Illicit Discharge Detection and Elimination (IDDE) Plan

University of New Hampshire

Permit Year 8

EPA NPDES Permit Number NHR042001

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1 IDDE Program Implementation Timeline

Table 1-1. IDDE Program Implementation Timeline

IDDE Program Requirement	Completion Date from Effective Date of Permit					
	1 Year	1.5 Years	2 Years	3 Years	7 Years	10 Years
Written IDDE Program Plan	X					
SSO Inventory	X					
Initial Outfall Ranking	X					
Written Catchment Investigation Procedure		X				
Phase I Mapping			X			
Phase II Mapping						X
IDDE Regulatory Mechanism or By-law (if not already in place)				X		
Dry Weather Outfall Screening				X		
Follow-up Ranking of Outfalls and Interconnections				X		
Catchment Investigations – Problem Outfalls					X	
Catchment Investigations – all Problem, High and Low Priority Outfalls						X

2 Authority and Statement of IDDE Responsibilities

2.1 Legal Authority

The University of New Hampshire will use the regulatory mechanism authorized by its Board of Trustees to provide the University and its Planning, Design, and Construction Guidelines with adequate legal authority to:

- Prohibit illicit discharges
- Investigate suspected illicit discharges
- Eliminate illicit discharges, including discharges from properties not owned by or controlled by the MS4 that discharge into the MS4 system
- Implement appropriate enforcement procedures and actions.

Chapter 1 (General Priinciples) of the UNH Planning, Design, and Construction guidelines (https://www.unh.edu/facilities/chapter-1-general-principles) will meet the requirements of the 2017 MS4 Permit.

2.2 Statement of Responsibilities

The UNH Facilities Department is the lead agency or department responsible for implementing the IDDE program.

3 Stormwater System Mapping

A copy of the existing storm system map is provided in **Appendix B**.

The MS4 Permit requires the storm system map to be updated in two phases as outlined below. The University is responsible for updating the stormwater system mapping pursuant to the 2017 MS4 Permit. The University will report on the progress towards completion of the storm system map in each annual report. Updates to the stormwater mapping will be included in **Appendix B**.

3.1 Phase I Mapping

Phase I mapping must be completed within two (2) years of the effective date of the permit (July 1, 2020) and include the information per Part 2.3.4.5.a of the MS4 Permit.

3.2 Phase II Mapping

Phase II mapping must be completed within ten (10) years of the effective date of the permit (July 1, 2028) and include the information per Part 2.3.4.5.b of the MS4 Permit.

4 Sanitary Sewer Overflows (SSOs)

University of New Hampshire has no Sanitary Sewer Overflows (SSOs).

SSO Inventory

Date of Discovery	Time of Discovery	Date of Correction	Time of Correction	Est. Volume	Location	Cause	Notes
2/17/2025	15:00	2/17/2025	15:20	200-2000 gallons	40 Gables Way Durham, NH	Lift station failure	Overflow was contained to a grassed area and did not enter storm drains

University of New Hampshire Facilities – SSO Written Report

Sanitary Sewer Overflow (SSO) Reporting Form

In the event of an SSO, **immediate verbal notification** to EPA is required. This report shall serve as a written follow-up to be submitted to EPA **within 5 days** of the overflow event. Attach map showing overflow location and affected areas.

UNH Contacts:

Dave Bowley
Utilities Systems Manager
(603) 608-8357
dave.bowley@unh.edu
6 Leavitt Ln Durham, NH 03824

Will Powers
Utilities Distribution Superintendent
(603) 815-2257
will.powers@unh.edu
6 Leavitt Ln Durham, NH 03824

Verbal Report Number: 1423837

Additional Agencies Notified:

- [x] Town of Durham
- [ ] NHDES
- [ ] UNH Water Treatment Plant
- [x] UNH EH&S

Initial Discovery

Date: 2/17/25 **Time:** 1500 **Responding Technician:** WP, JC, LB

Location:

- [x] *40 Gables Way*
- [ ] *35 Colovos Rd(Gregg)*
- [ ] *5 Edgewood Rd(Whittemore Ctr)*
- [ ] *46 College Rd(Rudman)*
- [ ] *Other:*

Component that was/is overflowing:

- [x] *Manhole*
- [ ] *Force Main Leak*
- [ ] *Gravity Main Leak*
- [ ] *Overflow Pipe (constructed)*

Cause of overflow conditions:

Failure of level controller at Gables Lift Station caused backup to sewer manhole #SSMH0340. Overflow occurred from manhole lid for approximately 10-20 minutes until technicians arrived on site and ran lift station pumps in "Hand" to lower wet well tank level and restore flow through collection system. Replaced cracked air tubing inside level control panel that caused failure. After tubing was replaced, the station was confirmed to be running with all systems set to "Auto."

Corrective Measures

Date overflow was corrected: 2/17/25 **Time:** 1520 ☐ **N/A (ongoing)**

Estimated Total Volume: 200-2,000 **US gal**

Steps taken or planned to reduce, eliminate, and prevent recurrence of the overflow:

Reassembled level controller air system, full rebuild anticipated upon receipt of replacement parts. Developed plan to install new cellular auto-dialer alarm to decrease technician response time in event of future lift station alarms.

Timeline for measures listed above:

Replacement level controller air system parts expected by 2/21/25. Alarm upgrades to be installed Spring 2025.

Steps taken or planned to mitigate impacts from release:

Installed boom to control overflow from spreading.

Timeline for mitigation measures:

Mitigation measures are in place.

5 Assessment and Priority Ranking of Outfalls

The MS4 Permit requires an assessment and priority ranking of outfalls in terms of their potential to have illicit discharges related public health significance. The ranking helps determine the priority order for performing IDDE investigations and meeting permit milestones.

5.1 Outfall Catchment Delineations

The catchments for each of the MS4 outfalls will be delineated to define contributing areas for investigation of potential sources of illicit discharges.

5.2 Outfall and Interconnection Inventory and Initial Ranking

The University will complete an initial outfall and interconnection inventory and priority ranking to assess illicit discharge potential based on existing information. The initial inventory and ranking will be completed within one (1) year from the effective date of the permit. An updated inventory and ranking will be provided in each annual report thereafter. The inventory will be updated annually to include data collected in connection with dry weather screening and other relevant inspections.

Outfalls and interconnections will be classified into one of the following categories:

1. **Excluded outfalls**:
   - Outfalls/interconnections that do not discharge to an impaired waterbody or are not listed in Part II Summary of Receiving Waters in the NOI.
   - Outfalls/interconnections with no potential for illicit discharges including roadway drainage in undeveloped areas with no dwellings and no sanitary sewers; drainage for athletic fields, parks or undeveloped green space and associated parking without services; cross-country drainage alignments (that neither cross nor are in proximity to sanitary sewer alignments) through undeveloped land.

2. **Problem Outfalls**: Outfalls/interconnections with known or suspected contributions of illicit discharges based on existing information shall be designated as Problem Outfalls. This shall include any outfalls/interconnections where previous screening indicates likely sewer input. Likely sewer input indicators are any of the following:

   - Olfactory or visual evidence of sewage,
   - Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
   - Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine.

   High Priority Outfalls: Outfalls/interconnections that have not been classified as Problem Outfalls and that are:

   - Discharging to an area of concern to public health due to proximity of public beaches, recreational areas, drinking water supplies or shellfish beds

- Determined by the permittee as high priority based on the characteristics listed in **Appendix C** .

3. **Low Priority Outfalls**: Outfalls/interconnections determined by the permittee as low priority based on the characteristics listed below or other available information.

Outfalls will be ranked into the above priority categories (except for excluded outfalls, which may be excluded from the IDDE program) based on the following characteristics of the defined initial catchment areas, where information is available. To prioritize initial mapping and outfall assessment work the permittee is using location-specific characteristics of water body impairments to focus initial work as included in **Appendix B**. It is understood that not all currently excluded catchments will remain excluded throughout the 10 year assessment period, however for initial outfall ranking and catchment investigations this approach will target the worst areas first.

- **Previous screening results** – previous screening/sampling results indicate likely sewer input (see criteria above for Problem Outfalls).

- **Past discharge complaints and reports.**

- **Poor receiving water quality** – the following guidelines are recommended to identify waters as having a high illicit discharge potential:
    - Exceeding water quality standards for bacteria
    - Ammonia levels above 0.5 mg/l
    - Surfactants levels greater than or equal to 0.25 mg/l

- **Density of generating sites** – Generating sites are those places, including institutional, municipal, commercial, or industrial sites, with a potential to generate pollutants that could contribute to illicit discharges. Examples of these sites include, but are not limited to, car dealers; car washes; gas stations; garden centers; and industrial manufacturing areas.

- **Age of development and infrastructure** – Industrial areas greater than 40 years old and areas where the sanitary sewer system is more than 40 years old will probably have a high illicit discharge potential. Developments 20 years or younger will probably have a low illicit discharge potential.

- **Sewer conversion** – Contributing catchment areas that were once serviced by septic systems, but have been converted to sewer connections may have a high illicit discharge potential.

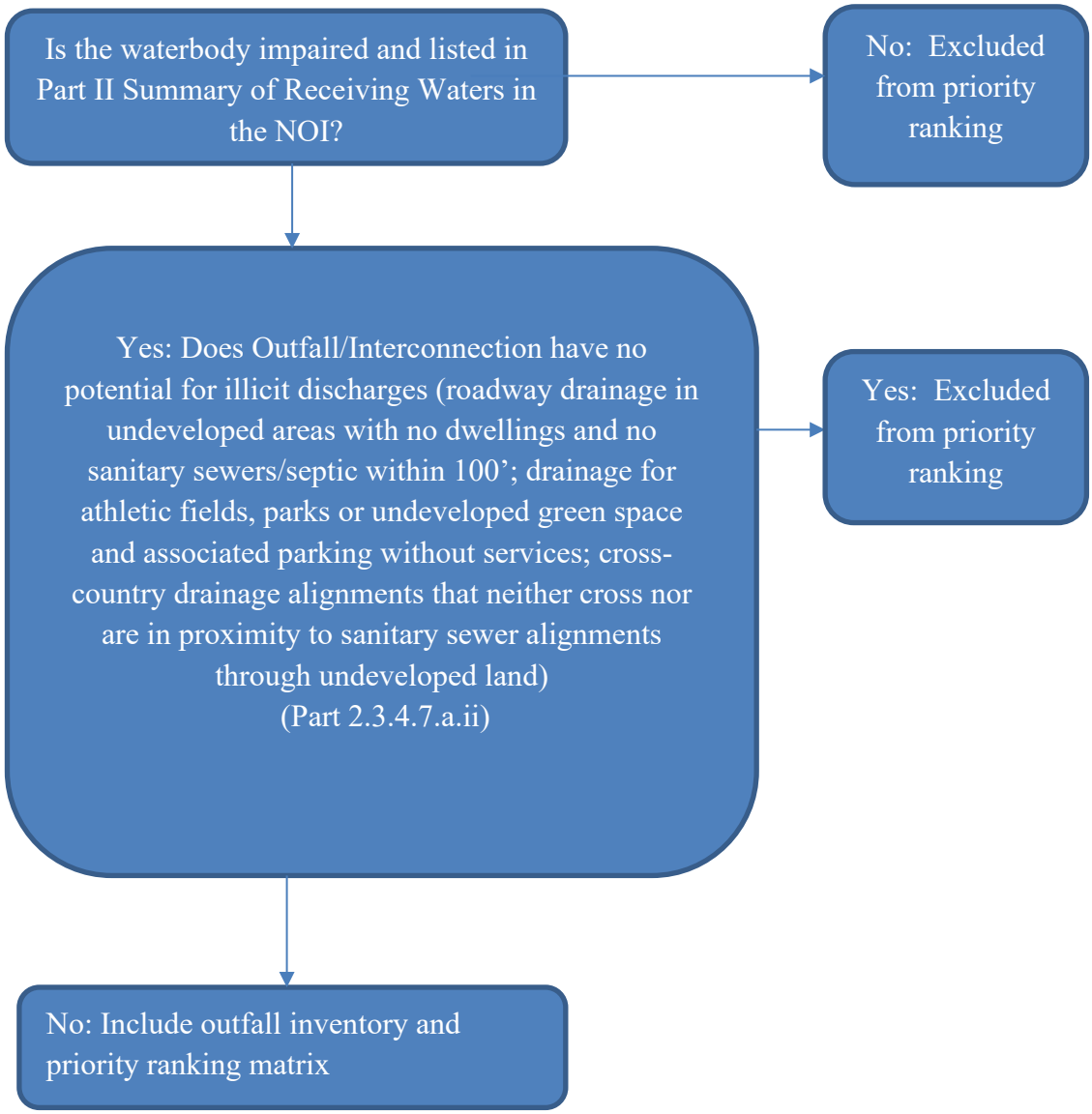
- **Historic combined sewer systems** – Contributing areas that were once serviced by a combined sewer system, but have been separated may have a high illicit discharge potential.

- **Surrounding density of aging septic systems** – Septic systems thirty years or older in residential land use areas are prone to have failures and may have a high illicit discharge potential.

- **Culverted streams** – Any river or stream that is culverted for distances greater than a simple roadway crossing may have a high illicit discharge potential.

- **Water quality limited waterbodies** that receive a discharge from the MS4 or waters with approved TMDLs applicable to the permittee, where illicit discharges have the potential to contain the pollutant identified as the cause of the water quality impairment.

The following is an initial outfall prioritization flowchart, see Appendix C for an outfall inventory and priority ranking matrix:



6 Dry Weather Outfall Screening and Sampling

Dry weather flow is a common indicator of potential illicit connections. The MS4 Permit requires all outfalls/interconnections (excluding Problem and Excluded Outfalls) to be inspected for the presence of dry weather flow. The University is responsible for conducting dry weather outfall screening, starting with High Priority outfalls, followed by Low Priority outfalls, based on the initial priority rankings described in the previous section by the end of Year 3.

Dry weather outfall Screening and Sampling shall be completed in accordance with Part 2.3.4.7.b of the MS4 Permit. Plans and procedures for such screening and sampling shall be incorporated into this plan.

