistics, October 1982.

Table A.4-4-2-17 Works Done by Private Contractors (1)

(Unit: '000)

Period		Civil Engineering: New Work, Additions and Alterations: Contractors Taken on or Increased in Value	Civil Engineering: New Work, Additions and Alterations: Work Done*	Civil Engineering: Repair Work Done
1969		17,092	15,746	1,283
1970		18,627	17,773	1,047
1971		34,711	27,194	836
1972		32,244	34,009	856
1973		52,492	44,093	915
1974		63,585	56,572	1,190
1975		62,577	65,132	1,112
1976		36,607	46,857	1,458
1977		46,686	45,137	966
1978		43,883	44,493	1,195
1979		43,740	46,908	3,035
1980		68,257	57,857	2,605
1981		140,565	87,765	4,663
1980	January	5,390	3,570	259
	February	2,287	3,673	222
	March	5,081	3,789	318
	April	3,052	4,159	166
	May	4,251	4,819	182
	June	6,619	5,085	226
	July	13,552	5,292	162
	August	1,832	4,596	158
	September	4,972	5,019	241
	October	7,069	5,971	254
	November	9,263	4,607	235
	December	4,889	7,277	182
1981	January	5,549	5,428	192
	February	12,256	4,536	240
	March	5,327	6,167	265
	April	3,821	5,417	224
	May	30,237	7,770	249
	June	4,941	10,076	325

Note : * The values of work done by private contractors are compiled from monthly estimates made by contractors and appear from recent censuses of production to be understated by about 15 percent.

Source : Monthly Digest of Statistics, October 1982.

Table A.4-4-2-17 Works Done by Private Contractors (2)

(Unit: '000)

Period		Civil Engineering: New Work, Additions and Alterations: Contractors Taken on or Increased in Value	Civil Engineering: New Work, Additions and Alterations: Work Done*	Civil Engineering: Repair Work Done
1981	July	40,697	8,236	1,191
	August	4,266	9,428	543
	September	19,789	6,343	506
	October	6,725	8,998	395
	November	3,937	7,739	189
	December	3,020	7,627	344
1982	January	22,559	8,551	402
	February	11,415	9,988	277
	March	3,888	10,317	580
	April	10,825	11,645	486
1981	Jan. - April	26,953	21,548	921
1982		48,687	40,501	1,745

