STORMWATER MANAGEMENT PROGRAM

SWAMPSCOTT, MASSACHUSETTS

EPA NPDES Permit Number: MA0100552

PREPARED BY:

KLEINFELDER
Bright People. Right Solutions.

Stormwater Management Program (SWMP)

Town of Swampscott

22 Monument Ave., Swampscott MA 01907

EPA NPDES Permit Number MA0100552

Certification

Authorized Representative (Optional): All reports, including SWPPPs, inspection reports, annual reports, monitoring reports, reports on training and other information required by this permit must be signed by a person described in Appendix B, Subsection 11.A or by a duly authorized representative of that person in accordance with Appendix B, Subsection 11.B. If there is an authorized representative to sign MS4 reports, there must be a signed and dated written authorization.
The authorization letter is:

☐ Attached to this document (document name listed below)

☐ Publicly available at the website below

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Printed Name Gino A. Cresta Jr.

Signature 

Date 6/28/23

Click Here for Revisions

Background

Stormwater Regulation

The Stormwater Phase II Final Rule was promulgated in 1999 and was the next step after the 1987 Phase I Rule in EPA's effort to preserve, protect, and improve the Nation's water resources from polluted stormwater runoff. The Phase II program expands the Phase I program by requiring additional operators of MS4s in urbanized areas and operators of small construction sites, through the use of NPDES permits, to implement programs and practices to control polluted stormwater runoff. Phase II is intended to further reduce adverse impacts to water quality and aquatic habitat by instituting the use of controls on the unregulated sources of stormwater discharges that have the greatest likelihood of causing continued environmental degradation. Under the Phase II rule all MS4s with stormwater discharges from Census designated Urbanized Area are required to seek NPDES permit coverage for those stormwater discharges.

Permit Program Background

On May 1, 2003, EPA Region 1 issued its Final General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (2003 small MS4 permit) consistent with the Phase II rule. The 2003 small MS4 permit covered "traditional" (i.e., cities and towns) and "non-traditional" (i.e., Federal and state agencies) MS4 Operators located in the states of Massachusetts and New Hampshire. This permit expired on May 1, 2008 but remained in effect until operators were authorized under the 2016 MS4 general permit, which became effective on July 1, 2018.

Stormwater Management Program (SWMP)

The SWMP describes and details the activities and measures that will be implemented to meet the terms and conditions of the permit. The SWMP accurately describes the permittees plans and activities. The document should be updated and/or modified during the permit term as the permittee's activities are modified, changed or updated to meet permit conditions during the permit term. The main elements of the stormwater management program are (1) a public education program in order to affect public behavior causing stormwater pollution, (2) an opportunity for the public to participate and provide comments on the stormwater program (3) a program to effectively find and eliminate illicit discharges within the MS4 (4) a program to effectively control construction site stormwater discharges to the MS4 (5) a program to ensure that stormwater from development projects entering the MS4 is adequately controlled by the construction of stormwater controls, and (6) a good housekeeping program to ensure that stormwater pollution sources on municipal properties and from municipal operations are minimized.

Town Specific MS4 Background (optional)

The Town of Swampscott was authorized under the 2003 small MS4 Permit, and is working to update its stormwater plans to comply with the 2016 Permit. The Town has undertaken significant work, through a separate EPA Consent Decree, to update its stormwater infrastructure through a targeted IDDE Program. Since 2016, Swampscott has prioritized infrastructure improvements in the Stacey's Brook catchment area, and is now working to expand beyond Stacey's Brook and into other areas of the Town.

Small MS4 Authorization

The NOI was submitted on Dec 7, 2018

The NOI can be found at the following (document name or web address):

EPA communities: https://www3.epa.gov/region1/npdes/stormwater/ma/tms4noi/swampscott.pdf

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Authorization to Discharge was granted on Jun 4, 2019

The Authorization Letter can be found (document name or web address):

https://www3.epa.gov/region1/npdes/stormwater/ma/tms4noi/swampscott-auth.pdf

Stormwater Management Program Team

SWMP Team Coordinator

Name	Gino A. Cresta Jr.	Title	DPW Director
Department	Director of Public Works		
Phone Number	781-596-8860	Email	gcresta@swampscottma.gov
Responsibilities	Responsible for the implementation of the Town's MS4 program and coordination of SWMP team members.		

SWMP Team

Name	Aleena Alsaraby	Title	Assistant Engineer
Department	Department of Public Works		
Phone Number	781-596-8860	Email	aalsaraby@swampscottma.gov
Responsibilities	Responsible for supporting the Town's MS4 program. This may include appropriate bylaw updates, coordination of legal enforcement and disciplinary actions, maintaining procedures and records, town wide system mapping, and outfall screening and sampling.		

Name	Steven Kent	Title	Forestry Foreman
Department	Forestry Division		
Phone Number		Email	
Responsibilities	Responsible for supporting the Town's MS4 program through completion of the Forestation Program and Tree Survey.		

Add SWMP Member

Receiving Waters

The following table lists all receiving waters, impairments and number of outfalls discharging to each waterbody segment.

OR

The information can be found in the following document or at the following web address:

Waterbody segment that receives flow from the MS4	Number of outfalls into receiving water segment	Chloride	Chlorophyll-a	Dissolved Oxygen/ DO Saturation	Nitrogen	Oil & Grease/ PAH	Phosphorus	Solids/ TSS/ Turbidity	E. coli	Enterococcus	Other pollutant(s) causing impairments
Foster Pond (MA 93026)	4	☐	☐	☐	☐	☐	☐	☐	☐	☐	DDT
Hawthorne Brook	31	☐	☐	☐	☐	☐	☐	☐	☐	☐	No known impairments
Massachusetts Bay	2	☐	☐	☐	☐	☐	☐	☐	☐	☐	No known impairments
Nahant Bay (MA 93-24)	22	☐	☐	☐	☐	☐	☐	☐	☐	☐	Fecal Coliform TMDL 50121
Palmer Pond	2	☐	☐	☐	☐	☐	☐	☐	☐	☐	No known impairments
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
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Click here to lengthen table

Eligibility: Endangered Species and Historic Properties

*Reminder: The proper consultations and updates to the SWMP must be conducted for construction projects related to your permit compliance where Construction General Permit (CGP) coverage, which requires its own endangered species and history preservation determination, is NOT being obtained.

Attachments:

- ☒ The results of Appendix C U.S. Fish and Wildlife Service endangered species screening determination
- ☒ The results of the Appendix D historic property screening investigations
- ☐ If applicable, any documents from the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officer (THPO), or other Tribal representative to mitigate effects

These attachments are required within one year of the permit effective date and are:

- ☒ Attached to this document (document names listed below)

  Appendix B - Eligibility: Endangered Species and Historic Properties

- ☐ Publicly available at the website listed below

Under what criterion did permittee determine eligibility for ESA?

☐ Criterion A ☒ Criterion B ☐ Criterion C

Under what criterion did permittee determine eligibility for Historic Properties?

☒ Criterion A ☐ Criterion B ☐ Criterion C ☐ Criterion D (NH only)

Below add any additional measures for structural controls that you're required to do through consultation with U.S. Fish and Wildlife Service (if applicable):

N/A

Below add any additional measures taken to avoid or minimize adverse impacts on places listed, or eligible for listing, on the NRHP, including any conditions imposed by the SHPO or THPO (if applicable):

N/A

MCM 1
Public Education and Outreach
Permit Part 2.3.2

Objective: The permittee shall implement an education program that includes educational goals based on stormwater issues of significance within the MS4 area. The ultimate objective of a public education program is to increase knowledge and change behavior of the public so that the pollutants in stormwater are reduced.

Examples and Templates:
EPA's Stormwater Education Toolbox
MassDEP's Stormwater Outreach Materials

Other templates relevant to MCM 1 can be found here: https://www.epa.gov/npdes-permits/stormwater-tools-new-england#peo

BMP:Yard Work Activities, Residents

BMP Number (Optional) **1-1**

Document Name and/or Web Address: https://www3.epa.gov/npdes/pubs/cu_solution_to_pollution.pdf

Description:

Informational Brochure for best practices for residential yard work activities.

Targeted Audience: Residents

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Provide residential yard work activities brochure and make available at Town Hall, Library, and Public Works Building.

Message Date(s): Brochures address seasonal concerns. Grass clippings in the Spring and leaf litter in the Fall.

BMP:Trash, Yard, Solid & Hazardous Waste Collection, Residents

BMP Number (Optional) **1-2**

Document Name and/or Web Address: https://www.swampscottma.gov/sites/g/files/vyhlif1296/f/uploads/solid_waste_brochure_1-18-22.pdf

Description:

Hazardous waste was collected in June 15, 2022. Town schedule four days a year to pickup Hazardous Waste.

Targeted Audience: Residents

Responsible Department/Parties:

Measurable Goal(s):

Brochure will notify the residents about hazardous and yard waste pick up schedule and inform the residents about the Trash and Recycling Program

Message Date(s): Messages are posted in the website to notify the residents about the Waste Pickup schedule

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BMP:Commercial Landscaping Practices, Businesses/Commercial Entities/Institutions

BMP Number (Optional) **1-3**

Document Name and/or Web Address: https://www.partnersforcleanwater.org/media/1070/commerical-landscaping-pollution-prevention-fact-sheet.pdf

Description:

Informational Brochure for best practices for commercial landscaping practices.

Targeted Audience: Businesses, institutions and commercial facilities

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Provide commercial landscaping best practices brochure and make available at Town Hall, Library, and Public Works Building.

Message Date(s): Brochures address seasonal concerns. Grass clippings in the Spring and leaf litter in the Fall.

BMP:Storage and handling of materials, Businesses/Commercial Entities/Institutions

BMP Number (Optional) **1-4**

Document Name and/or Web Address: https://www.bwsc.org/sites/default/files/2019-01/STORMWATER_MANAGEMENT_SMALL_BUSINESSES.PDF

Description:

Informational Brochure for proper storage and handling of materials for stormwater pollution prevention.

Targeted Audience: Businesses, institutions and commercial facilities

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Provide brochure for "Storage and handling of materials for pollution prevention" and make available at Town Hall, Library, and Public Works Building.

Message Date(s): Message will be posted anually

BMP:E+S Control Video Guide for New Development and Redevelopment, Developers

BMP Number (Optional) **1-5**

Document Name and/or Web Address: https://www.youtube.com/watch?v=Kdm-Z-_AGnU

Description:

Video highlighting erosion and sediment control best management practice for new development and redevelopment.

Targeted Audience: Developers (construction)

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Post informational video on public access channel, Town website, and Town Facebook page.

Message Date(s): Message will be posted anually

BMP:Construction General Permit Requirements, Developers

BMP Number (Optional) **1-6**

Document Name and/or Web Address: https://www.mass.gov/files/documents/2016/08/xc/npdesconstruction.pdf

Description:

Poster highlighting Construction General Permit requirements.

Targeted Audience: Developers (construction)

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Display Construction General Permit requirements poster at Town Hall and Public Works Building.