7 Catchment Investigations

Once stormwater outfalls with evidence of illicit discharges have been identified, various methods can be used to trace the source of the potential discharge within the outfall catchment area. Catchment investigation techniques include but are not limited to review of maps, historic plans, and records; manhole observation; dry and wet weather sampling; video inspection; smoke testing; and dye testing.

Catchment Investigations shall be completed in accordance with Part 2.3.4.8 of the MS4 Permit. A written catchment investigation procedure shall be developed and incorporated into this plan within 18 months of the permit effective date. Investigations of catchments associated with Problem Outfalls shall begin no later than two (2) years from the permit effective date and shall be completed within seven (7) years.

7.1 Illicit Discharge Removal

When the specific source of an illicit discharge is identified, the University will exercise its authority as necessary to require its removal. The annual report will include the status of IDDE investigation and removal activities including the following information for each confirmed source:

- The location of the discharge and its source(s)
- A description of the discharge
- The method of discovery
- Date of discovery
- Date of elimination, mitigation or enforcement action OR planned corrective measures and a schedule for completing the illicit discharge removal
- Estimate of the volume of flow removed.

7.2 Catchment Investigations

Once stormwater outfalls with evidence of illicit discharges have been identified, various methods can be used to investigate the source of the potential discharge within the outfall catchment area. Common catchment investigation techniques include, but are not limited to:

- Review of maps, historic plans, and records
- Manhole inspection
- Dry and wet weather sampling
- Video inspection
- Smoke testing
- Dye testing.

This section outlines a systematic procedure to investigate outfall catchments and identify the source(s) of potential illicit discharges. Information and data collected as part of the catchment investigations will be reported in each annual report.

7.3 Map and Record Review

The UNH Facilities Department will review relevant mapping and historic plans and records to identify areas within the catchment with higher potential for illicit connections. The following information will be reviewed:

- Plans related to the construction of the drainage network
- Prior work on the storm drains
- Health Department or other municipal data on septic system failures or required upgrades
- Records related to septic system breakouts, SSOs, and sanitary sewer surcharges

7.4 System Vulnerability Factors

Based on the Map and Records review, UNH Facilities Department will identify any of the following System Vulnerability Factors (SVFs). SVFs indicate a risk of sanitary or septic system inputs to the MS4 under wet weather conditions.
The UNH Facilities Department's SVF inventory (Appendix C) will be updated based on this information.

- History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages.
- Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs.
- Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints.
- Common or twin-invert manholes serving storm and sanitary sewer alignments.
- Common trench construction serving both storm and sanitary sewer alignments.
- Crossings of storm and sanitary sewer alignments.
- Sanitary sewer alignments known or suspected to have been constructed with an underdrain system.
- Areas formerly served by combined sewer systems.
- Sanitary sewer infrastructure defects such as leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through Inflow/Infiltration Analyses, Sanitary Sewer Evaluation Surveys, or other infrastructure investigations.
- Any storm drain infrastructure greater than 40 years old in medium and densely developed areas.

7.5 Dry Weather Catchment Investigation (Manhole Inspections)

The University will implement a dry weather storm drain network investigation that involves systematically and progressively observing, sampling and evaluating key junction manholes in the MS4 to determine the approximate location of suspected illicit discharges.
The UNH Facilities Department will be responsible for implementing the dry weather manhole inspection program and making updates as necessary. Infrastructure information will be incorporated into the storm system map, and catchment delineations will be refined based on the field investigation, where necessary. The SVF inventory will also be updated based on information obtained during the field investigations, where necessary.
Several important terms related to the dry weather manhole inspection program are defined by the MS4 Permit as follows:

- **Junction Manhole** is a manhole or structure with two or more inlets accepting flow from two or more MS4 alignments. Manholes with inlets solely from private storm drains, individual catch basins, or both are not considered junction manholes for these purposes.

- **Key Junction Manholes** are those junction manholes that can represent one or more junction manholes without compromising adequate implementation of the illicit discharge program. Adequate implementation of the illicit discharge program would not be compromised if the exclusion of a particular junction manhole as a key junction manhole would not affect the permittee's ability to determine the possible presence of an upstream illicit discharge. A permittee may exclude a junction manhole located upstream from another located in the immediate vicinity or that is serving a drainage alignment with no potential for illicit connections.

For all catchments identified for investigation, during dry weather, field crews will systematically inspect **key junction manholes** for evidence of illicit discharges and confirm or identify potential system vulnerability factors. This program involves progressive inspection and sampling at manholes in the storm drain network to isolate and eliminate illicit discharges.
The manhole inspection methodology will be conducted in one of two ways (or a combination of both):

- By working progressively up from the outfall and inspecting key junction manholes along the way, or
- By working progressively down from the upper parts of the catchment toward the outfall and inspecting key junction manholes along the way.

For most catchments, manhole inspections will proceed from the outfall moving up into the system. However, the decision to move up or down the system depends on the nature of the drainage system and the surrounding land use and the availability of information on the catchment and drainage system. Moving up the system can begin immediately when an illicit discharge is detected at an outfall, and only a map of the storm drain system is required. Moving down the system requires more advance preparation and reliable drainage system information on the upstream segments of the storm drain system, but may be more efficient if the sources of illicit discharges are believed to be located in the upstream portions of the catchment area. Once a manhole inspection methodology has been selected, investigations will continue systematically through the catchment.
Inspection of key junction manholes will proceed as follows:

1. Manholes will be opened and inspected for visual and olfactory evidence of illicit connections. A sample field inspection form is provided in **Appendix G.**

2. If flow is observed, a sample will be collected and analyzed at a minimum for ammonia, chlorine, and surfactants. Field kits can be used for these analyses, provided that they meet the minimum threshold indicator concentrations as outlined on Page 38 of the Permit (Section 2.3.4.7.b.iii.4.b). Sampling and analysis will be in accordance with procedures outlined in **Section 7**. Additional indicator sampling may assist in determining potential sources.

3. Where sampling results or visual or olfactory evidence indicate potential illicit discharges, the area draining to the junction manhole will be flagged for further upstream manhole investigation and/or isolation and confirmation of sources.

4. Subsequent key junction manhole inspections will proceed until the location of suspected illicit discharges can be isolated to a pipe segment between two manholes.

5. If no evidence of an illicit discharge is found, catchment investigations will be considered complete upon completion of key junction manhole sampling.

7.6 Wet Weather Catchment Investigation (Outfall Sampling)

Where a minimum of one (1) System Vulnerability Factor (SVF) is identified based on previous information or the catchment investigation, a wet weather investigation must also be conducted at the associated outfall. The UNH Facilities Department will be responsible for implementing the wet weather outfall sampling program and making updates as necessary.

Outfalls will be inspected and sampled under wet weather conditions, to the extent necessary, to determine whether wet weather-induced high flows in sanitary sewers or high groundwater in areas served by septic systems result in discharges of sanitary flow to the MS4.
Wet weather outfall sampling will proceed as follows:

At least one wet weather sample will be collected at the outfall for the same parameters required during dry weather screening.

1. Wet weather sampling will occur during or after a storm event of sufficient depth or intensity to produce a stormwater discharge at the outfall.
    a. To the extent feasible, sampling should occur during the spring (March through June) when groundwater levels are relatively high.
    b. There is no specific rainfall amount that will trigger sampling, although minimum storm event intensities that are likely to trigger sanitary sewer interconnections are preferred.
    c. Sampling during the initial period of discharge ("first flush") will be avoided.

2. If wet weather outfall sampling indicates a potential illicit discharge, then additional wet weather source sampling will be performed, as warranted, or source isolation and confirmation procedures will be followed as described in **Section 7.**

3. If wet weather outfall sampling does not identify evidence of illicit discharges, and no evidence of an illicit discharge is found during dry weather manhole inspections, catchment investigations will be considered complete.

7.7 Source Isolation and Confirmation

Once the source of an illicit discharge is approximated between two manholes, more detailed investigation techniques will be used to isolate and confirm the source of the illicit discharge. The following methods may be used in isolating and confirming the source of illicit discharges:

- Sandbagging
- Smoke Testing
- Dye Testing
- CCTV/Video Inspections
- Optical Brightener Monitoring
- IDDE Canines.

These methods are described in the sections below. Instructions and Standard Operating Procedures (SOPs) for these and other IDDE methods are provided in **Appendix E**.
Public notification is an important aspect of a detailed source investigation program. Prior to smoke testing, dye testing, or TV inspections, the UNH Facilities Department will notify property owners in the affected area. Smoke testing notification will include directed communication from the University's Facilities Control Center.

7.7.1 Sandbagging

This technique can be particularly useful when attempting to isolate intermittent illicit discharges or those with very little perceptible flow. The technique involves placing sandbags or similar barriers (e.g., caulking, weirs/plates, or other temporary barriers) within outlets to manholes to form a temporary dam that collects any intermittent flows that may occur. Sandbags are typically left in place for 48 hours, and should only be installed when dry weather is forecast. If flow has collected behind the sandbags/barriers after 48 hours it can be assessed using visual observations or by sampling. If no flow collects behind the sandbag, the upstream pipe network can be ruled out as a source of the intermittent discharge. Finding appropriate durations of dry weather and the need for multiple trips to each manhole makes this method both time-consuming and somewhat limiting.

7.7.2 Smoke Testing

Smoke testing involves injecting non-toxic smoke into drain lines and noting the emergence of smoke from sanitary sewer vents in illegally connected buildings or from cracks and leaks in the system itself. Typically a smoke bomb or smoke generator is used to inject the smoke into the system at a catch basin or manhole and air is then forced through the system. Test personnel are place in areas where there are suspected illegal connections or cracks/leaks, noting any escape of smoke (indicating an illicit connection or damaged storm drain infrastructure). It is important when using this technique to make proper notifications to area residents and business owners as well as local police and fire departments.

If the initial test of the storm drain system is unsuccessful then a more thorough smoke-test of the sanitary sewer lines can also be performed. Unlike storm drain smoke tests, buildings that do not emit smoke during sanitary sewer smoke tests may have problem connections and may also have sewer gas venting inside, which is hazardous.
It should be noted that smoke may cause minor irritation of respiratory passages. Residents with respiratory conditions may need to be monitored or evacuated from the area of testing altogether to ensure safety during testing.

7.7.3 Dye Testing

Dye testing involves flushing non-toxic dye into plumbing fixtures such as toilets, showers, and sinks and observing nearby storm drains and sewer manholes as well as stormwater outfalls for the presence of the dye. Similar to smoke testing, it is important to inform local residents and business owners. Police, fire, and local public health staff should also be notified prior to testing in preparation of responding to citizen phone calls concerning the dye and their presence in local surface waters.
A team of two or more people is needed to perform dye testing (ideally, all with two-way radios). One person is inside the building, while the others are stationed at the appropriate storm sewer and sanitary sewer manholes (which should be opened) and/or outfalls. The person inside the building adds dye into a plumbing fixture (i.e., toilet or sink) and runs a sufficient amount of water to move the dye through the plumbing system. The person inside the building then radios to the outside crew that the dye has been dropped, and the outside crew watches for the dye in the storm sewer and sanitary sewer, recording the presence or absence of the dye.
The test can be relatively quick (about 30 minutes per test), effective (results are usually definitive), and inexpensive. Dye testing is best used when the likely source of an illicit discharge has been narrowed down to a few specific houses or businesses.

7.7.4 CCTV/Video Inspection

Another method of source isolation involves the use of mobile video cameras that are guided remotely through stormwater drain lines to observe possible illicit discharges. IDDE program staff can review the videos and note any visible illicit discharges. While this tool is both effective and usually definitive, it can be costly and time consuming when compared to other source isolation techniques.

7.7.5 Optical Brightener Monitoring

Optical brighteners are fluorescent dyes that are used in detergents and paper products to enhance their appearance. The presence of optical brighteners in surface waters or dry weather discharges suggests there is a possible illicit discharge or insufficient removal through adsorption in nearby septic systems or wastewater treatment. Optical brightener monitoring can be done in two ways. The most common, and least expensive, methodology involves placing a cotton pad in a wire cage and securing it in a pipe, manhole, catch basin, or inlet to capture intermittent dry weather flows. The pad is retrieved at a later date and placed under UV light to determine the presence/absence of brighteners during the monitoring period. A second methodology uses handheld fluorometers to detect optical brighteners in water sample collected from outfalls or ambient surface waters. Use of a fluorometer, while more quantitative, is typically more costly, and is not as effective at isolating intermittent discharges as other source isolation techniques.

7.8 Illicit Discharge Removal

When the specific source of an illicit discharge is identified, the University will exercise its authority as necessary to require its removal. The annual report will include the status of IDDE investigation and removal activities including the following information for each confirmed source:

- The location of the discharge and its source(s)
- A description of the discharge
- The method of discovery
- Date of discovery
- Date of elimination, mitigation or enforcement action
- Estimate of the volume of flow removed.

7.8.1 Confirmatory Outfall Screening

Within one (1) year of removal of all identified illicit discharges and SSO sources within a catchment area, confirmatory outfall or interconnection screening will be conducted. The confirmatory screening will be conducted in dry weather unless System Vulnerability Factors have been identified, in which case both dry weather and wet weather confirmatory screening will be conducted. If confirmatory screening indicates evidence of additional illicit discharges, the catchment will be scheduled for additional investigation. Confirmatory screening is not required in catchments where no illicit discharges or System Vulnerability Factors have been identified and no previous screening indicated suspicious flows.

7.9 Follow-up Screening

Upon completion of all catchment investigations and illicit discharge removal and confirmation (if necessary), each outfall or interconnection will be scheduled for follow-up screening within five (5) years, or sooner based on the catchment's illicit discharge priority. Ongoing screening will consist of dry weather screening and sampling consistent with the procedures described in **Section 7** of this document. Ongoing wet weather screening and sampling will also be conducted at outfalls where wet weather screening was required due to System Vulnerability Factors and will be conducted in accordance with the procedures described in **Section 8.1**. All sampling results will be reported in the annual report.

