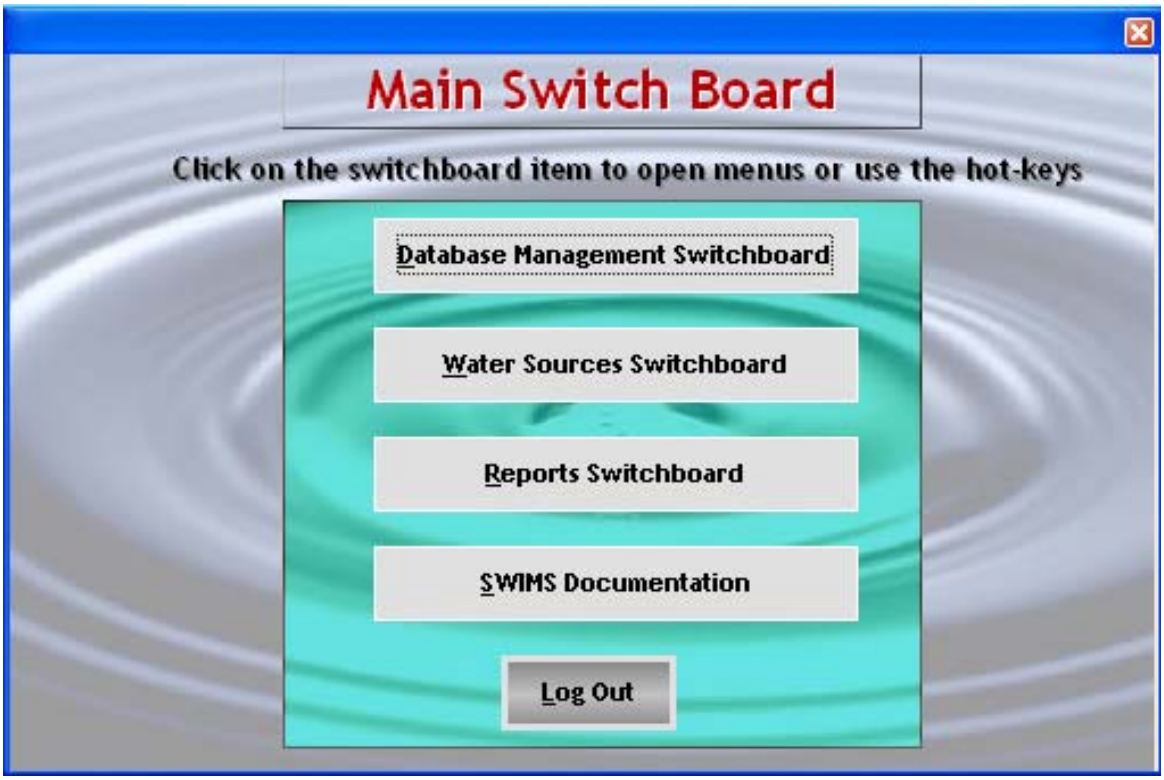
Somalia Water Sources Information Management System (SWIMS)



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1.0 INTRODUCTION TO SWIMS

The Somalia Water Sources Information Management System (SWIMS) was developed to provide a mechanism for constructing and maintaining an inventory of water sources in Somalia. It provides suitable planning level information for actors in the water sector in Somalia to support coordination, decision making and monitoring.

In the design phases of SWIMS, the following objectives for the system were identified:

1. To provide a tool for non-GIS Specialists to manage and maintain spatial data and associated attributes on water sources.

2. To provide a tool to allow easy translation of data collected in the field to a centralised, national database.

3. To provide a tool that would assist users in managing water sources information in a systematic and standardised way.

In designing a tool to meet these objectives, SWALIM produced an information management tool for water sources professionals in Somalia that includes; spatial data management capabilities; time-series management capabilities; past, current and future interventions information management; metadata management in accordance with ISO 19115; automated validation and verification of data; user management capabilities; and automated reporting functions. In addition, because SWIMS provides a means of reporting and managing spatial data, it is part of a national water sources Geographical Information System (GIS), which enables SWALIM and other users to produce and update maps at national, regional and district level.

1.1 Description of SWIMS and its Components

In its broadest form SWIMS consists of:

- Standard data collection methodologies to provide consistency across and between various data sets (standardized SWIMS data collection forms)

- A software application to ensure that the data collected is stored correctly and consistently in the database (SWIMS data base application)

- The personnel using the standard data collection and reporting formats.

The data contained in the SWIMS standard formats is categorised as follows:

- Data Management
- Functioning and Use
- Physical Parameters
- Water Characteristics
- Supply and Distribution
- Source Management

The data can be further classified as quantitative and qualitative. This distinction is important in using SWIMS, in understanding the system set up, and in understanding the type of information that can be extracted from the system.

For the purposes of this manual and SWIMS, we define quantitative data as data in numerical form that is collected in a replicable, objective way (e.g. GPS coordinates, EC and pH values, measurements of length, temperature, dates etc.). Qualitative data is defined as data, often non-numerical in form, which is collected in a way that may not be replicable and is subjective (e.g. number of users or livestock using a source, general condition of a source, smell, taste etc.). It should be noted that this definition of qualitative data also includes photographs, sketches, sound recordings, electronic files, all of which the SWIMS application can be used to manage.

In many ways the definitions given above are an arbitrary distinction. To some extent all quantitative data is based upon qualitative judgments; and all qualitative data can be described and manipulated numerically. By using the SWIMS information sheets and software, multiple users can collect and manage water sources data in a systematic way. The SWIMS system is designed to restrict the type of descriptions of qualitative data that a user can employ so that the multiple data sets in the system will be comparable and facilitates these comparisons to be made in a systematic and replicable manner. Further, because SWIMS can maintain histories of both quantitative and qualitative data, it allows users to compare and monitor water sources on a temporal and spatial basis.

1.2 Purpose of this Manual

The purpose of this field guide is to ensure a common approach to collecting data in the field is employed by all users of SWIMS. This is the critical first step to ensuring data quality and consistency both across and within the data sets housed in SWIMS. While the SWIMS information sheets can be used by non-technical staff as a means of monitoring water projects, it is recommended that the *Physical Parameters* and *Water Characteristics* sections should be completed by well trained technicians.

This manual is primarily intended for use by the technicians within the water sector in Somalia as a reference for SWIMS data collection. The manual provides guidance on equipment, field monitoring techniques, and filling the SWIMS field data forms. The data forms provide a crucial link between fieldwork and the database, allowing for flexibility in data entry and a means of verification of the data that is entered on the database.

2.0 FIELD DATA COLLECTION

SWIMS is a tool designed to build an inventory of water sources in Somalia that will allow a basic characterization of the sources in terms of physical, socio-economic and management practices. The attributes measured for SWIMS reflect an attempt to balance the water sources database information requirements with ease of deployment and reduced complexity.

2.1 Water Characteristics

Samples taken from a body of water are representative of the water body only at the time and place of sampling. The sample should be taken directly from the source, not from delivery pipes or storage containers.

The tests required on water characteristics for SWIMS have been chosen to provide a basic characterization of the water chemistry, and are not intended to be used to monitor water quality or enforce standards. Tests of water quality for the purposes of setting or enforcing regulatory standards should be carried out in a recognised professional laboratory. Such detailed analysis programmes are outside the scope of SWIMS, and hence this manual. However, where full chemical analysis is available for the water sources, such information can be integrated within SWIMS[1].

2.1.1 Electrical conductivity (EC)

Salts, acids and bases, when dissolved in water, conduct electricity owing to the motion of positive (cations) and negatively charged (anions) through the liquid. Liquids that conduct electricity in this way are called electrolytes. The specific current carrying ability of an electrolyte is called its electrical conductivity and has the units S m^{-1} (Siemens per metre), or micro Siemens per centimetre (μS cm^{-1}), as used in SWIMS.

The electrical conductivity is an indirect measure of the ions present in the water and depends on:

1. the concentration of the ions present;
2. the nature of the ions;
3. the temperature of the solution; and
4. the viscosity of the solution.

Thus measurement of EC determines the concentration of dissolved ionic species in water. As EC varies with temperature, comparisons between EC measurements made at different temperatures are meaningless. It is imperative that all EC measurements be reported at the 25° Celcius reference temperature. Many of the modern EC meters however have an automatic temperature correction facility. The EC meters should be well calibrated according to the manufacturer's instructions.

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[1] If such reports are available electronically they can be managed within the SWIMS application using the Attach Files Wizard, which will file the documents using the date, location and metadata.

The procedure for measuring EC varies depending on the type of EC meter being used. It is recommended that the field technicians be familiar with the equipment before going to the field to avoid making wrong measurements.

2.1.2 Hydrogen ion (pH)

pH is a measure of the activity of the hydrogen ion (H+) in water and is reported as the reciprocal of the logarithm of the hydrogen ion activity. The pH scale ranges from 0 to 14.

0	7	14
Acidic	Neutral	Basic

Pure water has a neutral pH of 7; water with a pH < 7 is considered acidic, soft and corrosive; while water with a pH > 7 is considered basic and hard. The normal range for pH in surface water systems is 6.5 to 8.5 and for groundwater systems 6 to 8.5.

