STANDARD OPERATING PROCEDURE (SOP)
"Water Quality Sample Collection and Processing"

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For
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Irrigation and Water resources Department
Govt of Haryana

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1. About the Standard Operating Procedure (SOP)

This Standard Operating Procedure (SOP) is a step-by-step guide on Water Testing Kit (WTK) under Atal Bhujal Yojana (ABHY) for Haryana. It provides instructions for water sampling and processing of each parameter of WTK in a concise format. This SOP is designed to helpPGWM committee/VWSC/WUA/WUG, District Implementation Partners (DIPs), District Project Management Unit (DPMU) and other field staff or staff in-charge for routine observation of water quality sampling, data collection and/or recording for better decision making and improved governance.

2. Scope and applicability

The purpose of this Standard Operation Procedure (SOP) is to establish a uniform procedure for routine collection and testing of water samples for the purposes of drinking and irrigation water quality monitoring. The procedures outlined in this SOP are applicable to all surface and groundwater bodies of each District under ABHY Haryana. This SOP includes the following procedures for assessment of quality of drinking water by DIPs.

- Methods to collect samples from various groundwaters and surface water sources.
- Organization of water quality samples including frequency and sample quantity
- Methods and procedure to analyze water quality samples
- Maintaining data records of collected samples
- The scope of the SOP is limited to routine observation and analysis procedures. The SOP excludes quality of water for industrial purpose.

3. Methodology of preparing SOP

The SOP is prepared as per the bidgivenby SPMU, Haryana and methodology for water quality analysis given by vendor (Hans Raj Scientific Metal Works). The field visits and training were undertaken by SPMU team members in order to provide training to DPMU and DIPs groundwater experts on water sample collection and water quality testing. The recommendations regarding sampling locations, actual number of samples to be collected, periodicity of sampling and the parameters for analysis need to be determined in the GPs as per requirement.

4. Water Sampling and Testing Procedure

This SOP lists clear step-by-step instructions for establishing sampling location, sample collection, storage and data recording. The water sampling and testing procedure is explained in these following seven sequential steps.

4.1 Identify essential water quality tests

4.2 Identify sampling locations
4.3 Sample collection, storage, labeling, handling and testing of samples
4.4 Perform water quality tests
4.5 Data recording and management
4.6 Inspection of water quality testing kit and sample processing

4.1 Essential water quality tests

The State Government encouraged conducting some of the essential chemical and bacteriological water quality testing on site using the water quality test kits. This section provides the details of the water quality parameters given for water quality testing kit in the Scope of Works of ABHY Haryana. All the water quality tests given in Scope of works are necessary to conduct in the field. For regular monitoring of water quality at community level, simple and user friendly "Field Water Test Kits" have been procured by ABHY Haryana.

Descriptions of the parameters, principle/methods, range of measurement and reagents/ chemicals are given in Table 1:

Table 1: Descriptions of the parameters, principle/ methods, range of measurement and reagents/ Chemicals

S. No.	Parameters	Principle / Method	Range of Measurements	Method / Reagents & Chemicals
1	pH	Visual Color Comparison Method	4.0 to 11.0 (Standard Color Comparison Chart with 4.0, 5.0, 6.0, 7.0, 9.0, 10.0 and 11.0)	Universal Indicator (Liq. form) – in 125 ml dropping bottle or pH strips (1 pkd; 70 strips)
2	Total Hardness (mg/L)	Complexometric Titration Method	6-1000 mg/L as CaCO3	0.1 N EDTA (Liq.Sol.)-in 125 ml bottle, Hardness Buffer (Liq. Sol) in 60 ml bottle,Erichrome Black- T (in Tablet/ Powder from)
3	Total Alkalinity (mg/L)	Acid Base Titration (Method)	0-1000 mg/L as CaCO3	0.1 N H_2SO_4 (Liq.Sol.)- in 100 ml bottle, Phenoptheline and methyl orange indicators
4	Nitrate (NO3) (mg/L)	Visual Color Comparison Method	0.10.0, 25.0, 45.0, 100.0 mg/L as NO3 (with standard color chart)	PDA method: PDA in 125 ml and Ammonia 125 ml)

S. No.	Parameters	Principle / Method	Range of Measurements	Method / Reagents & Chemicals
6	Iron (Fe) Mg/L	Digital Electrical Conductivity Meter (Portable Pen Type)	0 to 0.3 mg/l	Direct reading by Electrical Conductivity Meter, 0.01N KCI Solution in bottle (100 ml)
7	Electrical Conductivity (EC)	Digital Electrical Conductivity Meter (Portable Pen Type)	0 to 9990 µS/ cm	Direct reading by Electrical Conductivity Meter, 0.01N KCI Solution in bottle (100 ml)
8	Bacteriological/Faecalcoliform	Color comparison	Presence/Absence	M 7 FC Agar 60 gm air tight bottle including 4 nos100ml glass bottles

Note: To recognize the importance of routine water sampling and analyses, the DIPs groundwater expert should be equipped with a basic knowledge and understanding of various kinds of water quality tests and their importance.