Message Date(s): Message will be posted anually

BMP:Gravel Mining Operations, Industrial Facilities

BMP Number (Optional) **1-7**

Document Name and/or Web Address: https://www3.epa.gov/npdes/pubs/sector_j_mineralmining.pdf#:~:text=Prevention%20BMPs%20can%20include%20regular%20cleanup%2C%20collection%20and,other%20housekeeping%20practices%2C%20spill%20control%2C%20and%20employee%20training

Description:

Informational brochure on best management practices for stormwater pollution prevention at gravel mining operations.

Targeted Audience: Industrial facilities

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Mail stormwater Best Management Practices informational brochure to gravel mining operator(s) in Town.

Message Date(s): Message will be posted annually

BMP:Website Guidance, Industrial Facilities

BMP Number (Optional) **1-8**

Document Name and/or Web Address: https://www.epa.gov/system/files/documents/2021-11/bmp-land-grading.pdf
https://www.epa.gov/system/files/documents/2021-11/bmp-vehicle-maintenance-and-washing-areas-at-construction-sites.pdf
https://www.epa.gov/system/files/documents/2021-11/bmp-erosion-and-sediment-control-inspection-and-maintenance.pdf

Description:

Post information on Town website for heavy equipment operators pertaining to best management practices for stormwater pollution prevention.

Targeted Audience: Industrial facilities

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Post information for heavy equipment operators on Town website and Town Facebook page.

Message Date(s): Message will be posted annually

Add BMP

MCM 2
Public Involvement and Participation
Permit Part 2.3.3

Objective: The permittee shall provide opportunities to engage the public to participate in the review and implementation of the permittee's SWMP.

BMP: Public Review of Stormwater Management Program

BMP Number (Optional) **2-1**

Location of Plan and/or Web Address: https://www.swampscottma.gov/public-works/pages/stormwater-management

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Stormwater Management Plan is publicly available.

BMP: Public Participation in Stormwater Management Program Development

BMP Number (Optional) **2-2**

Description:

SWMP posted on website, link for public comments provided.

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Annual opportunity for public input provided.

BMP: [BMP name here]

BMP Number (Optional)

Document Name and/or Web Address:

Description:

Responsible Department/Parties:

Measurable Goal(s):


Add BMP

MCM 3
Illicit Discharge Detection and Elimination (IDDE) Program

Permit Part 2.3.4

Objective: The permittee shall implement an IDDE program to systematically find and eliminate illicit sources of non-stormwater discharges to its municipal separate storm sewer system and implement procedures to prevent such discharges.

Examples and Templates:
IDDE Program Template and SOPs

Other templates relevant to IDDE can be found here: https://www.epa.gov/npdes-permits/stormwater-tools-new-england#idde

BMP: IDDE Legal Authority

BMP Number (Optional) **3-1** **Completed** (by May 1, 2008) ☒

Ordinances Link or Reference: https://www.swampscottma.gov/sites/g/files/vyhlif1296/f/uploads/swampscott_stormwater_bylaws_0.pdf

Department Responsible for Enforcement: Department of Public Works

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BMP: Sanitary Sewer Overflow (SSO) Inventory

BMP Number (Optional) **3-2** **Completed** (by year 1) ☒

Document Name and/or Web Address: Included in IDDE Program

Description:

Inventory of SSO occurrences updated through June 2019.

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Annually track and report the following SSO information: the location; a clear statement of whether the discharge entered a surface water directly or entered the MS4; date(s) and time(s) of each known SSO occurrence; estimated volume(s) of the occurence; description of the occurrence indicating known or suspected cause(s); mitigation and corrective measures completed with dates implemented; and mitigation and corrective measures planned with implementation schedules. Update inventory as needed.

SSO Reporting:

In the event of an overflow or bypass, a notification must be reported within 24 hours by phone to MassDEP, EPA, and other relevant parties. Follow up the verbal notification with a written report following MassDEP's Sanitary Sewer Overflow (SSO)/Bypass notification form within 5 calendar days of the time you become aware of the overflow, bypass, or backup.

The MassDEP contacts are: Northeast Region (978) 694-3215 205B Lowell Street Wilmington, MA 01887	The EPA contacts are: EPA New England (617) 918-1510 5 Post Office Square Boston, MA 02109

BMP: Map of Storm Sewer System

BMP Number (Optional) **3-3** **Phase I Completed** (by year 2) ☒ **Phase II Completed** (by year 10) ☐

Document Location and/or Web Address:

Description:

Updated the storm system map (Appendix D- Storm System Map)

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Map 100% of outfalls and receving waters, open channel conveyances, interconnections with other MS4s and other storm sewer systems, municipally-owned stormwater treatment structures, waterbodies identified by name and indication of all use impairments, and initial catchment delineations within 2 years of the permit's effective date. Map 100% of outfall spatial locations, pipes, manholes, catch basins, refined catchment delineations, municipal sanitary sewer system (if available), and municipal combined sewer system (if applicable) within 10 years of the permit's effective date.

BMP: IDDE Program

BMP Number (Optional) **3-4**

Written Document Completed (by year 1) ☐

Document Name and/or Web Address: https://www.swampscottma.gov/public-works/pages/stormwater-management

Description:

Create a written IDDE Program

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Conduct 100% of outfall screening on High and Low Priority Outfalls within 3 years of the permit's effective date. Complete catchment investigations for 100% of the Problem Outfalls within 7 years of the permit's effective date. Complete 100% of all catchment investigations within 10 years of the permit's effective date.

The outfall/interconnection inventory and initial ranking and the dry weather outfall and interconnection screening and sampling results can be found:

Included in IDDE Program Attachment.

BMP: Employee Training

BMP Number (Optional) **3-5**

Description:

Train employees involved in the IDDE program about the program and specifically include how to recognize illicit discharges and SSOs.

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Training occurs annually. Town completed IDDE Training on May 17, 2023.

BMP:Implement IDDE Program

BMP Number (Optional) **3-6** **Completed** ☐

Document Name and/or Web Address:

Description:

Implement catchment investigations according to program and permit conditions. Phase I construction (Stacey's Brook) is underway (began 2017).

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

IDDE program activities completed 10 years after effective date of permit.

Add BMP

MCM 4
Construction Site Stormwater Runoff Control
Permit Part 2.3.5

Objective: The objective of an effective construction stormwater runoff control program is to minimize or eliminate erosion and maintain sediment on site so that it is not transported in stormwater and allowed to discharge to a water of the U.S. through the permittee's MS4.

Examples and Templates:
Examples and templates relevant to MCM 4, including model ordinances and site inspection templates, can be found here: https://www.epa.gov/npdes-permits/stormwater-tools-new-england#csrc

BMP: Sediment and Erosion Control Ordinance

BMP Number (Optional) **4-1** **Completed** (by May 1, 2008) ☒

Ordinances Link or Reference: http://www.swampscottma.gov/sites/swampscottma/files/uploads/swampscott_stormwater_bylaws_0.pdf

Department Responsible for Enforcement: Department of Public Works

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BMP: Site Plan Review Procedures

BMP Number (Optional) **4-2** **Written procedures completed** (by year 1) ☒

Document Name and/or Web Address:

Description:

Written site plan review procedures will be included in Town of Swampscott's rules and regulations adopted to support the Permit and the Construction and Post-Construction Stormwater Management Bylaw (Article XIX).

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Conduct site plan review of 100% of projects according to the procedures outlined above. Regulations have been written, and adopted by the Selectboard.

BMP: Site Inspections and Enforcement of Sediment and Erosion Control Measures Procedures

BMP Number (Optional) **4-3** **Completed** (by year 1) ☒

Document Name and/or Web Address:

Description:

Complete written procedures of site inspections and enforcement procedures.

Responsible Department/Parties:

Measurable Goal(s):

Complete written procedures within 1 year of effective date of permit. Regulations have been written, and adopted by the Selectboard.

BMP: Waste Control

BMP Number (Optional) **4-4** **Completed** ☒

Document Name and/or Web Address: http://www.swampscottma.gov/sites/swampscottma/files/uploads/swampscott_stormwater_bylaws_0.pdf

Description:

Adoption of requirements to control wastes (discarded building materials, concrete truck washout, chemicals, litter, and sanitary wastes) required by Construction and Post-Construction Stormwater Management Bylaw (Article XIX).

Responsible Department/Parties: Department of Public Works

Measurable Goal(s):

Adopted into bylaw text.

Add BMP

MCM 5
Post Construction Stormwater Management in New Development and Redevelopment

Permit Part 2.3.6

Objective: The objective of an effective post construction stormwater management program is to reduce the discharge of pollutants found in stormwater to the MS4 through the retention or treatment of stormwater after construction on new or redeveloped sites and to ensure proper maintenance of installed stormwater controls.

Examples and Templates:
Examples and templates relevant to MCM 5, including model ordinances and bylaw review templates and guidance can be found here: https://www.epa.gov/npdes-permits/stormwater-tools-new-england#pcsm

BMP: Post-Construction Ordinance

BMP Number (Optional) **5-1** **Completed** (by year 2) ☒

Town Ordinances Link or Reference: Construction and Post-Construction Stormwater Management Bylaw (Article XIX) http://www.swampscottma.gov/sites/swampscottma/files/uploads/swampscott_stormwater_bylaws_0.pdf

Department Responsible for Enforcement: Director of Public Works

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BMP: Street Design and Parking Lot Guidelines Report

BMP Number (Optional) **5-2** **Completed** (by year 4) ☒

Document Name and/or Web Address: MCM5 Design Guideline Analysis

Description:

Develop a report assessing requirements that affect the creation of impervious cover. The assessment will help determine if changes to design standards for streets and parking lots can be modified to support low impact design options.

Responsible Department/Parties: Director of Community Development

Measurable Goal(s):

Developed a report assessing requirements that affect the creation of impervious cover. Implement recommendations by 6/30/2024 with progress documented annually in report.

BMP: Green Infrastructure Report

BMP Number (Optional) **5-3** **Completed** (by year 4) ☒

Document Name and/or Web Address: MCM5 Design Guideline Analysis

Description:

Develop a report assessing existing local regulations to determine the feasibility of making green infrastructure practices allowable when appropriate site conditions exist.

Responsible Department/Parties: Director of Community Development

Measurable Goal(s):

Developed a report assessing existing local regulations to determine the feasibility of making green infrastructure practices allowable when appropriate site conditions exist. Implement recommendations by 6/30/2024 with progress documented annually in report.

BMP: List of Municipal Retrofit Opportunities

BMP Number (Optional) **5-4** **Completed** (by year 4) ☒

Document Name and/or Web Address: List of Properties for BMP Retrofit

Description:

Target properties to reduce impervious areas: Identify at least 5 permittee-owned properties that could be modified or retrofitted with BMPs to reduce impervious areas and update annually.

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

The list is completed by 07/01/2022 and updated as needed.

BMP: As-built plans for on-site stormwater control

BMP Number (Optional) **5-5** **Completed** ☒

Document Name and/or Web Address:

Description:

The procedures to require submission of as-built drawings and ensure long term operation and maintenance will be a part of the SWMP.

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Require submission of as-built plans for completed projects.

Add BMP

MCM 6
Good Housekeeping and Pollution Prevention for Permittee Owned Operations

Permit Part 2.3.7

Objective: The permittee shall implement an operations and maintenance program for permittee-owned operations that has a goal of preventing or reducing pollutant runoff and protecting water quality from all permittee-owned operations.