7.10 Illicit Discharge Detection and Elimination Training

The University will implement a training program, as outlined in Section 8 and **Appendix F** of the IDDE Program Plan, to employees involved in IDDE program about the program, including how to recognize illicit discharges and SSOs. The permittee shall report on the frequency and type of employee training in the annual report.

8 Training

Annual IDDE training will be made available to employees involved in the IDDE program. This training will at a minimum include information on how to identify illicit discharges and SSOs and may also include additional training specific to the functions of particular personnel and their function within the framework of the IDDE program. Training records will be maintained in **Appendix F**. The frequency and type of training will be included in the annual report.

9 Progress Reporting

The progress and success of the IDDE program will be evaluated on an annual basis. The evaluation will be documented in the annual report and will include the following indicators of program progress:

- Number of SSOs and illicit discharges identified and removed
- Number and percent of total outfall catchments served by the MS4 evaluated using the catchment investigation procedure
- Number of dry weather outfall inspections/screenings
- Number of wet weather outfall inspections/sampling events
- Estimate of the volume of sewage removed, as applicable
- Number of employees trained annually.

The success of the IDDE program will be measured by the IDDE activities completed within the required permit timelines.

Appendix A

UNH Planning, Design, and Construction Guidelines Chapter 1:

https://www.unh.edu/facilities/chapter-1-general-principles

Appendix B

Storm System Mapping

University of New Hampshire

Stormwater Conveyances

0 285 570 1,140 1,710 Feet

1" = 50'

N

New Hampshire State Plane Coordinate System
North American Datum (NAD) 83/86
US Feet

Facilities Campus Planning
GIS Group
(603) 862-4218

8/25/2023

UNH Facilities GIS

Catch Basin

University of New Hampshire

Total # of Catch Basins
(Active, UNH Owned, in Durham)

0 305 610 1,220 1,830 Feet

1" = 50'

N

New Hampshire State Plane Coordinate System
North American Datum (NAD) 83/86
US Feet

Facilities Campus Planning
GIS Group
(603) 862-4218

8/24/2023

Appendix C

Outfall Inventory and Priority Ranking Matrix

Outfall Priority Ranking														System Vulnerability Factors										
Catchment ID	Outfall ID	Previous Screening Results Indicate Likely Sewer Input? [1]	Receiving Water Body Impairment? [2]	Discharging to Area of Concern to Public Health? [3]	Frequency of Past Discharge Complaints	Density of Generating Sites [4]	Age of Development/ Infrastructure [5]	Historic Combined Sewers or Septic? [6]	Aging Septic? [7]	Culverted Streams? [8]	Additional Characteristics	Score	Priority Ranking	History of *unaddressed* SSO *in the catchment area*, including, but not limited to, due to rain events, high water table and blockages.	Common or twin-invert manholes serving storm and sanitary sewer	Common trench construction serving both storm sewer and sanitary sewer alignments	Crossing of storm and sanitary sewer where sewer is shallower than storm drain	Sanitary sewer alignments known or suspected to have been constructed with an underdrain/*infiltration* system	Inadequate sanitary sewer level of service resulting in regular surcharging, customer back-ups, or frequent customer complaints *(known aging septic[7] within catchment area - same as history of SSO)*	Area formally *(within last 40 years)* served by combined sewer systems	Area with known infrastructure defects and leaking	Optional Considerations[9]	Other as determined appropriate by municipality	Total SVFs
Information Source		Outfall inspections and sample results	Impaired Waters List	Maps	Town Staff	Land Use/GIS Maps, Aerial Photography	Land Use Information, Visual Observation	Town Staff, GIS Maps	Land Use, Town Staff	GIS and Storm System Maps	Other			Town Staff	Maps	Maps	Maps/Asset Management Program	Maps	Town Staff	Town Staff	Town Staff	Town Staff	Town Staff	
Scoring Criteria		Yes = 10 (Problem Outfall)	Yes = 10 (impairment listed as high priority in permit)	Yes = 10	Frequent = 3	High = 3	High = 3	Yes = 3	Yes = 3	Yes = 3	TBD			Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	
SWC_1756_0039	OTF0001	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0039	OTF0010	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0022	OTF0012	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0

SWC_1756_0021	OTF0013	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1754_0002	OTF0021	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0005	OTF0026	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0005	OTF0027	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0052	OTF0034	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0038	OTF0050	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0024	OTF0052	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0047	OTF0057	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0046	OTF0058	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0012	OTF0059	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0011	OTF0060	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0010	OTF0061	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	Yes	No	No	No	No	No	No	No	1
SWC_1752_0050	OTF0062	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0049	OTF0064	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	Yes	Yes	No	No	No	Yes	No	No	3
SWC_1752_0052	OTF0075	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0051	OTF0079	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0054	OTF0081	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0003	OTF0101	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0031	OTF0111	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0

SWC_1752_0070	OTF0130	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0036	OTF0133	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0016	OTF0138	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1754_0005	OTF0147	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	Yes	1
SWC_1754_0004	OTF0151	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1754_0003	OTF0153	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0006	OTF0160	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0007	OTF0161	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0009	OTF0178	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0011	OTF0179	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0019	OTF0209	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0037	OTF0210	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0036	OTF0218	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0060	OTF0221	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0068	OTF0222	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0008	OTF0226	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0034	OTF0227	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0035	OTF0253	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0032	OTF0256	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0

SWC_1756_0012	OTF0293	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1754_0003	OTF0295	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1754_0001	OTF0298	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0010	OTF0299	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	OTF0327	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0061	OTF0330	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0053	OTF0333	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0071	OTF0337	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	OTF0338	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0001	OTF0341	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0043	OTF0343	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0067	OTF0345	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0067	OTF0346	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0048	OTF0355	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1754_0006	OTF0356	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0027	OTF0357	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0027	OTF0358	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0027	OTF0359	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0023	OTF0360	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0

SWC_1756_0023	OTF0361	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0008	OTF0362	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0040	OTF0363	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0028	OTF0365	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0058	CB0401	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0015	CB0509	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0014	CB0510	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0026	CB0423	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0020	CB0428	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_CONVEYANCE	CB0431	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0017	CB0432	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0028	CB0442	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0023	CB0850	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0045	CB0613	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0004	CB0310	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0025	CB0424	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0024	CB0425	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0059	CB0404	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0040	CB0646	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0

SWC_1752_0029	CB0491	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0044	CB0492	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0001	DMH_0116	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0001	DMH_0106	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0027	DMH_0064	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0002	DMH_0210	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0031	OTF0403	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
<Null>	OTF0408	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
<Null>	OTF0416	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0031	OTF0417	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1754_0009	OTF0418	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0001	CB1130	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0001	CB1131	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0064	CB1140	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0064	CB1141	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0015	CB1159	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0064	CB1171	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0028	CB1185	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1176	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0

SWC_1752_0042	CB1177	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1180	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1181	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1182	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1183	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0043	CB1195	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0043	CB1194	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0043	CB1193	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0043	CB1192	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0043	CB1191	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0043	CB1190	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1203	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1204	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1205	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1206	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1207	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0007	CB1202	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1216	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1215	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0

SWC_1752_0042	CB1214	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1213	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	CB1218	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	DMH_0305	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1756_0007	DMH_0314	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	DMH_0313	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0042	DMH_0312	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
SWC_1752_0007	DMH_0309	0	10	0	0	0	3	0	0	0	None	13	High Priority	No	No	No	No	No	No	No	No	No	No	0
												0	Low Priority											0
												0	Low Priority											0
												0	Low Priority											0
												0	Low Priority											0

Appendix D

Field Forms, Sample Bottle Labels, and Chain of Custody Forms

*Appendix to include copies of the following field sampling documents **once fully developed** in accordance with the 2017 MS4 Permit:*

- Dry weather outfall inspection/sampling form
- Wet weather outfall inspection/sampling form
- Manhole inspection form
- Example sample labels (provided by laboratory)
- Example chain-of-custody form(s) (provided by laboratory(s))

UNH Facilities
MS4 Wet Weather Sampling Form

Oyster River & College Brook Watersheds

Storm Start Time/Date: _____ **Current Time/Date:** _____

Outfall ID: _____ **Catchment ID:** _____ **Samples taken by:** _____

Location Description: _____

Type: *Outfall Pipe* *Catch Basin* *Manhole* **Pipe Material:** _____ **Size:** _____ **in.**

Current Conditions: _____ **Temp:** _____ **°F** **Rainfall Past 24HRs:** _____ **in.**

Flow Present: *Yes / No* **Evidence of Illicit Discharge:** *Yes / No*

Field Test Kit

Parameter	Equipment	Time	Result
Temperature *(°C)*	Triplett Model WQ120		
Specific Conductance *(uS)*			
Salinity *(PPmS)*			
pH			
Free Chlorine	Hach DR300		
Dissolved Oxygen	Hach OX2P		

Lab Analysis

Parameter	Bottles	Notes	
BOD	**(OS-004)** 500ml plastic	Fill to neck	**COC#: _____**
Chloride	**(OS-003)** 60ml plastic	Fill to neck	
E. Coli	**(OS-005)** 100ml IDEX	1 bottle for both, fill to 100ml line (do not overfill)	
Total Coliform Bacteria			
Enteroccoci	**(OS-006)** 100ml IDEX	Fill to 100ml line (do not overfill)	
Nitrate/Nitrite	**(OS-001)** 250ml H2SO4 preserved	1 bottle for all 4, fill to neck	
Amonia			
Total Nitrogen			
Total Phosphorous			
Surfactants	**(OS-002)** 250ml amber vial	Fill to neck	

Describe any evidence of Illicit Discharge below.

Notes:

_____

_____

_____

_____

_____

_____

Absolute Resource Associates

124 Heritage Avenue #16, Portsmouth NH 03801

603-436-2001 absoluteresourceassociates.com

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Lab ID Here

Company Name: 1423837

Company Address: 6 Leavitt Lane Durham, NH 03824

Report To: will.powers@unh.edu

Phone #: 603-815-2257

Project Name: MS4 Wet Weather Sampling

Project #: 2/17/25

Project Location: NH MA ME VT [illegible]

Accreditation Required? N/Y: [illegible]

See absoluteresourceassociates.com for sample acceptance policy and current accreditation lists.

Protocol: RCRA SDWA NPDES MCP NHDES DOD

Notify ARA if your samples require specific methods, certifications or compliance protocol.

Reporting Limits: QAPP GW-1 S-1 EPA DW Other_____

ANALYSIS REQUEST

Lab Sample ID (Lab Use Only)	Field ID	# CONTAINERS	Matrix: WATER	SOLID	OTHER	Preservation Method: HCl	HNO_3	H_2SO_4	MeOH	Other	Sampling: DATE	TIME	SAMPLER	❑ VOC 8260 NHDES/Full List ❑ VOC 8260 MADEP	❑ VOC 624.1 ❑ VOC BTEX MtBE, only ❑ VOC 8021VT	❑ VPH MADEP ❑ GRO 8015 ❑ 1,4-Dioxane ❑ EDB	❑ VOC 524.2 NHDES/Full List ❑ Gases-List:	❑ TPH 8100 ❑ DRO 8015 ❑ EPH MADEP ❑ TPH Fingerprint	❑ 8270 PAH ❑ 8270 ABN ❑ 625.1	❑ 8082 PCB ❑ 8081 Pesticides ❑ 608.3 Pest/PCB	❑ PFAS 537.1 ❑ PFAS 533 ❑ PFAS isotope dilution	❑ O&G 1664 ❑ Mineral O&G 1664	☒ pH ☒ BOD ❑ Conductivity ❑ Turbidity ❑ Apparent Color	❑ TSS ❑ TDS ❑ TS ❑ TVS ❑ Alkalinity ❑ Acidity	❑ RCRA Metals ❑ Priority Pollutant Metals ❑ TAL Metals ❑ Hardness	❑ Total Metals-list:	❑ Dissolved Metals-list:	☒ Ammonia ❑ COD ❑ TKN ☒ TN ❑ TON ❑ TOC ❑ Ferrous Iron	☒ T-Phosphorus ❑ Bacteria P/A ☒ Bacteria MPN ☒ Enterococci	❑ Cyanide ❑ Sulfide ☒ Nitrate + Nitrite ❑ Ortho P ❑ Phenols	❑ Nitrate ❑ Nitrite ❑ Chloride ❑ Sulfate ❑ Bromide ❑ Fluoride	❑ Corrosivity ❑ Ignitibility/FP	❑ TCLP Metals ❑ TCLP VOC ❑ TCLP SVOC ❑ TCLP Pesticide	Subcontract: ❑ Grain Size ❑ Herbicides ❑ Asbestos	Surfactants	Anions (Chloride)	Grab (G) or Composite (C)
	OS - 001	1	✔																									✔	✔	✔									G
	OS - 002	20	✔																																	X			G
	OS - 003	1	✔																																		X		G
		1	✔																				✔																G
	OS - 005	1	✔																										✔										G
	OS - 006	1	✔																										✔										G
	2/17/25																																								
	1520																																								

TAT REQUESTED

Priority (24 hr)* ❑

Expedited (48 hr)* ❑

Standard ❑

(10 Business Days)

*Date Needed_____

Invoice To: usnh.invoices@usnh.edu

Email: cc; will.powers@unh.edu

PO #: P0312722

Quote #: _____

❑ NH Reimbursement Pricing

SPECIAL INSTRUCTIONS

E. coli count in addition to TC.

Reporting Instructions:

❑ EDD:_____ Report To (email): _____

RECEIVED ON ICE ❑YES ❑NO

TEMPERATURE _____°C

CUSTODY RECORD

QSD-01 Revision 02/23/2024

	Date	Time		Date	Time
Relinquished by Sampler:			Received by:		
Relinquished by:			Received by:		
Relinquished by:			Received by Laboratory:		

UNH Facilities
MS4 Wet Weather Sampling Form

Reservoir/Pettee Brook Watershed

Storm Start Time/Date: _____ **Current Time/Date:** _____

Outfall ID: _____ **Catchment ID:** _____ **Inspector Name:** _____

Location Description: _____

Type: *Outfall Pipe* *Catch Basin* *Manhole* **Pipe Material:** _____ **Size:** _____

Current Conditions: _____ **Temp:** _____ **°F** **Rainfall Past 24HRs:** _____ **in.**

Flow Present: *Yes / No* **Evidence of Illicit Discharge:** *Yes / No*

Field Test Kit

Parameter	Equipment	Time	Result
Temperature *(°C)*	Triplett Model WQ120		
Specific Conductance *(uS)*			
Salinity *(PPmS)*			
pH			
Free Chlorine	Hach DR300		
Dissolved Oxygen	Hach OX2P		

Lab Analysis

Parameter	Bottles	Notes	
BOD	**(OS-004)** 500ml plastic	Fill to neck	**COC#:** _____
Chloride	**(OS-003)** 60ml plastic	Fill to neck	
E. Coli	**(OS-005)** 100ml IDEX	1 bottle for both, fill to 100ml line (do not overfill)	
Total Coliform			
Nitrate/Nitrite	**(OS-001)** 250ml H_2SO_4 preserved	1 bottle for all 4, fill to neck	
Ammonia			
Total Nitrogen			
Total Phosphorous			
Surfactants	**(OS-002)** 250ml amber vial	Fill to neck	

Describe any evidence of Illicit Discharge below.