For pH meters used with SWIMS, it is recommended that calibration be carried out as per the manufacturer's instructions. Calibration is also required after the electrodes have been replaced, or if the electrodes have been stored and have been allowed to dry out. Periodic cleaning and inspection of the electrodes is also required, as contaminants at the electrode junctions can affect the measurements obtained. In general, the manufacturer's instructions for storage care and maintenance for both the electrodes and the meter should be followed.

As with the measurement of EC, the procedure for measuring pH varies depending on the type of pH meter being used, and the field enumerators should be familiar with the equipment to avoid mistakes.

2.1.3 Colour

Within SWIMS, colour is regarded as a qualitative attribute due to the subjectivity to the interpretation of colour. The colour attribute is included because it is an important determinant of the acceptability of water for different purposes. Colour may also indicate the presence of dissolved or suspended substances in the water. For example blue-green colour can indicate the presence of algae, the presence of which can cause the formation of organochlorines when chlorine is used as a disinfectant, making the treated water unpalatable. Similarly, a reddish/brown colour may indicate the presence of iron and manganese.

The general procedure for testing and reporting colour in SWIMS is as follows:

(i) Fill a clear, clean glass jar or test tube with water from the source;
(ii) Standing with your back to the sun, hold the jar with water sample at eye level with outstretched arm.
(iii) Allow sample to settle for about 60 seconds to allow trapped air, which may impart cloudy appearance to water, to clear.
(iv) Hold a sheet of clean, white paper or card behind the sample and note colour.

2.1.4 Taste and Smell

Within SWIMS, taste and smell are also regarded as qualitative attributes. These attributes are included because they are important determinants of the acceptability of water for different purposes. For example, taste and smell can indicate the presence of contaminants in water, creating the necessity for further investigations to determine the level of contaminant concentration.

2.2 Location Details

The location details of water sources are highly ranked in SWIMS, as all other parameters are attached to the location. The water source location is described in terms of administrative units (region, district, village/settlement), as well as the X-Y coordinates which are crucial for mapping the water sources. The coordinates of a water source can be obtained through the following:

2.2.1 GPS handsets

The Global Positioning System (GPS) consists of 24 satellites orbiting the earth at about 19 000 km. These satellites emit a low powered radio signal which is received by GPS receivers on the line of sight. The GPS receiver receives two types of information on these radio waves;

- Almanac data which lets the receiver know the approximate position of the satellites and is valid for about 6 hours.
- Ephemeris data which is constantly updated and contains corrections to the almanac data.

GPS operates on a time of arrival basis. Put simply this means that the velocity (V_S) of the received signal is multiplied by the travel time (T) to give the distance (D) from a satellite to the receiver

$$V_S \times T = D$$

The GPS receiver calculates it's position on the earths surface by carrying out this calculation for all the satellites in it's line of sight and triangulating the distance form each.

Three satellites allow the GPS to calculate its two-dimensional position (Latitude and Longitude). Four satellites allow the GPS to calculate its three-dimensional position (Latitude, Longitude and Altitude).

When using a GPS handset to collect data for SWIMS, the following settings should be ensured:

- Time Zone: GMT + 3.00
- Units: Metric
- Datumn: WGS 84
- North Reference: True
- Position Format: Decimal

The GPS coordinates should be collected as waypoints, and saved in the GPS handset as well as recorded on the field data forms.

2.2.2 Thuraya satellite phones

Thuraya satellite phones can provide GPS co-ordinates in decimal degree format to an accuracy of less than 100m. The datum used is WGS 84. The procedure for obtaining the coordinates using the Thuraya phone is outlined below:

(i) Go To "Menu"

(ii) Select "GPS Manager"

(iii) Select "Current Position"

(iv) Upon reading the GPS Coordinates, press "Options"

(v) Select "Save"

(vi) Select an empty location from the list, Press "select"

(vii) Enter a new name for your point

(viii) Press "Save"

Just like the GPS handsets, satellite phones only operate outdoors, and away from buildings, trees and other obstacles.

2.2.3 Humanitarian Reference Grid (HRG) maps

Humanitarian Reference Grid (HRG) maps have been adopted by the organizations working in Somalia to locate positions in situations where the use of GPS is not possible. The grid divides Somali into 404 rectangular blocks (like the one shown in the figure below), each corresponding to the internationally recognized topographic map file.

The rectangular blocks are given a unique alpha-numeric reference number e.g. NA-38-067. Each of these rectangles is then sub-divided in to 88 square cells: 11 across and 8 down. Each square cell is approximately 5 km by 5 km, representing an area of 25 km^2. The square cells are referenced from A to K horizontally and from 1 to 8 vertically.

To report the position of a water source:

- Locate the square cell on the map where the source lays, using estimated distance and direction from a known point such as a clinic, school or settlements as a guide.
- Note the alpha-numeric rectangle code (e.g. NA-38-067)
- Note the numeric reference of the square cell where the source is located (e.g 2)
- Note the alphabetic reference of the square cell where the source is located (e.g D)
- Report the location for the water source by quoting the full grid reference as follows: alpha-numeric rectangle code – cell numeric reference – cell alphabetic reference (i.e NA-38-067-2D).

2.3 Length and Height

SWIMS requires that a number of distance parameters be reported. In general these are;

- Length/ Radius.
- Width
- Depth/Height

In addition, the following parameters, derived from length measurements are also required;

- Area
- Volume

All distance measurements for SWIMS should be done in metric units.

It is important that a local datum be clearly established for depth/height measurements. This local datum should be marked on the source with an X, either with red paint or by inscription. The position of the datum should be clearly identified on a sketch of the water source, and if possible, on a digital photograph. Note also that in SWIMS the local coordinate[2] system used has the positive z-axis pointing directly downwards towards the centre of the earth. In establishing a datum it is best if a permanent point at or close to ground level is chosen so that all depth measurements are reported using positive numbers, and all elevation or height measurements are made using a negative value.

[2] This should not be confused with the Global Coordinate System used for the GPS. This uses the Global Datum of WGS 84, so elevations above sea level on the GPS are reported as a positive number.

3.0 STRUCTURE OF THE FIELD DATA FORMS

The SWIMS field data collection forms are divided into six categories based on the common water source types in Somalia: boreholes, dug wells, dams, springs, berkads and others. In each of these categories, the parameters monitored have been categorised into detailed and essential information. In the previous versions, data collection forms for the detailed and essential information were separate, but in the current version the two forms have been merged into one. In the merged data forms, the fields considered essential are marked bold to differentiate them from the rest of the parameters.

The essential information contains a limited number of fields extracted from the detailed information. It represents the minimum data required to include a point source in the database and maintain the integrity of the records. This represents the minimum information required to complete the inventory of water sources for Somalia.

The detailed information represent the data required to carry out the characterisation and analysis functions of the data base. It includes information on various categories that will allow statistical and spatial analysis in terms of socio-economic parameters, water quality, operation and management of the water sources.

The attributes on the SWIMS data forms are broken down into a series of categories/headings, listed in Section 1.1. All of these categories except the *Physical Parameters* are exactly the same. The approach used in the manual is to describe the common sections first, and then to discuss the *Physical Parameters* under a series of sub-headings relating to each source type.

3.1 Completing the Field Data Forms

In general, when in the field, black/blue ink should be used to complete the information sheets so as to ensure the quality and legibility of photocopies and scans. Ball point pens should be used in preference to fountain pens or felt-tip pens so as to prevent smearing and running. Ball-point ink is also more resistant to water.

The fields should be completed carefully in neat, legible block capitals as the attribute is measured. Making a fair copy from field notes is not recommended due to the possibility of error when copying to the sheets. When filling in the 'check-boxes' the ✓ symbol should be used. If a check box is ticked with the ✓ symbol by mistake, this symbol should be converted to an ✗ symbol. In this case the 4 points of the ✗ should extend outside the check box.

In general, the SWIMS data collection forms have been designed to provide as complete an inventory as possible under the prevailing circumstances in Somalia. It is recognised that in many circumstances it will not be possible for the enumerator to complete the detailed information sheets in their entirety. If the information is not available, the field should be left blank. Where a field on the forms is left blank, it will be assumed that this indicates a 'don't know' answer. This is similar to the procedure adopted in the SWIMS application, where a 'Null' value in a database field is assumed to indicate a 'don't know'.

In reading the descriptions in the following sections note that where the term 'precision' is used it is used in the information technology context and is not meant as to represent the resolution to which a measurement is reported.

3.1.1 Data management

The data management section of the sheets is critical in maintaining the data integrity of SWIMS datasets. It contains 5 fields in the header section of the form.

