



**INDIAN WATER QUALITY ASSOCIATION**

KNOWLEDGE | COLLABORATION | CLEANER TOMORROW

**TECHNICAL NOTE**

**Standard Operating Procedure**

# **Sampling of water for microbiological analysis**

Planning, sterile collection, field observations,  
cooled transport, laboratory acceptance and  
information management



Planning



Sterile  
Collection



Field  
Observations



Cooled  
Transport



Laboratory  
Acceptance



Information  
Management

Authors

**Dr Anil Mishra  
Dr Manju Kajla**

Review by

**Sanjay Sharma**

**Indian Water Quality Association**



## Contents

|                                                                           |    |
|---------------------------------------------------------------------------|----|
| Purpose and scope .....                                                   | 3  |
| 1 Why microbiological sampling quality matters .....                      | 4  |
| 2 Applicable standards and method hierarchy .....                         | 5  |
| 3 Risk based sampling plan.....                                           | 6  |
| 4 Sterile bottles and neutralizing agents .....                           | 7  |
| 5 Selecting a tap sampling objective .....                                | 8  |
| 6 Step by step sampling from a tap.....                                   | 9  |
| 6.1 Sterile bottle fill and headspace .....                               | 10 |
| 6.2 Tap collection precautions and exceptions.....                        | 10 |
| 7 Service reservoir and groundwater sampling .....                        | 11 |
| 7.1 Underground service reservoir outlet .....                            | 11 |
| 7.2 Overhead or elevated service reservoir outlet .....                   | 12 |
| 7.3 Tubewell or borehole with installed pump .....                        | 13 |
| 7.4 Dug well .....                                                        | 13 |
| 7.5 Hand pump.....                                                        | 14 |
| 8 Treatment plants, storage and distribution .....                        | 16 |
| 9 Wastewater treatment and final discharge sampling .....                 | 17 |
| 10 Target organisms, sample volumes and containers .....                  | 18 |
| 11 Measurements and observations at the site.....                         | 19 |
| 12 Transport in a dedicated sampling van .....                            | 20 |
| 12.1 Chain of custody for microbiological samples .....                   | 21 |
| 12.2 Chain of custody flow sheet.....                                     | 22 |
| 13 Laboratory reception, registration and acceptance.....                 | 23 |
| 14 Field quality controls and nonconformities .....                       | 24 |
| 15 Information management and response.....                               | 25 |
| 15.1 Suggested mobile app and LIMS architecture .....                     | 25 |
| 15.2 Data fields, alerts and offline controls .....                       | 26 |
| 16 Worked route and implementation checklist.....                         | 28 |
| References .....                                                          | 29 |
| Annex A Microbiological sampling plan and point approval form.....        | 30 |
| Annex B Microbiological sample drawing and field data sheet .....         | 32 |
| Annex C Microbiological sample deposit registration and custody form..... | 34 |
| Annex D Acronyms and abbreviations .....                                  | 36 |

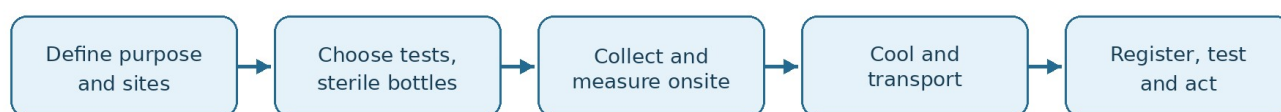


## Purpose and scope

A microbiological result is valid only for the water actually collected and for organisms that remain detectable when testing starts. This note sets out a defensible sampling process for groundwater abstraction points, treatment plants, service reservoirs, distribution taps and wastewater treatment. It covers sample design and custody; it does not prescribe culture incubation conditions or claim that a negative indicator test excludes every pathogen. [1-5]

In India, the governing sequence is the applicable drinking-water, packaged-water or discharge specification; the approved test method and laboratory scope; and the sampling requirements in IS 17614 (Part 25):2022 / ISO 19458:2006 and IS 1622 where relevant. Requirements differ among routine indicators, pathogen investigations and wastewater. The laboratory must issue a sample-specific instruction before dispatch. [1-4]

*Figure 1 Microbiological sampling and custody from plan to result*



The central distinction from chemical sampling is asepsis: do not rinse a sterile bottle, touch its interior, decant a sample between ordinary containers, or let residual disinfectant continue killing organisms after collection. A matching field aliquot can measure free chlorine, temperature and pH, but it must never be poured from the microbiological bottle. [1,4,6]



## 1 Why microbiological sampling quality matters

Microorganisms occur unevenly in a system and may increase or die between collection and analysis. A clean looking water sample can contain faecal contamination; a positive tap result can also be caused by a contaminated faucet even when the main is clean. The question being asked determines the sampling site, time, flushing and tap disinfection. [1,5]

A false negative can follow sampling downstream of an active chlorination point when the target is untreated water, omitting the neutralizer, keeping samples warm, or testing after the permitted time. A false positive can follow touching the bottle mouth, using a dirty aerator for a system-quality sample, or transferring water through an unsterile sampler. [1,4,6]

| Control point               | Failure and effect                                  | Field safeguard                                         |
|-----------------------------|-----------------------------------------------------|---------------------------------------------------------|
| Location and timing         | An unrepresentative sample misses a short event.    | Map hydraulic zones and sample at risk periods.         |
| Aseptic collection          | Hands, caps or fittings add organisms.              | Sterile kit, clean gloves and controlled tap handling.  |
| Disinfectant neutralization | Residual chlorine suppresses recoverable organisms. | Pre-dosed, validated neutralizer for disinfected water. |
| Cold chain and timing       | Population changes after collection.                | Prompt delivery and method-specific temperature/time.   |
| Custody                     | Wrong bottle or time makes result unusable.         | Barcode, field log and receipt review.                  |

Microbiological monitoring supports water safety plans, treatment checks and incident response. It must be combined with operational data such as turbidity and disinfectant residual and with sanitary inspection rather than interpreted as a stand-alone guarantee of safety. [5]



## 2 Applicable standards and method hierarchy

| Reference                                     | Use in sampling programme                                                                              |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------|
| IS 17614 (Part 25):2022 / ISO 19458:2006      | Primary Indian-aligned guidance for microbiological sampling, transport and storage. [1]               |
| IS 1622:2026                                  | Indian methods of sampling and microbiological examination; apply the relevant approved provision. [2] |
| IS 10500:2012 and updates                     | Drinking-water quality specification; determine the required indicators and sampling context. [3]      |
| IS 14543:2024 / IS 13428:2024                 | Packaged drinking water / natural mineral water specifications, where the product is in scope. [7,8]   |
| ISO 9308-1 / IS 15185, other approved methods | Laboratory culture and target organism methods; method controls the actual sample volume. [9]          |
| WHO 2026 and US EPA guidance                  | Risk framework and practical comparators; US holding times are not Indian statutory limits. [5,6]      |

Before a route begins, the laboratory should record the exact edition and clause of each applicable standard, permit or method in a controlled method-to-bottle matrix. If instructions disagree, resolve that discrepancy in writing with the laboratory technical manager and the responsible authority. A broad statement such as “analyse within 24 hours” must not replace the target-specific maximum. [1,2,6]