Examples and Templates:
Examples and templates relevant to MCM 6, including SOP templates for catch basin cleaning, street sweeping, vehicle maintenance, parks and open space management, winter deicing, and Stormwater Pollutoin Prevention Plans can be found here: https://www.epa.gov/npdes-permits/stormwater-tools-new-england#gh

PERMITTEE OWNED FACILITIES

BMP: Parks and Open Spaces Operations and Maintenance Procedures

BMP Number (Optional) **6-1A** **Written Document Completed** (by year 2) ☒

Document Name and/or Web Address:

Description:

Create written O&M procedures including all requirements contained in 2.3.7.a.ii for parks and open spaces.

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Program adopted for institution of all SOPs for identified parks and open spaces.

Properties List (Optional)**:**

Good Housekeeping Manual Attachment

BMP: Buildings and Facilities Operations and Maintenance Procedures

BMP Number (Optional) **6-1B** **Written Document Completed** (by year 2) ☒

Document Name and/or Web Address:

Description:

Create written O&M procedures including all requirements contained in 2.3.7.a.ii for buildings and facilities.

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Program adopted for institution of all SOPs for identified buildings and facilities.

Properties List (Optional)**:**

Good Housekeeping Manual Attachment

BMP: Vehicles and Equipment Operations and Maintenance Procedures

BMP Number (Optional) **6-1C** **Written Document Completed** (by year 2) ☒

Document Name and/or Web Address:

Description:

Create written O&M procedures including all requirements contained in 2.3.7.a.ii for the storage and fueling of vehicles and equipment.

Responsible Department/Parties:

Measurable Goal(s):

Program adopted for institution of all SOPs for identified vehicle and equipment storage and fueling areas.

Properties List (Optional)**:**

INFRASTRUCTURE

BMP: Infrastructure Operations and Maintenance Procedures

BMP Number (Optional) **6-2** **Written Procedure Completed** (by year 2) ☐

Document Name and/or Web Address:

Description:

Establish a detailed written program for timely maintenance of MS4 infrastructure.

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Complete and implement written program for MS4 infrastructure maintenance.

BMP: Catch Basin Cleaning Program

BMP Number (Optional) **6-3** **Written Procedure Completed** (by year 1) ☒

Document Name and/or Web Address: Infrastructure O&M Procedures

Description:

Establish schedule for catch basin cleaning such that each catch basin is no more than 50% full and clean catch basins on that schedule.

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

All catch basins are cleaned in accordance to the document above such that no catch basin is more than 50% full at any given time.

BMP: Street Sweeping Program

BMP Number (Optional) **6-4** **Written Procedure Completed** (by year 1) ☒

Document Name and/or Web Address: Infrastructure O&M Procedures

Description:

Sweep all streets and permitee-owned parking lots in accordance with permit conditions; Twice per year.

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Sweep 100% of all streets and 50% of all municipal parking lots twice per year.

BMP: Winter Road Maintenance Program

BMP Number (Optional) **6-5** **Written Procedure Completed** (by year 1) ☒

Document Name and/or Web Address: Infrastructure O&M Procedures

Description:

Establish and implement a program to minimize the use of road salt; Maintain covered salt storage; Calibrate salt spreaders annually.

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Evaluate at least one salt/chloride alternative for use in the municipality. Implement salt use optimization during deicing season; maintenance of salt storage and equipment.

BMP: Stormwater Treatment Structures Inspection and Maintenance Procedures

BMP Number (Optional) **6-6** **Completed** (by year 1) ☒

Document Name and/or Web Address: Infrastructure O&M Procedures

Description:

Establish and implement inspection and maintenance procedures and frequencies for stormwater treatment structures.

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Inspect and maintain 100% of treatment structures to ensure proper function in accordance with standard practice or manufacturer's guidance.

BMP: SWPPP

BMP Number (Optional) **6-7** **Completed** (by year 2) ☒

Document Name and/or Web Address:

Description:

Create SWPPPs for maintenance garages, transfer stations, and other waste-handling facilities

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

Develop and implement SWPPPs for 100% of facilities.

BMP: Employee Training

BMP Number (Optional) **6-8** **Completed** ☒

Document Name and/or Web Address:

Description:

Provide training to DPW staff on general stormwater topics including best management practices and stormwater pollution prevention.

Responsible Department/Parties: Director of Public Works

Measurable Goal(s):

One training day per year. Town completed SWPPP Training on May 17, 2023.

Add BMP

Annual Evaluation

Year 1 Annual Report

Document Name and/or Web Address:

https://www3.epa.gov/region1/npdes/stormwater/ma/reports/2019/swampscott-ma-ar19.pdf

Year 2 Annual Report

Document Name and/or Web Address:

https://www3.epa.gov/region1/npdes/stormwater/ma/reports/2020/swampscott-ma-ar20.pdf

Year 3 Annual Report

Document Name and/or Web Address:

Year 3 Annual Report: Massachusetts Small MS4 General Permit - SWAMPSCOTT, MA (epa.gov)

Year 4 Annual Report

Document Name and/or Web Address:

Year 5 Annual Report

Document Name and/or Web Address:

Year X Annual Report

Document Name and/or Web Address:

Add a Year

TMDLs and Water Quality Limited Waters

Select the applicable Impairment(s) and/or TMDL(s).

Impairment(s)

☐ Bacteria/Pathogens ☐ Chloride ☐ Nitrogen ☐ Phosphorus

☐ Solids/oil/grease (hydrocarbons)/metals

TMDL(s)

In State:

☐ Assabet River Phosphorus ☒ Bacteria and Pathogen ☐ Cape Cod Nitrogen

☐ Charles River Watershed Phosphorus ☐ Lake and Pond Phosphorus

Out of State:

☐ Bacteria and Pathogen ☐ Metals ☐ Nitrogen ☐ Phosphorus

Clear Impairments and TMDLs

Bacteria/Pathogens

Combination of Impaired Waters Requirements and TMDL Requirements as Applicable

Applicable Receiving Waterbody(ies)	TMDL Name (if applicable)	Add/Delete Row
Nahant Bay (MA93-24)	50121	+ -

Annual Requirements Beginning Year 1

Rank outfalls to these receiving waters as high priority for IDDE implementation in the initial outfall ranking

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

The Town is complying with the TMDLs by implementing the BMPs listed below.

Public Education and Outreach

(Public education messages can be combined with other public education requirements as applicable (see Appendix H and F for more information))

Annual message encouraging the proper management of pet waste, including noting any existing ordinances where appropriate

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

1-9 and 1-10

Permittee or its agents disseminate educational material to dog owners at the time of issuance or renewal of dog license, or other appropriate time

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

1-9

Provide information to owners of septic systems about proper maintenance in any catchment that discharges to a water body impaired for bacteria

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

1-10

Nitrogen

Combination of Impaired Waters Requirements and TMDL Requirements as Applicable

Applicable Receiving Waterbody(ies)	**TMDL Name** (if applicable)	**Add/Delete Row**
N/A		+ -

Annual Requirements Beginning Year 1

Rank outfalls to these receiving waters as high priority for IDDE implementation in the initial outfall ranking

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Public Education and Outreach

(Public education messages can be combined with other public education requirements as applicable (see Appendix H and F for more information))

Distribute an annual message in the spring (April/May) that encourages the proper use and disposal of grass clippings and encourages the proper use of slow-release fertilizers

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Distribute an annual message in the summer (June/July) encouraging the proper management of pet waste, including noting any existing ordinances where appropriate

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Distribute an annual message in the fall (August/September/October) encouraging the proper disposal of leaf litter

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Good Housekeeping and Pollution Prevention for Permittee Owned Operations

---

Establish requirements for the use of slow release fertilizers on permittee owned property currently using fertilizer, in addition to reducing and managing fertilizer use as provided in part 2.3.7.1

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Establish procedures to properly manage grass cuttings and leaf litter on permittee property, including prohibiting blowing organic waste materials onto adjacent impervious surfaces

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Increase street sweeping frequency of all municipal owned streets and parking lots subject to Permit part 2.3.7.a.iii.(c) to a minimum of two times per year (spring and fall)

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Nitrogen Reduction Tracking BMP

Any structural BMPs listed in Table 3 of Attachment 1 to Appendix H already existing or installed in the regulated area by the permittee or its agents shall be tracked and the permittee shall estimate the nitrogen removal by the BMP consistent with Attachment 1 to Appendix H. .

The BMP type, total area treated by the BMP, the design storage volume of the BMP and the estimated nitrogen removed in mass per year by the BMP is found in the following document or website and is updated yearly at a minimum:

N/A

Requirements Due by Year 2

Stormwater Management in New Development and Redevelopment

The requirement for adoption/amendment of the permittee's ordinance or other regulatory mechanism shall include a requirement that new development and redevelopment stormwater management BMPs be optimized for nitrogen removal

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Requirements Due by Year 4

Complete a Nitrogen Source Identification Report

The document name (if attached) and/or web address is/are:

N/A

Stormwater Management in New Development and Redevelopment

Retrofit inventory and priority ranking under 2.3.6.1.b. shall include consideration of BMPs to reduce nitrogen discharges

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Requirements Due by Year 5

Potential Structural BMPs

Evaluate all permittee-owned properties identified as presenting retrofit opportunities or areas for structural BMP installation under Permit part 2.3.6.d.ii or identified in the Nitrogen Source Identification Report that are within the drainage area of the impaired water or its tributaries

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Complete a listing of planned structural BMPs and a plan and schedule for implementation

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Chloride

Applicable Receiving Waterbody(ies)	TMDL Name (if applicable)	Add/Delete Row
N/A		+ -

Annual Requirements Beginning Year 1

Rank outfalls to these receiving waters as high priority for IDDE implementation in the initial outfall ranking

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Public Education and Outreach

(Public education messages can be combined with other public education requirements as applicable (see Appendix H and F for more information))

Include an annual message in November/December to private road salt applicators and commercial industrial site owners on the proper storage and application rates of winter deicing material, along with the steps that can be taken to minimize salt use and protect local waterbodies

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Requirements Due by Year 3

Develop a Salt Reduction Plan

The document name (if attached) and/or web address is/are:

N/A

Requirements Due by Year 4

Continue implementation of the Salt Reduction Plan

Requirements Due by Year 5

Fully implement the Salt Reduction Plan

Solids, Oil and Grease (Hydrocarbons), or Metals

Combination of Impaired Requirements and TMDL Requirements as Applicable

Applicable Receiving Waterbody(ies)	TMDL Name (if applicable)	Add/Delete Row
N/A		+ -

Annual Requirements Beginning Year 1

Rank outfalls to these receiving waters as high priority for IDDE implementation in the initial outfall ranking

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Good Housekeeping and Pollution Prevention for Permittee Owned Operations

---

Increase street sweeping frequency of all municipal owned streets and parking lots to a schedule to target areas with potential for high pollutant loads

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Prioritize inspection and maintenance for catch basins to ensure that no sump shall be more than 50 percent full; Clean catch basins more frequently if inspection and maintenance activities indicate excessive sediment or debris loadings