4.1.1 Physical, chemical and Bacteriological Test

This set of tests generally conducted on site includes analysis of turbidity, pH, and EC value to assess physical properties of water. Chemical tests provide assessment of total hardness ($CacO_3$), fluorides (F), nitrate (NO_3), alkalinity and Iron (Fe). These basic chemical tests will be performed on site using water quality testing kit;however,the identical samples from the GPs can also be sampled for laboratories chemical testing. A detailed methodology on collection of water samples for laboratory analysis is given in Annexure 1. Bacteriological (Faecal coliform) tests will also be conducted in the field using FTK.

4.1.2 Checklist

It is good practice to prepare a checklist, so that nothing is missing or forgotten before a sampling expedition to ABHY Haryana is undertaken. In preparation for the field work, the following checks and balances should be ensued.

Paperwork

- √ A copy of the Standard operating procedures/ Sampling Guide for sampling
- √ Itinerary for movement from one sampling site to the next
- √ GPS device to record sampling sites coordinates
- √ Map or instructions for locating the sampling site or sites
- √ Inventory details of sampling stations;

√ List of sites where water quality sampling is to be recorded
√ Item for field testing kit

The check list of the items required for field testing kit is shown in Table 2.

Table 2: Check list of items for field testing kit

S. No.	Item	Quantity in Nos.	Used in the Test
1	Field Test Kit bag/Box with handle	1	To carry the chemicals, reagents, polywares and glassware
2	Universal Indicator (Liq. form) 9 100 ml dropping bottle)	1	pH Test
3	0.1 N EDTA (LiqSol.) (125 ml bottle)	1	Hardness Test
4	Hardness Buffer (Liq.Sol.)- (60 ml dropping bottle)	1	Hardness Test
5	ErichromeBlack –T (Tablet)	Pack	Hardness Test
6	0.1 N H2SO4 (Liq.Sol)- (125 ml dropping bottle)	2	Alkalinity Tests
7	Phnopthline and methyl orange indicators (60 ml each)	2	Alkalinity Test
8	Nitrate-A and Nitrate-B tablets	2	Nitrate Test
9	Zirconium Alizarin solution (75 ml)	1	Fluoride Test
10	1, 10- Phenanthroline 125 ml, buffer solution 125 ml, Hcl and hydroxylamine solution 60 ml each	4	Iron Test
11	Silver nitrate 125 ml and Potassium chromate 60 ml	2	Chloride
12	100 H2S Vials	1	Faecal coliform
13	Electrical Conductivity Meter (Pen Type)	1	EC Test
14	0.01 N KCl-100 ml in reagent bottle	1	For EC meter calibration
15	Gloves 1 pair, cloth mask 1, wire gauge 1, spatula 1, cloth duster	4	For color developing during test
16	1 glass Beaker 50 ml, 1 conical flask 100 ml	2	
17	Calibrated titrant specific syringes with titrant name	4	

18	Poly lab wash bottle with 500 ml Distilled water		
19	Measuring Cylinder- plastic (Graduated) 50 ml	1	For sample measurement
20	User manual and test procedure in Hindi	1	For FTK instructions
21	Laminated Standard Color Charts	4	For color comparison of test
22	1 forceps	1	
23	Check list for items in the field Kit	1	For check the items in FTK
24	Quality check certificate	1	For chemicals, reagents, glassware 's quality check
25	Scissors	1	For Pouch and packing
26	Test tube with Cork	2	For analysis
27	Test tube stand	1	For holding test tube

4.2 Sampling locations

The number of locations from where samples for water quality testing should be collected is based on the source of water. Water samples should be collected at the surface water and ground water source. The major criteria for selection of water quality sampling location at GP level is given below:

1. Water quality may vary significantly with even at short distances due to heterogeneities in the aquifers, geomorphological settings etc
2. Groundwater sampling should be spatially distributed in the GP.
3. Wells tapping different aquifers (depth ranges) should be selected for water quality sampling and analysis.
4. 10 wells will be identified in every Gram Panchayat for water quality monitoring purpose to get a realistic picture of water quality of different aquifers in every GP.
5. If the number of villages are more than 10 in a GP, Minimum one well be identified in every village, ensure the wells identified should be evenly distributed.
6. It is preferable to use same wells for water quality analysis and water level monitoring. The wells selected for flow meter measurement can also be used for same purpose, if the 10 monitoring wells (Piezometer) are not found in the GP.