- Metadata Reference: a unique reference to a metadata record.
- Date: the date the location was visited and the form filled in.
- Inspected By: the name of the person who physically collected the data.
- Entry Agency: the name of the agency who entered the data on the SWIMS software
- Inspecting Agency: the name of the agency responsible for physically collecting the data

3.1.2 Location

- Region: the administrative region that the source is in.
- District: the administrative district that the source is in.
- Source Name: the local name for the source / where the source is located. Where there are a number of sources with the same name in an area, then each individual source should be given a numeral label (e.g. SOURCE1, SOURCE2).
- North: the latitude (x) coordinate of the source, reported to a precision of 6 decimal places.
- East: the longitude (y) coordinate of the source, reported to a precision of 6 decimal places.
- GPS Make and Model: the make and model of the equipment used to establish position coordinates. If humanitarian reference grid maps are used, the map reference should be reported here.
- Positional Accuracy[3]: the positional accuracy indicated by the GPS, reported to a maximum precision of 1m.
- Elevation: the elevation of the source in meters above sea level, reported to a maximum precision of 1m.
- Nearest Settlement Name: the name of permanent settlement nearest to the water source.
- Nearest Settlement Distance: the distance in km, reported to a maximum precision of 100 m (0.1 km) to the nearest permanent settlement, as indicated by the odometer on a car or motor bike[4].
- Users: describe the predominant users of the source as rural, urban or nomadic, or all three.
- Municipal Code: a description of the location for the sources.

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[3] Because a GPS can give different accuracies depending on it's type (recreational, surveying etc), this attribute will be used in determining which GPS coordinates to use in the national database in the case where there are discrepancies in reported coordinates. In such cases, the coordinates with the lowest value of Positional Accuracy will be used.

[4] Where the source is located within the boundaries of the Settlement, this field should be completed with a 'zero'. If the field is left blank a 'don't know' answer will be assumed.

3.1.3 Function and use

- Functioning: the current operational status of the water source (if abandoned an explanatory note should be included in the notes box to the right of the functioning question.
- Operator: does the water source have a trained, permanent operator?
- Permanent Use: is the water source used throughout the year?
- Humans; Sheep/Goats; Camel; Cattle; Irrigated Area: this section is included so an estimate of the user numbers can be provided. These fields represent qualitative estimates of the number of users for any given season. It is recognised that estimates will vary in time due to population movements, climate variables and other factors. Estimates will also vary depending on who collected the data and how the estimates were conducted. In general, as many of the sources user's as possible should be questioned and the enumerator's best judgement should be used to provide *indicative* figures for users under each of the categories.
- Distance to Nearest Permanent Source: SWIMS defines a permanent source as a water source such as a borehole, spring, dam or stream that, in a normal year, provides water at all times throughout the year.
- Description of Nearest Permanent Source: a description of the nearest permanent source. GPS coordinates should be included if possible in the *notes section.*
- Number of Other Water Sources in the Area: this is, to a large extent, an example of qualitative data given the subjectivity inherent in defining the term 'Area'. As a general rule of thumb, SWIMS defines the *Area* in question as all other water sources that are within one days return walk of the water source.
- Settlements Served by the Source: a common definition of settlements served poses some difficulties, both in terms of time and distance. Similarly to the user estimates, the more of the users questioned the better. If there is an operator or a management committee they should be questioned, especially if water trucking is practised.
- General Condition: the enumerator's opinion of the general condition of the source as good, fair or poor.
- Sanitary Condition: the enumerator's opinion of the sanitary condition of the source as good, fair or poor.
- Environmental Condition: the enumerator's opinion of the environmental condition of the source as good, fair or poor.
- Intervention Required: the enumerator's opinion of type intervention required on the source as develop, improve or rehabilitate (if none required leave unchecked).
- Last Intervention: the name of the agency, if any, which carried out a physical intervention at the source, and the date (*mmyyyy* format) of the intervention. (a general description of the intervention should be included in the *notes box* if possible).

1 Source Established: the name of the agency that established the source, and the date (*mmyyyy* format) that the source was established. (if the source was established by a community or individual, please indicate).

3.1.4 Water characteristics

- EC @ 25° C: the electrical conductivity of a sample from the source, corrected to the reference standard of 25° Celsius.
- EC Meter Make and Model: the name of the manufacturer of the EC meter and the manufacturer's model number.
- Calibration Date: the date that the EC meter was last calibrated.
- pH: the pH of a sample from the source reported to a maximum precision of 0.1.
- pH Meter Make and Model: the name of the manufacturer of the pH meter and the manufacturer's model number.
- Calibration Date: the date that the pH meter was last calibrated.
- Temperature: the temperature, reported to a maximum precision of 0.5° Celsius, at which the pH measurement was made.
- Turbidity: if available, reported in NTU.
- E.Coli: if available, reported in MPN.
- Colour: the colour of a water sample from the source
- Smell: the smell of a water sample from the source
- Taste: the taste of a water sample from the source
- Full Chemical Analysis Available: analysis such as major ion chemistry, bacteriological screens etc.

3.1.5 Supply and distribution

- Supply System Condition: the condition of a distribution network, including animal troughs, if applicable.
- Engine Room Condition: the condition of the engine room, if applicable
- Storage Tank Condition: the condition of a storage tank, including valves and connections, if applicable.
- Storage Tank Capacity: the usable volume, i.e. the volume calculated between the tank outlet and tank overflow, for the storage tank in cubic meters, reported to a maximum precision of 1 litre (0.001 m^3)
- Pipeline Delivery Length: the complete length of the main delivery pipeline in metres, including branches, reported to a precision of 1m
- Taps / Outlets: the number of user outlets attached to the source distribution system, if applicable. If none enter '0'.
- Kiosks: the number of public vending points associated with the source, if applicable. If none enter '0'.
- Animal Troughs: the number of animal watering troughs associated with the source and it's distribution system, if applicable. If none enter '0'.
- Tankering Points: the number of points associated with the source and it's distribution system where water is drawn for distribution by tanker (mechanical or animal traction). If none enter '0'.
- Water Lifting Technology: indicate the type of water lifting technology at the source (multiple choices are valid)

- Pump Make[5]: the name of the pump manufacturer
- Pump Model[6]: the pump manufacturers model number
- Pump Serial Number: the pump manufacturer's serial number.
- Date Installed: the date, in *mmyyyy* format, that the pump was installed.
- Delivery: the flow rate, reported to a precision of 1 ls^{-1} ($0.001m^3/s$), of the pump.
- Head: the delivery head of the pump, reported to a precision of 100 mm (0.1 m), at which the flow rate is achieved.
- Prime Mover: indicate the type of power source at the source (multiple choices are valid).
- Engine Make: the name of the generator manufacturer.
- Engine Model: the engine manufacturer's model number.
- Engine Serial: the engine manufacturer's serial number.
- Date Installed: the date, in *mmyyyy* format, that the engine was installed.
- Engine Output[7]: the engine output, reported to a precision of 1 Watt.
- Generator Make: the name of the generator manufacturer.
- Generator Model: the generator manufacturer's model number.
- Generator Serial Number: the generator manufacturer's serial number.
- Date Installed: the date, in *mmyyyy* format, that the generator was installed.
- Generator Output: the generator output, reported to a precision of 100 Voltampere (0.1kVA) of the generator.

3.1.6 Source management

- Owner: indicate whether the source is privately owned, community owned or other.
- Water Selling Price: the cost of water per specified unit(s) in dollars.
- Management Committee: indicate whether the source is managed by a management committee or not.

[5] Many pump, engine and generator manufacturers provide electronic versions of their technical literature available via the World Wide Web. The Add Files Wizard within the SWIMS application can be used to attach this documentation, if available to a specific source.

[6] Pump, engine and generator manufacturers place this information on metal plates that are riveted to the housing/bodies of their assemblies. This plate should be checked each time the source is visited. It is particularly important to check the serial number of equipment at each visit.

[7] If the engine has been de-rated, this details should be included in the Notes box in Function and Use Section.

3.1.7 Physical parameters: Berkad

- No. of Berkad in Cluster: indicate the number of berkads available in the same cluster with the source (berkad).
- Catchment area: an estimate of the catchment area, reported to a precision of 1 m^2, of the berkad.
- Reservoir Capacity: the usable volume of the berkad, reported to a maximum precision of 1 m^3.
- Reservoir Dimensions, Depth: the vertical distance, reported to a maximum precision of 100 mm, (0.1m) from the chosen datum to the deepest part of the reservoir.
- Reservoir Dimensions, Length/Radius: the length, reported to a maximum precision of 100 mm (0.1m), of the reservoirs first dimension (if prismatic) or radius (if spherical)
- Reservoir Dimensions; Width: the length, reported to a maximum precision of 100 mm (0.1m), of the reservoirs shortest or second dimension (if prismatic).
- Silt Trap: does the Berkad have a functional silt trap?
- Roof: is the surface area of the Berkad covered?
- Supply Chamber: does the Berkad construction include a separate chamber from which water is drawn?
- Filter: does the berkad have a water filter?
- Fencing: is access to the Berkad restricted around it's entire perimeter?

3.1.8 Physical parameters: Dam

- Type of Dam: choose a description for the type of dam.
- Number of Dams in Cluster: The number of dams in a single cluster.
- Silt Trap: does the Dam have a functional silt trap?
- Reservoir Capacity: the usable volume, reported to a maximum precision of 1 m^3 of the reservoir.
- Reservoir Dimensions, Depth: the average vertical distance, reported to a maximum precision of 1m from the chosen datum to the deepest part of the reservoir
- Reservoir Dimensions, Length/Radius: the length, reported to a maximum precision of 1m, of the reservoirs first dimension (if prismatic) or radius (if spheroid)
- Reservoir Dimensions; Width: the length, reported to a maximum precision of 1m, of the reservoirs shortest or second dimension (if prismatic).
- Bund Wall Height; the vertical distance, reported to a maximum precision of 1m from the chosen datum to the deepest part of the reservoir (use negative number if above datum)
- Bund Wall Material; choose a description of the main material used in the dams construction.
- Catchment Area; an estimate of the catchment area of the dam, reported to a maximum precision of $1m^2$.
- Spillway: does the Dam construction incorporate a functional spillway?
- In-flow channel: is there an inflow channel connected to the dam?
- Fencing: is access to the Dam restricted around it's entire perimeter?
- Well: does the dam have a well associated with it?