For routine drinking-water indicators, IS 10500 and its applicable revisions govern the compliance decision. Pathogen-specific investigations require a separate plan. Results from wastewater monitoring must be interpreted using the applicable discharge consent and method rather than drinking-water limits. [3,5]



### 3 Risk based sampling plan

Use the approval form in Annex A. Write the decision first: compliance, operational control, contamination complaint, supply restart, outbreak investigation, treatment validation or source tracking. Define target organisms, site and time, sample type, detection limit, action threshold, reporting window and responsible responder. Avoid changing a planned site after learning the field result without documenting why. [1,5]

| Plan item          | Record before sampling                                                                              |
|--------------------|-----------------------------------------------------------------------------------------------------|
| Site and purpose   | Unique ID, GPS, hydraulic position, consumer/utility tap and intended tap-sampling objective.       |
| Event timing       | Intermittent supply start, pressure loss, repair, rainfall, peak demand or process stage.           |
| Analytical suite   | E. coli/coliforms, enterococci, HPC or special pathogens, method and laboratory.                    |
| Bottle and journey | Sterility lot, neutralizer, volume, dispatch time, route, cold compartment and test start deadline. |
| Field controls     | Free and total chlorine, temperature, pH, turbidity if required, blanks and paired samples.         |
| Response           | Who receives urgent positives; resampling, field investigation and protective action triggers.      |

Use paired upstream and downstream samples to isolate a suspected ingress point. For an intermittent network, sample after supply resumes and document the time since restart; a result taken after prolonged flushing answers a different question. Include repeat sites, representative zones and rotating locations, but do not rely only on convenient treatment-plant outlets. [1,5]



## 4 Sterile bottles and neutralizing agents

Issue sealed, individually identified sterile bottles against the approved Annex A plan. A routine 100 mL determination commonly uses a 125–150 mL sterile polypropylene or other validated plastic bottle, leaving mixing headspace. Glass may be used when validated for the target and sterilization process. Larger bottles or field filtration assemblies are reserved for methods that require them. The laboratory must specify collected volume plus allowances for repeats; 100 mL is not a universal volume for pathogens. [1,6]

| Container or reagent                     | Use and release check                                                                                                 |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Sterile 125–150 mL bottle                | Routine drinking-water indicators; intact tamper seal and legible sterility lot.                                      |
| Bottle pre-dosed with sodium thiosulfate | Chlorinated or otherwise compatible halogen-disinfected water; pre-dose and capacity validated for expected residual. |
| Sterile 250–500 mL bottle                | Multiple indicators or repeat testing only when approved volume and neutralizer capacity suffice.                     |
| Sterile 1 L bottle / special kit         | Legionella or pathogen work, only under its validated method and sampling plan.                                       |
| Sterile swab, filter or large-volume kit | Biofilm or protozoa/virus investigations; chain of custody and processing rules differ.                               |

The laboratory should procure certified sterile single-use bottles or clean and sterilize reusable containers under a validated SOP. For reusable glass, discard damaged bottles, remove residue with a suitable laboratory detergent, rinse thoroughly with potable then purified water, dry, package or cap appropriately, and apply a validated sterilization cycle compatible with bottle, cap and neutralizer. Record cycle, batch, sterility checks and shelf life. Verify neutralizer dose and sterility before issue. Never field-rinse a sterile bottle: rinsing removes neutralizer and introduces contamination. Never add a metals or organics preservative to a microbiology bottle. [1,2,6]



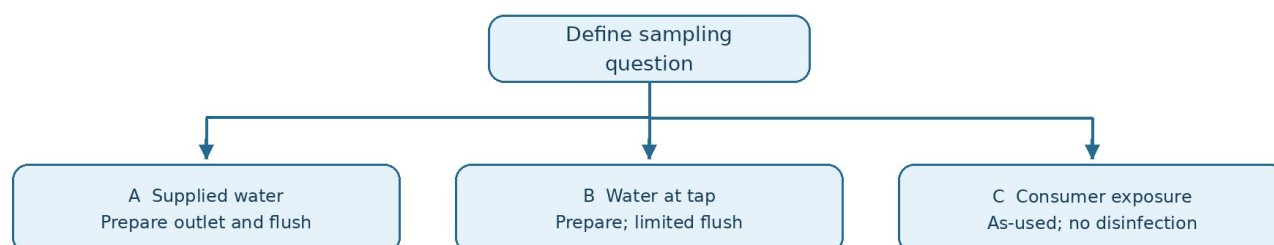
## 5 Selecting a tap sampling objective

The tap procedure depends on what water the result must represent. The ISO 19458 sampling purposes distinguish the supplied water from the consumer fitting and its local plumbing. Record the chosen purpose and the exact cleaning, disinfection and flushing operations; do not retrospectively reinterpret one type of sample as another. [1]

| Purpose                          | What it investigates                                                 | Tap preparation                                                                                                                      |
|----------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| System or distribution water (A) | Quality supplied upstream of the fixture.                            | Use an approved sampling tap; remove attachments, clean/disinfect outlet and flush sufficiently to replace local water as specified. |
| Water delivered at tap (B)       | Water in the local line reaching the outlet.                         | Prepare outlet and use the limited method-defined flush; document volume/time.                                                       |
| Consumer exposure or fitting (C) | The water as used, including a potentially contaminated tap/aerator. | Normally retain the relevant fitting and avoid disinfecting it; collect first draw or specified exposure sample.                     |

ISO purpose labels A, B and C are often used for these questions, respectively, but the laboratory SOP must define the exact procedure for each. “Flame every tap” is not an appropriate blanket rule: heat can damage plastic fittings, pose fire risk, and erase evidence of contamination at the outlet. Chemical disinfection also requires validated contact and flushing so disinfectant is not carried into the bottle. [1]

Figure 2 Tap sampling branches for supplied water and consumer exposure





## 6 Step by step sampling from a tap

1. Verify the exact site code, tap and approved purpose in Annex A. Confirm whether the target is supply quality, local line, or consumer exposure. Inspect aerator, leaks, drain splash, recent repairs, pressure and intermittent-supply state. For a specified first-draw exposure sample, collect before any disinfection or flushing; record stagnation and the original fitting condition in Annex B. [1,4,6]
2. Collect the exposure sample first when paired samples are specified. For a prepared outlet sample, prepare the outlet under step 3, then use a separate flowing aliquot to measure free/total chlorine, temperature, pH and turbidity as planned before filling the sterile bottle. Record the time and residual before neutralization; never pour a field-test aliquot into a microbiology bottle. [1,6]
3. For supply-quality monitoring, remove attachments if prescribed and clean/disinfect the outlet using the laboratory-approved contact time and material-safe technique; flush to replace the local dead leg and document duration, volume, flow and stabilization. Avoid flaming plastic, nearby fuel or fittings that cannot tolerate heat. For consumer-exposure sampling, keep the fitting and do not disinfect or flush unless the plan explicitly calls for it. [1,4,6]
4. Check the sterile bottle, intact seal, correct test volume, neutralizer identity and expiry. Wear clean gloves, open immediately before collection, hold the cap by its exterior without setting it down, and keep bottle mouth clear of tap and fingers. Fill to the marked line, leaving only the headspace specified by the microbiology method and avoiding overflow that washes out neutralizer. Do not rinse, top up later, use a nonsterile funnel, or transfer between bottles. Cap promptly and mix only as the method directs. [1,2,6]
5. Mark unique bottle ID, site/port, collection basis, exact time, collector, disinfectant status and test request; scan into Annex B or its app equivalent. Place upright in a protected cooled compartment, avoid freezing, complete the handoff, and record deviations. At receipt, reconcile all bottles and deadlines using Annex C. [1,2]