7. It is preferable to collect and analyze surface water samples of those water bodies (lakes/ponds) and rivers which are selected for rejuvenation under ABHY. However, other surface water bodies can also be analyzed.
8. Stagnant water in the well must be avoided
9. Approachability in all weather conditions must be ensured.
10. Water sample analysis by testing kit should be separately maintained in a register at every Gram Panchayat.

4.2.1 Sampling frequency

Establish a sampling regime should be identified at GP level. The sampling regime should list the number of samples to be collected and frequency of sampling at each sampling location for routine water quality. Table 3 provides the recommended frequency of sampling at GP level for field water quality test.

Table 3: Frequency of required water quality tests using WTK

Source	**Frequency of Required Tests**			**Minimum number of Samples**
	Physical	**Chemical**	**Bacteriological**	
Groundwater				
Tube well/ Bore well/ dug well/ Open well	Quarterly	Quarterly	Quarterly	At 10 identified (spatially distributed) well of the GP
Surface water				
Canal Water	Quarterly	Quarterly	Quarterly	One per source
Lakes/Ponds/River	Quarterly	Quarterly	Quarterly	One per source.
Treated wastewater for irrigation	Quarterly	Quarterly	Quarterly	One per source
Recharge water quality	Quarterly	Quarterly	Quarterly	One per source

1. The water quality analysis using WTKshould be carried out in situ on quarterly basis from 10 monitoring wells and at least 5 surface water sources from each Gram Panchayat.
2. At least 40 groundwater samples and 20 surface water samples should be analyzed on an annual basis from each GP using WTK.
3. Water quality monitoring during the construction/ rejuvenation period of lake/pond should also be analyzed.
4. Canal water quality samples should be analyzed from all the major canals falling in the GP.
5. Treated water or recharge water sample should also be analyzed in each GP

4.3Sample collection, storage, labeling, handling and testing of samples

Since these tests are to be carried out in situ, there are no special handling, storage or transportation procedures required. The samples collected should be immediately transferred to test tubes and tested. These samples need not be labeled. The samples collected for these tests should be discarded after the tests are done. However, the samples for laboratory analysis will also be collected per GP. The detailed sampling procedure for laboratory analysis is given Annexure 1.

4.4Performing water quality tests

The following physical parameters should be checked by the field staff and noted on the recording formats

4.4.1 Conducting pH test:

pH value denotes the acidic or alkaline condition of water which is expressed on a scale ranging from 0 to 14, which is the common logarithm. pH is the term used universally to express the intensity of the acid or alkaline conditions of a substance. pH is a measure of Hydrogen ion activity in water sample.

Method:

1. Take 10 ml water sample in to a clean test rube using a measuring cylinder.
2. Add 4 drops of Universal Indicator to it.
3. Replace the lid and invert gently to mix the contents.
4. Read the test results immediately by comparing the color of the test tube to the pH color chart.
5. Record the pH value.
6. Range: 4.0 to 11.0

Result

BIS prescribed permissible limits in drinking water as pH between the 6.5 - 8.5. Beyond this range the water will affect the mucous membrane and / or water supply system. If the pH value of water sample is in the range of 6.5 to 8.5, the water is potable (good for drinking).

4.4.2 Conducting Electrical Conductivity (EC) test

Electrical conductivity (EC) estimates the amount of total dissolved salts (TDS), or the total amount of dissolved ions in the water. TDS in mg/l is obtained from EC in µs/cm by dividing the obtained EC valve by 0.5.

Measurement method

1. Pour the sample water in a beaker.
2. Remove the Protective Cap of EC meter.
3. Turn the EC meter on. The ON/OFF switch is located on the panel.
4. Immerse the meter into the beaker of water up to the max. Immersion level (1 or 2").
5. Lightly stir the meter to dislodge any air bubbles.
6. Wait until the display stabilizes. Once the reading stabilizes (approx. 30-45 seconds), press the HOLD button to view the reading out of the water.
7. If the meter displays a flashing "x10" symbol, multiply the reading by 10.
8. After usage, shake off any excess water from your meter and wipe with a tissue. Replace the cap.