3.1.9 Physical parameters: Borehole

- Type of Well: choose a description for the borehole type.
- No. of Wells in Cluster: the number of boreholes in a single cluster.
- Depth: the vertical distance, reported to a maximum precision of 100mm (0.1 m), from the chosen datum to the bottom of the well shaft.
- Static Water Level: the vertical distance, reported to a maximum precision of 100mm (0.1 m), from the chosen datum to the potentiometric surface of the aquifer.
- Pump Test Type: the type of pump test that was carried out on the well
- Pump Test Source: please write the name/address/e-mail address where the pump test data is available, if known.[8]
- Tested Max. Yield: yield from the well, reported to a maximum precision of $0.1 m^3 hr^{-1}$ as determined by the pump test
- Tested Max Drawdown: the maximum vertical distance, reported to a maximum precision of 100mm (0.1 m), from the chosen datum to the water level in the well shaft developed during the pump test.
- Recovery Time: the time that was recorded in the well test. This should be rounded to the nearest 30 minutes (½ hour).
- Specific Capacity: the quantity of water that a borehole can produce per unit of drawdown, reported to a maximum precision of $0.1 m^3 hr^{-1} m^{-1}$.
- Operating Yield: the extraction rate from the well, reported to a maximum precision of $0.1 m^3 hr^{-1}$ under normal operating conditions.
- Operating Drawdown: the vertical distance, reported to a maximum precision of 100mm (0.1 m), from the chosen datum to the water level in the shaft under normal operating conditions.
- Operating Hours: the number of hours the well is operated in a day, rounded to the nearest 30 minutes (½ hour).
- Pump Casing Type: what material is the pump casing constructed from?
- Pump Casing Size: the internal bore of the pump casing, reported to a maximum precision of 1mm.
- Riser Type: what material is the riser constructed from?
- Riser Size: the internal bore, reported to a maximum precision of 1mm, of the riser.
- Cut Off Electrode: is there a functioning cut-off electrode on the system?
- Screen Depth: the vertical distance, reported to a maximum precision of 100 mm (0.1 m), from the chosen datum to the start of the screen section; & the vertical distance, reported to a precision of 1 mm (0.1 m), from the chosen datum to the end of a screen section.
- Screen Type: the screen construction and material.
- Well Head Protected: does the well have a sanitary seal?
- Pump level: the vertical distance, reported to a maximum precision of 100mm (0.1 m), from the chosen datum to the water pump.
- Hydraulic Conductivity: the ease with which water can move through pore spaces or fractures of a soil.

[8] Note that if the pump test documentation is available it can be scanned and stored within the SWIMS application using the Attach Files Wizard.

- Transmissivity: the rate at which a water of a prevailing density and viscosity is transmitted through a unit width of an aquifer or confining bed under a unit hydraulic gradient.
- Piezometric Level: the vertical distance, reported to a maximum precision of 100mm (0.1 m), from the datum to the level of water in the aquifer.
- Lithology Known: is the lithology of the aquifer for the source known from geophysical logs etc.
- Lithology Source: provide contact details for the source of Lithological data if available.

3.1.10 Physical parameters: Dug well

- Type of Dug Well: please choose a description for the type of dug well
- No. of Wells in Cluster: the number of dug wells in a single cluster.
- Depth: the vertical distance, reported to a maximum precision of 1mm (0.001 m), from the chosen datum to the bottom of the well shaft.
- Static Water Level: the vertical distance, reported to a maximum precision of 100mm (0.1 m), from the chosen datum to the potentiometric surface of the aquifer.
- Lining Material: what type of material is the well lining made of?
- Shaft Diameter: what is the diameter of the well shaft?
- Apron: does the well have an apron?
- Soakaway: does waste water from the well drain into a soak away pit?
- Infiltration Gallery: does the well have an infiltration gallery?
- Pump Test: has the well been pump tested?
- Tested Yield: what is the maximum volumetric flow rate, reported to a maximum precision of 0.1 m^3 hr^{-1}, achieved during the pump test?
- Operating Yield: what is the extraction rate from the well, reported to a maximum precision of 0.1 m^3 hr^{-1}, under normal operating conditions?
- Operating Drawdown: the vertical distance, reported to a maximum precision of 100 mm (0.1 m), from the chosen datum to the water level in the shaft under normal operating conditions?
- Operating Hours: for how many hours a day is the well operated, rounded to the nearest 30 minutes (½ hour).
- Recharge Rate: describe the rate, as either good, fair or poor, at which the water level in the well returns to the static water level after normal operational extraction.
- Pump Level: the vertical distance, reported to a maximum precision of 100mm (0.1 m), from the chosen datum to the water pump.
- Riser Size: the internal bore, reported to a maximum precision of 1mm, of the riser.
- Well Head Protected: does the well have a sanitary seal?

3.1.11 Physical parameters: Spring

- Type of Spring: the hydrogeological classification of the spring
- No. of Discharge Points: how many distinct 'eyes' does the spring have?
- Cumulative Discharge Rate: the total volumetric flow rate, reported to a maximum precision of 0.1 $l\ s^{-1}$ of the spring
- Seasonal Deviation in Discharge: the magnitude of fluctuation in the volumetric flow rate of the spring between wet and dry seasons.
- Rate Test Type: a description of the type of rate test carried out.
- Rate Test Source: provide contact details for the source of rate test data if available.
- Source Protected: has the source been protected from contamination?

3.1.12 Physical parameters: Other

- Type of Source: provide a description of the source type.
- Water Category: classification of the primary source of the water.
- Source Capacity: an estimate of the volume of water, reported to a maximum precision of 100 l (0.1 m^3), of the sources usable storage capacity.
- Source Yield: the yield of the source, reported to a precision of 1 l s^{-1} (0.001 $m^3 s^{-1}$)
- Source Dimensions, Depth: the vertical distance, reported to a maximum precision of 100 mm, (0.1m) from the chosen datum to the deepest part of the reservoir
- Source Dimensions, Length/Radius: the length, reported to a maximum precision of 100mm (0.1m), of the reservoirs first dimension (if prismatic) or radius (if spherical)
- Source Dimensions; Width: the length, reported to a maximum precision of 100mm (0.1m), of the reservoirs shortest or second dimension (if prismatic).
- Aquifer: a subsurface zone of porous rock, unconsolidated gravel, fractured rock or cavernous limestone, that yields economically important amounts of water to wells.
- Watershed: the area contributing to flow into the water source.
- Tugga: seasonal stream connected to the source
- Source Protected: has the source been protected from contamination?
- Pump Level: the vertical distance, reported to a maximum precision of 100mm (0.1 m), from the chosen datum to the water pump.

ANNEXES

Annex I: Glossary and Definitions

Aquifuge	An absolutely impermeable lithologic layer that will not transmit any water.
Aquitard	(A.k.a. Aquiclude) a lithologic layer of low permeability that is incapable of storing or transmitting groundwater in sufficient quantities for exploitation. Aquitards may be important on a large scale by virtue of their area.
Catchment area	The area that can supply water to a point (generally the inlet of a source is SWIMS) under the action of drainage by gravity.
Confined Aquifer	(A.k.a. Artesian) an aquifer that is overlain by a confining layer that allows recharge in an area where the aquifer outcrops or from downward percolation of water through the confining layer.
Contact spring	A spring formed at a lithologic contact where a more permeable layer overlies a less permeable layer
Datum	A known and constant surface relative to which position measurements are made.
Depression spring	A spring formed when the water table reaches a land surface because of a change in topography
Develop	Enumerator advises that a new source is required e.g due to permanent expansion of population) or an alternative source is required (e.g. due to salinity problems in the water or other user concerns)
Drawdown	The reduction in the Static Water Level within the well resulting from abstraction.
Embankment dam	An impermeable obstruction in a river channel or narrow valley constructed for the purpose of impounding water in the channel or valley upstream of the dam.
Environmental Condition	The Enumerator's assessment of the area the area surrounding the water source. For example are there latrines within a 20m radius of the source? Is the area well drained? Is the source freely accessible to all users?
Fault Spring	A spring formed by the movement of two rock units on a fault
General Condition	The Enumerator's assessment of the general operation and structural condition of the source. Are all masonry or concrete elements sound? Is the pump working efficiently? Are fences well maintained?
Improve	Enumerator advises that improvements to the source are required (e.g. capping an open spring, installing a pump on an open well, erecting a roof over a berkad etc.)
Infiltration gallery	An infiltration gallery comprises a trench backfilled with gravel media, in which is placed a slotted, drilled, open jointed pipe or purpose made well screen, for the purpose of supplying water