## 6.1 Sterile bottle fill and headspace

Unlike a VOC chemical sample, a routine microbiological water bottle generally needs the manufacturer or method-defined mixing headspace. For a 100 mL test, collect at least the marked 100 mL without overflowing a pre-dosed neutralizer. The approved method may specify a larger bottle or different fill line for particular organisms. Do not substitute a universal “fill to the brim” or “leave one inch” rule for the actual bottle instruction. Use a separate chemistry aliquot for chlorine or pH. [1,2,6]

## 6.2 Tap collection precautions and exceptions

Keep a sterile bottle capped until flow and outlet preparation are complete. Do not spray disinfectant into the sample, touch the rim or replace the cap after it falls. If the site cannot be safely disinfected or flushed as required, document the departure and obtain a new approved point; do not present a contaminated-fitting sample as representative of the distribution main. Investigations for *Legionella* or a biofilm at the outlet require their own hot/cold temperature, flush and swab protocol. [1,6,12]



## 7 Service reservoir and groundwater sampling

Identify whether the intended microbiological result represents water supplied from a well, water at the hand-pump spout, standing dug-well water or an outlet downstream of treatment. The detailed procedures are in sections 7.3–7.5 and each point must have a distinct site code. [1,2]

| Source type                 | Critical control                                                                                  | Useful paired site                                                          |
|-----------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Borehole or hand pump       | Document purge, pump state and wellhead condition.                                                | Raw bore plus post-treatment outlet.                                        |
| Rainwater or household tank | Protect sample from lid/bucket contamination unless that is the target.                           | Tank inlet and consumer tap.                                                |
| Dug well                    | Define pumped supply versus standing water and record depth, condition and recent surface inflow. | Pumped outlet and standing-water sample only if both questions are planned. |

Collect field and laboratory blanks where low expected counts make contamination especially consequential. Never use the chemical-sampling bottle or an unsterile bucket to decant microbiological water. [1,2]

### 7.1 Underground service reservoir outlet

Sample the active underground service reservoir (UGR) outlet through a dedicated, disinfected port downstream of storage and upstream of later dosing/blending, unless the plan targets a downstream state. A tank hatch or scour line answers a different question. [1,4]

1. Confirm tank/compartment code, outlet pipe, service zone, water level, inlet/outlet valves, pumps, last cleaning and whether water is currently leaving the reservoir. Match the physical port to Annex A.
2. Choose a safe outlet tap outside confined spaces. Inspect the port for hose, leaks and splash from drains; protect sterile kits from dust. For supply quality, remove fittings and disinfect the spout by the approved method.
3. Flush the port dead leg while the tank is delivering water; document duration and operating state. Obtain chlorine residual, pH and temperature from a separate aliquot.



4. Open the neutralizer-containing sterile bottle only when ready, avoid contact between outlet and rim, fill to the marked volume without overflowing, cap and label; log exact outlet state and any chlorine dose downstream.
5. Cool immediately and complete Annex B; obtain an inlet pair only if the plan needs to test what changed during storage.

Precautions: Do not use a tank drain or a dip bucket as a surrogate for the outlet. Never enter a reservoir for routine sampling. Unusual backflow, recently switched compartments and flushing failure require a documented qualification.

## **7.2 Overhead or elevated service reservoir outlet**

Use the active outlet header of the identified overhead reservoir (OHR); distinguish it from overflow, scour, inlet and post-dosing points. Record which compartment and zone are supplying water. [1,4]

1. Confirm tank ID, active outlet and water-level/fill-discharge cycle with the operator. Note recent cleaning, chlorination, compartment switching and current pressure.
2. Access a ground-level or safely located outlet sampling valve; avoid roof hatch sampling or unsafe work at height. Prepare the valve to represent supply water, or preserve the fitting as found for a separately planned exposure objective.
3. Disinfect and flush the dedicated outlet as the selected microbiological purpose requires, including a documented dead-leg purge. Verify stable flow and measure chlorine and temperature in a separate aliquot.
4. Collect directly into the sterile, correctly neutralized bottle with minimal splash, leave method-specified headspace and cap immediately.
5. Log collection time, tank operating state, field readings and exceptions in Annex B; transfer promptly to the cooled carrier.

Precautions: A roof-hatch or surface-water grab is not an outlet sample. If a valve is after booster chlorination or blending, give it a separate site code and interpretation.



### 7.3 Tubewell or borehole with installed pump

Select a raw groundwater sampling port close to the wellhead and before chlorination, aeration, blending, pressure tank or household storage if the purpose is well-water quality. Mark a treated outlet as a separate site. [1,2]

1. Record bore ID, screened depth if known, pump duty, last start/stop, wellhead protection, recent repairs and the exact raw-water port.
2. Inspect the port for hoses and splash, then prepare/disinfect the outlet for an aquifer or supply-quality sample under the approved SOP; document any reason for retaining the fitting as found.
3. Run the pump at a steady safe rate. Flush the outlet dead leg and, when the well has been idle, monitor time, volume, water clarity, temperature and conductivity until the laboratory-approved representative condition is met. Record purge and cycling; do not force a universal casing-volume rule.
4. Check any residual disinfectant separately; use the correct sterile bottle/neutralizer for the actual water. Fill directly from a gentle stream without contacting the spout.
5. Cap, label, cool and record all field conditions in Annex B, including nonstabilization, loss of prime or suspected short-circuiting.

Precautions: Avoid post-treatment points when raw well status is the question. Do not run a well dry or allow purge water to flow back to the wellhead. The sampling port itself may be contaminated, so document preparation.

### 7.4 Dug well

A dug well requires an explicit decision between pumped water supplied to users and standing water within the well. Open wells are sensitive to recent rain and surface ingress. [1,2]

1. Inspect cover, apron, drainage, wall, water level, recent rainfall and any nearby sanitary hazards without leaning across an unsafe opening.



2. For pumped supply, choose a dedicated outlet before treatment, prepare the spout, pump until stagnant riser/outlet water is replaced and collect as in section 7.3.
3. For a planned standing-water investigation, choose a pre-specified depth and a validated sterile sampler that will not touch the wall, rim or bottom sediment. Record the exact depth and sampler ID; take an equipment blank when required.
4. Transfer aseptically using the sterile device/method, fill the correct bottle to its mark and cap immediately. Do not decant from a household bucket.
5. Measure any chlorine and physical variables in separate aliquots; log well level, sample depth, visible inflow, device and method in Annex B, then cool promptly.