Result

BIS prescribed maximum permissible limits of Total Dissolved soils in drinking water as 2000 mg/l. Beyond this limit, portability decreases and may cause gastro intestinal irritation.

Changing the Batteries

1. Remove the battery compartment.
2. Install new batteries (2x1.5V). Be sure the batteries are properly aligned.
3. Replace the battery compartment. The meter will turn on automatically.

Precautions

1. The meter is not water-tight. Do not dip the meter beyond the water level Limit.
2. Do not store the meter in high temperatures or direct sunlight.

Calibration

1. Before attempting to re-calibrate the AP-2, make sure to have a certified bottle of calibration solution. Any brand will work. Never calibrate the meter to distilled or de-ionized water (below 2 µS).

2. Press the POWER button to turn the meter on. Dip the meter into the calibration solution. If the reading matches the TDS value of the calibration solution level, then you do not need to re-calibrate the meter.
3. If the reading does not match the calibration solution, press and hold the MODE button for four seconds. The temperature reading will switch to "CAL."
4. Change the reading so that it matches the calibration solution. Raise the reading by pressing the UP (MODE) button. Lower the reading by pressing the DOWN (HOLD) button.
5. Once the reading matches the calibration solution level, press and hold the MODE button again for four seconds until the temperature appears again. Your meter is now calibrated.

4.4.3 Total Alkalinity

The alkalinity of water is a measure of its capacity to neutralize acids. It is expressed as mg/l in terms of calcium carbonate. Alkalinity is an important parameter in evaluating the optimum coagulant dosage. The Total Alkalinity of water is a measurement of its capacity to neutralize acids. Natural waters may contain appreciable amounts of Bicarbonates, Carbonates and Hydroxide Alkalinity. High Alkaline waters are usually unpalatable.

Measurement method

1. Take 10 ml sample water into a clean conical flask, with the help of a measuring cylinder.
2. Add 2-3 drops of Phenolphthalein indicator to it.
3. Swirl to mix the contents. If P- Alkalinity is present, the color will change to pink.
4. Add 0.1 N H_2SO_4 drop by drop to the conical flask until the solution color changes from pink to colorless. **Note**: Be sure to count the number of drops added and mix the solution by swirling after every drop.
5. To obtain the P-Alkalinity in water in mg/l as $CaCO_3$, multiply the number of drops that were added (in Step 4) by 25 factors.
6. Now add 2-3 drops of Methyl orange indicator to the solution in which the P-Alkalinity has been determined.
7. Swirl to mix. The color will change to yellow.
8. Add 0.1 N H_2SO_4 drop by drop to the conical flask until the solution color changes from yellow to orange red /pink. Note: Be sure to count the number of drops added and swirl the conical flask after each drop.
9. To obtain the Total Alkalinity in water in mg/l as $CaCO_3$, multiply the number of drops that were added in (step 8) by 25 factors.
10. Range is 0 - 1000 mg/l.

Results

BIS prescribed maximum permissible limits of Total Alkalinity in drinking water as 600 mg/l. Beyond this limit, taste becomes unpleasant.

4.4.4 Total Hardness

Hardness of water signifies them dissolved mineral content. If water consumes excessive soap to produce lather, it is said to be hard. Hardness is caused by divalent metallic actions. The principal hardness causing cations are calcium, magnesium, strontium, ferrous and manganese ions. The total hardness of water is defined as the sum of calcium and magnesium concentrations, both expressed as calcium carbonate, in mg/l. Temporary or carbonate hardness can be precipitated by prolonged boiling. Non-carbonate ions cannot be precipitated or removed by boiling, hence the term permanent hardness. Water is considered to be Hard if it does not readily develop lather/ foam with soap. In general, ground water sources are harder than that of surface water.

Measurement method

1. Take 42 ml sample water into a clean conical flask, with the help of a measuring cylinder.
2. Add 20 drops of Hardness buffer to it.
3. Add one Eriochrome Black- T Hardness Indicator to it.
4. Swirl and mix the contents. The color will change to wine red.
5. Add 0.1N EDTA drop by drop to the conical flask until the solution color changes from wine red to blue. **Note:** Be sure to count the number of drops added and mix the solution by swirling after every drop.
6. To obtain the Total Hardness in water in mg/l as CaCO3, multiply the number of drops that were added in (step 5) by 6 factors.
7. Range: 6 – 1000 mg/l.