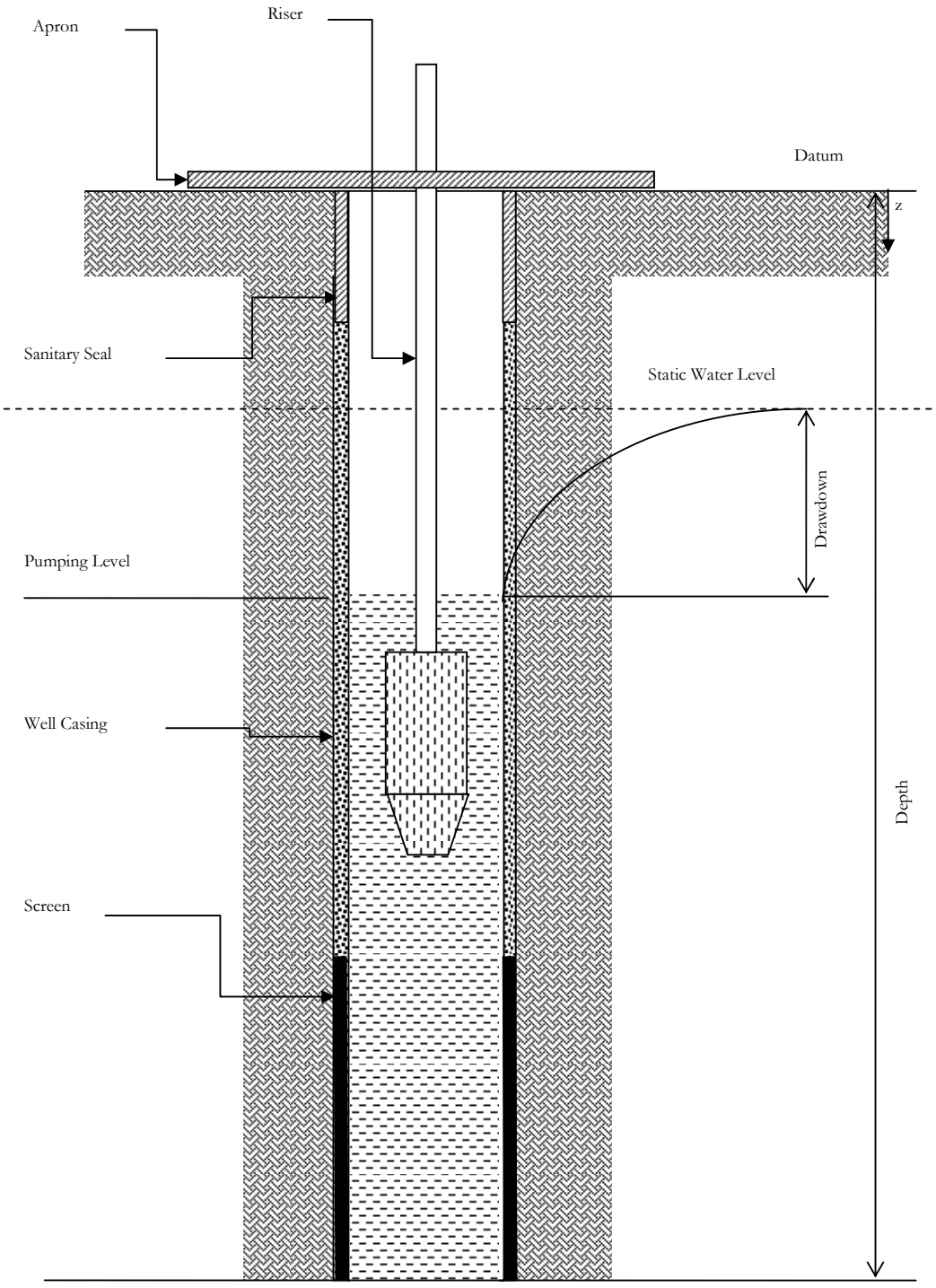
	filtered to a collector well from a surface source. May be constructed on the bank or in the bed.
Infiltration well	A point source well constructed in the stream/river bed using a porous ring that collects filtered surface water through infiltration through the stream bed. The top ring is normally extended above the flood level or sealed (see Infiltration Gallery)
Joint/Fracture spring	A spring formed by fracture or jointing of an individual rock unit.
Owner	Indicate whether the source is privately owned, community owned or other. Other could include a well in a hospital or a school which, while not open to the community at large, is still a public amenity.
Perched Aquifer	A layer of saturated soil or sediment formed by a lens of low permeability formed in more permeable materials.
Potentiometric Level	(A.k.a. Piezometric level:) the level of an imaginary surface in m to which the water level rises. In a confined aquifer it is the height to which the water would rise by virtue of the pressure in the aquifer. (see also standing water level).
Well Casing	(A.k.a. Casing, pump casing): a tube used as a permanent lining for the well shaft.
Rehabilitate	Enumerator advises that restoring the source to it's previous condition is required (e.g. replacing a pump or generator in a drilled well, repairing a damaged storage tank etc.)
Riser	A pipe carrying water from within a well to a point of discharge
Riverside well	A well dug adjacent to a surface water source that collects filtered surface water through infiltration through permeable banks.
Sand dam	A dam, built up over several years, built by accumulating sediments by means of an obstruction across a Tugga.
Sand storage dam	A retaining wall constructed to accumulate sediment so as to retain and store water in those sediments. Normally found in Tuggas
Sanitary Condition	The Enumerator's assessment of the sanitary condition of the source. Does the source have a sanitary seal? Is the source protected from contamination from surface run-off and seepage? Does the source have adequate drainage? Is the water lifting method employed at the source sanitary? If the source is used to water animals, are troughs provided?
Semi-confined Aquifer:	(a.k.a) A confined aquifer that is bounded above or below by an aquitard.
Silt-trap	A low level obstruction in an inlet channel constructed so as to restrict water velocity, allowing silt to settle from the water and de-silted water to enter a reservoir by overflowing the obstruction.
Sinkhole spring	A spring created by groundwater flowing from a sinkhole in a karstic terrain

Soak-away	An excavation with a stable, porous lining with it's upper edge sealed constructed so as to receive wastewater and allow it to drain away through the sides of the excavation. May be backfilled with stones to support the roof and sides.
Specific capacity	The rate of discharge of water from a well per unit of drawdown
Static Water Level	(a.k.a Specific Head) the height, relative to an arbitrary datum, of a column of water that can be supported by the static pressure in the well.
Sub-surface dam	A dam constructed below ground level that prevents the passage of groundwater in the sand bed of a Tugga.
Un-confined Aquifer:	(A.k.a. Water table aquifer) an aquifer that is overlain by continuous layers of high intrinsic permeability materials that allow recharge through downward seepage through the unsaturated zone. Recharge can also occur through ground water movement or upward seepage.
Usable volume	The volume of water between the highest point on a reservoir and the lowest point on a reservoir that can supply water (e.g. the distance between reservoir overflow and reservoir supply ouflow)
Yield	The rate at which water is pumped from the source.

Annex II: SWIMS Field Equipment List

- pH, EC multimeter; with automatic temperature correction to 25^0 Celsius.
- Deep meter; length 250 – 450m
- Measuring tape; length 100m
- Manilla rope; 250m
- Sinking weight
- GPS handset / Humanitarian Reference Grid maps
- Digital camera
- Maps of survey areas
- Plastic beaker; capacity of 1 litre
- Stationery: plastic folders, clipboards, ball point pens, permanent markers, data collection forms
- First aid kit