Precautions: A single dip is not automatically representative of the whole well. Do not lower a nonsterile rope, bucket or bottle; stop if safe access cannot be maintained.

## 7.5 Hand pump

For a hand pump, distinguish first-use water and spout contamination from water produced after the pump and riser have been purged. Select one or paired samples in the plan. [1,2]

1. Record pump ID, platform condition, use pattern, last operation, splash/standing water, leaks and any hose attached to the spout.
2. If consumer first-use exposure is intended, collect the first required water without prior spout disinfection or pumping; document the collection sequence and pump condition.
3. If pumped groundwater quality is intended, remove attachments as directed, prepare the spout under the approved SOP and pump steadily to replace standing water. Record strokes, time, approximate volume, clarity and field reading stability.
4. Reduce splashing, keep bottle mouth from touching the spout, fill sterile neutralizer-compatible bottle to mark and cap immediately; measure chlorine and temperature separately.
5. Record use, purge, spout preparation, anomalies and any loss of prime in Annex B and complete cold-chain handoff.



Precautions: A contaminated spout may itself be the exposure question; disinfecting it first would erase that evidence. Avoid dirty platforms and caps placed on pump handles. Do not call an unpurged sample representative of the aquifer.



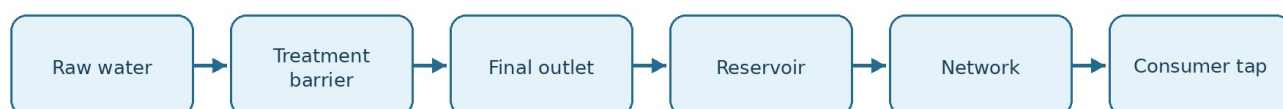
## 8 Treatment plants, storage and distribution

For a water treatment plant (WTP), pair raw inlet, post-filtration or other relevant barrier, clear-water storage and final outlet samples with the hydraulic residence time. Record filtration status, turbidity and disinfectant dose/residual. A positive post-treatment sample cannot be attributed to a single unit unless sampling times and flow paths are aligned. [1,5]

At reservoirs and distribution, locate the inlet and outlet, near and far zones, low-pressure ends, intermittent-supply areas, tanks after cleaning and recent repairs. Use a purpose-built sampling tap where practical. A tap fed through a household RO, storage vessel or flexible hose may answer a household-exposure question but must not silently stand in for the distribution main. [1,5]

For packaged water, use the relevant IS 14543:2024 or IS 13428:2024 specification and take unopened retail or production samples by its prescribed sampling scheme. Opening and transferring product into a standard field bottle changes the sampled unit and risks contamination. Keep lot identity, packaging condition and temperature history. [7,8]

*Figure 3 Sampling points from treatment plant to consumer tap*



At each point, keep a separate aliquot for onsite residual disinfectant and document whether that point is upstream or downstream of dosing. A microbiological zero finding at one instant does not substitute for continuous barrier performance monitoring. [5]



## 9 Wastewater treatment and final discharge sampling

The purpose may be faecal indicator loads, pathogen reduction, disinfection performance or final-effluent verification. Choose influent, intermediate and final-effluent points at a sewage treatment plant (STP) or other facility with flow, travel time and treatment state recorded. For chlorinated effluent, use a neutralizer compatible with the method; otherwise organisms may continue to die during transit and apparent removal will be overstated. [1,10]

Use grab sampling for an instantaneous discharge or a contamination incident. A time- or flow-proportional composite is appropriate only when the permit and method allow it and the sampler can keep the collection sterile and chilled. Long residence in sampler tubing can support regrowth and bias an organism count. The laboratory must validate composite equipment cleaning, sterilization and holding-time definition. [1,10]

The test method and discharge consent determine whether *E. coli*, intestinal enterococci, faecal coliforms, bacteriophages or specific pathogens should be measured. Do not apply drinking-water absence criteria to wastewater, and do not assume that one faecal indicator reliably quantifies all pathogens. [5,10]



## 10 Target organisms, sample volumes and containers

The table is a kit-planning guide, not a universal holding-time table. The accredited laboratory must confirm analytical volume, bottle size, neutralizer, transport time and extraction/filtration deadline for its exact method before field dispatch. [1,2,6,9–12]

| Target or test                 | Practical collection planning                                                                                      | Special handling                                            |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| E. coli and total coliforms    | At least 100 mL test volume; sterile 125–150 mL bottle.                                                            | Neutralize disinfectant; leave headspace; short route.      |
| Heterotrophic plate count      | Sterile bottle, volume sufficient for method and dilutions.                                                        | Collect separately if lab needs a distinct aliquot.         |
| Enterococci / faecal indicator | Usually 100 mL test portion for drinking-water MF methods.                                                         | Higher contamination needs validated dilution.              |
| Pseudomonas / C. perfringens   | Method-defined test portion, often 100 mL for relevant bottled-water methods.                                      | Separate kit if target/method requires it.                  |
| Legionella                     | Typically 1 L sterile bottle for bulk-water investigation.                                                         | Collect paired swab where specified; special transport SOP. |
| Cryptosporidium / Giardia      | Large-volume filtration with immunomagnetic separation (IMS) per Method 1623.1 or method-defined 10 L bulk sample. | Dedicated kit and much longer logistics plan.               |
| Viruses / molecular assays     | Method-defined large volume and transport medium.                                                                  | Separate molecular contamination controls and chain.        |

Never assume that a 100 mL total-coliform bottle also supports all other tests. The collected quantity must cover the largest test portion, repeats, blanks and any method-required dilution while respecting the bottle's neutralizer capacity. [1,6,11]



## 11 Measurements and observations at the site

Record water temperature, air temperature where relevant, free and total disinfectant residual, pH and turbidity as applicable; note colour, smell, visible sediment, pressure and flow. Field chlorine should be measured promptly by a validated DPD colorimetric procedure using a separate aliquot. A zero residual or sudden turbidity increase is operational evidence that may demand urgent action even before culture results arrive. [5,6]

Measure free chlorine before the microbiological sample is neutralized, and do not reuse the chlorine-test vessel for microbiology. Use calibrated field meters and log calibration/verification. Onsite tests are supportive parameters; an incubator in a van is not a substitute for a competent microbiology laboratory unless the specific portable test and quality system are validated. [1,5,6]

| Variable                       | Why record it                                                                 |
|--------------------------------|-------------------------------------------------------------------------------|
| Free/total disinfectant        | Explains viability, identifies loss of barrier and verifies neutralizer need. |
| Temperature and transport time | Helps explain growth/loss and confirms the cold chain.                        |
| Turbidity and pH               | Supports interpretation of filtration and disinfection performance.           |
| Pressure, restart, rainfall    | Links an isolated positive to a hydraulic or sanitary event.                  |



## 12 Transport in a dedicated sampling van

A dedicated van is recommended for multi-site municipal monitoring because it can secure aseptic kits, create a documented cool environment and deliver samples directly to the laboratory. The sample compartment should be enclosed and dustproof, fitted with shock-restraint racks and secondary containment, and actively cooled to  $5 \pm 3$  °C (ISO 19458), ideally near 4 °C without freezing bottles. Record calibrated compartment and arrival temperatures. A validated insulated cooler can be used for a short route when it meets the same conditions. [1,6]