Results

BIS prescribed maximum permissible limits of Total hardness in drinking water as 600 mg/l. Beyond this limit, Encrustation in water supply structure and adverse effects on domestic use occurs.

4.4.5 Nitrate

Nitrates in surface waters occur by the leaching of fertilizers from soil during surface run-off and also nitrification of organic matter. Presence of high concentration of nitrates is an indication of pollution. Nitrate represents the most completely oxidized state of Nitrogen commonly found in water. Drinking Waters containing excessive amounts of Nitrates can cause infant methemoglobinemia (blue baby disease).

Measurement method

1. Take water sample up to the mark of 10 ml in to clean test vial.
2. Add one Nitrate - A tablet to it followed by one Nitrate -B tablet to it.
3. Replace the cork tightly and shake vigorously for 2 minutes until the tablets have been completely dissolved.
4. Wait for a six-minute reaction period to complete.
5. Read the test results immediately by comparing the color of the test tube to the Nitrate color chart. The test tube should be viewed in a well-lit area.
6. Record the Nitrate value in mg/L.
7. Range: 0.00 to 100.0 mg/I

Results

BIS prescribed maximum permissible limits of Nitrates in drinking water as 45 mg/l. Beyond this limit, Methemoglobinemia occurs.

4.4.6 Chloride

Chloride ion may be present in combination with one or more of the cations of calcium, magnesium, iron and sodium. Excessive chloride in water indicates presence of septic tank effluents, animal feeds, industrial effluents, irrigation drainage, and seawater intrusion in coastal areas. Chlorides occur in all natural waters in widely varying concentration. Surface water and mountain supplies usually are quite low in chlorides, whereas ground water usually has a considerable amount. At concentrations above 250mg/l it gives a salty taste to water, which is objectionable to many people.

Measurement method

1. Take 5 ml sample water into a clean test tube with the help of a measuring cylinder
2. Add 2-3 drops of Potassium chromate to it.
3. Swirl to mix the contents. The color will change to yellow.
4. Add silver Nitrate drop by drop to the test tube until the solution color changes from yellow to red brown (brick red) color. **Note:** Be sure to count the number of drops added and mix the solution by swirling after every drop.
5. To obtain the Chloride content in water in mg/l as Cl^-, multiply the number of drops that were added in (step 4) by 10 factors.
6. Range: 10 – 1000 mg/l.

Results

BIS prescribed maximum permissible limits of Chloride in drinking water as 1000 mg/l. Beyond this limit, taste, corrosion and palatability are affected.

4.4.7 Fluoride

Fluoride is a naturally occurring compound derived from fluorine. It is found in many rocks and minerals in the soil and enters drinking water as water passes through these soils. Fluoride has been shown to prevent tooth decay, but too much fluoride can cause teeth discoloration. Water is contaminated with fluorides when it gets contact with natural deposits of fluoride such as fluorspar, calcium fluoride and Cryolite as well as by the effluents from glass and aluminum manufacturing industries which are found to contain excess fluoride. In India alone about 30 million people are suffering from fluorosis. Presence of large amount of fluoride (>1.5mg/l) is associated with dental and skeletal fluorosis and less amount (<1.0 mg/l) causes dental cavities.

Measurement method

1. Take water sample up to the mark of 4 ml in to clean test vial.
2. Add 15 drops of fluoride reagent to it.
3. Replace the cap tightly and invert gently to mix the contents.
4. Read the test results by comparing the color of the test tube to the fluoride color chart. The test tube should be viewed in a well-lit area.
5. Record the Fluoride value in mg/l.
6. Range: 0.0 to 2.0 mg/l.

Result

BIS prescribed maximum permissible limits of Fluoride in drinking water as 1.5 mg/l.

4.4.8 Iron

Iron is found on earth mainly as insoluble ferric oxide. When it comes in contact with water, it dissolves to form ferrous bicarbonate under favorable conditions. This ferrous bicarbonate is oxidized into ferric hydroxide, which is a precipitate. Iron imparts bad taste to the water and incrustations in water mains. In oxygenated surface waters Iron concentrations are less. Some ground waters may contain considerably more Iron. A bittersweet astringent taste is detectable at levels above 1mg/l.