Notes:

_____

_____

_____

_____

_____

Absolute Resource Associates

124 Heritage Avenue #16, Portsmouth NH 03801

603-436-2001 absoluteresourceassociates.com

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Lab ID Here

Company Name: 1423837

Company Address: 6 Leavitt Lane Durham, NH 03824

Report To: will.powers@unh.edu

Phone #: 603-815-2257

Project Name: MS4 Wet Weather Sampling

Project #: 2/17/25

Project Location: NH MA ME VT WP, JC, LB

Accreditation Required? N/Y: 1500

See absoluteresourceassociates.com for sample acceptance policy and current accreditation lists.

Protocol: RCRA SDWA NPDES MCP NHDES DOD

Notify ARA if your samples require specific methods, certifications or compliance protocol.

Reporting Limits: QAPP GW-1 S-1 EPA DW Other

ANALYSIS REQUEST

Lab Sample ID (Lab Use Only)	Field ID	# CONTAINERS	Matrix: WATER	SOLID	OTHER	Preservation Method: HCl	HNO_3	H_2SO_4	MeOH	Other	Sampling: DATE	TIME	SAMPLER	Surfactants	Anions (Chloride)	Grab (G) or Composite (C)
	OS - 001	1	✔													
	OS - 002	200-2,I	✔											X		
	OS - 003	1	✔												X	
		1	✔													
	OS - 005	1	✔													
	OS - 006	1	✔													
	2/17/25															
	1520															

Analysis columns (in order): VOC 8260 NHDES/Full List; VOC 8260 MADEP; VOC 624.1; VOC BTEX MtBE, only; VOC 8021VT; VPH MADEP; GRO 8015; 1,4-Dioxane; EDB; VOC 524.2 NHDES/Full List; Gases-List:; TPH 8100; DRO 8015; EPH MADEP; TPH Fingerprint; 8270 PAH; 8270 ABN; 625.1; 8082 PCB; 8081 Pesticides; 608.3 Pest/PCB; PFAS 537.1; PFAS 533; PFAS isotope dilution; O&G 1664; Mineral O&G 1664; pH ✔; BOD; Conductivity; Turbidity; Apparent Color; TSS; TDS; TS; TVS; Alkalinity; Acidity; RCRA Metals; Priority Pollutant Metals; TAL Metals; Hardness; Total Metals-list:; Dissolved Metals-list:; Ammonia; COD; TKN ✔; TN; TON; TOC; Ferrous Iron; T-Phosphorus; Bacteria P/A; Bacteria MPN ✔; Enterococci; Cyanide; Sulfide; Nitrate + Nitrite ✔; Ortho P; Phenols; Nitrate; Nitrite; Chloride; Sulfate; Bromide; Fluoride; Corrosivity; Ignitibility/FP; TCLP Metals; TCLP VOC; TCLP SVOC; TCLP Pesticide; Subcontract:; Grain Size; Herbicides; Asbestos

TAT REQUESTED

Priority (24 hr)* ❑
Expedited (48 hr)* ❑
Standard ❑
(10 Business Days)
*Date Needed_____

Invoice To: usnh.invoices@usnh.edu
Email: cc; will.powers@unh.edu
PO #: P0312722
Quote #: _____
❑ NH Reimbursement Pricing

SPECIAL INSTRUCTIONS

E. coli count in addition to TC.

Reporting Instructions:
❑ EDD:_____ Report To (email): _____

RECEIVED ON ICE ❑YES ❑NO
TEMPERATURE _____°C

CUSTODY RECORD

QSD-01 Revision 02/23/2024

	Date	Time		Date	Time
Relinquished by Sampler:			Received by:		
Relinquished by:			Received by:		
Relinquished by:			Received by Laboratory:		

University of New Hampshire

DRAIN MANHOLE INSPECTION LOG **Manhole ID:** _____

Inspection Date: _____ Tributary Area:_____

Street: _____ Inspector: _____

Inspection: Not Found ____ Surface ____ Internal ____ Follow Up Inspection_____

Time Since Last Rain: < 48 hours _____ 48 – 72 hours _____ > 72 hours _____

Observations:

Standing Water in Manhole: Yes ____ No ____ Color of Water: Clear ____ Cloudy ____ Other _____

Flow in Manhole: Yes _____ No _____ Velocity: Slow _____ Medium _____ Fast _____ Depth of Flow: _____ in. Color of Flow: No Flow: _____ Clear _____ Cloudy _____ Suspended Solids _____ Other _____ Blockages: Yes _____ No _____ Sediment in Manhole: Yes ____ No____ If Yes: Percent of Pipe Filled: _____ % Floatables: None _____ Sewage _____ Oil Sheen _____ Foam _____ Other _____ Odor: None _____ Sewage _____ Oil _____ Soap _____Other _____

Field Testing:

Temp _____ Conductivity _____ Surfactants: Yes/No Ammonia: Yes/No Chlorine _____ Salinity _____

Lab analysis:

E. coli _____ Pollutants of Concern* _____

*For TMDLs or Water Quality Limited (WQL), refer to Appendix G of the MS4 Permit.

MH DETAILS

Location:		Material:		MH Cover size:		MH Diameter:		Invert/Flow Channel:	
Roadway		Brick		24"		48"		Present Y/N	
Gutter		Block		26"		60"		Material:	
Grass		Concrete		30"		Other (describe below)		Concrete	
Easement		Lined		36"				Brick/mortar	
Other (describe below)		Other (describe below)		Other (describe below)				Other (describe below)	

CONDITION

Cover:		Ring &Frame		Chimney:		Wall:		Rungs:	
Serviceable		Serviceable		Serviceable		Serviceable		Serviceable	
Loose		Loose		Cracked/Broken		Cracked/Broken		Unsafe	
Below Grade		Displaced		Corroded		Corroded		Missing any	
Damaged		Missing Grout		Misaligned		Misaligned		Corroded	
Sealed		Raise		Infiltration		Infiltration		N/A - no rungs	
Holes (# of holes)		Lower		Roots at Joints		Roots at Joints			

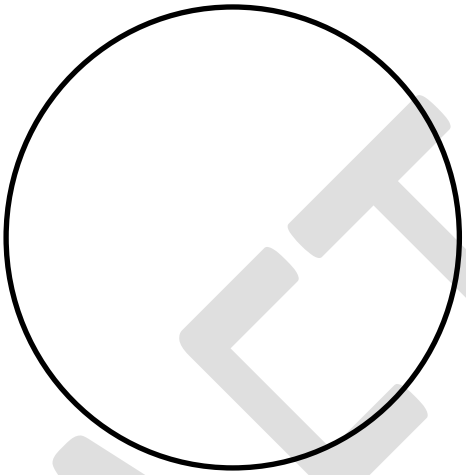
Include any pertinent notes regarding component conditions below:

_____

_____

MANHOLE DIAGRAM

(Outgoing pipe should be at the 6:00 position. Label all pipes with size/type and flow direction)



INSERT PHOTO(S) BELOW:

DRAFT

Appendix E

Water Quality Analysis Instructions, User's Manuals and Standard Operating Procedures

*Appendix to include copies of water quality analysis instructions, procedures, and SOPs for all sample parameters and all meters or field test kits that are used for analysis **once fully developed** in accordance with the 2017 MS4 Permit. This includes the manufacturer's instructions for how to use field test kits as well as the manufacturer's instructions or user's manual for any field instrumentation.*

Overview

Wet weather sampling shall be conducted in accordance with the UNH IDDE Plan for all catchments with 1 or more identified System Vulnerability Factors:

- When possible, sampling should occur between March-June when groundwater levels are high.
- Sampling during the initial period of discharge ("first flush") shall be avoided.
- T.C. & Enterococci samples **MUST BE DELIVERED TO THE LAB WITHIN 8 HRS.** *(No bacteria on Fridays or weekends. Lab hours 9am-5pm M-F)*
- Samples must be delivered to the lab for analysis within their specific hold times:

  Absolute Resource Associates

  124 Heritage Ave, Ste 16

  Portsmouth, NH

Lab Analysis Sample Collection

1. **Fill out Chain of Custody (COC) and label bottles.**
   - Ensure that the appropriate Field Kit is being used for the Outfall being sampled. Outfalls to Oyster River and College Brook (ORANGE) require additional sampling for Enterococci bacteria. Outfalls to Reservoir/Pettee Brook (BLUE) do not.
   - Record the COC# on the Data Collection Form.

2. **All samples MUST BE KEPT ON ICE once collected until received by the lab.**
   - Ice is available at the Facilities OPS B building located at 9 Leavitt Lane. Coolers will be provided.

3. **Fill sample bottles by holding them approximately 6" away from the Outfall Pipe. Bacteria bottles (clear 100ml IDEX) are filled to ~1" from the top (line before neck on bottle). All other samples are filled to the neck of the bottle.**
   - Avoid overfilling the bottles or allowing water to splash out from them during filling. Some of the bottles contain a preservative that is necessary to obtain an accurate result at the laboratory.
   - If an outfall pipe is located at or below grade, use a dipper rod to collect the sample. Make sure to rinse out the container on the dipper rod using sample water first.

4. **Replace cap, return to bag and store in cooler. Coordinate drop-off with UNH Utilities.**

Field Kit Instructions

pH, Conductivity, & Salinity

Equipment: Tripplett WQ120

1. **Power on the unit. Press and hold the "MODE/HOLD" button to select the desired parameter:**
    - Current parameter is shown at top of screen:
        - **pH** = pH
        - **uS** = Conductivity
        - **PPm S** = Salinity
        - **PPm** = TDS [not used]

    - If this is the first sample of the day, soak the electrode in deionized water for 5-10 minutes prior to use.

2. **Fill the sample cell and insert the probe, ensuring that the electrode is completely submerged.**
    - For conductivity and salinity, stir the probe to remove any air bubbles from the sample.

3. **Allow the meter to settle out to obtain reading.**
    - For salinity, the readout on the display needs to be multiplied by a compensation ratio. The ratio has been set to 0.50, record both measurements on the collection form.

      For example, if the probe readout is 10.0, record the result as: *10.0 (5.0ppm)*

4. **Record the sample result and time, repeat steps for each remaining parameter.**

5. **Rinse sample cell with deionized or tap water and replace cap.**
    - Fill cap with deionized or tap water before replacing if this is the last sample of the day.

Free Chlorine

Equipment: Hach DR300

1. **Power the unit on.**
2. **Rinse sample cell using sample water**
3. **Fill sample cell to 10ml mark and wipe the outside with a lint-free cloth or towel.**
4. **Place the sample cell into the analyzer and put the cover on. Press the blue "0" button to calibrate or "zero" the analyzer.**
    - The display should read "0.00" once this step is complete. If a different value appears on the display repeat Step 4.

5. **Add contents of one Free Reagent Powder packet to the sample cell.**
    - Shake lightly and observe any color change. The sample will turn pink if chlorine is present.

6. **Wipe the outside of the sample cell with a lint-free cloth or towel. Place the sample cell into the analyzer and put the cover on.**
7. **Press the green "✓" button to read the sample.**
8. **Record the sample result and time.**
9. **Rinse sample cell with deionized water for storage.**

Dissolved Oxygen

Equipment: Hach OX2P

1. **Rinse sample cells and tube with sample water.**

2. **Fill the BOD bottle (round w/ stopper) with sample water by allowing it to overflow for 2-3 minutes.**
    - Avoid turbulence and bubbles while filling.

3. **Tilt the bottle slightly and insert the stopper to avoid trapping air.**
    - If air bubbles become trapped in the bottle, discard the sample and start over.

4. **Remove the stopper and add one Dissolved Oxygen 1 Reagent Powder packet and one Dissolved Oxygen 2 Reagent Powder packet.**
    - Replace the stopper carefully to avoid trapping air bubbles.
    - Invert the bottle and lightly shake it up and down vertically until the reagent is dissolved.

5. **Flocculant precipitate will form. Allow the flocculant to settle to approximately half the bottle volume.**
    - This could take up to 4-5 minutes, especially if a high concentration of chloride is present.

6. **Invert the bottle again to mix.**

7. **Repeat Step 5**

8. **Remove the stopper and add one Dissolved Oxygen 3 Reagent powder pillow.**
    - Invert the bottle several times. Flocculant will dissolve and sample will turn yellow if oxygen is present.

9. **Measure one glass tube from the BOD bottle and add it to the smaller, square sample bottle.**
    - Save the contents of the BOD bottle for the low range test.