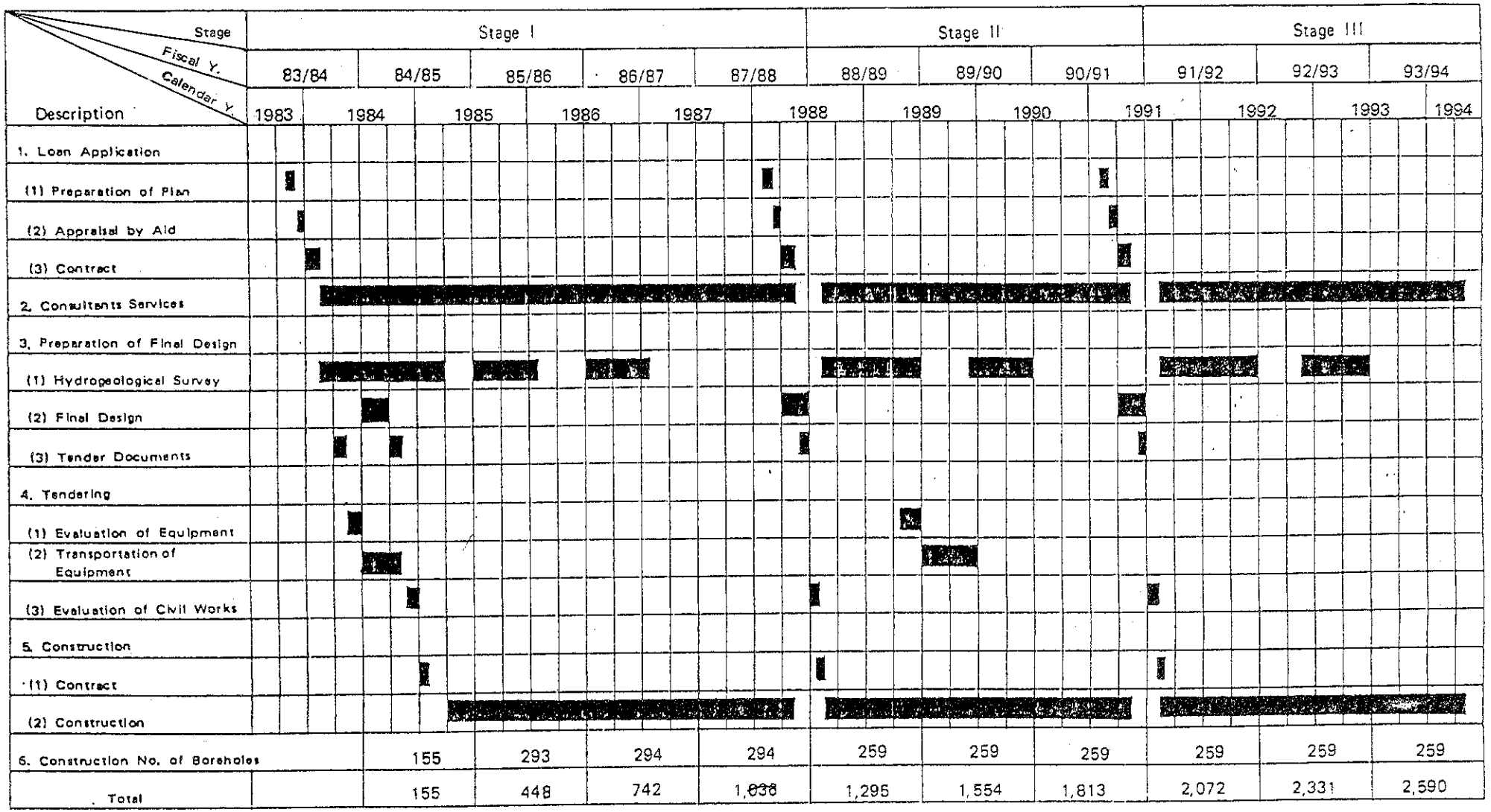
Note : The values of work done by private contractors are compiled from monthly estimates made by contractors and appear from recent censuses of production to be understated by about 15 percent.

Sources : Monthly Digest of Statistics, October 1982.

APPENDIX V IMPLEMENTATION PROGRAMME AND OPERATION & MAINTENANCE

APPENDIX V IMPLEMENTATION PROGRAMME AND OPERATION & MAINTENANCE

Fig. A.5-1 Implementation Programme



APPENDIX VI PROJECT EVALUATION

APPENDIX VI PROJECT EVALUATION

Table A.6-1 Payment of Amortization Repayment Condition

Interest ..... 1.25 %
Glace period ..... 5 years
Repayment period .... 20 years
(Unit : US$)

Year	Construction Cost	Interest	Total Loan	Amount of Repayment	Year	Construction Cost	Interest	Total Loan	Amount of Repayment
1983	1,477	18	1,495	-	2002	-	165	12,155	1,201
84	506	25	2,026	-	3	-	152	11,106	1,201
85	896	37	2,959	-	4	-	139	10,044	1,201
86	1,048	50	4,057	-	5	-	126	8,969	1,201
87	1,108	65	5,230	-	6	-	112	7,880	1,201
88	4,337	120	9,598	89	7	-	99	6,778	1,201
89	1,721	141	11,340	120	8	-	85	5,751	1,112
90	1,633	162	12,961	174	9	-	72	4,742	1,081
91	2,194	189	15,107	237	10	-	59	3,774	1,027
92	2,295	218	17,316	304	11	-	47	2,857	964
93	2,646	250	19,646	566	12	-	36	1,996	897
94	-	246	19,222	670	13	-	25	1,386	635
95	-	240	18,693	769	14	-	17	872	531
96	-	234	18,025	902	15	-	11	451	432
97	-	225	17,209	1,041	16	-	6	158	299
98	-	215	16,223	1,201	17	-	0	0	160
99	-	203	15,225	1,201	18	-			0
2000	-	190	14,214	1,201					
2001	-	178	13,191	1,201	Total				