Measurement method

1. Take 10 ml of water sample in a clean test tube.

1. Add 10 drops of Iron Buffer, 2 drops of hydroxyl amine, 2 drops of HCl and 4 drops of 1,10-Phenanthroline to the same test tube.
2. Replace the lid and shake to mix the contents properly.
3. Wait for a 15-minute reaction period to complete.
4. Read the test results immediately by comparing the color of the test tube to the Iron color chart.
6. Record the Iron value in mg/l.
7. Range: 0.0 to 2.0 mg/l.

Result

BIS prescribed maximum permissible limits of Iron in drinking water as 1.0 mg/l. Beyond this limit taste and appearance are affected, has adverse effect on domestic uses and water supply structures and promotes iron bacteria.

4.4.9 Bacteriological/Faecal coliform

Bacterial examination of water is very important, since it indicates the degree of pollution. Water polluted by sewage contains one or more species of disease producing pathogenic bacteria. Pathogenic organisms cause water borne diseases, and many non-pathogenic bacteria such as E.Coli, a member of coliform group, also live in the intestinal tract of human beings. Coliform itself is not a harmful group but it has more resistance to adverse condition than any other group. So, if it is ensured to minimize the number of coliforms, the harmful species will be very less. So, coliform group serves as indicator of contamination of water with sewage and presence of pathogens. This is a Presence/Absence (P/A) bacteriological test to assess whether the water sample tested is fit for drinking or not. Presence of coliform bacteria indicate recent faecal contamination of the water source and hence not fit for drinking because the contaminated water causes various water borne diseases/infections in humans such as Cholera, Amoeabiasis, dysentery etc., Absence of bacteria indicate that water is free from faecal contamination and hence fit for drinking purpose.

Measurement method

1. Open the sealed cap of the vial and fill it with the water sample up to the mark given (20 ml).
2. Replace the cap tightly and shake the vial gently to mix the contents properly.
3. Keep the vial at room temperature (25 ºC -35 ºC) or preferably at 35-37 º C for 24 to 48 hours.
4. Contaminated water will produce black color while microbial free water will remain yellow or amber colored clear solution.

Results

a) Positive: If the sample turns to black, it is not safe for drinking.
b) Negative: If the sample doesn't turn black, it is safe for drinking.

Note:

1. Test will not perform below 25º C temperature.
2. Store the vials in a cool and dry place.

This test only provides presence or absence ofcoliform bacteria in the water. For detailed analysis water sample can be sent for laboratory analysis. However, only the sample showing presence of coliform bacteria will be sent for laboratory analysis

4.5Data recording and management

The analysis results for all samples tested in field or sent to the laboratory should be duly recorded and compiled by the DIPs,PGWM committee/VWSC/WUAon a regular basis. The forms for recording these test results, should not be complicated, but must be comprehensive and provide all necessary information such as location where sample was taken, data and time and the results of the test. The forms should preferably be in the local language for the ease of field staff. This section presents comprehensive forms for recording sampling locations and test results for field water quality testing kit (Table 4).

4.6 Inspection of water quality testing kit and sample processing

District project Management Unit (DPMU) will hand over all Water Quality Testing Kits to PGWM committee/VWSC/WUA and concerned DIP(hand over take over form is annexed in the annexure 2 &3), handling the Water Quality Testing Kit and measuring & recording the data will be carried out by PGWM committee/VWSC/WUA and concerned DIP. Water quality data analysis carried out by DIPs field in- charge should be inspected periodically, as the DIPs field in-charge may change time to time in the field. DPMU will carry out 4 times field inspection on an annual scale. Inspections should be suitably spaced so that there are at least 2inspections before the monsoon. The detailed form for inspection of WTK is given in Table 5.

Note: All DPMU/DIP/PGWM committee/VWSC /WUA/WUG hereby ensure to fill instrument handover form while hand over & take over process, and ensure submitting of the same to DPMU/SPMU within 7 working days.

Table 4: Water quality testing kit data recording format for ABHY Haryana

S. No.	Block Name	GP Name	Source	Site Name	Date and time of sample collection	Lat	Long	pH	EC (µs/cm)	Total Alkalinity (mg/l)	Total Hardness (mg/l)	Nitrate (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Iron (mg/l)	Bacteriological/Faecal coliform (Presence/Absence)
1																
2																
3																
Drinking water standard (BIS) (Desirable/permissible limit) Source: BIS: 10500, 2012								6.5-8.5	1500	200	200-600	45	250-1000	1-1.5	0.3	Must not be detectable in any 100 ml sample.