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Requirements Due by Year 2

Stormwater Management in New Development and Redevelopment

Stormwater management systems designed on commercial and industrial land use area draining to the water quality limited water body shall incorporate designs that allow for shutdown and containment where appropriate to isolate the system in the event of an emergency spill or other unexpected event

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Phosphorus

Combination of Impaired Waters Requirements and TMDL Requirements as Applicable

Applicable Receiving Waterbody(ies)	TMDL Name (if applicable)	Add/Delete Row
N/A		+ -

Annual Requirements Beginning Year 1

Rank outfalls to these receiving waters as high priority for IDDE implementation in the initial outfall ranking

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Public Education and Outreach

(Public education messages can be combined with other public education requirements as applicable (see Appendix H and F for more information))

Distribute an annual message in the spring(April/May) that encourages the proper use and disposal of grass clippings and encourages the proper use of slow-release and phosphorus-free fertilizers

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Distribute an annual message in the summer (June/July) encouraging the proper management of pet waste, including noting any existing ordinances where appropriate

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Distribute an annual message in the fall (August/September/October) encouraging the proper disposal of leaf litter

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Good Housekeeping and Pollution Prevention for Permittee Owned Operations

---

Increase street sweeping frequency of all municipal owned streets and parking lots subject to Permit part 2.3.7.a.iii.(c) to a minimum of two times per year (spring and fall)

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Establish procedures to properly manage grass cuttings and leaf litter on permittee property, including prohibiting blowing organic waste materials onto adjacent impervious surfaces

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Stormwater Management in New Development and Redevelopment

Retrofit inventory and priority ranking under 2.3.6.1.b. shall include consideration of BMPs to reduce nitrogen discharges

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Nitrogen Reduction Tracking BMP

Any structural BMPs listed in Table 3 of Attachment 1 to Appendix H already existing or installed in the regulated area by the permittee or its agents shall be tracked and the permittee shall estimate the phosphorus removal by the BMP consistent with Attachment 1 to Appendix H.

The BMP type, total area treated by the BMP, the design storage volume of the BMP and the estimated phosphorus removed in pass per year by the BMP is found in the following document or website and is updated yearly at a minimum:

N/A

Requirements Due by Year 2

Stormwater Management in New Development and Redevelopment

The requirement for adoption/amendment of the permittee's ordinance or other regulatory mechanism shall include a requirement that new development and redevelopment stormwater management BMPs be optimized for phosphorus removal

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Requirements Due by Year 4

Complete a Phosphorus Source Identification Report

The document name (if attached) and/or web address is/are:

N/A

Stormwater Management in New Development and Redevelopment

Retrofit inventory and priority ranking under 2.3.6.1.b. shall include consideration of BMPs that infiltrate stormwater where feasible

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Requirements Due by Year 5

Potential Structural BMPs

Evaluate all permittee-owned properties identified as presenting retrofit opportunities or areas for structural BMP installation under Permit part 2.3.6.d.ii or identified in the Phosphorus Source Identification Report that are within the drainage area of the impaired water or its tributaries

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Complete a listing of planned structural BMPs and a plan and schedule for implementation

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Charles River Watershed Phosphorus TMDL

PCP Phase	Document Location
I (completed by year 5)	
II (completed by year 10)	
III (completed by year 15)	

Lake and Pond Phosphorus TMDL

Begin Phase 1 of the Lake Phosphorus Control Plan during year 1 and complete by year 5.

Applicable Receiving Waterbody(ies)	PCP Complete	Document Location	Add/Delete Row
N/A	☐		+ -

APPENDIX A
Illicit Discharge Detection & Elimination Program

ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDDE) PROGRAM PLAN TOWN OF SWAMPSCOTT, MASSACHUSETTS

JUNE 2023

A Report Prepared for:

Town of Swampscott, Massachusetts
22 Monument Avenue
Swampscott, MA 01907

ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDDE) PROGRAM PLAN

Prepared by:

_____
Portia Freeman, Professional

Reviewed by:

_____
Adria Fichter
Senior Professional

KLEINFELDER
One Beacon Street, Suite 8100
Boston, MA 02108

June 2023
Kleinfelder Project No.: 24000511.001A

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DEFINITIONS

Best Management Practice (BMP): An activity, procedure, restraint, or structural improvement that helps to reduce the quantity or improve the quality of stormwater runoff.

Catch basin: A chamber or well, usually built to the curb line of a street that allows surface water to discharge into a storm water drain.

Clean Water Act: The Federal Water Pollution Control Act (33 U.S.C. § 1251 *et seq*.) as hereafter amended.

Discharge of Pollutants: The addition of any pollutant or combination of pollutants into the municipal storm drain system or into the waters of the United States or Commonwealth from any source.

Groundwater: Water beneath the surface of the ground including water in soil and bedrock beneath water bodies

Illicit Connection: A surface or subsurface drain or conveyance, which allows an illicit discharge into the municipal storm drain system, including without limitation sewage, process wastewater, or wash water and any connections from indoor drains, sinks, or toilets, regardless of whether said connection was previously allowed, permitted, or approved before the effective date of bylaws enacted to prohibit such discharges.

Illicit Discharge: Direct or indirect discharge to the municipal storm drain system that is not composed entirely of stormwater, except as exempted by the EPA's Phase II regulations.

Interconnection: The point (excluding sheet flow over impervious surfaces) where the permittee's MS4 discharges to another MS4 or other storm sewer system, through which the discharge is conveyed to waters of the United States or to another storm sewer system and eventually to a water of the United States.

Manhole: Sewer system structure typically made from brick, concrete block, or monolithic concrete sections. Manholes have solid covers that do not accept runoff like a catch basin. Manholes within a storm sewer system are installed typically at bends in pipe runs, every 300 feet to 400 feet within a storm sewer pipe run, intersections of two or more pipe runs, and at the ends of pipe runs. Manholes allow for the cleaning and inspection of storm sewer systems. Manholes are typically 'fed' stormwater by catch basins and upstream storm sewer pipes.

Junction Manhole: Per the MS4 Permit, a 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.

Municipal Separate Storm Sewer System (MS4): The system of conveyances designed or used for collecting or conveying stormwater, including any road with a drainage system, street, gutter, curb, inlet, piped storm drain, pumping facility, retention or detention basin, natural or man-made or altered drainage channel, reservoir, and other drainage structure that together comprise the storm drainage system owned or operated by the Town of Swampscott.

National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit: A permit issued by United States Environmental Protection Agency or jointly with the Commonwealth of Massachusetts that authorizes the discharge of pollutants to waters of the United States.

Non-Stormwater Discharge: Discharge to the municipal storm drain system not composed entirely of stormwater.

Outfall: A point source where a municipal separate storm sewer discharges to waters of the United States**.**

Point-source means a discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, (also bridge drains); this term does not include return flows from irrigated agriculture or agricultural storm water runoff.

Pollutant: Any element or property of sewage, agricultural, industrial or commercial waste, runoff, leachate, heated effluent, or other matter whether originating at a point or nonpoint source, that is or may be introduced into any sewage treatment works or waters of the Commonwealth. Pollutants shall include without limitation:

(1) paints, varnishes, and solvents;
(2) oil and other automotive fluids;
(3) non-hazardous liquid and solid wastes and yard wastes;
(4) refuse, rubbish, garbage, litter, or other discarded or abandoned objects, accumulations and floatables;
(5) pesticides, herbicides, and fertilizers;
(6) hazardous materials and wastes; sewage, fecal coliform and pathogens;
(7) dissolved and particulate metals;
(8) animal wastes;
(9) rock; sand; salt, soils;
(10) construction wastes and residues;
(11) and noxious or offensive matter of any kind.

Stormwater: Runoff from precipitation or snow melt.

Wastewater: Any sanitary waste, sludge, or septic tank or cesspool overflow, and water that during manufacturing, cleaning or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct or waste product.

Storm sewer: A sewer that carries only surface runoff, street wash, and snow melt from the land. In a separate sewer system, storm sewers are separate from those that carry domestic and commercial wastewater (sanitary sewers).

ACRONYMS

BMP – Best Management Practice

USEPA – United States Environmental Protection Agency

GIS – Geographic Information System

GPS – Global Positioning System

IDDE – Illicit Discharge Detection and Elimination

MassDEP – Massachusetts Department of Environmental Protection

MassDOT – Massachusetts Department of Transportation

MS4 – Municipal Separate Storm Sewer System

NOI – Notice of Intent

NPDES – National Pollutant Discharge Elimination System

SWMP – Storm Water Management Plan

ILLICIT DISCHARGE DETECTION AND ELIMINATION PROGRAM
TOWN OF SWAMPSCOTT, MASSACHUSETTS

1 PERMIT BACKGROUND

This Illicit Discharge Detection and Elimination (IDDE) Plan was developed by the Town of Swampscott to address the requirements of the United States Environmental Protection Agency's (USEPA's) 2016 National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) in Massachusetts, hereafter referred to as the "2016 Massachusetts MS4 Permit" or "MS4 Permit."

The 2016 Massachusetts MS4 Permit requires that each permittee, or regulated community, address six Minimum Control Measures. These measures include the following:

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination Program
4. Construction Site Stormwater Runoff Control
5. Stormwater Management in New Development and Redevelopment (Post Construction Stormwater Management); and
6. Good Housekeeping and Pollution Prevention for Permittee Owned Operations.

Under Minimum Control Measure 3, the permittee is required to implement an IDDE program to systematically find and eliminate sources of non-stormwater discharges to its municipal separate storm sewer system and implement procedures to prevent such discharges. The IDDE program must also be recorded in a written (hardcopy or electronic) document. This IDDE Plan has been prepared to address this requirement.

1.1 ILLICIT DISCHARGES

According to the Permit, “An illicit discharge is any discharge to a municipal separate storm sewer that is not composed entirely of stormwater, except discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the municipal separate storm sewer) and discharges resulting from firefighting activities.” Additional descriptions of allowable discharges are in Section 1.2. Common illicit discharges include sanitary wastewater from crushed or collapsed pipes or from surcharges, overflow from septic tanks, vehicle wash wastewater, and improper disposal of automobile and household products.

Illicit discharges can enter the system in many ways: through direct or indirect connections, one-time dumping, system failures, or illegal connections. These connections may not always be obvious and could be continuous, periodic, or irregular. Regardless of the source, the permit requires immediate elimination of these discharges once they are identified due to the potential for these discharges to contribute high levels of pollutants, such as heavy metals, toxics, oil, grease, solvents, and pathogens to surface waters in Swampscott.

1.2 ALLOWABLE NON-STORMWATER DISCHARGES

The following categories of allowable non-stormwater discharges under the MS4 permit include:

- Water line flushing
- Landscape irrigation
- Diverted stream flows
- Rising ground water
- Uncontaminated ground water infiltration
- Uncontaminated pumped groundwater
- Discharge from potable water sources
- Foundation drains
- Air conditioning condensation
- Irrigation water, springs
- Water from crawl space pumps
- Footing drains
- Lawn watering
- Individual resident car washing
- De-chlorinated swimming pool discharges
- Street wash waters
- Residential building wash waters without detergents

If the permittee, EPA, or the Massachusetts Department of Environmental Protection (MassDEP) determines that any of the above sources are significant contributors of pollutants to the MS4, the discharge will no longer be allowed and will be considered and treated as an illicit discharge.