10. **Add Sodium Thiosulfate Solution using dropper. Add slowly and count the drops until the water changes from yellow to colorless.**
    - Record the number of drops it takes to make the sample colorless. This is the High Range Result (HR)

11. **Pour off the contents of BOD bottle until level is at the white line.**

12. **Repeat Step 10, counting the number of drops it takes for the solution to turn from yellow to colorless.**
    - Multiply the number of drops by 0.20 and record the result. This is the Low Range Result (LR)

13. **Record the sample results and time on the data collection form**

    Example: 13HR/2.2LR

14. **Rinse the sample cells and tube with deionized water for storage.**



DOC022.97.90639

DR300

09/2021, Edition 5

User Manual
Manual de usuario
Manuel d'utilisation
Manual do Usuário
用户手册
使用手冊
ユーザーマニュアル
사용 설명서
คู่มือผู้ใช้

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2 General information on page 4
3 Install the batteries on page 7
4 User interface and navigation on page 8
5 Set the time on page 10
6 Do a test on page 11
7 Show measurements on page 15
8 Calibration on page 15
9 Maintenance on page 20
10 Troubleshooting on page 21
11 Replacement parts and accessories on page 24

Section 1 Specifications

Specifications are subject to change without notice.

Specification	Details
Dimensions (W x H x D)	6.9 x 15.7 x 3.4 cm (2.7 x 6.2 x 1.3 in.)
Enclosure	IP67, waterproof at 1 m (3.3 ft) for 30 minutes when battery compartment is closed and locked.
Light source	Light emitting diode (LED)
Detector	Silicon photodiode
Display	LCD with backlight
Weight	0.25 kg (0.55 lb)
Power requirements	4 AAA batteries; approximate life of 5000 tests (use of backlight decreases this number) Rechargeable batteries are not recommended.
Operating environment	0 to 50 °C (32 to 122 °F), 0 to 90% relative humidity non-condensing
Storage temperature	–20 to 55 °C (–4 to 131 °F), 0 to 80% relative humidity non-condensing
Wavelength	Fixed wavelength ±2 nm, different for each model
Filter bandwidth	15 nm
Absorbance range	0 to 2.5 Abs
Sample cell	25 mm (10 mL) and 1 cm (10 mL)
Data storage	Last 50 measurements

Specification	Details
Bluetooth® [1]	Bluetooth® is on when the optional Hach Communication Dongle is installed.
Certifications	CE
Warranty	1 year (EU: 2 years)

Section 2 General information

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

2.1 Safety information

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is soley responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

[1] The Bluetooth® word mark and logos are registered trademarks owned by the Bluetooth SIG, Inc. and any use of such marks by HACH is under license.

2.1.1 Use of hazard information

⚠ DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

2.1.2 Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
	Electrical equipment marked with this symbol may not be disposed of in European domestic or public disposal systems. Return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.

2.1.3 Certification

Canadian Radio Interference-Causing Equipment Regulation, ICES-003, Class B:

Supporting test records reside with the manufacturer.

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de classe B répond à toutes les exigences de la réglementation canadienne sur les équipements provoquant des interférences.

FCC Part 15, Class "B" Limits

Supporting test records reside with the manufacturer. The device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

1. The equipment may not cause harmful interference.
2. The equipment must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their expense. The following techniques can be used to reduce interference problems:

1. Move the equipment away from the device receiving the interference.
2. Reposition the receiving antenna for the device receiving the interference.
3. Try combinations of the above.

2.2 Product overview

This instrument is a portable filter photometer used for testing water.

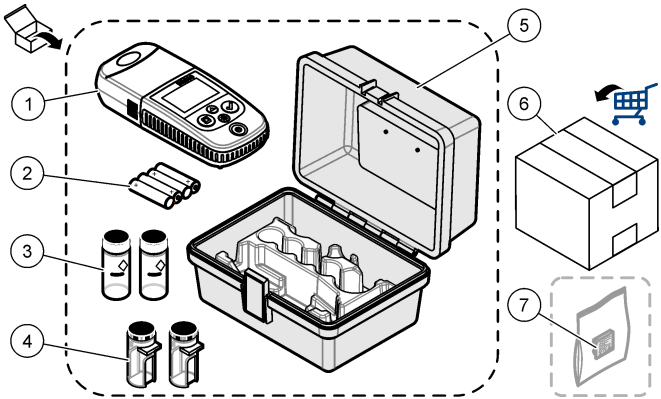
Note: *This instrument has not been evaluated to measure chlorine and chloramines in medical applications in the United States.*

2.3 Product components

Make sure that all components have been received. Refer to Figure 1. If any items are missing or damaged, contact the manufacturer or a

sales representative immediately. Figure 1 is an example and shows the parts supplied with LPV445.99.00110. Other instruments come with different components.

Figure 1 Product components



1 DR300	**5** Storage case
2 AAA alkaline batteries	**6** Reagents
3 Sample cells, 25 mm (10 mL), glass	**7** Hach Communication Dongle (optional, supplied separately)
4 Sample cells, 1 cm (10 mL), plastic	

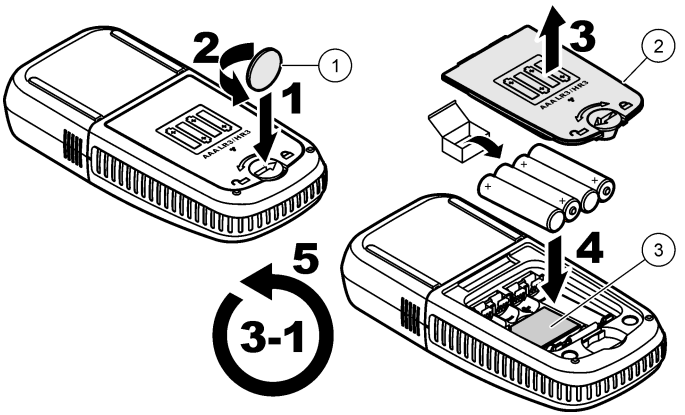
Section 3 Install the batteries

⚠ WARNING

Explosion hazard. Incorrect battery installation can cause the release of explosive gases. Be sure that the batteries are of the same approved chemical type and are inserted in the correct orientation. Do not mix new and used batteries.

Refer to Figure 2 to install the batteries. Then, push ⏻ to set the instrument to on.

Figure 2 Install the batteries



1 Coin	**3** Plastic insert for dongle[2]
2 Battery cover	

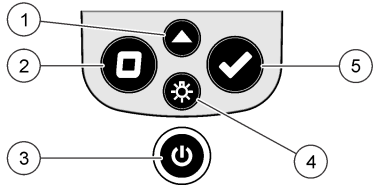
Section 4 User interface and navigation

4.1 Keypad description

Figure 3 shows the keypad and gives the key functions.

[2] Only remove the plastic insert to install the Hach Communication Dongle. Refer to the installation instructions supplied with the dongle.

Figure 3 Keypad

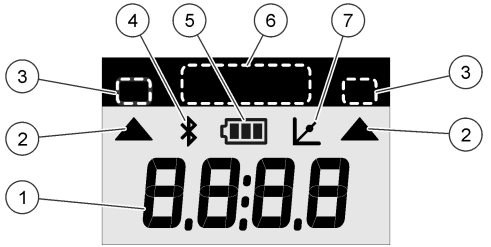


1 Range key: Selects the measurement range (e.g., LR or HR). Push and hold for 3 seconds to enter or exit menu mode. In menu mode, scrolls up or increases the value of the selected digit.	**4 Backlight key:** Sets the backlight to on and off. In menu mode, scrolls down or decreases the value of the selected digit.
2 Zero key: Sets the zero value before a measurement. In menu mode, goes back one menu level or moves the cursor to the previous digit.	**5 Read key:** Starts a sample measurement. In menu mode, selects the menu option shown or moves the cursor to the next digit.
3 Power key: Sets the power to on and off. Push and hold for 5 seconds to reset the instrument. The calibration is not deleted.	

4.2 Display description

Figure 4 shows the values and icons shown on the display.

Figure 4 Display



1 **Numeric display:** Measured value or menu options	**5** **Battery icon:** Battery power level. Flashes when the battery power level is low.
2 **Range icon:** Points to the selected measurement range	**6** Parameter and measurement ranges
3 Measurement ranges or parameters	**7** **Calibration adjusted icon:** The factory default calibration was adjusted or a user-entered calibration curve was entered.
4 **Bluetooth® icon:** Bluetooth® is on[3].	

Section 5 Set the time

Set the time (24-hour format).

1. Push and hold ▲ for 3 seconds to enter menu mode.
   The time shows (or 00:00).
2. Push ✔ to set the time.
3. Push the ▲ or ☼ to change the number that flashes. Push ✔ to go to the next digit. Push ◘ to go to the previous digit.

[3] Shows when the Hach Communication Dongle is installed.

Section 6 Do a test

⚠ DANGER



Chemical or biological hazards. If this instrument is used to monitor a treatment process and/or chemical feed system for which there are regulatory limits and monitoring requirements related to public health, public safety, food or beverage manufacture or processing, it is the responsibility of the user of this instrument to know and abide by any applicable regulation and to have sufficient and appropriate mechanisms in place for compliance with applicable regulations in the event of malfunction of the instrument.

⚠ DANGER





Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

⚠ CAUTION



Chemical exposure hazard. Dispose of chemicals and wastes in accordance with local, regional and national regulations.

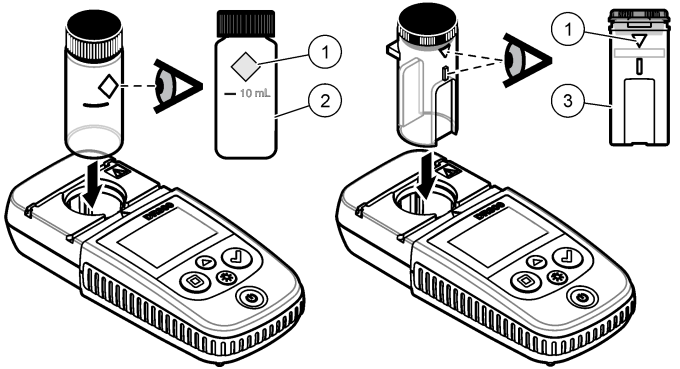
The generic steps to do a test follow.

To do a test for a specific parameter (e.g., chlorine), download the test procedure from the manufacturer's website. Refer to Download a test procedure on page 14.

1. Push ▲ to select the applicable measurement range (e.g., LR or HR).
2. Prepare the blank. Refer to the test procedure.
3. Clean the sample cell with a no-lint cloth.
4. Insert the blank sample cell into the cell holder. Make sure to install the blank sample cell in the correct and consistent orientation so that the results are more repeatable and precise. Refer to Figure 5.
5. Install the instrument cap over the cell holder. Refer to Figure 6.

6. Push ◘ to set the instrument zero.
7. Remove the blank sample cell.
8. Prepare the sample. Refer to the test procedure.
9. Clean the sample cell with a no-lint cloth.
10. Insert the sample cell into the cell holder. Make sure to install the sample cell in the correct and consistent orientation so that the results are more repeatable and precise. Refer to Figure 5.
11. Install the instrument cap over the cell holder. Refer to Figure 6.
12. Push ✔. The display shows the results in concentration units or absorbance.
    Note: *The result flashes if the result is less or more than the instrument range.*
13. Remove the sample cell from the cell holder.
14. Immediately empty and rinse the sample cell. Rinse the sample cell and cap three times with deionized water (or distilled water).
    Note: *As an alternative, use tap water to rinse the sample cell if the samples measured have a higher concentration than the tap water.*

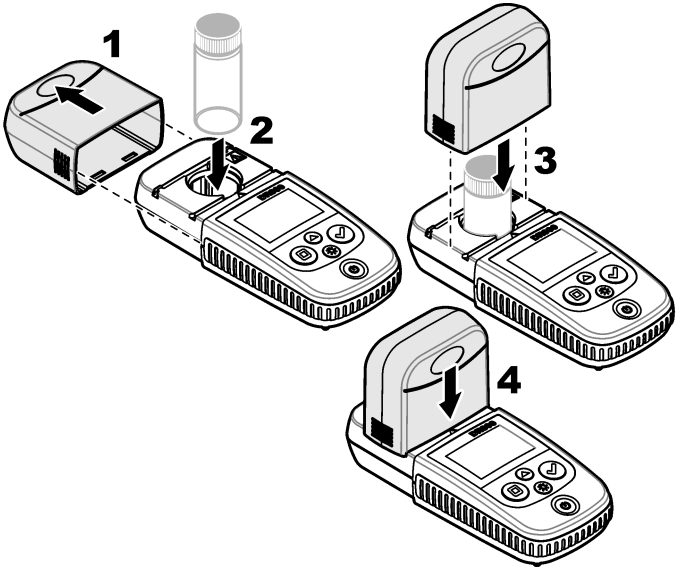
Figure 5 Sample cell orientation



1 Orientation mark[4]	**2** Sample cell, 25-mm (10 mL), glass[5]	**3** Sample cell, 1-cm (10 mL), plastic[6]

[4] Some variants of the instrument have sample cells without an orientation mark.
[5] Use the glass sample cell for low-range chlorine tests.
[6] Use the plastic sample cell for high-range chlorine tests.

Figure 6 Install the instrument cap over the cell holder



6.1 Download a test procedure

1. Go to http://www.hach.com.
2. Enter "DR300" in the Search box.
3. Select the "Downloads" option on the left side in the "Search Type" box.
4. Scroll down to "Methods/Procedures".
5. Click the link for the applicable test procedure to download it.

Section 7 Show measurements

Note: *The instrument saves a maximum of 50 measurements. After 50 measurements are done, new measurements replace the oldest measurements.*

1. Push and hold ▲ for 3 seconds.
2. Push ▲ until "rCL" (recall) shows, then push ✔.

   "– 01 –" shows. Measurement 01 is the last measurement done.
3. Push ✔ to scroll forward.

   The measurement number is followed by the measurement value and then the time.
4. To go to a measurement number, push ✔ until a measurement number shows, then push ▲ or ☼.

   Note: *Measurements cannot be deleted.*
5. Push and hold ▲ for 3 seconds to go back to measurement mode.

Section 8 Calibration

This instrument is calibrated at the factory. No user calibration is necessary.

8.1 Standard calibration adjust

Use the standard calibration adjust (SCA) option when a calibration must be adjusted to meet regulatory requirements. The factory calibration is adjusted slightly with the standard calibration adjust (SCA) option so that the instrument shows the expected value of the standard solution. The adjusted calibration is then used for all test results. This adjustment can increase the test accuracy when there are slight variations in the reagents or instruments.