Signature of VWSC representative
Name and designation
Date and time

Signature of DIP representative
Name and designation
Date and time

Table 5: Inspection form for field water quality testing kit

Inspection report received from inspector on:			
Inspection report of water quality test station (GP) at:			
District: State: Latitude (dd): Longitude (dd):			
Inspected on:		Reported by:	Signature:
Height a, msl.....Meters		Date of visit.	
Water sample taken? Yes/No		No. of Sample:	
Specific diagnostic information for assessment		**Risk**	
		Yes	**No**
1. Is there a latrine within 10 m of the water sampling site?			
2. Is there any other source of pollution (e.g. animal excreta, rubbish, and surface water) within 10 m of the sampling site?			
4. Is the drainage poor, causing stagnant water within 2 m of the sampling site?			
5. Does sampling site need cleaning?			
6. Is the fencing around the sampling site inadequate, allowing animals in?			
7. Is there any ponding around the sampling site?			
8. Are there any cracks around the sampling site permit water to enter the well? which could permit water to enter the well?			
9. Is the tube well/bore well loose at the point of attachment to the base so that water could enter the casing?			
10. Is the concrete floor less than 1 m wide all around the well?			
Total score of risks..... /10			
Contamination risk score: 9–10 = very high; 6–8 = high; 3–5 = intermediate; 0–2 = low			
Particulars about observer/ Field in-charge			
1. Name of observer/Field in-charge:			
2. Is he has basic knowledge of water quality parameter given in WTK?			
3. Is location of observation wells for water quality sampling is fixed? Is there has been any change of sites?			
4. Is location for water quality testing is suitable?			
5. Is he able to perform water quality test using WTK?			
6. Is observer doingthe sampling and analysis as per instructions given in SOP?			
7. Does he take observation(s) at the prescribed date/month?			
8. Whether the regents are sufficient to perform water quality testing?			
9. Whether the observer notes the water quality data analysis results neatly kept and are in good order and recorded in excel sheet properly			
10. Does he pickup instructions readily?			
11. Distance of residence from water quality testing site?			

12. Special instructions given, if any
Results and recommendations
The following important points of risk were noted: ..... (List no 1–10) and the authority advised on remedial action.
Signature and Designation of Inspector/ DPMU

Annexure 1: Water quality sample collection frequency for Lab. analysis

The main objective of sampling is to collect a small portion of water which can be easily transported to laboratory, without contamination or deterioration and which should accurately represent the water being supplied.

Water Quality Monitoring at Gram Panchayat level:

Quality of ground water is gradually gaining more and more importance; preliminary analysis of existing data has indicated certain concerns as well. Accordingly, a regular mechanism of ground water quality monitoring has been proposed under Atal Bhujal Yojana to ensure safe supply of water for domestic/irrigation use as well as impact of the demand and supply side interventions in the present groundwater regime.

Therefore, it is proposed to collect ground water quality samples on annual basis following standard procedure. The guideline for ground water quality sampling and frequency is detailed below:

Criteria for Identification of monitoring well for water quality:

- Of the 10 well identified for monitoring water level at GP level, water samples may be collected from five (5) wells once a year during Pre-monsoon (April/May).
- If the numbers of villages are more than 10 in a Gram Panchayat, water sample should be collected proportionately with respect to the number of villages.
- Water samples which are taken annually must be analyzed through NABL laboratories only.
- Stagnant water in the well must be avoided.
- Wells tapping different aquifers (depth ranges) shall be selected for monitoring.
- Approachability in all weather conditions must be ensured.

Sample collection from Monitoring Wells

- Wash your hands thoroughly.
- Note sampling conditions on field formats.
- Start the pump. Allow water to flow for 5 to 10 minutes
- Use regular plastic bottles for collecting samples for physical tests and sterilized bottles for bacteriological testing.
- Remove the sample bottle cap. Do not touch the inside of the bottle cap, lip of the container, or inside of the container.
- Be careful not to overfill sample bottles. Fill 80%-90% of the bottle with sample water. Leave some space for oxygen to avoid killing the bacteria in the sample. For bottles pre-filled with preservative, overfilling could cause loss of the preservative.
- Close the bottle tightly.
- Bring the bottle up out of the water and immediately replace the cap.

- Repeat for the remaining sample bottles

List of Parameters for laboratory analysis

The list of parameters needs to be collected as sample for laboratory analysis are given below.