Annex III: Well Terminology Diagram



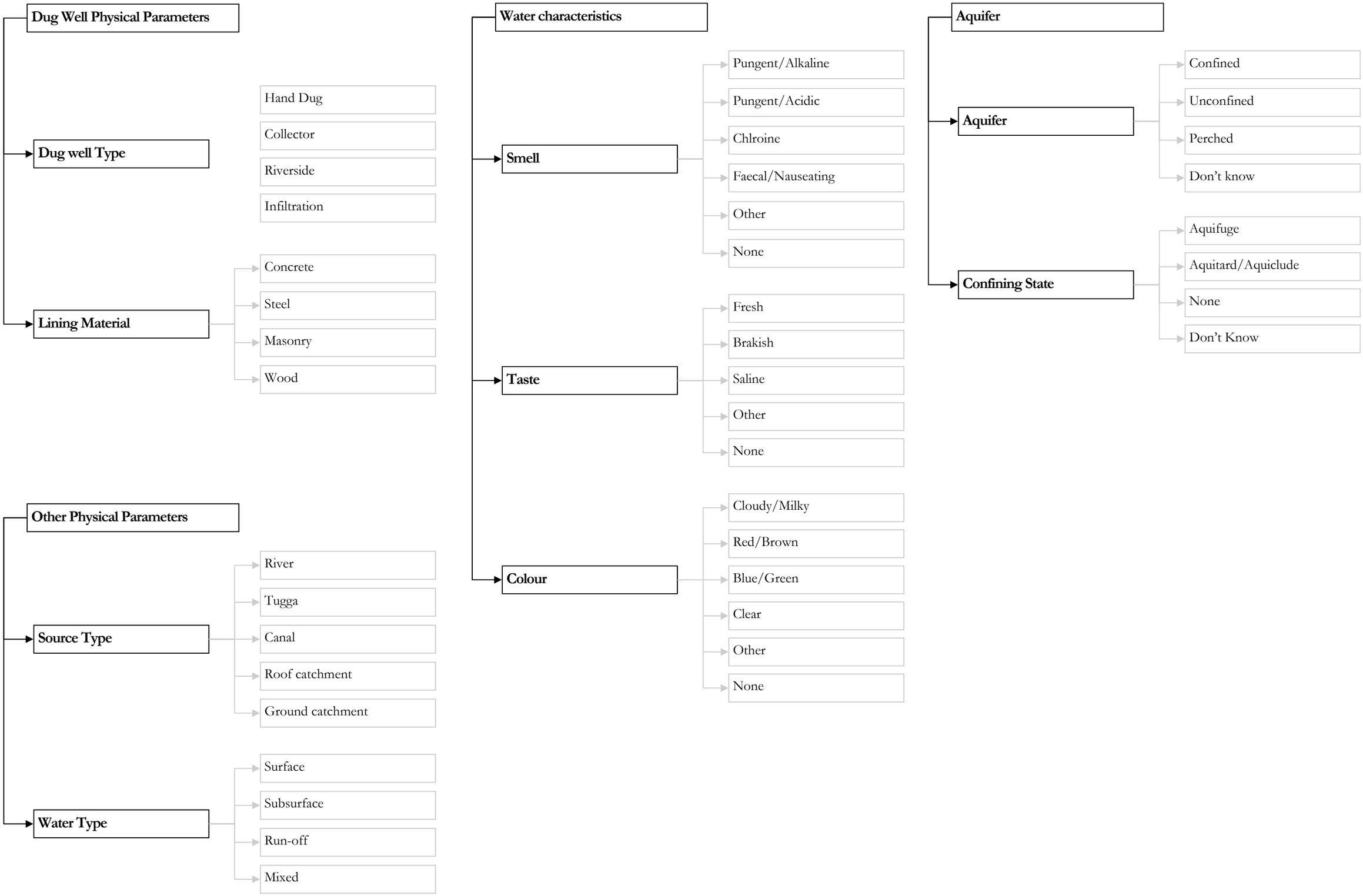
Annex IV: SWIMS Drop Down Fields

- **Location**
- **Source Type**
  - Berkad
  - Dam
  - Drilled Well
  - Dug Well
  - Spring
  - Other
- **Municpal Code**
  - Don't Know
  - IDP Camp
  - Large Pop. Centre (>10,000)
  - Medium Pop. Centre(<10,000)
  - Small Pop. Centre (<1,000)
  - Nomadic Settlement
  - Rural

- **Dam Physical Parameters**
- **Dam Type**
  - Balli/War
  - Sub-surface
  - Sand Dam
  - Check Dam
  - Embankment dam
- **Material**
  - Earth
  - Concrete
  - Masonry, brick
  - Masonry, stone

- **Spring**
- **SpringType**
  - Don't know
  - Depression
  - Contact
  - Fault
  - Sinkhole
  - Joint/Fracture
- **Rate test type**
  - Bucket and stop watch
  - Wier
  - Other

- **Borehole Physical Parameters**
- **Borehole Type**
  - Driven/Tube
  - Jetted Well
  - Borewell
  - Rotary
  - Percussion
- **Pump test type**
  - Step-Drawdown
  - Constant Discharge
  - Constant Discharge & recovery
  - Constant Drawdown
  - Constant Drawdown & recovery
  - Slug/Bailer test
- **Screen type**
  - Don't know
  - Blank
  - Slotted Pipe
  - Bridge Slot
  - Continuous Slot
  - Louvred
- **Riser type**
  - Don't know
  - PVC
  - PE
  - ABS
  - Stainless Steel
  - Galvanised Steel


Dug Well Physical Parameters
Dug well Type
Hand Dug
Collector
Riverside
Infiltration
Lining Material
Concrete
Steel
Masonry
Wood
Water characteristics
Smell
Pungent/Alkaline
Pungent/Acidic
Chlroine
Faecal/Nauseating
Other
None
Taste
Fresh
Brakish
Saline
Other
None
Colour
Cloudy/Milky
Red/Brown
Blue/Green
Clear
Other
None
Aquifer
Aquifer
Confined
Unconfined
Perched
Don't know
Confining State
Aquifuge
Aquitard/Aquiclude
None
Don't Know
Other Physical Parameters
Source Type
River
Tugga
Canal
Roof catchment
Ground catchment
Water Type
Surface
Subsurface
Run-off
Mixed

Annex V: SWIMS Field Data Collection Forms

Detailed Information Sheet: Borehole

Metadata reference

Definition: A well developed by mechanical means. Typically drilled, with limited bore diameter and of significant depth. May also be called, drilled well, tubewell. etc.

Data Management

Date

Inspected by

Entry Agency

Inspecting Agency

Location

Region

District

Source name

GPS Make and Model

North °

Positional accuracy ± m

East °

Distance to nearest settlement km

Elevation masl

Nearest settlement name

Users ☐ Rural ☐ Urban ☐ Nomadic

Municipal Code

Function and Use

Functioning ☐ Yes ☐ No ☐ Abandoned

Operator ☐ Yes ☐ No ☐ Don't Know

Permanent Use ☐ Yes ☐ No ☐ Don't Know

Notes: general condition, repairs required etc.

Humans	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Sheep/goats	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Camel	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Cattle	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Irrigated area	Gu	ha	Hagaa	ha	Deyr	ha	Jilaal	ha

Distance to nearest permanent source km

Description of nearest permanent source e.g. name, coordinates, source type, etc.

Number of other Water Sources in the Area

Berkad	Number	Borehole	Number
Dam	Number	Spring	Number
Dug Well	Number	Other	Number

Number of settlements served by source? Number

General condition ☐ Good ☐ Fair ☐ Poor

Sanitary Condition ☐ Good ☐ Fair ☐ Poor

Environmental condition ☐ Good ☐ Fair ☐ Poor

Intervention required? ☐ Develop ☐ Improve ☐ Rehab ☐ None

Last intervention? Agency Date

Source Established? Agency Date

Physical parameters

Type of well		No. of wells in cluster	
Depth	m	Static Water Level (SWL)	Ground level to SWL m
Pump test type		Pump test source	
Test max. yield	m^3/hr	Test max drawdown	m
Recovery time	hr	Specific capacity	$m^3/hr/m$
Operating hours	hr	Operating Yield	m^3/hr
Operating drawdown	m	Pump casing type	
Pump casing size	mm	Riser type	
Riser size	mm	Cut-off electrode?	☐ Yes ☐ No
Screen depth:	From m To m	Screen type	
Well-head Protected ?	☐ Yes ☐ No	Pump level	Ground level to the pump inlet m

If possible a sketch of the well design should be included in the space provided showing positions of pump housing, riser (production casing), blind and open screens.

Hydraulic conductivity	m/d	Transmissivity	m^2/d
Piezometric Level	m		
Lithology known?	☐ Yes ☐ No	Lithology source	

Water Characteristic

EC @ 25°C	± µS/cm	**EC meter**	Make and model / Calibration date
pH		**pH meter**	Make and model / Calibration date
Temperature	°C	Turbidity	NTU
E.Coli	MPN/100ml	Colour	
Smell		**Taste**	
Additional chemical analysis available?	☐ Yes ☐ No	Analysis source	

Supply & distribution

Supply system condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Engine Room condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Storage tank condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Storage tank capacity	m^3	Pipeline delivery length	m
Taps/outlets	Number	Kiosks	Number
Animal troughs	Number	Tankering points	Number

Water lifting technology ☐ Submersible ☐ Surface ☐ Mono ☐ Handpump ☐ Bucket & Windlass

	Make	Model Number	Serial Number	Date installed	Rated Delivery Delivery	Rated Delivery Head
Pump					m^3/s	m

Prime Mover ☐ Petrol ☐ Diesel ☐ Electric ☐ Solar panel ☐ Wind turbine

	Make	Model Number	Serial Number	Date installed		
Engine					Engine output	W
Generator					Generator output	kVA

Source Management

Owner? ☐ Private ☐ Community ☐ Other

Management Committee? ☐ Yes ☐ No

Cost per unit

Tanker	$/$m^3$	Camel	$/100
Jerican	$/l	Cattle	$/100
Drum	$/l	Sheep/goat	$/100

Additional notes & Sketches

Detailed Information Sheet: Dug Well

Metadata reference

1.1 Definition: *Any source that taps groundwater that has been developed by non-mechanical means. The descriptor name may therefore be in Somali (eg. Beeyo, buq, laas, ceel) or English (eg. Collector well, hand dug well, traditional well, farm well, etc.).*

Data Management

Date		**Inspected by**	
Entry Agency		**Inspecting Agency**	

Location

Region		District	
Source name		**GPS Make and Model**	
North	°	**Positional accuracy**	± m
East	°	**Distance to nearest settlement**	km
Elevation	masl	**Nearest settlement name**	
Users	☐ Rural ☐ Urban ☐ Nomadic	Municipal Code	

Function and Use

Functioning ☐ Yes ☐ No ☐ Abandoned

Operator ☐ Yes ☐ No ☐ Don't Know

Permanent Use ☐ Yes ☐ No ☐ Don't Know

Notes: general condition, repairs required etc.