1.3 WATER QUALITY CONCERNS

Table 1 lists all waterbodies, including the "impaired waters" within the boundaries of Swampscott's regulated area based on the 2018/2020 Massachusetts Integrated List of Waters which is finalized and issued by MassDEP. This is the current approved list as of June 2023. Impaired waters are water bodies that do not meet water quality standards for one or more designated use(s) such as recreation or aquatic habitat. One waterbody, Nahant Bay (MA 93-24), has bacteria/pathogen impairments, which means that outfalls discharging here will automatically be ranked as a High Priority as discussed in Section 5.

Table 1: Impaired Waters in the Town of Swampscott

Category 5* Water Bodies		
Water Body	**ID**	**Impairment**
Foster Pond	MA93026	• DDT in Fish Tissue
Nahant Bay	MA93-24	• Enterococcus • Fecal Coliform
Category 5*: Water bodies that are impaired by at least one pollutant and require a TMDL to restore the water quality.		

1.4 IDDE PROGRAM GOALS, FRAMEWORK, AND TIMELINE

The goals of the IDDE program are to find and eliminate illicit discharges to the municipal separate storm sewer system and to prevent illicit discharges from happening in the future. The program consists of the following major components as outlined in the MS4 Permit:

- Legal authority and regulatory mechanism to prohibit illicit discharges and enforce this prohibition
- Storm system mapping
- Inventory and ranking of outfalls
- Dry weather outfall screening
- Catchment investigations
- Identification/confirmation of illicit sources
- Illicit discharge removal
- Follow-up screening
- Employee training

The required timeline for implementing the IDDE program and investigation procedure framework are shown in **Appendix A**.

1.5 WORK COMPLETED TO DATE

The 2003 MS4 Permit required each MS4 community to develop a plan to detect illicit discharges using a combination of storm system mapping, adoption, and enforcement of a regulatory mechanism to prohibit illicit discharges, and identification of tools and methods to investigate suspected illicit discharges. Each MS4 community was also required to define how confirmed discharges would be eliminated and how the removal would be documented. Swampscott has, since the 2003 Permit, completed extensive IDDE work following an EPA Consent Decree issued in 2015.

1.5.1 Consent Decree: IDDE Work

The Town has conducted IDDE work related to the Consent Decree since 2016. The initial work included the dry and wet weather water quality sampling of all outfalls in the Town's MS4 per paragraphs 14 and 15 of the Consent Decree (with analytes including Escherichia coli (E. coli) bacteria, enterococcus bacteria, surfactants, ammonia, and residual chlorine). The dry and wet weather outfall water quality testing identified the drainage catchments that exhibited the highest degree of water quality impairment. Kleinfelder, the Town, and the EPA agreed to utilize enterococci thresholds of 2,000 Most Probable Number (MPN)/100 mL and 5,000 MPN/100 mL for dry and wet weather samples, respectively, to prioritize subsequent IDDE work. The results of the wet weather and dry weather outfall testing reaffirmed prioritizing IDDE and infrastructure improvements within the Stacey's Brook catchment ("the Project Area"), as required by paragraph 17 of the Consent Decree.

The first task in the Stacey's Brook IDDE Program consisted of dry and wet water quality testing of the drain manholes at key junction points of drainage branches throughout Stacey's Brook drainage system. The intent of testing these selected drain manholes was to better isolate and target potential non-storm water discharged into the drainage system and to create Project Sub-Areas. A total of forty (40) drain manholes were selected for this task (see **Appendix B** – Stacey's Brook IDDE Program, IDDE Sampling Map).

The results of the water quality testing at the forty (40) manholes identified eight (8) sub-areas in the Project Area to include in the Phase 1 Project Area, including sub-areas 1, 2, 4, 6, 7, 8, 10, and 21. See **Appendix C** – Stacey's Brook IDDE, Phase 1 Project Areas. IDDE within sub-areas downgradient to the subareas selected for the Phase 1 Project Area may be performed at a future date. However, the current focus is on the subareas with the greatest bacteria concentrations first. Further, addressing the upgradient subareas first may yield sufficient downgradient water quality improvements.

The IDDE work specific to Stacey's Brook Phase 1 Project Area included underdrain system visual inspections and dye testing, sanitary sewer and underdrain manhole inspections, sanitary sewer Closed-Circuit Television (CCTV) inspections, and smoke testing of the drainage system and building inspections. The purpose of the IDDE field program was to narrow down the potential areas where non-stormwater discharges to the MS4 may be occurring and inform subsequent preliminary and final design for comprehensive sewer rehabilitation in the Phase 1 Project Area. The IDDE work associated with the

Phase 1 Project Area did not identify any explicit point sources of non-stormwater illicit discharges to the drainage system. Instead, the IDDE work led to the hypothesis that the wastewater is exfiltrating from the sewer collection system and infiltrating into the drainage system. **Table 2** below provides the quantities associated with the IDDE work in the Phase 1 Project Area.

Table 2: Summary of Consent Decree IDDE Tasks

Task	Quantity
Underdrain Manhole Inspections	33 Manholes
Underdrain Dye Testing	9,000 Linear Feet
Sewer Collection System CCTV	40,500 Linear Feet
Sewer Collection System Manhole Inspections	263 Manholes
Drainage System Smoke Testing	21,000 Linear Feet
Building Inspection/Dye Testing	13 Buildings

In addition, in 2019, the Town completed IDDE work in areas outside of Stacey's Brook per paragraph 19 of the Consent Decree. The scope of work is similar in nature to the IDDE work completed in 2016 under paragraph 17 of the Consent Decree. The project areas were prioritized and selected based on the following criteria:

1. Stormwater catchments where dry and wet weather town wide outfall water quality testing from 2016, yielded enterococci thresholds of 2,000 MPN/100mL and 5,000 MPN/100mL for dry and wet weather samples, respectively;
2. Stormwater catchments of relatively larger scale within Swampscott;
3. And stormwater catchments tributary to public beaches.

Based on the project area criteria, the following scope was developed across four project areas:

- Wet weather and dry weather water quality testing for up to four (4) outfalls and four (4) manholes;
- Targeted manhole inspections and dry weather testing at up to six (6) manholes;
- Smoke testing of up to 9,000 linear feet of the drain pipeline;
- Building inspections and dye testing at properties with positive results from smoke testing or other locations suspected of having illicit connections to the drainage system based on field investigations; and,
- CCTV inspection of up to 10,000 linear feet of the sewer pipelines in the project areas if point sources are not identified by water quality testing, smoke testing and building inspections.

The results of the IDDE work in areas outside of Stacey's Brook were compiled into a preliminary design report and submitted to the EPA prior to the subsequent final design for infrastructure improvements necessary to prevent flows other than stormwater from contributing discharges to stormwater outfalls draining areas in Swampscott outside of Stacey's Brook.

2 IDDE RESPONSIBILITIES

2.1 LEGAL AUTHORITY

The Town of Swampscott adopted a Bylaw to define and eliminate illicit discharges. A copy of the Bylaw is provided in **Appendix D**. Article XVIII specifically addresses illicit discharges, with the following goals:

- To prevent pollutants from entering the Town's municipal separate storm sewer system;
- To prohibit illicit connections and unauthorized discharges to the municipal separate storm sewer system;
- To require the removal of all such illicit connections;
- To comply with State and Federal statutes and regulations relating to stormwater discharges; and
- To establish the legal authority to ensure compliance with the provisions of this Bylaw through inspection, monitoring, and enforcement.

The Bylaw defines the following terms:

Discharge of Pollutants: The addition from any source of any pollutant or combination of pollutants into the municipal storm drain system or into waters of the United States or Commonwealth from any source.

Illicit Connection: A surface or subsurface drain or conveyance, which allows an illicit discharge into the municipal storm drain system, including without limitation sewage, process wastewater, or wash water and any connections from indoor drains, sinks, or toilets, regardless of whether said connection was previously allowed or approved before the effective date of this Bylaw.

Illicit Discharge: Direct or indirect discharge to the municipal storm drain system that is not composed entirely of stormwater, except as exempted in Section 8. The term does not include a discharge in compliance with an NPDES Storm Water Discharge Permit or a Surface Water Discharge Permit, or resulting from firefighting activities exempted pursuant to Section 8, Subsection (a) of this Bylaw.

The current Bylaw is in compliance with the requirements of the MS4 Permit.

2.2 RESPONSIBLE TEAMS

The Department of Public Works (DPW) is the lead agency in charge of implementing the IDDE program as stated here and in the stormwater bylaw included in **Appendix D**. The DPW will be responsible for administering all aspects of the IDDE program and will ask for input from other departments.

2.3 COORDINATION EFFORTS

The Stormwater Management Program Team, as described in the Stormwater Management Plan, coordinates the Town-wide efforts for adherence to the permit. The DPW employees are appropriately trained to complete field inspection including dry weather screening and sampling and catchment investigations. Other Town departments such as the Board of Health and the Building Department assist with providing relevant records. If there is a need for enforcement action, the DPW will work directly with the Select Board.

3 STORMWATER MAPPING

3.1 MAPPING UPDATES

The Town of Swampscott originally developed mapping of its stormwater system to meet the mapping requirements of the 2003 MS4 Permit. Through their Consent Decree, and the requirements of this MS4 Permit, the Town has further developed its GIS mapping of the MS4 system. Annually, the Town submits its map updates as a part of the Consent Decree reporting process. Some of the specific updates the Town has made that are relevant to the MS4 Permit include:

- Drain and sewer manholes
- Municipal interconnections
- Waterbodies
- Catch basins
- Outfalls

As the Town inspects its MS4 system in compliance with the Consent Decree and this Permit, the resulting findings are updated into the GIS maps that are submitted annually to the EPA. A map of the Town's stormwater system can be found in **Appendix E**.

The 2016 MS4 Permit requires the storm sewer system map to be updated in two phases as outlined below. The Town of Swampscott will report on the progress towards completion of the storm sewer system map in each Annual Report.

3.2 IDDE MAPPING REQUIREMENTS: PHASE I

Phase I of the mapping was completed within two (2) years of the permit's effective date and includes outfalls and interconnections, open channel conveyances (swales, culverts, etc.), receiving water bodies, catchment delineations, and other municipally owned stormwater treatment structures.

3.3 IDDE MAPPING REQUIREMENTS: PHASE II

Phase II mapping must be completed within ten years of the effective date of the permit (July 1, 2028) and include the following information:

- Outfall spatial location (accuracy of +/-30 feet)
- Pipes
- Manholes
- Catch basins
- Refined catchment delineations. Catchment delineations shall be updated to reflect information collected during catchment investigations

3.4 MAPPING NEXT STEPS

The Town will continue to collect GIS data to comply with the Permit mapping requirements, in conjunction with the requirements of the Consent Decree. Since the Town already has a robust outfall inspection and sampling program, many of the elements required for the Phase I Map are already complete.

As fieldwork efforts progress in Permit Year 6, the 2021 MS4 Map will be updated to confirm location and connectivity of thirteen (13) outfalls that were unable to be located in the field.