Carry sterile spare bottles, gloves, disinfectant and clean water for outlet preparation, waste bags, custody forms, barcode scanner, GPS, a temperature logger, DPD chlorine meter, pH/temperature meter and turbidity meter where planned. Segregate used PPE and wastewater samples from unopened sterile kits. Keep ice packs out of direct bottle contact and protect caps from meltwater. [1,6]

Plan routes backwards from the earliest method deadline. Aim for same-day delivery and an operational target of testing within six hours when practical, but adopt only the actual method/permit maximum as the acceptance rule. US EPA allows up to 30 hours for certain drinking-water total-coliform samples and shorter times for some source-water methods; neither limit is a blanket Indian rule. Cooling cannot extend a method holding time. ISO 19458 also specifies its own maximum interval between collection and start of analysis for cooled samples; take that value from the current edition of the standard and enter it in the method-to-bottle matrix. [1,6]

*Figure 4 Cold-chain and custody checks*





## 12.1 Chain of custody for microbiological samples

Chain of custody (CoC) records each sample's identity, condition and custodian from collection to final disposition. It links bottle labels, field sheets, test requests, transfer signatures, transport logs and laboratory accession. Microbiological custody also requires control of sterility, disinfectant neutralization, temperature and elapsed time. A seal alone does not establish integrity.

At collection, record the unique bottle ID, site and port, sampling purpose, date and time, collector, organisms requested, volume, sterile bottle lot and neutralizer in Annex B. Measure residual disinfectant in a separate aliquot. Match labels to field records and test requests. Do not rinse the sterile bottle, touch its mouth or cap interior, or insert a thermometer. Cap promptly with the prescribed mixing headspace.

At every handoff, reconcile bottle IDs and counts. Both custodians record their names, signatures or authenticated electronic identities, release and receipt times, cooler ID, seal number where used, and condition in Annex C. Link courier tracking when carrier signatures are unavailable. Protect paperwork from moisture. Secure unattended samples under an identified custodian; record authorized opening and resealing.

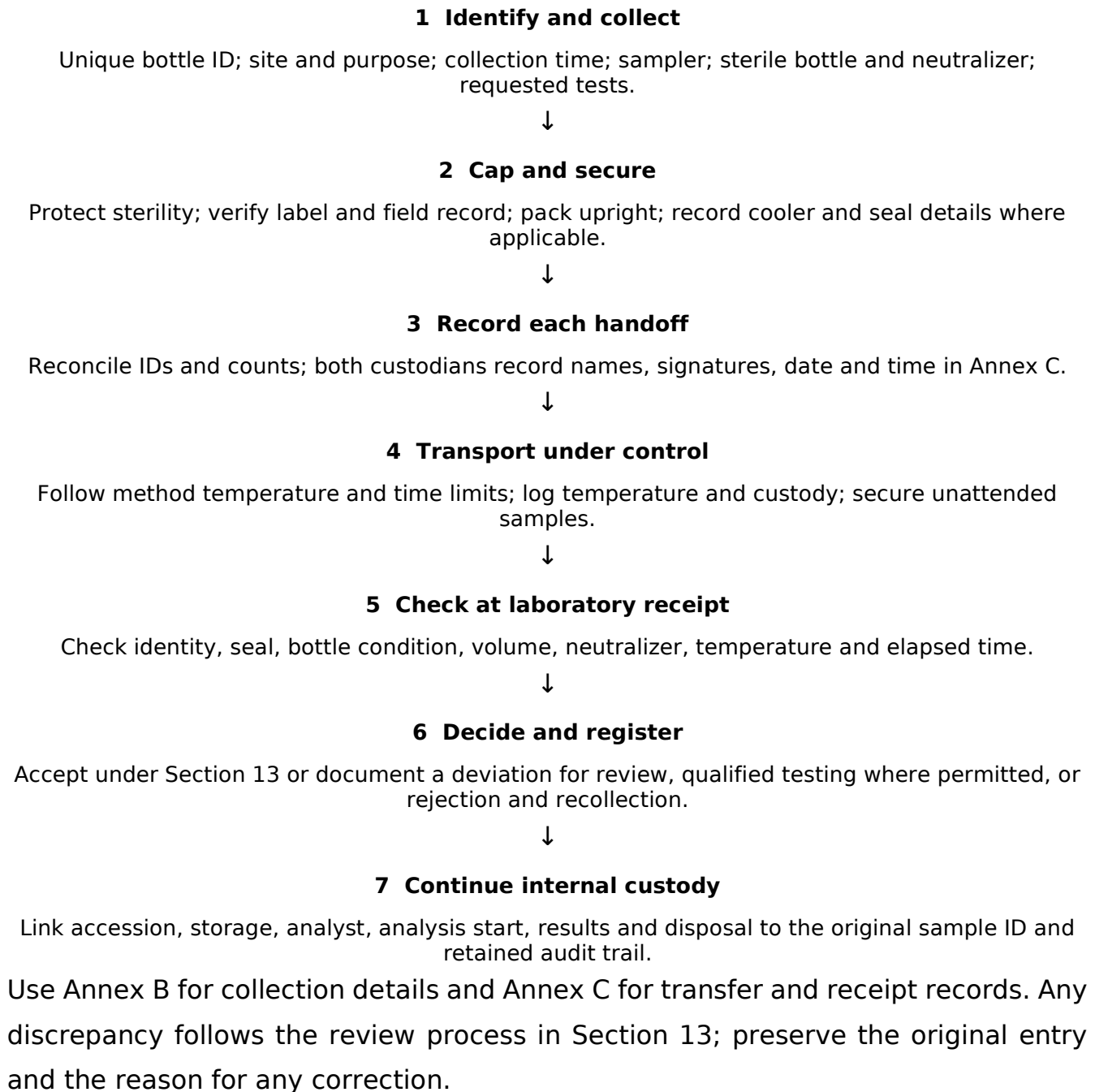
Maintain the approved method's transport temperature and holding time; do not freeze or immerse bottle closures in meltwater. Link the temperature logger or approved temperature-check record to the cooler. At reception, document receipt time, IDs, bottle condition, seals, temperature, volume, neutralizer information and collection-to-receipt interval. Record analysis start separately: laboratory registration does not restart the holding-time clock.

Record broken seals, uncertain identity, missing signatures and any failure of temperature, sterility, neutralizer or time requirements. Obtain the laboratory's decision under Section 13. Do not backdate signatures or decant into a fresh bottle. Later neutralization cannot be assumed to reverse organism loss. The reviewer determines rejection, recollection or qualified testing where permitted. Link storage, analyst transfers, results and disposal to the original ID in LIMS and retain the audit trail.