Note: *For instruments with factory-calibrated ranges or methods, the standard calibration adjust (SCA) feature is disabled when a user-entered calibration is entered into the instrument. To set SCA back to on, set the instrument to the factory default calibration. Refer to* Set to the factory default calibration on page 20.

8.1.1 Do a standard calibration adjust

1. Complete the test procedure for the range to calibrate. For the sample, use the standard solution concentration given in the test procedure documentation.

   Note: *If a standard solution concentration is not given in the test procedure documentation, a different known standard can be used.*
2. When the test procedure is completed, push and hold ▲ for 3 seconds.
3. Push ▲ until “SCA” shows, then push ✔.

   The display shows the standard calibration adjust value.
4. If a different known standard is used, enter the value of the standard:

   a. Push ▲ until "Edit" shows, then push ✔.
   b. Enter the value of the standard.

      Push the ▲ or ☼ to change the number that flashes. Push ✔ to go to the next digit. Push ☐ to go to the previous digit.
5. Push ✔ to add the standard calibration adjust value to the factory calibration curve.

8.1.2 Set the standard calibration adjust to off

To use the factory default calibration again, set standard calibration adjust (SCA) to off.

1. Push and hold ▲ for 3 seconds to enter menu mode.
2. Push ▲ until "SCA" shows, then push ✔.
3. Push ▲ until "OFF" shows, then push ✔.

Note: *To set the SCA function to on again, do a standard calibration adjust.*

8.2 User-entered calibration curve

This instrument accepts a user-prepared calibration curve. The calibration curve can be from 0 to 2.5 absorbance. Make sure that the calibration curve includes standard values that are less and more than the range of interest.

The instrument range will be the same as the calibration range. For example, when the standards that are used are 1.00, 2.00 and 4.00. The instrument range is 1.00 to 4.00.

There are two options to enter a user calibration curve:

- **Enter a calibration curve with standards**—The standard solution values are entered with the keypad and the absorbance values are measured.
- **Enter a calibration curve with the keypad**—The standard solution values and absorbance values are entered with the keypad.

Note: *If the instrument is set to off or the instrument power is removed before a user-entered calibration curve is completed, the calibration curve is not saved. The instrument automatically switches off in user-entered calibration entry mode after 60 minutes of no activity. User-entered calibrations are completed when the user goes out of calibration (cal) mode or edit mode.*

8.2.1 Enter a calibration curve with standards

⚠ WARNING



Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

⚠ CAUTION



Chemical exposure hazard. Dispose of chemicals and wastes in accordance with local, regional and national regulations.

Note: *As an alternative, deionized water can be used for the blank unless the sample is significantly more turbid or has more color than deionized water.*

1. Push ▲ to set the instrument to the range to calibrate (e.g., LR or HR).
2. Prepare the blank. Refer to the test procedure.
3. Clean the sample cell with a no-lint cloth.
4. Set the instrument to zero.
   a. Insert the blank sample cell in the cell holder.

b. Install the instrument cap over the cell holder.

c. Push ☐. The display shows "- - - -", then "0.00".

5. Push and hold ▲ for 3 seconds to enter menu mode.

6. Push ▲ until "USEr" shows, then push ✔.

7. Push ▲ until "CAL" shows, then push ✔.

8. When "S0" shows on the display, push ✔.

9. Enter 00.00 (or 000.0) for the blank value.

Push the ▲ or ☼ to change the number that flashes. Push ✔ to go to the next digit. Push ☐ to go to the previous digit.

10. When "A0" shows on the display, push ✔ to measure the absorbance of the blank.

The display shows the absorbance value for "S0".

11. Remove the sample cell from the cell holder.

12. Prepare the sample. Refer to the test procedure. For the sample, use the standard solution concentration given in the test procedure documentation.

13. Clean the sample cell with a no-lint cloth.

14. Push ☼ to show "S1" (or "Add"), then push ✔.

15. Enter the concentration value of the first calibration standard, then push ✔.

16. When "A1" shows on the display, do the steps that follow to measure the absorbance:

a. Insert the reacted standard sample cell in the cell holder.

b. Install the instrument cap over the cell holder.

c. Push ✔. The display shows the absorbance value for "S1".

17. The calibration is completed with two calibration points. If additional standards are necessary for calibration:

Do steps 11 – 16 again to measure more calibration standards.

18. Remove the sample cell from the cell holder.

19. Immediately empty and rinse the sample cell. Rinse the sample cell and cap three times with deionized water (or distilled water).

    Note: *As an alternative, tap water can be used to rinse the sample cell if the concentration of the parameter in the tap water is less than the samples measured.*

20. Push and hold ▲ for 3 seconds to go back to measurement mode.

8.2.2 Enter a calibration curve with the keypad

At least two data pairs are necessary to enter a user-prepared calibration curve. A concentration value and the absorbance value for the given concentration is necessary for each data pair. A maximum of 10 data pairs can be entered.

1. Push ▲ to set the instrument to the range to calibrate (e.g., LR or HR).
2. Push and hold ▲ for 3 seconds to enter menu mode.
3. Push ▲ until "USEr" shows, then push ✔.
4. Push ▲ until "Edit" shows, then push ✔.
5. When "S0" shows on the display, push ✔.
6. Enter the first data pair.

   The first data pair is S0 (concentration value) and A0 (absorbance value).

   - Push ▲ or ☼ to change the number that flashes.
   - Push ✔ to go to the next digit.
   - Push ◘ to go to the previous digit.
7. Do steps 5 and 6 again to enter the second data pair (S1 and A1).
8. The calibration is completed with two data pairs. If additional data pairs are necessary for calibration:

   a. When “Add” shows, push ✔.
   b. Do steps 5 and 6 again to enter more data pairs.
9. Push and hold ▲ for 3 seconds to go back to measurement mode.

8.2.3 Set to the factory default calibration

To remove a user-entered calibration curve from the instrument and use the factory calibration, do the steps that follow:

1. Push and hold ▲ for 3 seconds to enter menu mode.
2. Push ▲ until "USEr" shows, then push ✔.
3. Push ▲ until "dFL" (default) shows, then push ✔.

Section 9 Maintenance

⚠ CAUTION



Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

NOTICE

Do not disassemble the instrument for maintenance. If the internal components must be cleaned or repaired, contact the manufacturer.

9.1 Clean the instrument

Clean the exterior of the instrument with a moist cloth and a mild soap solution and then wipe the instrument dry as necessary.

9.2 Clean the sample cells

⚠ CAUTION



Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

⚠ CAUTION



Chemical exposure hazard. Dispose of chemicals and wastes in accordance with local, regional and national regulations.

Most laboratory detergents are used at recommended concentrations. Neutral detergents, such as Liquinox, are safer to use when regular cleaning is necessary. To decrease the cleaning times, increase the temperature or use an ultrasonic bath. To complete the cleaning, rinse a few times with deionized water and then let the sample cell air dry. Sample cells may also be cleaned with acid, followed by a thorough rinse with deionized water.

Note: *Always use acid to clean sample cells that were used for low-level metal tests.*

Special cleaning methods are necessary for individual procedures. When a brush is used to clean sample cells, take extra care to avoid scratches on the interior surfaces of the sample cells.

9.3 Replace the batteries

Replace the batteries when the battery power level is low. Refer to Install the batteries on page 7.

Section 10 Troubleshooting

Error	Description	Solution
E-00	No Zero	In user calibration mode, a standard solution was measured before the instrument zero was set. Measure a blank solution to set the instrument to zero.
E-01	Ambient light error[7]	There is ambient light in the cell holder. Make sure that the instrument cap is fully installed on the cell holder. Refer to Do a test on page 11.
E-02	LED error[7]	The LED (light source) is out of regulation. Replace the batteries. Make sure that the LED in the cell holder comes on when ✔ or ☐ is pushed.

[7] When an E-01 or E-02 error occurs on a measurement, the display shows "_.__". The decimal place depends on the chemistry. If the E-01 or E-02 error occurs while the instrument is set to zero, set the instrument to zero again.

Error	Description	Solution
E-03	Standard adjust error	• The measured value of the standard solution is more than the adjustment limits. Prepare a fresh standard. • The standard solution is not within the concentration range that can be used for standard calibration adjust. Prepare a standard with a value at or near the recommended concentrations given in the procedure. • Make sure that the concentration of the standard solution is entered correctly.
Reading flashes followed by E-04	The reading is more or less than the instrument range.[8]	If the reading is less than the instrument range, make sure that the instrument cap is fully installed on the cell holder. Measure a blank. If the blank reading is not zero, set the instrument to zero again.
		If the reading is more than the instrument range, identify if there is a light blockage in the cell holder. Dilute the sample. Do the test again.
E-06	Absorbance error	The absorbance value is not correct or the user-entered calibration curve has fewer than two points. Enter or measure the absorbance value again.
E-07	Standard value error	The standard solution concentration is equal to another standard solution concentration that is already entered in the user-entered calibration curve. Enter the correct standard concentration.
E-09	Flash error	The instrument is not able to save data. Push and hold ⏻ for 5 seconds to reset the instrument.
E-10	Environment temperature too high or too low	The ambient temperature is out of range. Use the instrument only in the specified operating conditions. Refer to Specifications on page 3.

[8] The value that flashes will be 10% over the upper test range limit.

Error	Description	Solution
E-12	Low battery power	Battery power is too low. Replace the batteries. Refer to Install the batteries on page 7.
E-13	Parameter load failure	The memory of the instrument is defective. Contact technical support.
E-14 followed by "_.__" or "0" if no zero was present	Zero measurement invalid	The zero measurement is too low. Use a sample cell filled with water and try again. If the error continues, contact technical support.
E-15 followed by "_.__"	Absorbance too high	Identify if there is a light blockage in the cell holder. Clean the cell holder. Dilute the sample. Do the test again. ***Note:*** *This instrument can not read absorbance values higher than 3.5 Abs.*
E-20	Signal measurement out of range	There is too much light on the light detector. Make sure that the instrument cap is fully installed on the cell holder. Do the test again. If the error continues, contact technical support.
E-21	Signal measurement unstable	There is an unstable signal on the light detector. There is too much or unstable ambient light. Make sure that the instrument cap is fully installed on the cell holder. Do the test again. If the error continues, contact technical support.
E-22	Hardware error	The electronic system is defective. Contact technical support.

The following errors can occur immediately after an instrument update.

Error	Description	Solution
E-30	No application	There was an error during the application update. A valid application was not found on the instrument. Update the instrument again.
E31	Bootloader update failed	There was an error during the transmission of the bootloader update. Update the bootloader again.

Error	Description	Solution
E-32	Application update failed	There was an error during the transmission of the application update. Update the instrument again.
E-66	Update failed	The instrument is defective. Contact technical support.

Section 11 Replacement parts and accessories

⚠ WARNING



Personal injury hazard. Use of non-approved parts may cause personal injury, damage to the instrument or equipment malfunction. The replacement parts in this section are approved by the manufacturer.

Note: *Product and Article numbers may vary for some selling regions. Contact the appropriate distributor or refer to the company website for contact information.*

Replacement parts

Description	Quantity	Item no.
AAA batteries, alkaline	4/pkg	4674300
Instrument cap	1	LPZ445.99.00006
Battery cover	1	LPZ445.99.00007
Sample cell, 25 mm (10 mL), glass	6/pkg	2427606
Sample cell, 1 cm (10 mL), plastic	2/pkg	4864302

Accessories

Description	Quantity	Item no.
Hach Communication Dongle	1	LPV446.99.00012
Soft-sided case/holster	1	5953100



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Dissolved Oxygen Test

0.2 to 4 and 1 to 20 mg/L O_2
For test kit 146900 (Model OX-2P) DOC326.98.00014

Additional copies available on www.hach.com

Test preparation

- Rinse tube with the sample water before testing. Rinse tube and bottles with deionized water after testing.
- To check reagent accuracy, use a standard solution in place of the sample (see Optional items).
- When titrating, hold the dropper vertically. The dropper should not contact the bottle.
- Use clippers to open powder pillows.
- To remove interferences from activated sludge samples, follow the steps under Sample pretreatment for activated sludge, then proceed with the test procedure.
- To increase sensitivity with the low range test, titrate the sample in step 2. until the color changes to a pale yellow. Add 2 drops of Starch Indicator Solution (see Optional items) and mix. The color will turn blue. Continue adding drops of sodium thiosulfate until the color changes from blue to colorless. Count all drops of sodium thiosulfate (before and after starch solution) when determining the result in step 3.

CAUTION: Handle chemical standards and reagents carefully. Review Material Safety Data Sheets for safe handling, storage and disposal information.

Replacement items

Description	Unit	Catalog no.
Bottle, BOD, 60-mL w/ 30 mL mark, glass w/ stopper	each	190902
Bottle, square mixing	6/pkg	43906
Clippers for medium powder pillows	each	96800
Dissolved Oxygen 1 Reagent Powder Pillows	100/pkg	98199
Dissolved Oxygen 2 Reagent Powder Pillows	100/pkg	98299
Dissolved Oxygen 3 Reagent Powder Pillows	100/pkg	98799
Measuring Tube, plastic, 5.83-mL	each	43800
Sodium Thiosulfate Standard Solution, stabilized, 0.0109 N	100 mL MDB[1]	2408932

[1]Marked Dropping Bottle

Optional items

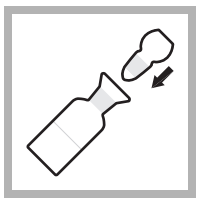
Description	Unit	Catalog no.
Copper Sulfate-Sulfamic Acid Solution, APHA	100 mL MDB[1]	35732
Cylinder, plastic graduated, 1000 mL	each	108153
Deionized Water	500 mL	27249
Potassium Iodide-Iodate Standard Solution, 0.00125 N	500 mL	40149
Siphon tube, copper	each	186441
Starch Indicator Solution	100 mL MDB[1]	34932
Stopper, for BOD bottle	each	190901
Tubing, latex, 6 inch, for siphon	each	713400

[1]Marked Dropping Bottle

High range (1 to 20 mg/L) test procedure



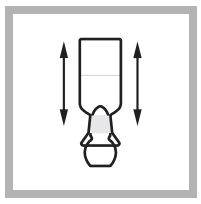
1. Fill the BOD bottle (round bottle with glass stopper) with sample water by allowing the sample water to overflow the bottle for 2–3 minutes. Avoid turbulence and bubbles in the sample while filling.