S. No.	Parameters
1	EC
2	pH
3	TDS
4	Total Hardness
5	Ca –Calcium
6	Mg –Magnesium
7	Na –Sodium
8	K –Potassium
9	Carbonate
10	Bicarbonate
11	SO4 –Sulphate
12	Cl –Chloride
13	F –Fluoride
14	No3—Nitrate

Ground water quality monitoring for data disclosure under DLI # 1

Monitoring of existing wells for which data already disclosed:

As per the DLI#1, all the states have disclosed the historical data of ground water quality (Select parameters) as per the protocol for the period 2015-2019, which forms the base line data for the DLI#1. The wells have water quality data with minimum frequency of once a year (preferably Premonsoon). The data disclosed of the existing wells partly belongs to CGWB and partly from the State GW Departments. The same data also was included in Block Hydrogeological Reports as per the protocol of DLI#1. The data disclosed initially was verified by QCI during first round of verification conducted in year 2021.

The WQ monitoring wells for which data has already been disclosed and verified monitored by CGWB/SGWB need to be essentially monitored and samples must be analyzed annually and updated every Year for disclosure. In case, where sampling and analysis has not been carried out by the specific agency, the same may be taken up through Atal Jal scheme and analysis may be from any NABL accredited labs. Keeping this in view, lab up gradation is also kept in PIP. For existing monitoring wells, the monitoring data should be compiled as per the prevailing protocols and should be disclosed for further round of verification.

Only NABL accredited laboratory reports are acceptable. Water quality Monitoring Protocol along with parameters for which chemical analysis has to be done will be shared separately.

Establishment / Monitoring of new wells:

New wells preferably open wells/dug wells are to be established for water quality monitoring. The sampling to be done once a year (Pre- monsoon) and analysis to be carried out through any NABL accredited lab only. In case where dug wells are not available, water samples may be collected from hand pumps/ tube wells which are preferably tapping the first aquifer).

Annexure 2: Water Quality Testing Kit (WTL) Handover Form- DPMU to DIP

Atal Bhujal Yojana –Haryana

Irrigation & Water Resource Department,
Haryana Government

Handover of Water Quality Testing Kit (WTK) by District Project Management Unit (DPMU) to concerned District Implementation Partners (DIPs).

Detail of Supplier and Receiver

Detail of Receiver	DIP (Authorized Signatory) Name:	
	DIP (Authorized Signatory) Contact No.:	
	DIP (Authorized Signatory) E-mail ID:	
Detail of Supplier	DPMU (Authorized Signatory) Name:	
	Designation & Office	
	Handover Date:	

Equipment Description:

Equipment Name & Number	Equipment Description	Quantity	Remarks

DIP hereby acknowledges that, above mentioned equipment/material is **checked, inspected, found functional**. They understand that this equipment belongs to the Irrigation & Water Resource Department, (ABhY) Haryana and is under their possession while carrying out the work. They hereby assure that they will take care of the equipment to the best possible extent.

Signatures of Authorized Person

Detail	Name & Department	Signature
Authorized Signature (DPMU/SE/XEN/SDO/JE)		
Signature Handed over by (DPMU representative)		
Signature DIPs Representative (Inspected & received by)		

Annexure 3: Water Quality Testing Kit (WTK) Handover Form DIP to PGWM committee /VWSC /WUA/WUG

Atal Bhujal Yojana –Haryana
Irrigation & Water Resource Department,
Haryana Government

Handover of Water Quality Testing Kit (WTK) by District Implementation Partners (DIPs) to concerned PGWM committee/VWSC /WUA/WUG.

Detail of Supplier and Receiver

Detail of receiver	Representative Name: (PGWM committee/VWSC /WUA/WUG)	
	Designation:(PGWM committee/VWSC /WUA/WUG)	
	Contact Number (PGWM committee/VWSC /WUA/WUG)	
Detail of Supplier	DIP (Authorized Signatory) Name:	
	DIP (Authorized Signatory) Contact No.:	
	DIP (Authorized Signatory) E-mail ID:	
	Handover date	

Equipment Description:

Equipment Name & Number	Equipment Description	Quantity	Remarks

Representative (PGWM committee/VWSC /WUA/WUG) hereby acknowledges that above mentioned equipment/material is **checked, inspected, found functional & received**. They understand that this equipment belongs to the Irrigation & Water Resource Department, (ABhY) Haryana and is under their possession while carrying out the work. They hereby assure that they will take care of the equipment to the best possible extent.

	Name & Department	Signature
Signature Handed over by (DIP representative)		
Signature Representative (PGWM committee/VWSC /WUA/WUG) (Inspected & received by)		