4 ASSESSMENT AND RANKING OF OUTFALLS AND INTERCONNECTIONS

The IDDE Methodology in the 2016 MS4 Permit describes the methods required for categorizing and further prioritizing outfalls for investigation and elimination of any illicit discharges. First, the outfalls must be designated as either Problem, High Priority, Low Priority, or Excluded outfalls (each described further below). This determines the priority for screening each outfall. Next, all the outfalls (except Excluded outfalls) must be further ranked within the respective categories based any of the following available information, as dictated by Section 2.3.4.7.a.iii. of the Permit:

- Past discharge complaints and reports
- Poor receiving water quality
- Density of generating sites
- Age of development and infrastructure
- Sewer conversion
- Historic combined sewer systems
- Surrounding density of aging septic systems
- Culverted streams
- 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.

4.1 CLASSIFICATION AND RANKING OF OUTFALLS

The Town completed an initial outfall and interconnection priority ranking inventory and map to assess illicit discharge potential based on existing sampling information from the Consent Decree work in **Appendix F**. 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.

The Town of Swampscott has identified 61 outfalls that must be ranked by illicit discharge risk level. Originally the Town reported that they had 73 outfalls, but through field investigations, they determined that there are currently 61 MS4 outfalls due to misidentification of 12 outfalls. An overview of the ranking as described by the Permit is included in **Table 3**.

Table 3: Overview of Outfall Categorization

Category	Description	Quantity of Outfalls in Category
PROBLEM	Known or suspected illicit discharge. This designation is given to any outfall where non-stormwater discharge is suspected from the dry weather inspections (or prior reports).	None
HIGH	High potential for illicit discharge / High priority for investigation.	25
LOW	Low potential for illicit discharge / Low priority for investigation.	36
EXCLUDED	No potential for illicit discharge / No needed investigation.	None

4.1.1 Problem Outfalls

Problem outfalls are determined based on currently available outfall information and institutional knowledge about the existence of an illicit discharge. As described by Section 2.3.4.7.a.ii of the MS4 Permit, Problem outfall indicators include:

- 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.

All Problem outfalls represent an illicit discharge which must be immediately eliminated. The screening process to confirm an illicit discharge is included in Section 6. If a discharge cannot be eliminated within 60 days, the Town of Swampscott is required to establish an elimination schedule, as well as record the progress in its Annual Reports. Dry weather screening and sampling, as described in Section 6 of this IDDE Plan, and Part 2.3.4.7.b of the MS4 Permit, is not required for Problem Outfalls. Swampscott currently has no Problem outfall(s).

4.1.2 High Priority Outfalls

There are currently 25 High Priority outfalls in the Town of Swampscott. Outfalls that drain to impaired waterbodies, are near public recreational areas, or are in close proximity to drinking water wells are considered to have a high priority in the IDDE ranking. Additionally, areas in and around Stacey's Brook have been designated as High Priority based on the Town's Consent Decree. This means that these outfalls have a higher likelihood of contributing an illicit discharge. Twenty-two (22) High priority

outfalls were screened and three (3) additional high priority outfalls were visited but require additional field investigations and desktop connectivity review because field crews were unable to locate them previously. Screening of these three (3) outfalls is scheduled for 2023 during Permit Year 6.

4.1.3 Low Priority Outfalls

Low priority outfalls are the remaining outfalls with a chance for illicit discharge, but that are not classified as High or Problem outfalls based on the available data. There are currently 36 Low Priority outfalls in the Town. These will be scored along with the High Priority outfalls to prioritize the screening and sampling process. As with the High Priority outfalls, Low Priority outfalls must also be screened within the first three years of the permit effective date. Twenty-six (26) low priority outfalls were screened, and ten (10) low priority outfalls were visited but require additional field investigations and desktop connectivity review because field crews were unable to locate them previously. Screening of these ten (10) outfalls is scheduled for 2023 during Permit Year 6.

4.1.4 Excluded Outfalls

Any outfall with no potential for illicit discharge is considered an Excluded outfall and does not need to be considered as a part of the IDDE Plan. This category includes outfalls leading to roadway drainage in undeveloped areas, athletic field drainage, undeveloped green space or parking without services, or alignments through undeveloped land. Swampscott has no Excluded outfalls.

4.2 OUTFALL PRIORITIZATION METHODOLOGY

Swampscott, due to the work with the existing Consent Decree, has collected significant sampling data at all the MS4 outfalls. Since this data was readily available, it provided the basis of the outfall priority ranking. Specifically, the parameters used for the ranking include:

- Ammonia levels, dry and wet weather screening results
- Surfactant levels, dry and wet weather screening results
- Chlorine levels, dry and wet weather screening results
- Enterococci levels, dry and wet weather screening results
- Poor receiving water body (outfalls discharging to an impaired waterbody)
- Outfalls discharging to beaches

Values were assigned to the outfalls for each of the characteristics above using existing available data. In order to combine all these parameters to priority rank the outfalls, the Town used a “Preference-Based” ranking tool, which compares the outfalls against each other across all the scoring categories listed above. Outfalls with higher sampling levels rose to the top of the priority ranking using this tool, while outfalls with no adverse sampling results fall to the bottom. The results of this priority ranking, organized by Problem, High, and Low categories, are included in **Appendix F**. A map of the initial outfall priority rankings is also included in **Appendix F**.

4.3 SUMMARY

Further field investigation is needed to access most of the remaining outfalls not screened thus far due to inaccessibility and/or issues with locating. The completed outfall screenings have reprioritized the initial outfall rankings with updated data from the screenings, based on the prioritization methodology outlined in Section 4.2, which is included in **Appendix E.** The initial prioritization results are included as an inventory and a map in **Appendix F.** The Town's plan is to proceed with catchment investigations as per Section 7 of this report. As part of catchment investigations, they will perform verification of connectivity for the thirteen (13) remaining outfalls.

5 SANITARY SEWER OVERFLOWS (SSO)

The 2016 MS4 Permit requires municipalities to prohibit illicit discharges, including sanitary sewer overflows (SSOs), to the separate storm sewer system. SSOs are discharges of untreated sanitary wastewater from a municipal sanitary sewer that can contaminate surface waters, cause serious water quality problems and property damage, and threaten public health. SSOs can be caused by blockages, line breaks, sewer defects that allow stormwater and groundwater to overload the system, power failures, improper sewer design, and vandalism.

The Town of Swampscott completed an inventory of SSOs that have discharged to the MS4 within the five (5) years prior to the effective date of the 2016 MS4 Permit, based on review of available documentation pertaining to SSOs (**Table 4**). The inventory includes all SSOs that occurred during wet or dry weather resulting from inadequate conveyance capacities or where interconnectivity of the storm and sanitary sewer infrastructure allows for transfer of flow between systems.

As required by the 2016 Permit, in the event of an overflow or bypass, Town of Swampscott will eliminate it as expeditiously as possible and take interim measures to minimize the discharge of pollutants to and from its MS4 until the SSO is eliminated. The Town will also formally notify MassDEP, USEPA, and other relevant parties, within 24 hours by phone and follow up with a written report according to MassDEP's SSO/Bypass notification form within five (5) calendar days of the time the Town becomes aware of the overflow, bypass, or backup.

Northeast Region MassDEP Contact
(978) 694-3215
205B Lowell Street
Wilmington, MA 01887
24-hour Emergency Line: (888) 304-1133

New England USEPA Contact
(617) 918-1510
5 Post Office Square
Boston, MA 02109

Beyond the MS4 reporting requirements, the Town is also required to comply with newly issued 314 CMR 16 that specifies how and when the public must be notified of SSOs.

The inventory in **Table 4** will be updated by the DPW when new SSOs are detected. The SSO inventory will be included in the Annual Report, including the status of mitigation and corrective measures to address each identified SSO.

Table 4: Sanitary Sewer Overflows (SSO) Inventory

SSO Location[1]	Discharge Statement[2]	Date[3]	Time Start[3]	Time End[3]	Estimated Volume[4]	Description[5]	Mitigation Completed[6]	Mitigation Planned[7]
Intersection of Ocean Ave and Shepard Ave	SSO discharge to ground surface; no discharge to MS4 or surface waters.	12/9/2014-12/10/2014	8:00pm	9:00am	50-100 gallons	Wet weather rain event caused SSO.	Street was power-washed, with both SSO and wash water directed back into manhole.	n/a; cleaned on-site
Intersection of Monument Ave and Burrill Street	SSO discharge to MS4 catch basin.	7/3/2015	7:00pm	8:30pm	5 gallons	Sewer system blockage was reported.	Sewer jetter truck cleared obstruction (assumed to be a grease buildup).	n/a; obstruction removed on-site
10 Hillcrest Circle	No discharge to surface waters observed.	10/16/15-2/10/16	-	-	Not quantified	Collapsed building service.	Pipe repair completed by Public Works Department.	n/a; point repair was completed.
70 Galloupes Point Road	SSO discharge direct to Atlantic Ocean.	11/23/2015	2:00pm	8:00pm	50 gallons	A small hole was discovered in the bottom of a 4-inch force main.	The Public Works crew made the repair.	n/a; repaired on-site
16 Reid Terrace	SSO discharge direct to Atlantic Ocean.	2/27/2016	2:00pm	6:00pm	20 gallons	Blockage in private owned sewer.	Town dislodged small blockage in manhole and told homeowner to have service cleaned.	n/a; pipe is not owned by Town.

SSO Location[1]	Discharge Statement[2]	Date[3]	Time Start[3]	Time End[3]	Estimated Volume[4]	Description[5]	Mitigation Completed[6]	Mitigation Planned[7]
14 Devens Road	No discharge to surface waters; vacuum truck was immediately hired to pump/bypass flows to next manhole until repair completed.	6/6/2018	3:00pm	5:00pm	50-100 gallons	Collapsed pipe.	Pipe repairs were made by contractor.	n/a; repaired on-site
Intersection of Superior Street and Duncan Terrace	No discharge to surface waters observed.	8/10/2019 – 8/11/2019	11:30am	1:30pm	50 gallons	Blockage in Town side of sewer.	Town jetted main and washed the street.	None required, as a point repair was completed.
35 Atlantic Ave - rear	No discharge to surface waters observed.	9/23/2019	2:30pm	5:00pm	10 gallons	Blockage in Town side of sewer.	Town contractor jetted line and cut roots from interior of pipe.	Will be re-lined.
Manhole in front of 10 and 12 Puritan Lane	No discharge to surface waters observed.	2/19/2020	1:30pm	2:30pm	50 gallons	Blockage in Town side of sewer.	Town jetted main and washed the street.	Construct manhole downstream where this run connects perpendicular to the main.
Manhole in property at 44-66 Humphrey St	SSO discharge to ground surface and catch basin to Atlantic Ocean.	3/17/2021 – 3/18/2021	2:00pm	1:30pm	200 gallons	Blockage in Private side of sewer.	Town tried to divert flow to remain in private driveway and washed public way again after SSO stopped.	None required.