2. Incline the bottle slightly and stopper the bottle carefully to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.



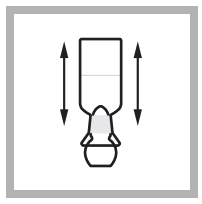
3. Remove the stopper and add one Dissolved Oxygen 1 Reagent Powder Pillow and one Dissolved Oxygen 2 Reagent Powder Pillow. Stopper the bottle carefully to avoid trapping air bubbles.



4. Invert the bottle several times until the powders are dissolved. Flocculent (floc) precipitate will form. Brownish-orange precipitate indicates oxygen is present.



5. Wait for floc to settle to approximately half the bottle volume. Floc will slowly settle if high concentrations of chloride are present. In this case, wait 4–5 minutes before proceeding.



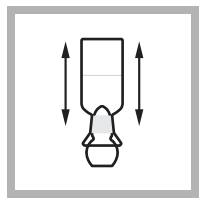
6. Invert the bottle again to mix.



7. Wait for floc to settle to approximately half the bottle volume. Floc will slowly settle if high concentrations of chloride are present. In this case, wait 4–5 minutes before proceeding.



8. Remove the stopper and add one Dissolved Oxygen 3 Reagent Powder Pillow. Stopper the bottle.



9. Invert the bottle several times. Floc will dissolve and the sample will turn yellow if oxygen is present.



10. Add one full measuring tube of sample to the bottle.

Note: *Save the rest of the prepared sample for the low range test, if necessary.*

High range (1 to 20 mg/L) continued



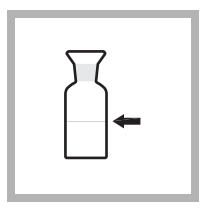
11. Add Sodium Thiosulfate Solution by drops. Count the drops until the color changes from yellow to colorless. Swirl to mix after each drop.



12. The number of drops is equal to the test result in mg/L.

Note: *If the result is 3 mg/L or less, it is advisable to perform a more sensitive test. Follow low range test procedure.*

Low range (0.2 to 4 mg/L) test procedure



1. Use the prepared sample left from Step 9 of the High Range Test. Pour off the contents of the BOD bottle until the level reaches the 30-mL mark on the bottle.

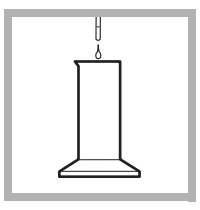


2. Add Sodium Thiosulfate Solution by drops. Count the drops until the color changes from yellow to colorless. Swirl to mix after each drop.

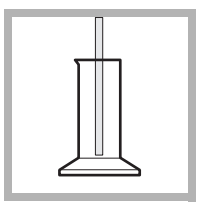


3. The number of drops multiplied by 0.2 is equal to the test result in mg/L.

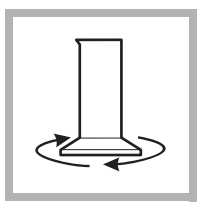
Sample pretreatment for activated sludge



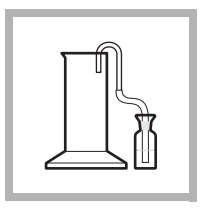
1. Add 10 mL of Copper Sulfate-Sulfamic Acid Solution to a clean 1000-mL graduated cylinder.



2. Fill the cylinder with sample using a tube that empties near the bottom of the cylinder. Overflow the cylinder with approximately 200 mL of sample.



3. Swirl to mix. Allow the suspended solids to settle.



4. Siphon the relatively clear top layer into a BOD bottle through a siphon tube extended to the bottom of the bottle. Withdraw the siphon tube while the sample is flowing, ensuring that no air bubbles are trapped in the bottle.

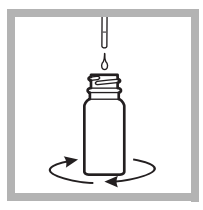
Sodium Thiosulfate Standard Solution accuracy check



1. Add one full measuring tube of 0.00125 N Potassium Iodide-Iodate Standard Solution to the bottle.



2. Add one Dissolved Oxygen 3 Reagent Powder Pillow to the bottle. Swirl to mix.



3. Add Sodium Thiosulfate Solution by drops. Count the drops until the color becomes colorless. Swirl to mix after each drop.

It should take 10 drops of 0.0109 N Sodium Thiosulfate Standard Solution for the titration end point.

Note: *If fewer than 10 drops of Sodium Thiosulfate Standard Solution are required, repeat the test carefully. If more than 10 drops are required, replace the sodium thiosulfate solution.*

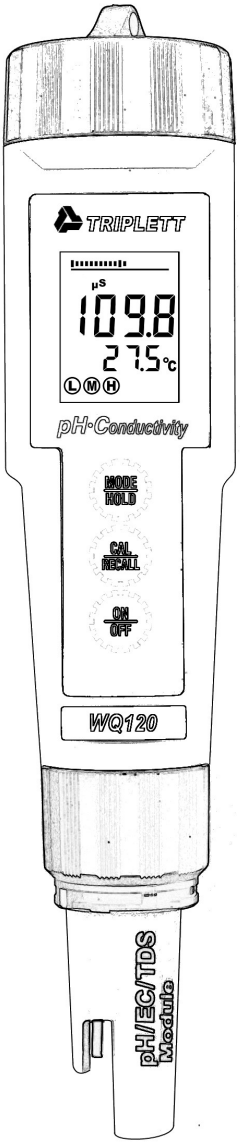
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User Manual

TRIPLETT

WQ120

pH / Conductivity / TDS / Salinity / Temperature Meter



CE

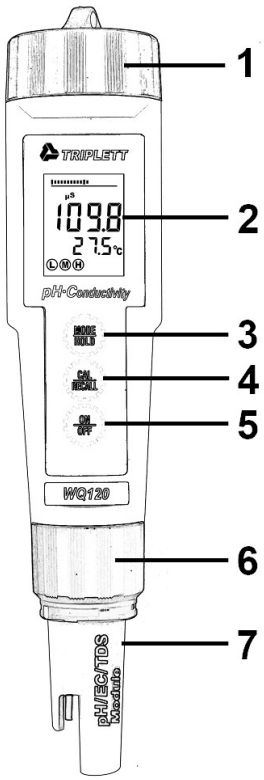
Introduction

Thank you for selecting the Triplett WQ120 pH/Conductivity/Total Dissolved Solids (TDS) / Salinity meter. With the WQ120's dynamic cell-constant technology it is possible to measure a wide range of Conductivity, TDS, and Salinity with the same electrode. Careful use and maintenance provide years of reliable service.

Description

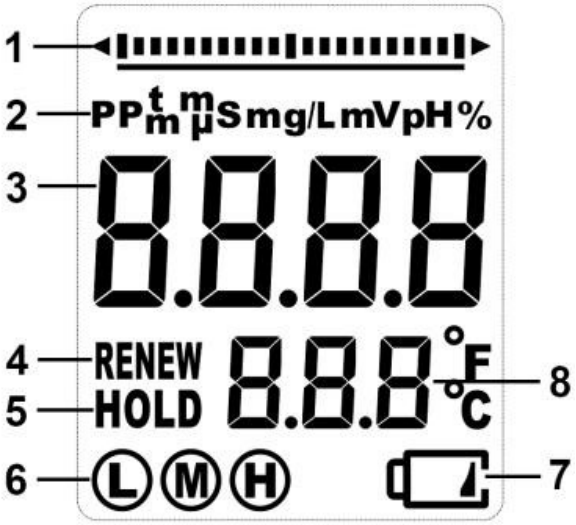
METER DESCRIPTION

1. Battery compartment cap
2. LCD Display
3. MODE / HOLD button
4. CAL / RECALL button
5. ON/OFF button
6. Electrode collar
7. pH/Conductivity Electrode



LCD DISPLAY

1. Bar graph reading
2. Measurement Units
3. Main Display
4. RENEW Indicator
5. HOLD Indicator
6. RANGE Calibration Indicator
7. Low Battery Indicator
8. Temperature Display



Powering On

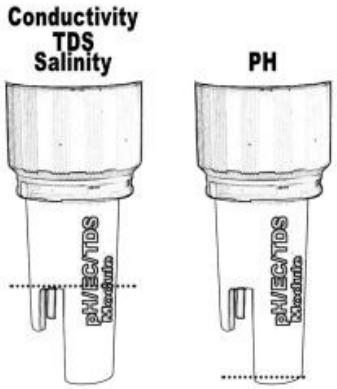
The WQ120 uses four (4) CR2032 Lithium Ion Batteries (included). If the batteries are weak, the 'Low Battery' indicator appears on the LCD. Press the ON/OFF key to turn the WQ120 on or off. The auto power off feature shuts the WQ120 off automatically after 10 minutes of inactivity to preserve battery life.

Getting Started

- Remove the cap from the bottom of the WQ120 to expose the pH electrode, reference junction and conductivity electrodes.
- Before the first use or after storage, soak the electrode in tap water or pH 4 buffer solution for about 10 minutes.
- White KCL crystals may be present in the cap or on the electrode. This is to be expected depending on the length of time in storage. These crystals will dissolve while soaking the electrode or they can be rinsed away with tap water.
- For best results calibrate with pH 7 buffer solution first, then calibrate with the buffer solution closest to the expected pH value of the solution or material to be tested.
- To preserve the pH electrode life, keep the sponge in the protective cap soaked with tap water or pH 4 buffer solution.
- For best results, calibrate for conductivity with a standard in the expected range of the sample. For maximum accuracy calibrate from low conductivity value standards to high value standards.

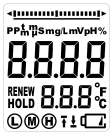
Measurement Procedure

Sample Preparation:

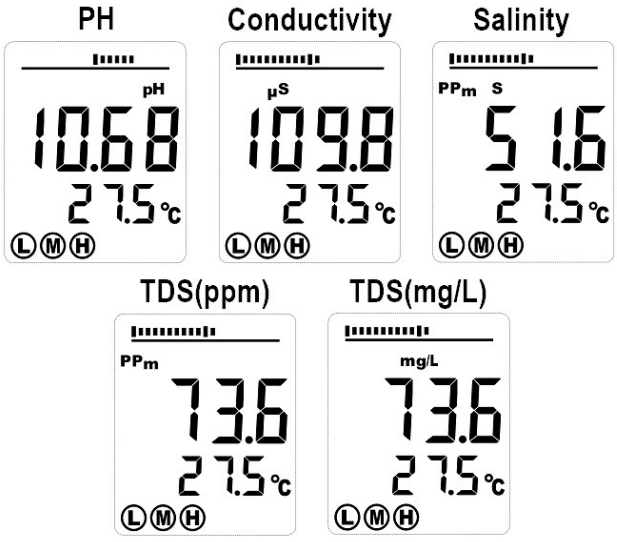


1. For Conductivity, TDS or Salinity place the test sample in a sample cup with enough depth (2.5cm minimum) to cover the electrode. Stir the solution to remove any air bubbles.
2. For pH, place the tip of the electrode in the sample or make contact with a wet surface.

Measurement:



1. Press the **ON** button. (and then “SELF CAL” will appear in the display during the turn-on diagnostics)
2. Depress and hold the **MODE/HOLD** key to scroll to the desired measurement mode.
3. Insert the electrode into the sample making sure that the electrodes are completely submersed.
4. Slowly stir the solution with the electrode to remove air bubbles if in the Conductivity, TDS or Salinity mode.
5. If in the Conductivity, TDS or Salinity modes, the meter will auto-range to the proper range and then display the reading.



Changing Measurement Function

The meter can be set to measure pH, Conductivity, TDS or Salinity.

To change the mode:

1. Press and Hold the **MODE/HOLD** button for 2 seconds and the display will begin to scroll through the units.

   pH; **µS** (Conductivity); **ppm S** (Salinity); **ppm** (TDS); **mg/l** (TDS);

   Note: The "HOLD" function cannot be on when changing the measurement function. If "HOLD" is displayed in the lower left corner of the display, briefly press the **MODE/HOLD** button to turn it off.

2. When the desired units are displayed, release the MODE/HOLD button.

TDS Compensation Ratio

The TDS value is determined by multiplying a conductivity reading by a known ratio factor. The meter allows for selecting a conversion ratio in the range of 0.40 to 1.00. The ratio varies with the application, but is typically set between 0.50 and 0.70.

Note: The stored ratio will briefly appear in the lower temperature display when the meter is first turned on, or when changing measurement function to TDS.

Note: In the Salinity mode the ratio is 0.40 to 0.60 auto.

To change the ratio, while in the TDS measurement mode (ppm or mg/l):

1. Press and release the **CAL/RECALL** button twice in succession. The stored ratio will appear in the display.
2. Press the **MODE/HOLD** button to increase the ratio value in steps of 0.01.
3. When the desired ratio is displayed, press and release the CAL/RECALL button to store the value and return to the normal mode.
4. If no buttons are pressed for 5 seconds, the meter returns to measure mode.



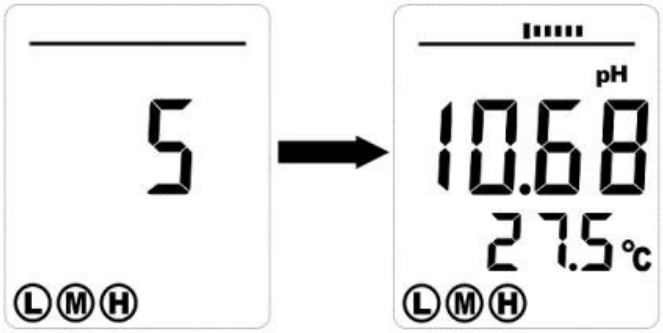
Storing Readings



1. Press the **MODE/HOLD** button to store a reading. The storage location number will be displayed on the lower display, while the main display shows the stored reading. The meter will enter the HOLD mode and the “HOLD” indicator will appear.
2. Press the **MODE/HOLD** button again to exit the HOLD mode and return to normal operation.
3. If more than 25 readings are stored, previously stored readings (starting with number 1) will be overwritten.