## 12.2 Chain of custody flow sheet

Figure 5 Microbiological sample custody from collection to laboratory control





### 13 Laboratory reception, registration and acceptance

Using Annex C, reception compares the field log and custody record with every physical bottle: unique ID, site, collector, collection time, requested tests, container/sterility, neutralizer, fill volume, seal, leakage, temperature and deadline. Enter the sample into LIMS with a unique laboratory number without replacing the original field identity. Separate clean sample handling from wastewater reception. [1,2]

| Condition                                                      | Decision                                                                                                                    |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Intact, labeled, correct sterile kit, time and temperature     | Accept and schedule processing before the shortest deadline.                                                                |
| Warm, delayed, overfilled, wrong neutralizer or uncertain site | Technical review; qualify or reject under documented method rule.                                                           |
| Leaking, opened, visibly contaminated or unlabeled             | Quarantine; normally reject and recollect.                                                                                  |
| Public-health incident with compromised sample                 | Consider urgent analysis with explicit qualification and immediate recollection; never report as ordinary compliant sample. |

Record both arrival time and start-of-analysis time. Preserve the original field result and notes in the audit trail, including any cooler temperature excursion or label correction. A delayed negative result should not be interpreted as proof of safe water. [1,2,6]



## 14 Field quality controls and nonconformities

Build a field quality-control (QC) plan, within the laboratory's quality-assurance (QA) system, with sterile field blanks, equipment blanks for reusable samplers, route blanks, duplicates at defined risk sites, temperature blanks/loggers and periodic observer checks. A blank positive can reveal environmental, reagent or handling contamination; a duplicate difference may reflect true microbial patchiness as well as collection variability. Record corrective action before releasing a conclusion. [1,2]

| Problem                                        | Likely bias                         | Response                                                  |
|------------------------------------------------|-------------------------------------|-----------------------------------------------------------|
| Sterile bottle rinsed or cap interior touched  | Neutralizer loss or false positive. | Reject or qualify and recollect promptly.                 |
| No thiosulfate in chlorinated sample           | False low or false negative.        | Do not treat as compliant; recollect with correct bottle. |
| Tap disinfected for consumer-exposure question | Fitting contamination erased.       | Repeat under correct tap objective.                       |
| Sample warm or past method time                | Organisms grow or die.              | Apply documented acceptance rule; report limitation.      |
| Wastewater splashed onto sterile kit           | Cross-contamination.                | Replace kit, control waste and recollect.                 |

Do not “correct” a poor sample by transferring it to a sterile bottle in the lab. Record the nonconformance, notify the sampler and arrange recollection. Trend field blank failures, cooler deviations and rejected samples by team and route. [1,2]



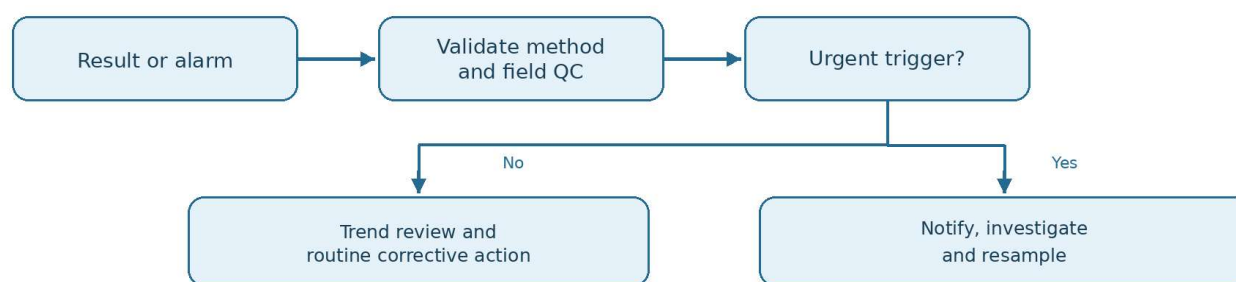
## 15 Information management and response

The field app should implement Annexes A–C as controlled records. A LIMS should connect approved plan, field kit, sample barcode, site/GPS, collection objective, time, chlorine and temperature observations, transport compartment, chain of custody, receipt condition, test initiation, method, quality controls, result review and notifications. An offline-capable field application can prevent undocumented route changes and synchronize after connectivity returns. [1,5]

Positive *E. coli* in treated drinking water, repeated total coliform positives or a cluster of low disinfectant residuals demands prompt verification and operational investigation under the utility's response SOP. Preserve the original sample record, check blanks and method validity, review pressure/repair/dosing data, repeat targeted samples and alert the authorized public-health and utility officials in the specified sequence. Do not wait for routine report compilation if a method-defined urgent trigger occurs. [3,5]

For wastewater at treatment and discharge points, compare organism load with flow and treatment condition, not count alone. The database should retain raw values, method limits, qualified results, rechecks and corrective actions so that recurring contamination and treatment failures are visible over time. [5,10]

*Figure 6 Escalation after a microbiological result or field alarm*



### 15.1 Suggested mobile app and LIMS architecture

A utility-owned, offline-capable field app should draw approved sites, sampling purposes, bottle kits, tests and route deadlines from the LIMS. A controlled interface synchronizes time-stamped visit events, bottle scans, field readings, custody handoffs and deviations. The laboratory accepts each bottle and issues an



accession ID while preserving the original field sample ID. This architecture is a recommendation for implementation, not a required commercial product. [1,2]

Workflow: plan approval (Annex A) → assignment and sterile kit release → exact point and purpose verification → outlet preparation/purge → separate chlorine measurement → sterile bottle/barcode collection (Annex B) → cooled custody handoffs → laboratory receipt and decision (Annex C) → analysis and technical review → response action and closure. The app must distinguish consumer-exposure first draw from a disinfected/flushed supply sample and prohibit quiet conversion between the two.

Roles: programme officer approves sites and frequency; microbiology laboratory controls methods, bottle sterility lot and neutralizer; field sampler records visits; transporter signs custody and temperature; receptionist accepts, qualifies or rejects containers; analyst records start and result; reviewer authorizes release and action notification. Require an attributable reason for every correction.

## 15.2 Data fields, alerts and offline controls

Core linked records are Site/Port (asset type, hydraulic position and GPS), Plan (organisms, purpose, method, volume, neutralizer and response threshold), Visit (operator and conditions), Sample/Bottle (barcode, lot, fill, time and collection basis), Field Observation (chlorine, temperature, pressure, outlet preparation and purge), Custody (from/to/time/seal/temperature), Receipt (condition and decision), Test (method and start time), Result, Nonconformity and Response Action.

Validation should warn of duplicate IDs, missing site/port, unapproved route changes, expired sterile bottle lot, neutralizer mismatch, absent chlorine reading where planned, insufficient test volume, breached temperature or holding-time limits, and missing transfer signature. A positive result or zero chlorine observation should reach designated responders under the organisation's approved SOP, with acknowledgement and follow-up traceable.