SSO Location[1]	Discharge Statement[2]	Date[3]	Time Start[3]	Time End[3]	Estimated Volume[4]	Description[5]	Mitigation Completed[6]	Mitigation Planned[7]
Intersection of Ocean Ave and Shepard Ave	Discharged to Palmer Pond	9/2/2021	8:00am	1:00pm	1600 gallons	Overflow from sanitary sewer manhole in street; rain event	Closed off impacted area with sawhorses. Disinfected and pressure washed street.	None required.
116 Windsor Avenue	Discharged to Fosters Pond (DDT impairment)	9/2/2021	12:00pm	8:00pm	500 gallons	Pump station failure led to SSO discharge; rain event	Called in Town's lift station O/M contractor to investigate issue. Disinfected and pressure washed the street.	None required.
22 Roy Street	Discharge to King's Beach/Stacey's Brook	5/29/2022	6:00pm	8:00pm	300 gallons	Overflow from sanitary sewer manhole in street	Public Works staff removed sewer blockage	None required.
9 Roy Street	Discharge to King's Beach/Stacey's Brook	10/14/2022 – 10/15/2022	10:00pm	12:00am	100 gallons	Sewer blockage caused backup into private property	Closed off impacted area with sawhorses. Disinfected and pressure washed the street.	None required.

[1] Location (approximate street crossing/address and receiving water, if any)
[2] A clear statement of whether the discharge entered a surface water directly or entered the MS4
[3] Date(s) and time(s) of each known SSO occurrence (i.e., beginning and end of any known discharge)
[4] Estimated volume(s) of the occurrence
[5] Description of the occurrence indicating known or suspected cause(s)
[6] Mitigation and corrective measures completed with dates implemented
[7] Mitigation and corrective measures planned with implementation schedules

6 DRY WEATHER SCREENING AND SAMPLING

According to the 2015 Consent Decree, all accessible outfalls and interconnections (except for Problem and Excluded Outfalls, as well as Stacey's Brook outfalls) needed to be inspected for the presence of dry weather flow by June 30, 2016. Using the outfall ranking discussed in Section 5, and working from High to Low priority, the Town screened all High and Low priority outfalls that were accessible by June 2021. The presence of dry weather flow can be a strong indicator of an illicit connection, and this screening is a logical starting point for identifying potential areas of concern.

6.1 APPROPRIATE WEATHER CONDITIONS

Dry weather outfall screening and sampling should occur when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period and no significant snow melt is occurring. For purposes of determining dry weather conditions, program staff will use precipitation data from the closest National Weather Service Station, which is located at Olmsted Historic District in Swampscott, MA (KMASWAMP9). If Olmsted Historic District is not available or not reporting current weather data, the Town will use The Compound in Swampscott, MA (KMASWAMP10) as a backup.

6.2 SCREENING REQUIREMENTS

The dry weather outfall inspection and sampling procedure consists of the following general steps:

1. Identify outfall(s) to be screened/sampled based on initial outfall inventory and priority ranking.
2. Acquire the necessary staff, maps, charged iPad and field equipment.
3. Conduct the outfall inspection during dry weather:
    a. Mark and photograph the outfall.
    b. Record the inspection information and outfall characteristics in the inspection form shown in **Appendix G**.
    c. Look for and record visual/olfactory evidence of pollutants in flowing outfalls including odor, color, turbidity, and floatable matter (suds, bubbles, excrement, toilet paper or sanitary products). Also observe outfalls for deposits and stains, vegetation, and damage to outfall structures.
4. If flow is observed, sample and test in accordance with the procedures described in the following sections and **Appendix G**. At a minimum, the flow will be sampled and tested for the following minimum parameters:
    - Temperature
    - Surfactants
    - Conductivity
    - Ammonia
    - Turbidity

- Chlorine
- E. Coli

If the discharge is directly into an impaired water (see **Table 1**), then the flow must also be tested for the pollutants identified as causing the impairment for that water body (e.g., metals, nitrogen, phosphorus, oil and grease, etc.)[1].

5. If no flow is observed, but evidence of illicit flow exists (illicit discharges are often intermittent or transitory), revisit the outfall during dry weather within one week of the initial observation, if practicable, to perform a second dry weather screening and sample any observed flow. Other techniques can be used to detect intermittent or transitory flows including conducting inspections during evenings or weekends and using optical brighteners.
6. Input results from screening and sampling into spreadsheet/database. Include pertinent information in the outfall/interconnection inventory and priority ranking.
7. Include all screening data in the Annual Report.

Dry weather flow is a strong indicator of illicit discharges, but it is not the only physical sign of potential illicit connections. Taking careful note of the conditions around the outfall is critical to finding non-stormwater discharges. Illicit discharges can be intermittent or sporadic. Other indicators of past flow may be present even if there is no active dry weather flow at the time of the field visit. **Table 5** is still a helpful reminder for understanding confusing field observations. This table, originally adapted from Pitt et al. 1993, was modified for the Town's use in 2019.

Table 5: Outfall Observations and Possible Sources

Parameter	Observations	Possible Reason/Source
Odor	Sewage	Stale sanitary wastewater, especially pooled near outfall
	Sulfur (rotten eggs)	Industries discharge sulfide components or organics (meat packers, canneries, dairies, etc.). Also could be petroleum related "high-sulfur" fuels.
	Rancid-sour	Food preparation facilities (restaurants, hotels, etc.)
	Oil and gas	Petroleum refineries or many facilities associated with vehicle maintenance or petroleum product storage
	Chlorine	Residential pool, or drinking water, likely not recurrent
Color	Yellow	Chemical plants, textile and tanning plants
	Brown	Meat packers, printing plants, metal works, stone and concrete, fertilizers, and petroleum refining facilities.

[1] *Where the discharge is directly into a water quality limited water or a water subject to an approved TMDL, the sample must be analyzed for the pollutant(s) of concern identified as the cause of the water quality impairment.*

Parameter	Observations	Possible Reason/Source
	Green	Chemical plants, textile facilities
	Red	Metal packers, metal works
	Gray	Dairies, and sewage
Turbidity	Cloudy	Sanitary wastewater, concrete or stone operations, fertilizer facilities, and automotive dealers
	Opaque	Food processors, lumber mills, metal operations, pigment plants
Floatable Matter	Oil sheen, grease	Petroleum refineries or storage facilities and vehicle service facilities, and restaurants
	Sewage	Sanitary wastewater
	Soap/bubbles	Sanitary wastewater
Deposits and Stains	Sediment	Construction site erosion
	Oily	Sanitary wastewater
Vegetation	Excessive Growth	Food product facilities, fertilizers, farming agricultural use.
	Inhibited growth, stressed vegetation	High stormwater flows, beverage facilities, printing plants, metal product facilities, drug manufacturing, petroleum facilities, vehicle service facilities and automobile dealers
Damage to Outfall Structures	Concrete cracking	Industrial flows, chemicals
	Concrete spalling	
	Peeling paint	
	Metal corrosion	

6.3 FIELD EQUIPMENT

During outfall field screenings, the Town may encounter a multitude of conditions or obstacles. In preparation for these possibilities, the field equipment in **Table 6** will be used.

Table 6: Field Equipment List

Category	Item	Note
Recordkeeping	Clipboard/Tablet	Recording screening results
	Inspection Sheets/Procedures	For inspection and sampling results
	Chain of Custody Forms	For laboratory submittal
	Pencils/Permanent Markers	For screening results, field notes, COCs, and sample labels
	Camera	For documenting current outfall condition
PPE/Field Gear	Reflective Vest	Safety and Visibility
	Nitrile Gloves and Work Gloves	Safety while working with sampling jars, and environmental conditions
	Safety glasses	
	Safety Boots and Rubber boots	Safety working on uneven surfaces and entering shallow water
	Long pants/sleeves	

Category	Item	Note
	Insect/plant Repellant and Sunscreen	Protection from environmental conditions such as brush, insects, and poisonous plants
	Hand Sanitizer	Decontamination in the field
Outfall Screening Tools	Tape Measure	Measuring the outfall, distances, and depth of flow
	Flashlight with batteries	For looking in outfalls, manholes, and catch basins
	GPS Receiver	Recording location of outfalls and other infrastructure
	Cones	Safety around screening site if adjacent to road way
	Pry Bar, Pick, Shovel	For opening manholes or catch basins
	Hammer	
	Utility Knife	Miscellaneous field requirements
	Machete/Clippers	Accessing overgrown infrastructure
Sampling	Cooler with Ice	Laboratory sample submittals
	Field Test Kits	Field screening of samples
	Rinse Water/Calibration standards	Cleaning equipment and calibration
	Sample Jar Labels	Proper sample recording
	Sample containers	Laboratory sampling
	Water Quality Meters	Field analysis
	Sand bags	For sampling if there is low-flow

It is possible that during outfall screening, the Town may visit outfalls that need maintenance or pose impending problems for the Town. Although not a part of the IDDE, this information will be communicated to the DPW for repair purposes.

6.4 SAMPLE COLLECTION AND ANALYSIS

If flow is present during a dry weather outfall inspection, a sample will be collected and analyzed for the minimum parameters and pollutants of concern[2]. All analyses except for indicator bacteria and pollutants of concern can be completed in the field. In Swampscott, the only pollutant of concern is Fecal Coliform in Nahant Bay. Although Foster Pond is impaired by DDT, no additional sampling is required based on Appendix G of the Permit. The indicator bacteria for sampling is dependent on the type of water body that the outfall is discharging to. Outfalls discharging to freshwater are sampled for E. coli and outfalls discharging to salt or brackish water are sampled for enterococcus. These are summarized in **Table 7.**

[2] *Other potentially useful parameters, although not required by the MS4 Permit, include fluoride (indicator of potable water sources in areas where water supplies are fluoridated), potassium (high levels may indicate the presence of sanitary wastewater), and optical brighteners (indicative of laundry detergents).*

Table 7: Water Body Impairments

Water Bodies with Approved TMDLs	
Water Body	**Impairment**
Foster Pond	DDT in Fish Tissue
Nahant Bay	Enterococcus Fecal Coliform

The general procedure for collection of outfall samples is as follows:

1. Fill out all sample information on sample bottles and field sheets.
2. Put on protective gloves (nitrile/latex/other) before sampling.
3. Collect sample with dipper or directly in sample containers. If possible, collect water from the flow directly in the sample bottle. Be careful not to disturb sediments.
4. If using a dipper or other device, triple rinse the device with distilled water and then in water to be sampled (not for bacteria sampling).
5. Use test strips, test kits, and field meters (rinse similar to dipper) for most parameters (see **Table 6** and **Table 8**).
6. Place laboratory samples on ice for analysis of bacteria and pollutants of concern.
7. Fill out chain-of-custody form for laboratory samples.
8. Coordinate laboratory pick-up or deliver samples directly to selected laboratory.
9. Dispose of used test strips and test kit ampules properly.
10. Decontaminate all testing personnel and equipment.

If an outfall is submerged, either partially or completely, or inaccessible, field staff will proceed to the first accessible upstream manhole or structure for the observation and sampling and report the location with the screening results. Field staff will continue to the next upstream structure until there is no longer an influence from the receiving water on the visual inspection or sampling. The location of observation and sampling will be recorded with the results.

Table 8 summarizes the sampling needs for parameters to be analyzed in the field. The threshold indicator value is included in the permit as an indicator of a potential illicit connection. Based on the results collected, the Town will determine if there are potential illicit connections from sanitary sources.