Recalling Stored Readings

1. Press the **CAL/RECALL** button and then press the **MODE/HOLD** button. A location number (1 through 25) will briefly appear and then the value stored in that location will appear. The displayed units will flash, indicating that the storage recall mode is active.



2. The last stored reading will be displayed first. Pressing and releasing the **MODE/HOLD** button will scroll through the stored readings one at a time. The location number is displayed first, followed by the reading stored in that location.
3. To exit the storage mode, press the **CAL/RECALL** button and the meter will return to normal operation, after displaying “End”.

Clear Stored Memory

With the unit on, press and hold ON/OFF for 4 seconds. “CLr” will be briefly displayed when the memory is cleared.

Changing Temperature Units

To change the displayed temperature units (^{O}C or ^{O}F):

1. With the unit OFF, press and hold down the **CAL/RECALL** button.
2. With the **CAL/RECALL** button depressed momentarily press the **ON/OFF** button. When “SELF CAL” appears in the display release the **CAL/RECALL** button. The unit will power on with temperature displayed in the new units.

Data Hold Mode

Press the **MODE/HOLD** button to hold (freeze) a reading in the display. The meter will enter the HOLD mode and the “HOLD” indicator will appear.

Note: This also stores the reading.

Press the **MODE/HOLD** button again to return to normal operation.

Auto Power OFF

The auto power off feature automatically shuts the meter off 10 minutes after the most recent button press.

Auto Power OFF Disable

To disable the Auto Power Off feature:

1. Turn the unit on.
2. Press **CAL/RECALL** once (**Quickly**)
3. Immediately and simultaneously press the **MODE/HOLD** and **ON/OFF** buttons for approximately 2 seconds, until “**oFF**” is briefly displayed

To disengage this feature, turn the unit off with the **ON/OFF** button. The next time the unit is powered up, Auto Power OFF mode will be engaged again.

Low Battery Indication

When the batteries become weak the “  ” icon will appear in the display. Refer to the Maintenance section for battery replacement information.

Calibration - pH (1, 2, or 3 points)

1. Place the electrode into a buffer solution (4, 7, or 10). Press and hold the **CAL/RECALL** key until “CAL” appears in the lower (temp.) display. When doing a 2 or 3 point calibration, calibrate with pH 7 buffer first, then follow with pH 4 then the pH 10 buffer.
2. The WQ120 automatically recognizes the solution and calibrates itself to that value (the circled number on the LCD will match the solution). Note that if the solution is more than 1 pH unit off from the L (4), M (7), or H (10) pH buffer, or if the electrode slope is low, the WQ120 will assume an error and abort the calibration (‘End’ will be displayed, and the unit will return to measure mode.)
3. During calibration, the pH reading flashes on the main display.
4. When calibration is complete, the WQ120 automatically displays “SA”, then “End” and returns to normal operation mode.
5. The appropriate circled indicator (L, M, or H) appears on the LCD when a particular calibration or series of calibrations has been completed within one power on cycle. When the WQ120 is turned off, the circled indicator configuration and the calibration data will be retained.
6. For a two or three-point calibration, repeat steps 1-4.
7. See **Reset Calibration Data** to clear all calibration data from the meter.

CAL Reminder Display

When in pH measurement mode, a “CAL” icon will appear after 15 on/off cycles of the meter without performing a calibration. The CAL display is simply a reminder to calibrate pH, and will turn off when the pH electrode is recalibrated. The reminder does not affect function in any way.

RENEW Display

A flashing ‘RENEW’ warning indicates that the probe is not performing to expected specifications. If cleaning and recalibration does not cause the RENEW icon to disappear, replace the probe (see optional accessories on the last page of this manual). The RENEW display appears as a result of the pH electrode slope falling below 65% of a nominal slope.

Measurement and Display Considerations

If the unit appears to be locked (display frozen). It is possible that the Data Hold mode has been inadvertently accessed by pressing the **MODE/HOLD** button. (“HOLD” will be displayed in the bottom left of the LCD.) Simply press the **MODE/HOLD** button again or turn the meter off and then on.

For maximum accuracy, allow sufficient time for the temperature of the probe to reach the temperature of the sample before calibrating. This will be indicated by a stable temperature reading on the display.

Reset Calibration Data

Follow this procedure to clear all calibration data from the meter. Resetting the calibration data may be necessary when new calibration solutions are used or accuracy of measurements is in question.

1. Turn off the meter.
2. Press and Hold the Cal/Recall and Mode/Hold buttons.
3. Momentarily press the On/Off button, as soon as the display comes on, release all 3 buttons.
4. The display will show “dFLt rSt” (default reset) and all of the calibration data will be erased. If “dFLt rSt” does not appear, retry the procedure.
5. Proceed to the calibration routine for pH and Conductivity.

Calibration - Conductivity

Meter accuracy verification should be performed on a periodic basis. Once per month is the recommended cycle for normal use. If calibration is required, a conductivity standardizing solution must be obtained. The meter can be calibrated in any or all of the three ranges. Standardizing solutions of 84µS/cm, 1413µS/cm or 12.88mS/cm (12,880µS/cm) are used for the automatic calibration recognition procedure. No other calibration values are permitted.

Calibration is always done in conductivity mode. Since salinity and TDS values are calculated from conductivity values, this procedure also calibrates the salinity and TDS ranges.

Fill a sample cup with the standardizing solution.

1. Turn the meter ON and insert the electrode into the solution. Tap or move the electrode in the sample to dislodge any air bubbles.
2. Press and hold the **CAL/RECALL** button (approximately 2 seconds) until “CAL” appears in the lower (temp) display. The main display will start flashing.
3. The meter will automatically recognize and calibrate to the standardizing solution. The display will briefly indicate “SA”, End and then return to the measurement mode after a calibration.
4. Note: The “SA” will not appear if the calibration fails.
5. The “range calibrated” symbol will appear in the display for each range that is calibrated during that power on cycle.

   Ⓛ Low range, 84µS/cm

   Ⓜ Medium range, 1413µS/cm

   Ⓗ High range, 12.88mS/cm (12,880µS/cm)

Note: Each time the calibration mode is entered all calibration symbols on the display are cleared, but only the calibration data for the currently calibrated range is replaced. The other two ranges keep the existing calibration data, just the symbols are removed. Calibration of all three ranges must be performed during one power on period for all three range calibration symbols to appear.

See **Reset Calibration Data** to clear all calibration data from the meter.

Note: The meter allows for a 1, 2 or 3 point calibration. If calibration is done for more than one point the lowest value standard should be done first to obtain the best accuracy.

Considerations and Techniques

Do not touch the inner surfaces of the conductivity electrodes. Touching the surface of the platinized electodes may damage and reduce the life of the probe.

Store the electrode in the wetting cap with the sponge moistened with pH 4.01 buffer solution.

Always rinse the electrode in de-ionized water between measurements to avoid cross contamination of the sample. Double rinsing is recommended when high accuracy is required.

Periodically, accumulated salt deposits from the reference electrode may build up in the storage cap, and should be rinsed away. These deposits could affect measured values of low conductivity samples.

When measuring low conductivity samples, extra care is recommended in rinsing the probe to avoid contamination of the sample with electrolyte from the pH reference electrode. This will only be a factor when measuring in the low range, and can be further minimized by increasing the volume of the sample. (Example: Try a 200 to 500 mL sample.)

If the 20mL sample cup is to be used, then the electrode should not be allowed to sit in the sample for any longer than necessary, to avoid pH electrolyte leakage into the sample, raising the conductivity value.

Specifications

Display	2000 count LCD with Bargraph
pH Range	0.00 to 14.00
pH Accuracy	±0.01 pH typical
pH ATC Range	32°F to 194ºF (0°C to 90ºC)
pH Reference Junction	Permanent gel, non-refillable
Conductivity ranges	0.0 to 199.9µS
	200 to 1999µS
	2.00 to 19.99mS
TDS ranges	0.0 to 99.9ppm or mg/L
(Variable ratio)	100 to 999ppm or mg/L
	1.00 to 9.99ppt or g/L
Salinity range	0.0 to 99.9ppm
	100 to 999ppm
	1.00 to 9.99ppt
TDS Ratio	0.40 to 1.00 adjustable
Salinity Ratio	0.40 to 0.60 auto
Conductivity ATC	2.0% per oC
Conductivity ATC Range	32.0°F to 140oF (0.0°C to 60.0oC)
Temperature Range	32.0°F to 194oF (0.0°C to 90.0oC)
Temperature Resolution	0.1 up to 99.9, 1 >100
Temperature Accuracy	±1.8°F; 1°C
Accuracy	Conductivity: ±2% full scale
	TDS: ±2% full scale
	Salinity: ±2% full scale
Measurement Memory	25 tagged (numbered) readings
Low battery indication	‘ ’ appears on the LCD
Power	Four (4) CR2032 Lithium Ion Batteries
Auto power off	After 10 minutes (override available)
Operating conditions	23°F to 122oF (-5°C to 50oC)
Dimensions	1.5 x 7.8 x 1.5” (38 x 198 x 38 mm)
Weight	3.5 oz (100 g)

Maintenance

Battery Replacement

1. Twist off the battery compartment cap
2. Replace the four (4) 2032 batteries observing polarity.
3. Replace the battery compartment cap





Electrode Replacement

1. To remove an electrode, unscrew and completely remove the electrode collar (turn the collar counter-clockwise to remove).
2. Gently rock the electrode from side to side, pulling it downwards, until it disconnects from the meter.
3. To attach an electrode, carefully plug the electrode into the meter socket (note that the electrode connector is keyed, ensuring proper connection).
4. Tighten the electrode collar firmly enough to make a good seal (a rubber gasket seals the electrode with the meter).

Cleaning Recommendations

When cleaning the probe, take care not to scratch or damage the sensing surface or the platinized electrode surfaces.

Contaminant	***Cleaning Solution***	***Instructions***
Water soluble substances	Deionized water	Soak or scrub with a soft brush. Recondition in 4 or 7 buffer for 1 hour.
Grease & Oil	Warm water and household detergent	Soak or scrub with a soft brush, maximum of 10 minutes. Rinse thoroughly with DI water, recondition in 4 or 7 buffer for 1 hour.
Heavy grease & Oil	Alcohol	Maximum of 5 minute soak, scrub with a soft brush. Rinse thoroughly with DI water, recondition in 4 or 7 buffer for 1 hour.
Lime and hydroxide coatings	10% acetic acid	Soak until coating dissolved, maximum of 5 minutes. Rinse thoroughly with DI water, recondition in 4 or 7 buffer for 1 hour.

Please Note: Since the WQ120 does not have a refillable pH reference electrolyte chamber, it is important not to soak the electrode in the above solutions for more than the recommended times. To do so may cause a reference potential shift, which will cause degradation in performance or failure.

Warranty

Triplett / Jewell Instruments extends the following warranty to the original purchaser of these goods for use. Triplett warrants to the original purchaser for use that the products sold by it will be free from defects in workmanship and material for a period of (1) one year from the date of purchase. This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons in any way or purchased from unauthorized distributors so as, in our sole judgment, to injure their stability or reliability, or which have been subject to misuse, abuse, misapplication, negligence, accident or which have had the serial numbers altered, defaced, or removed. Accessories, including batteries are not covered by this warranty

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Appendix F

Illicit Discharge Detection and Elimination (IDDE)
Employee Training Record

University

Date	Type of Training	Participants
2/23/2017	Departmental Trainings of MS4 compliance and IDDE procedures	UNH Utilities Distribution Dept.
3/8/2017	Departmental Trainings of MS4 compliance and IDDE procedures	UNH Grounds and Roads Dept.
5/17/2017	Departmental Trainings of MS4 compliance and IDDE procedures	UNH Facilities Project Management Dept.
3/26/2018	Departmental Trainings of MS4 compliance and IDDE procedures	UNH Utilities Distribution Dept.
4/10/2019	Departmental Trainings of MS4 compliance and IDDE procedures	UNH Utilities Distribution Dept.
2/12/2020	Departmental Trainings of MS4 compliance and IDDE procedures	UNH Utilities Distribution Dept.
6/22/2021	Departmental Trainings of MS4 compliance and IDDE procedures	UNH Utilities Distribution Dept.
04/14/2022	Departmental Trainings of MS4 compliance and IDDE procedures	UNH Utilities Distribution Dept.
03/20/2023	Departmental Trainings of MS4 compliance and IDDE procedures	UNH Utilities Distribution Dept.
05/15/2024	Departmental Trainings of MS4 compliance and IDDE procedures	UNH Utilities Distribution Dept.
12/18/2024	Departmental Trainings of MS4 compliance and IDDE procedures	UNH Utilities Distribution Dept.

Appendix G

Source Isolation and Confirmation Methods:
Instructions, Manuals, and SOPs

Illicit Discharge Investigation and Removal Report

Inspector Name:	Date:	Outfall ID:	Outfall Priority:
Location:			
Recent Rainfall: ☑ *<24hrs* ☐ *24-48hrs* ☐ *>48hrs*			

Illicit Discharge Removal

Date of discovery: _____ Date of elimination: _____ Est. volume of flow removed: _____

Method of discovery: _____

Desc. of the discharge: _____

Method of elimination: _____

Notes: _____

_____

_____

Catchment Investigation

Describe evidence of Illicit Discharge and potential sources:

_____

_____

Investigation methods used *(attach any inspection / sampling results)*:

☐ Review of maps, plans, and records ☐ Manhole inspection

☐ Dry/wet weather sampling ☐ Video Inspection ☐ Other

☐ Smoke testing ☐ Dye testing

Notes: _____

_____

_____

Confirmatory Outfall Screening

Date of initial Confirmatory Outfall Screening: _____

Date of follow up screening(s): _____

Does screening indicate that the Illicit Discharge has been successfully removed? ☐ Y ☐ N

Notes: _____

_____

_____

Attach all reports, sampling results, and inspections related to the Illicit Discharge to this Report.