	Gu	Hagaa	Deyr	Jilaal
Humans	Number	Number	Number	Number
Sheep/goats	Number	Number	Number	Number
Camel	Number	Number	Number	Number
Cattle	Number	Number	Number	Number
Irrigated area	ha	ha	ha	ha

Distance to the nearest permanent source km

Description of nearest permanent source e.g. name, coordinates, source type, etc.

Number of other Water Sources in the Area

Berkad	Number	Borehole	Number
Dam	Number	Spring	Number
Dug Well	Number	Other	Number

Number of settlements served by source? Number

General condition ☐ Good ☐ Fair ☐ Poor

Sanitary Condition ☐ Good ☐ Fair ☐ Poor

Environmental condition ☐ Good ☐ Fair ☐ Poor

Intervention required? ☐ Develop ☐ Improve ☐ Rehab ☐ None

Last intervention? Agency Date

Source Established? Agency Date

Physical parameters

Type of dug well		**No. of dug wells in cluster**	Number
Depth	m	**Static Water Level (SWL)**	Ground level to SWL m
Lining Material		Shaft diameter	m
Pump test	☐ Yes ☐ No	**Operating yield**	m^3/hr
Tested yield	m^3/hr	Operating hours	hr
Operating drawdown	m	Riser size	mm
Pump level	Ground level to the pump inlet m		
Well-head protected ?	☐ Yes ☐ No	Recharge rate	☐ Good ☐ Fair ☐ Poor
Apron	☐ Yes ☐ No	Apron dimensions	Length/Radius m; Width m
Soak away	☐ Yes ☐ No	Soak away dimensions	Depth m; Length/Radius m; Width m
Infiltration gallery	☐ Yes ☐ No	Infiltration gallery dimensions	Depth m; Length/Radius m; Width m

Water Characteristic

EC @ 25°C	± µS/cm	**EC meter**	Make and model; Calibration date
pH		**pH meter**	Make and model; Calibration date
Temperature	°C	Turbidity	NTU
E.Coli	MPN/100ml	Colour	
Smell		**Taste**	
Additional chemical analysis available?	☐ Yes ☐ No	Analysis source	

Supply & distribution

Supply system condition?	☐ None ☐ Good ☐ Fair ☐ Poor		
Engine Room condition?	☐ None ☐ Good ☐ Fair ☐ Poor	Storage tank condition?	☐ None ☐ Good ☐ Fair ☐ Poor
Storage tank capacity	m^3	Pipeline delivery length	m
Taps/outlets	Number	Kiosks	Number
Animal troughs	Number	Tankering points	Number

Supply & distribution continued

Water lifting technology ☐ Submersible ☐ Surface ☐ Mono ☐ Handpump ☐ Bucket & Windlass

	Make	Model Number	Serial Number	Date installed	Rated Delivery	Head
Pump					Delivery m^3/s	m

Prime Mover ☐ Petrol ☐ Diesel ☐ Electric ☐ Solar panel ☐ Wind turbine

	Make	Model Number	Serial Number	Date installed		
Engine					Engine output	W
Generator					Generator output	kVA

Source Management

Owner? ☐ Private ☐ Community ☐ Other

Management Committee? ☐ Yes ☐ No

Cost per unit

Tanker	$/$m^3$	Camel	$/100
Jerrican	$/l	Cattle	$/100
Drum	$/l	Sheep/goat	$/100

Additional notes & Sketches

Detailed Information Sheet: Dam

Metadata reference

A dam acts as a barrier to impound water. The most typical dams are Balli or War type, open ponds with a bund wall to impound surface run-off. Sub-surface and sand dams are also encountered.

Data Management

Date

Inspected by

Entry Agency

Inspecting Agency

Location

Region

District

Source name

GPS Make and Model

North °

Positional accuracy ± m

East °

Distance to nearest settlement km

Elevation masl

Nearest settlement name

Users ☐ Rural ☐ Urban ☐ Nomadic

Municipal Code

Function and Use

Functioning ☐ Yes ☐ No ☐ Abandoned

Operator ☐ Yes ☐ No ☐ Don't Know

Permanent Use ☐ Yes ☐ No ☐ Don't Know

Notes: general condition, repairs required etc.

Humans	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Sheep/goats	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Camel	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Cattle	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Irrigated area	Gu	ha	Hagaa	ha	Deyr	ha	Jilaal	ha

Distance to nearest permanent source km

Description of nearest permanent source e.g. name, coordinates, source type, etc.

Number of other Water Sources in the Area

Berkad	Number	Borehole	Number
Dam	Number	Spring	Number
Dug Well	Number	Other	Number

Number of settlements served by source? Number

General condition ☐ Good ☐ Fair ☐ Poor

Sanitary Condition ☐ Good ☐ Fair ☐ Poor

Environmental condition ☐ Good ☐ Fair ☐ Poor

Intervention required? ☐ Develop ☐ Improve ☐ Rehab ☐ None

Last intervention? Agency Date

Source Established? Agency Date

Physical parameters

Type of dam

Number of dams in cluster

Reservoir Capacity m^3

Reservoir dimensions: Depth m | Length/Radius m | Width m

Bund wall material

Bund wall height m

Catchment area m^2

Silt trap? ☐ Yes ☐ No

Spillway? ☐ Yes ☐ No

In-flow channel? ☐ Yes ☐ No

Fencing? ☐ Yes ☐ No

Well? ☐ Yes ☐ No

Synthetic lining? ☐ Yes ☐ No

Water Characteristic

EC @ 25°C ± µS/cm

EC meter Make and model | Calibration date

pH

pH meter Make and model | Calibration date

Temperature °C

Turbidity NTU

E.Coli MPN/100ml

Colour

Smell

Taste

Additional chemical analysis available? ☐ Yes ☐ No

Analysis source

Supply & distribution

Supply system condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Engine Room condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Storage tank condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Storage tank capacity m^3

Pipeline delivery length m

Taps/outlets Number

Kiosks Number

Animal troughs Number

Tankering points Number

Water lifting technology ☐ Submersible ☐ Surface ☐ Mono ☐ Handpump ☐ Bucket & Windlass

	Make	Model Number	Serial Number	Date installed	Rated Delivery m^3/s	Head m
Pump						

Prime Mover ☐ Petrol ☐ Diesel ☐ Electric ☐ Solar panel ☐ Wind turbine

	Make	Model Number	Serial Number	Date installed	
Engine					Engine output W
Generator					Generator output kVA

Source Management

Owner? ☐ Private ☐ Community ☐ Other

Management Committee? ☐ Yes ☐ No

Cost per unit

Tanker	$/$m^3$	Camel	$/100
Jerican	$/l	Cattle	$/100
Drum	$/l	Sheep/goat	$/100

Detailed Information Sheet: Spring

Metadata reference

1.2 *Any source of water naturally flowing from the ground to or across its surface. The descriptor may be in Somali (isha, laas) or English (artesian spring, spring well, etc.).*

Data Management

Date		**Inspected by**	
Entry Agency		**Inspecting Agency**	

Location

Region		District	
Source name		**GPS Make and Model**	
North	°	**Positional accuracy**	± m
East	°	**Distance to nearest settlement**	
Elevation	masl	**Nearest settlement name**	km
Users	☐ Rural ☐ Urban ☐ Nomadic	Municipal Code	

Function and Use

Functioning ☐ Yes ☐ No ☐ Abandoned

Operator ☐ Yes ☐ No ☐ Don't know

Permanent Use ☐ Yes ☐ No ☐ Don't know

Notes: general condition, repairs required etc.

	Gu	Hagaa	Deyr	Jilaal
Humans	Number	Number	Number	Number
Sheep/goats	Number	Number	Number	Number
Camel	Number	Number	Number	Number
Cattle	Number	Number	Number	Number
Irrigated area	ha	ha	ha	ha

Distance to the nearest permanent source km

Description of nearest permanent source e.g. name, coordinates, source type, etc.

Number of other Water Sources in the Area

Berkad	Number	Borehole	Number
Dam	Number	Spring	Number
Dug Well	Number	Other	Number

Number of settlements served by source? Number

General condition ☐ Good ☐ Fair ☐ Poor

Sanitary Condition ☐ Good ☐ Fair ☐ Poor

Environmental condition ☐ Good ☐ Fair ☐ Poor

Intervention required? ☐ Develop ☐ Improve ☐ Rehab ☐ None

Last intervention?	Agency	Date
Source Established?	Agency	Date

Physical parameters

Type of spring

No. of discharge points

Rate test type

Rate test source

Cumulative discharge rate l/s

Seasonal deviation in discharge rate ☐ Great ☐ Small ☐ None

Protected? ☐ Yes ☐ No

Water Characteristic

EC @ 25°C ± µS/cm

EC meter Make and model | Calibration date

pH

pH meter Make and model | Calibration date

Temperature °C

Turbidity NTU

E.Coli MPN/100ml

Colour

Smell

Taste

Additional chemical analysis available? ☐ Yes ☐ No

Analysis source

Supply & distribution

Supply system condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Engine Room condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Storage tank condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Storage tank capacity m^3

Pipeline delivery length m

Taps/outlets Number

Kiosks Number

Animal troughs Number

Tankering points Number

Water lifting technology ☐ Submersible ☐ Surface ☐ Mono ☐ Handpump ☐ Bucket & Windlass

	Make	Model Number	Serial Number	Date installed	Rated Delivery: Delivery m^3/s	Head m
Pump						

Prime Mover ☐ Petrol ☐ Diesel ☐ Electric ☐ Solar panel ☐ Wind turbine

	Make	Model Number	Serial Number	Date installed		
Engine					Engine output	W
Generator					Generator output	kVA

Source Management

Owner? ☐ Private ☐ Community ☐ Other

Management Committee? ☐ Yes ☐ No

Cost per unit

Tanker	$/m^3$	Camel	$/100
Jerrican	$/l	Cattle	$/100
Drum	$/l	Sheep/goat	$/100

Detailed Information Sheet: Berkad

Metadata reference

Definition: A berkad is a manmade cistern to store run off water. Typically it is sunk into the ground and made of stone/brick wall and plastered to minimize water leakage.