Cache assigned routes for offline work; store signed device time and uncertainty, original event time and sync time separately. Encrypt local records, use role-based access and an audit trail, resolve conflicting edits before import, and permit paper



Annexes A–C during outages with later attributed transcription. Pilot one tap, UGR, OHR, bore, dug-well and hand-pump route before rollout. [1,2]



## 16 Worked route and implementation checklist

Example: after an intermittent-supply complaint, collect a plant outlet, reservoir outlet, upstream main, affected street main and consumer tap within a planned hydraulic window. At the consumer site, obtain separate samples for as-used exposure and prepared-outlet system water if the investigation requires both. Record restart time, pressure, free chlorine and turbidity at each point. Compare paired results with field blanks and recent baselines before locating the likely ingress or premise-plumbing source. [1,5]

| Before dispatch                               | At site and in transit                    | At laboratory                                |
|-----------------------------------------------|-------------------------------------------|----------------------------------------------|
| Approve sites, methods and notification tree. | Confirm point, purpose and aseptic setup. | Check seal, ID, fill, neutralizer and temp.  |
| Issue sterile and pre-dosed kits.             | Measure residual in separate aliquot.     | Log collection and analysis start times.     |
| Calibrate meters and map cold route.          | Fill, seal, cool and scan bottle.         | Run blanks, review quality and report.       |
| Reserve test capacity for urgent samples.     | Record deviations and handoffs.           | Escalate urgent positives and close actions. |

A programme manager should review sample rejection rates, missed deadlines, false-positive blank events, site coverage, repeat positives and time from field alarm to action. Update the plan after source changes, new connections, repairs, treatment changes and recurring consumer complaints. [1,5]



## References

- [1] BIS, IS 17614 (Part 25):2022 / ISO 19458:2006, Water Quality—Sampling—Part 25: Microbiological Analysis.  
[https://www.services.bis.gov.in/php/BIS\\_2.0/bisconnect/pow\\_new/Pow/download\\_pow\\_pdf\\_dept\\_commtt/62/351/](https://www.services.bis.gov.in/php/BIS_2.0/bisconnect/pow_new/Pow/download_pow_pdf_dept_commtt/62/351/)
- [2] BIS, IS 1622:1981, Methods of Sampling and Microbiological Examination of Water (First Revision), with applicable amendments; confirm current BIS status and any later published revision. BIS preview:  
<https://www.services.bis.gov.in/tmp/SR1622.pdf>
- [3] BIS, IS 10500:2012, Drinking Water—Specification (Second Revision); applicable amendments and revisions to be confirmed.  
[https://services.bis.gov.in/php/BIS\\_2.0/bisconnect/standard\\_review/Standard\\_review/Isdetails?ID=ODEzNg%3D%3D](https://services.bis.gov.in/php/BIS_2.0/bisconnect/standard_review/Standard_review/Isdetails?ID=ODEzNg%3D%3D)
- [4] ISO, ISO 19458:2006, Water quality—Sampling for microbiological analysis.  
<https://www.iso.org/standard/33845.html>
- [5] WHO, Guidelines for drinking-water quality, fourth edition incorporating the first, second and third addenda (2026). <https://www.who.int/publications/i/item/9789240121225>
- [6] US EPA, Quick Guide to Drinking Water Sample Collection, second edition, September 2016 update.  
<https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1010IHC.txt>
- [7] BIS, IS 14543:2024, Packaged Drinking Water (Other Than Packaged Natural Mineral Water)—Specification. [https://www.services.bis.gov.in/tmp/Circular\\_5mE4\\_2024-07-15.pdf](https://www.services.bis.gov.in/tmp/Circular_5mE4_2024-07-15.pdf)
- [8] BIS, IS 13428:2024, Packaged Natural Mineral Water—Specification (Third Revision).  
[https://www.services.bis.gov.in/php/BIS\\_2.0/bisconnect/ISL/is\\_details?IDS=MTcyNjA%3D](https://www.services.bis.gov.in/php/BIS_2.0/bisconnect/ISL/is_details?IDS=MTcyNjA%3D)
- [9] BIS, IS 15185:2016 / ISO 9308-1:2014, E. coli and coliforms by membrane filtration; method cross-reference. [https://www.services.bis.gov.in/tmp/WCCHD35128467\\_31072025\\_1.pdf](https://www.services.bis.gov.in/tmp/WCCHD35128467_31072025_1.pdf)
- [10] US EPA, Approved Clean Water Act microbiological methods. <https://www.epa.gov/cwa-methods/approved-cwa-microbiological-test-methods>
- [11] US EPA, Method 1623.1, Cryptosporidium and Giardia in water by filtration, immunomagnetic separation and immunofluorescence. <https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100J7G4.TXT>
- [12] CDC, Legionella sampling procedure and potential sites. <https://www.cdc.gov/investigate-legionella/media/pdfs/cdc-sampling-procedure.pdf>



## Annex A Microbiological sampling plan and point approval form

Complete before fieldwork. Select the microbiological purpose and exact sampling point. Repeat the site and bottle rows as needed; write N/A when a field does not apply.

| A1 Programme and approval    |                                                                                                                                            |                       |  |  |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--|--|
| Plan ID                      |                                                                                                                                            | Version               |  |  |
| Programme / zone             |                                                                                                                                            | Valid dates           |  |  |
| Sampling decision            | <input type="checkbox"/> Routine <input type="checkbox"/> Complaint<br><input type="checkbox"/> Incident <input type="checkbox"/> Outbreak | Responsible responder |  |  |
| Applicable standard / method |                                                                                                                                            | Reporting deadline    |  |  |
| Prepared by / date           |                                                                                                                                            | Approved by / date    |  |  |

| A2 Point schedule One line per approved site |                    |              |                  |                  |
|----------------------------------------------|--------------------|--------------|------------------|------------------|
| Site ID                                      | Asset / exact port | GPS / map ID | Sampling purpose | Frequency / time |
|                                              |                    |              |                  |                  |
|                                              |                    |              |                  |                  |
|                                              |                    |              |                  |                  |

| A3 Site specific collection instruction Copy per site |                                                                                                                                                              |                        |                                                                                                                                                                                                                   |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Selected site ID                                      |                                                                                                                                                              | Operating condition    |                                                                                                                                                                                                                   |
| Sampling purpose                                      | <input type="checkbox"/> Supplied water <input type="checkbox"/> Local line<br><input type="checkbox"/> Consumer exposure <input type="checkbox"/> First use | Point category         | <input type="checkbox"/> Tap <input type="checkbox"/> UGR outlet <input type="checkbox"/> OHR outlet<br><input type="checkbox"/> Tubewell <input type="checkbox"/> Dug well<br><input type="checkbox"/> Hand pump |
| Outlet preparation                                    | <input type="checkbox"/> As found <input type="checkbox"/> Remove fitting<br><input type="checkbox"/> Clean/disinfect                                        | Flush / purge rule     |                                                                                                                                                                                                                   |
| Disinfection method / contact                         |                                                                                                                                                              | Stability or stop rule |                                                                                                                                                                                                                   |
| Sanitary hazards / access                             |                                                                                                                                                              | Paired site if any     |                                                                                                                                                                                                                   |



| A4 Method, kit and journey |  |                           |  |
|----------------------------|--|---------------------------|--|
| Target organisms / method  |  | Test volume / bottle size |  |
| Sterile bottle / lot       |  | Neutralizer / capacity    |  |
| Fill line / headspace      |  | Separate field tests      |  |
| Sterile blanks / duplicate |  | Maximum test-start time   |  |
| Cooling range / protection |  | Transport / lab contact   |  |
| Route and backup           |  | Action threshold / notice |  |

| A5 Dispatch sign off  |  |                                |  |
|-----------------------|--|--------------------------------|--|
| Team / route          |  | Kit issue date                 |  |
| Map or photo revision |  | Deviation approver / signature |  |