Data Management

Date

Inspected by

Entry Agency

Inspecting Agency

Location

Region

District

Source name

GPS Make and Model

North °

Positional accuracy ± m

East °

Distance to nearest settlement .

Elevation masl

Nearest settlement name

Users ☐ Rural ☐ Urban ☐ Nomadic

Municipal Code

Function and Use

Functioning ☐ Yes ☐ No ☐ Abandoned

Operator ☐ Yes ☐ No ☐ Don't know

Permanent Use ☐ Yes ☐ No ☐ Don't know

Notes: general condition, repairs required etc.

Humans	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Sheep/goats	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Camel	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Cattle	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Irrigated area	Gu	ha	Hagaa	ha	Deyr	ha	Jilaal	ha

Distance to nearest permanent source km

Description of nearest permanent source: e.g. name, coordinates, source type, etc.

Number of other Water Sources in the Area

Berkad	Number	Borehole	Number
Dam	Number	Spring	Number
Dug Well	Number	Other	Number

Number of settlements served by source? Number

General condition ☐ Good ☐ Fair ☐ Poor

Sanitary Condition ☐ Good ☐ Fair ☐ Poor

Environmental condition ☐ Good ☐ Fair ☐ Poor

Intervention required? ☐ Develop ☐ Improve ☐ Rehab ☐ None

Last intervention? Agency Date

Source Established? Agency Date

Physical parameters

No. of berkads in cluster

Catchment area m^2

Reservoir Capacity m^3

Reservoir dimensions: Depth m | Length/Radius m | Width m

Silt trap? ☐ Yes ☐ No

Filter? ☐ Yes ☐ No

Supply chamber? ☐ Yes ☐ No

Fencing? ☐ Yes ☐ No

Roof? ☐ Yes ☐ No

Water Characteristic

EC @ 25°C ± µS/cm

EC meter Calibration date | Make and model

pH

pH meter Calibration date | Make and model

Temperature °C

Turbidity NTU

E.Coli MPN/100ml

Colour

Smell

Taste

Additional chemical analysis available? ☐ Yes ☐ No

Analysis source?

Supply & distribution

Supply system condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Engine room condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Storage tank condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Storage tank capacity m^3

Pipeline delivery length m

Taps/outlets Number

Kiosks Number

Animal troughs Number

Tankering points Number

Water lifting technology ☐ Submersible ☐ Surface ☐ Mono ☐ Handpump ☐ Bucket & Windlass

	Make	Model Number	Serial Number	Date installed	Rated Delivery m^3/s	Head m
Pump						

Prime Mover ☐ Petrol ☐ Diesel ☐ Electric ☐ Solar panel ☐ Wind turbine

	Make	Model Number	Serial Number	Date installed	
Engine					Engine output W
Generator					Generator output kVA

Source Management

Owner? ☐ Private ☐ Community ☐ Other

Management Committee? ☐ Yes ☐ No

Cost per unit

Tanker	$/$m^3$	Camel	$/100
Jerrican	$/l	Cattle	$/100
Drum	$/l	Sheep/goat	$/100

Detailed Information Sheet: Other

Metadata reference

Should be used where the definition is not immediately clear, or does not fit the above division of surface and groundwater sources. Surface water abstractions from rivers, streams and swamps should be recorded here

Data Management

Date		**Inspected by**	
Entry Agency		**Inspecting Agency**	

Location

Region		District	
Source name		**GPS Make and Model**	
North	°	**Positional accuracy**	± m
East	°	**Distance to nearest settlement**	km
Elevation	masl	**Nearest settlement name**	
Users	☐ Rural ☐ Urban ☐ Nomadic	Municipal Code	

Function and Use

Functioning ☐ Yes ☐ No ☐ Abandoned

Operator ☐ Yes ☐ No ☐ Don't Know

Permanent Use ☐ Yes ☐ No ☐ Don't Know

Notes: general condition, repairs required etc.

Humans	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Sheep/goats	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Camel	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Cattle	Gu	Number	Hagaa	Number	Deyr	Number	Jilaal	Number
Irrigated area	Gu	ha	Hagaa	ha	Deyr	ha	Jilaal	ha

Distance to nearest permanent source km

Description of nearest permanent source e.g. name, coordinates, source type, etc.

Number of other Water Sources in the Area

Berkad	Number	Borehole	Number
Dam	Number	Spring	Number
Dug Well	Number	Other	Number

Number of settlements served by source? Number

General condition ☐ Good ☐ Fair ☐ Poor

Sanitary Condition ☐ Good ☐ Fair ☐ Poor

Environmental condition ☐ Good ☐ Fair ☐ Poor

Intervention required? ☐ Develop ☐ Improve ☐ Rehab ☐ None

Last intervention?	Agency	Date
Source Established?	Agency	Date

Physical parameters

Type of source		Water category	
Source yield	m^3/hr	Source dimensions	Depth m / Length/Radius m / Width m
Source capacity	m^3	Aquifer	
Watershed		Tugga	
Source protected ?	☐ Yes ☐ No	Pump level	Ground level to the pump inlet m

Water Characteristic

EC @ 25°C	± µS/cm	**EC meter**	Make and model / Calibration date
pH		**pH meter**	Make and model / Calibration date
Temperature	°C	Turbidity	NTU
E.Coli	MPN/100ml	Colour	
Smell		**Taste**	
Additional chemical analysis available?	☐ Yes ☐ No	Analysis source	

Supply & distribution

Supply system condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Engine Room condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Storage tank condition? ☐ None ☐ Good ☐ Fair ☐ Poor

Storage tank capacity	m^3	Pipeline delivery length	m
Taps/outlets	Number	Kiosks	Number
Animal troughs	Number	Tankering points	Number

Water lifting technology ☐ Submersible ☐ Surface ☐ Mono ☐ Handpump ☐ Bucket & Windlass

	Make	Model Number	Serial Number	Date installed	Rated Delivery m^3/s	Head m
Pump						

Prime Mover ☐ Petrol ☐ Diesel ☐ Electric ☐ Solar panel ☐ Wind turbine

	Make	Model Number	Serial Number	Date installed		
Engine					Engine output	W
Generator					Generator output	kVA

Source Management

Owner? ☐ Private ☐ Community ☐ Other

Management Committee? ☐ Yes ☐ No

Cost per unit

Tanker	$/m^3$	Camel	$/100
Jerrican	$/l	Cattle	$/100
Drum	$/l	Sheep/goat	$/100

Information Sheet: Interventions

Metadata reference

Please use this sheet to report on current and planned activities.

Data Management

Source Type		Date	
Entry Agency		Intervention Agency	

Location

Region		District	
Source name		GPS Make and Model	
North	°	Positional accuracy	± m
East	°	Nearest settlement name	
Elevation	masl	Nearest settle-ment distance	km

Intervention funding Donor

Proposal Status In progress ○ Accepted ○ Rejected ○

Grant Code Grant Dates Start Date Finish Date

Intervention Components							
	Source	New	○	Improve	○	Rehabilitate	○
	Source Protection	New	○	Improve	○	Rehabilitate	○
	Water Lifting System	New	○	Improve	○	Rehabilitate	○
	Storage	New	○	Improve	○	Rehabilitate	○
	Supply & Distribution System	New	○	Improve	○	Rehabilitate	○

Intervention Activities							
	System Operation	Physical	☐	Training	☐	Education	☐
	System Maintenance	Physical	☐	Training	☐	Education	☐
	System Management	Physical	☐	Training	☐	Education	☐
	Water Treatment	Physical	☐	Training	☐	Education	☐
	Sanitary	Physical	☐	Training	☐	Education	☐
	Hygiene	Physical	☐	Training	☐	Education	☐

	Start Date	Finish Date		
Planned Intervention?			Lead Agency	
			Partner Agency	
	Start Date	Finish Date		
Actual Intervention?			Partner Agency	

Please Provide a brief Description of the intervention in not more than 500 word

Intervention Active Yes ○ No ○

SWIMS Metadata Record

Metadata Tag	
Metadata Stamp Date	
Language	
Title	
Abstract	
Start Date	
Finish Date	
Close Record?	
Citation	
Online Resources	
Credits	
Key Words	

Contact Person	Contact Agency	Contact Address