## Annex B Microbiological sample drawing and field data sheet

One form per site visit. Enter the actual collection basis and order. Measure chlorine in a separate aliquot before the sterile bottle is neutralized.

| B1 Site and sample identity |                                                                                                                                             |                           |                                                                                                                                                                                         |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Plan / version              |                                                                                                                                             | Visit and site ID         |                                                                                                                                                                                         |
| Exact port / landmark       |                                                                                                                                             | Date / GPS                |                                                                                                                                                                                         |
| Sampler / contact           |                                                                                                                                             | Arrival / collection time |                                                                                                                                                                                         |
| Sample purpose              | <input type="checkbox"/> Supply <input type="checkbox"/> Local line<br><input type="checkbox"/> Consumer <input type="checkbox"/> First use | Point                     | <input type="checkbox"/> Tap <input type="checkbox"/> UGR <input type="checkbox"/> OHR<br><input type="checkbox"/> Bore <input type="checkbox"/> Dug <input type="checkbox"/> Hand pump |

| B2 Conditions before sampling |  |                             |  |
|-------------------------------|--|-----------------------------|--|
| Supply / flow state           |  | Tank level / cycle          |  |
| Pump since / valve            |  | Pressure / leakage          |  |
| Rain / repair / ingress       |  | Tap fitting / condition     |  |
| Last use / stagnation         |  | Water level / depth         |  |
| Visible sanitary risks        |  | Recent chlorination / blend |  |

| B3 Preparation, flushing and purge |                                                                                       |                        |                                                                                       |
|------------------------------------|---------------------------------------------------------------------------------------|------------------------|---------------------------------------------------------------------------------------|
| Fitting removed?                   | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Disinfection used?     | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A |
| Product / contact time             |                                                                                       | Flush start / finish   |                                                                                       |
| Flush volume / flow                |                                                                                       | Hand-pump strokes      |                                                                                       |
| Purge stop or stability            |                                                                                       | Sample order if paired |                                                                                       |



#### B4 Field readings before neutralization

|                         |  |                        |                                                          |
|-------------------------|--|------------------------|----------------------------------------------------------|
| Free chlorine<br>mg/L   |  | Total chlorine<br>mg/L |                                                          |
| Water<br>temperature °C |  | pH                     |                                                          |
| Turbidity NTU           |  | Meter / check ID       |                                                          |
| Readings time           |  | Separate<br>aliquot?   | <input type="checkbox"/> Yes <input type="checkbox"/> No |

#### B5 Sterile bottle record One line per bottle

| Barcode / test | Sterility lot | Neutralizer / lot | Fill mark / volume | Sample time /<br>cooler |
|----------------|---------------|-------------------|--------------------|-------------------------|
|                |               |                   |                    |                         |
|                |               |                   |                    |                         |
|                |               |                   |                    |                         |

#### B6 Field QC, sealing and handoff

|                                  |  |                             |  |
|----------------------------------|--|-----------------------------|--|
| Sterile blank /<br>duplicate IDs |  | Sampler device /<br>QC      |  |
| Photo / sanitary<br>note         |  | Deviation /<br>approval     |  |
| Seal / cooler ID                 |  | Sampler<br>signature / time |  |
| Custody handoff<br>/ time        |  | Next deadline               |  |



## Annex C Microbiological sample deposit registration and custody form

Complete at each handoff and laboratory receipt. Keep collection time and start-of-analysis time as separate entries. Repeat bottle lines as needed.

| C1 Deposit summary     |  |                       |  |  |  |
|------------------------|--|-----------------------|--|--|--|
| Plan / visit ID        |  | Site / port ID        |  |  |  |
| Collection date / time |  | Sampling purpose      |  |  |  |
| Transporter / vehicle  |  | Dispatch / arrival    |  |  |  |
| Cooler / seal ID       |  | Temperature / logger  |  |  |  |
| Required max time      |  | Receiving lab / tests |  |  |  |

| C2 Chain of custody Every transfer |           |             |              |               |           |
|------------------------------------|-----------|-------------|--------------|---------------|-----------|
| From / sign                        | To / sign | Date / time | Bottle count | Cooler / seal | Condition |
|                                    |           |             |              |               |           |
|                                    |           |             |              |               |           |

| C3 Receipt by bottle |               |                     |                    |                   |
|----------------------|---------------|---------------------|--------------------|-------------------|
| Barcode              | Lab accession | Bottle / lot / fill | Neutralizer / seal | Deadline / status |
|                      |               |                     |                    |                   |
|                      |               |                     |                    |                   |
|                      |               |                     |                    |                   |



| C4 Acceptance, nonconformity and action |                                                                                                                                         |                            |                                                          |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------------------------------------|
| Arrival temp / time                     |                                                                                                                                         | Analysis start deadline    |                                                          |
| Actual test start time                  |                                                                                                                                         | Bottle sterile / intact?   | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Fill and neutralizer                    |                                                                                                                                         | Requested test / volume    |                                                          |
| Receipt decision                        | <input type="checkbox"/> Accept <input type="checkbox"/> Qualify<br><input type="checkbox"/> Quarantine <input type="checkbox"/> Reject | Reason / action            |                                                          |
| Recollection / notification             |                                                                                                                                         | Storage location / time    |                                                          |
| Reception signature / time              |                                                                                                                                         | Reviewer / authorisation   |                                                          |
| LIMS accession / audit                  |                                                                                                                                         | Field team notified / time |                                                          |



## Annex D Acronyms and abbreviations

| Term    | Meaning                                                    |
|---------|------------------------------------------------------------|
| BIS     | Bureau of Indian Standards                                 |
| CDC     | Centers for Disease Control and Prevention (United States) |
| DPD     | N,N-diethyl-p-phenylenediamine (chlorine test reagent)     |
| E. coli | Escherichia coli                                           |
| GPS     | Global Positioning System                                  |
| HPC     | Heterotrophic plate count                                  |
| IMS     | Immunomagnetic separation                                  |
| IS      | Indian Standard                                            |
| ISO     | International Organization for Standardization             |
| LIMS    | Laboratory information management system                   |
| MF      | Membrane filtration                                        |
| PPE     | Personal protective equipment                              |
| QA      | Quality assurance                                          |
| QC      | Quality control                                            |
| RO      | Reverse osmosis                                            |
| SOP     | Standard operating procedure                               |
| STP     | Sewage treatment plant                                     |
| US EPA  | United States Environmental Protection Agency              |
| WHO     | World Health Organization                                  |
| WTP     | Water treatment plant                                      |
| UGR     | Underground service reservoir                              |
| OHR     | Overhead reservoir                                         |
| API     | Application programming interface                          |

This annex expands terms used in the note. Method-specific sample conditions must always be read from the approved method and the controlled laboratory sampling instruction.