Field test kits or field instrumentation are permitted for all parameters except indicator bacteria and any pollutants of concern. Testing for indicator bacteria and any pollutants of concern must be conducted using analytical methods and procedures found in 40 CFR § 136. Samples for laboratory analysis must also be stored and preserved in accordance with procedures found in 40 CFR § 136 or **Table 8**. The pollutants of concern in Swampscott include E. Coli, Enterococcus, and DDT. Analytic procedures and user's manuals for field test kits and field instrumentation are provided in **Appendix G.**

Table 8: Sampling Parameters, Analysis Methods, Detection Limits, Hold Times, and Preservatives

Analyte or Parameter	Instrumentation (Portable Meter)	Field Test Kit	Detection Limit	Threshold Limits	Max. Hold Time	Preservative
Ammonia	CHEMetrics™ V-2000 Colorimeter Hach™ DR/890 Colorimeter Hach™ Pocket Colorimeter™ II	CHEMetrics™ K-1410 CHEMetrics™ K-1510 (series) Hach™ NI-SA Hach™ Ammonia Test Strips	0.05 mg/L	≥ 0.5 mg/L (Field Tests) ≥ 0.1 mg/L (Lab Tests)	28 days	Cool ≤6°C, H_2SO_4 to pH <2, No preservative required if analyzed immediately
Surfactants (Detergents)	CHEMetrics™ I-2017	CHEMetrics™ K-9400 and K-9404 Hach™ DE-2	0.01 mg/L	≥ 0.25 mg/L (Field Tests) ≥ 0.1 mg/L (Lab Tests)	48 hours	Cool ≤6°C
Chlorine	CHEMetrics™ V-2000, K-2513 Hach™ Pocket Colorimeter™ II	N/A	0.02 mg/L	≥ 0.02 mg/L	Analyze within 15 minutes	None Required
Conductivity	CHEMetrics™ I-1200 YSI Pro30 YSI EC300A Oakton 450	N/A	*NA*		Immediate	None Required
Temperature	YSI Pro30 YSI EC300A Oakton 450	N/A	0.2 µs/cm		28 days	Cool ≤6°C
Salinity	YSI Pro30 YSI EC300A Oakton 450	N/A			28 days	Cool ≤6°C
Pollutants of Concern						
Analyte or Parameter	**Analytical Method**	**Field Test Kit**	**Detection Limit**		**Max. Hold Time**	**Preservative**
Indicator Bacteria: E. Coli	**EPA** 1603; **SM** 9221B, 9221F, 9223B (Sample Bottles)	N/A	1 cfu/100 mL; 2 MPN/100 mL	≥ 410 cfu/100 ml	6 hours	Cool ≤ 10°C, 0.0008% Na2S2O3
Enterococcus	**EPA**: 1600 **SM**: 9230 C **Other**: Enterolert®		**EPA**: 1 cfu/100mL **SM**: 1 MPN/100mL **Other**: 1 MPN/100mL	≥ 130 cfu/100 ml	8 hours	Cool ≤10°C, 0.0008% $Na_2S_2O_3$

1. SM: Standard Method

Based on the results collected, the Town will determine if there are potential illicit connections from sanitary sources. An illicit sanitary source is likely if outfall sample results include the following values:

- Ammonia ≥ 0.5 mg/L
- Surfactants ≥ 0.25 mg/L,
- Bacteria for Water Bodies Classified as A or B
    - E.coli > 235 cfu/mL
    - Enterococci > 61 cfu/mL, AND
- Bacteria for Water Bodies Classified as SA or SB
    - Enterococci > 104 cfu/mL

  Or
- Ammonia ≥ 0.5 mg/L
- Surfactants ≥ 0.25 mg/L, AND
- Detectable levels of chlorine (> 0.2 mg/L)

Additionally, if conductivity is measured above 2,000 µS/cm, this indicates potential for an illicit connection.

Based on the dry weather screening results, the Town will continue to update its ranking and further investigate potential connections through catchment investigations.

6.4.1 Field Test Kits and Water Quality Meters

The Town rents water quality meters for sampling to conduct some of the required monitoring in house. During employee training, the Town will use and select instruments or kits based on ease of use and familiarity with the method. Error! Reference source not found. includes instruments and field test kits that the Town can choose from.

6.5 FOLLOW-UP RANKING OF OUTFALLS AND INTERCONNECTIONS

The Town of Swampscott updated its initial outfall and interconnection rankings based on information gathered during dry weather screening. The rankings will be updated periodically as dry weather screening information becomes available. The reprioritized and reranked outfall inventory is in **Appendix E.**

Outfalls/interconnections where relevant information was found indicating sewer input to the MS4 or sampling results indicating sewer input are highly likely to contain illicit discharges from sanitary sources. Such outfalls/interconnections will be ranked at the top of the High Priority Outfalls category for investigation.

Other outfalls and interconnections may be re-ranked based on any new information from the dry weather screening.

7 CATCHMENT INVESTIGATIONS

Once stormwater outfalls with evidence of illicit discharges are 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 observations; dry and wet weather sampling; video inspections; smoke testing; and dye testing. This section outlines a systematic procedure to investigate outfall catchments to trace the source of potential illicit discharges. All data collected as part of the catchment investigations will be recorded and reported in each Annual Report.

Catchments are investigated in order of priority, with catchments draining to Problem Outfalls investigated first, followed by High Priority and then Low Priority Outfalls. Within each category the catchments are investigated in the order they are ranked. Work can be ongoing in multiple catchments simultaneously to expedite the process. **Table 9** provides a schedule for completion of catchment investigations.

Table 9: IDDE Schedule for Completion of Catchment Investigations

Parameter	Start	Complete
Problem Catchments	No later than 2 years from permit effective date (2020)	Within 7 years of permit effective date (2025)
Catchments with sewer input identified at outfall[1]	No permit requirement	Within 7 years of permit effective date (2025)
All Catchments	No later than 3 years from the permit effective date (2021)	Within 10 years of permit effective date (2028)

[1]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.

All data collected as part of the catchment investigations will be recorded and reported in each Annual Report.

7.1 SYSTEM VULNERABILITY FACTORS

System mapping and historic plans and records were reviewed to identify MS4 catchments with higher potential for illicit connections. The following information was reviewed as part of the analysis:

- Town GIS mapping of MS4 system
- Plans related to the construction of the sewer and drainage network
- Prior and planned work on storm drains or sewer lines
- Board of Health or other municipal data on septic systems
- Complaint records related to SSOs
- Septic system failures.

Based on the review of this information, the presence of any of the following **System Vulnerability Factors (SVFs)** was identified for each catchment. In total 23 catchments were found to contain SVFs:

- History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages.
- 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 where the sanitary system is shallower than the storm drain system.
- Sanitary sewer alignments known or suspected to have been constructed with an underdrain system.
- Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints.
- 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.
- Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs.
- Any sanitary sewer and storm drain infrastructure greater than 40 years old.
- Widespread code-required septic system upgrades required at property transfers (indicative of inadequate soils, water table separation, or other physical constraints of the area rather that poor owner maintenance).
- History of multiple Board of Health actions addressing widespread septic system failures (indicative of inadequate soils, water table separation, or other physical constraints of the area rather that poor owner maintenance).

Locations of SVFs were mapped and compared to the Town's existing MS4 catchment layers to complete an inventory of SVFs present in each catchment. As catchment investigations continue and the mapped areas refined, the SVF inventory (**Appendix H**) will be updated to reflect the most current information available. An SVF inventory template is in **Table 10**. A completed SVF inventory is documented for each outfall in **Appendix H** retained as part of this IDDE Plan and included in the Annual Report.

Table 10: System Vulnerability Factor (SVF) Inventory

Outfall ID	Receiving Water	1 History of SSOs	2 Common or Twin Invert Manholes	3 Common Trench Construction	4 Storm/Sanitary Crossings (Sanitary Above)	5 Sanitary Lines with Underdrains	6 Inadequate Sanitary Level of Service	7 Areas Formerly Served by Combined Sewers	8 Sanitary Infrastructure Defects	9 SSO Potential In Event of System Failures	10 Sanitary and Storm Drain Infrastructure >40 years Old	11 Septic with Poor Soils or Water Table Separation	12 History of BOH Actions Addressing Septic Failure
A	XYZ River	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No

Presence/Absence Evaluation Criteria:

1. History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages
2. Common or twin-invert manholes serving storm and sanitary sewer alignments
3. Common trench construction serving both storm and sanitary sewer alignments
4. Crossings of storm and sanitary sewer alignments where the sanitary system is shallower than the storm drain system
5. Sanitary sewer alignments known or suspected to have been constructed with an underdrain system
6. Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints
7. Areas formerly served by combined sewer systems
8. 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
9. Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs
10. Any sanitary sewer and storm drain infrastructure greater than 40 years old
11. Widespread code-required septic system upgrades required at property transfers (indicative of inadequate soils, water table separation, or other physical constraints of the area rather that poor owner maintenance)
12. History of multiple Board of Health actions addressing widespread septic system failures (indicative of inadequate soils, water table separation, or other physical constraints of the area rather that poor owner maintenance)

7.2 DRY WEATHER MANHOLE INSPECTIONS

The Town of Swampscott implemented 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 or SSOs.

The DPW is 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. 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, ("bottom-up") or
- By working progressively down from the upper parts of the catchment toward the outfall ("top-down")

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 it 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. Sampling and analysis will be in accordance with procedures outlined in Section 6. Additional indicator sampling may assist in determining potential sources (e.g., bacteria for sanitary flows, conductivity to detect tidal backwater, etc.).
3. Where sampling results or visual or olfactory evidence indicate potential illicit discharges or SSOs, the area draining to the junction manhole will be flagged for further upstream manhole investigation and/or isolation and confirmation of sources as described in Section 7.4.
4. Subsequent key junction manhole inspections will proceed until the location of suspected illicit discharges or SSOs can be isolated to a pipe segment between two (2) manholes.
5. If no evidence of an illicit discharge is found, catchment investigations will be considered complete upon completion of key junction manhole sampling.

7.3 WET WEATHER SAMPLING

Where a minimum of one (1) required 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 DPW is responsible for implementing the wet weather outfall sampling program and making updates as necessary. A full list of catchment areas containing at least one (1) SVF is included in **Appendix H**.

These 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:

1. At least one (1) wet weather sample will be collected at the outfall for the same parameters required during dry weather screening.
2. Wet weather sampling will occur during or after a storm event of sufficient depth or intensity to produce a stormwater discharge at the outfall. 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. To the extent feasible, sampling should occur during the spring (March through June) when groundwater levels are relatively high.

3. 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 8.4.
4. 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.

7.4 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
- Dye Testing
- Smoke Testing
- CCTV/Video Inspections
- Optical Brightener Monitoring
- IDDE Canines

These are all options that Swampscott can rely on. However, sandbagging, dye testing, smoke testing, and CCTV inspections, if necessary, will be utilized first. Any homeowners or businesses that will be impacted by these investigations will be notified prior to starting.

These methods are described in the sections below. Public notification is an important aspect of a detailed source investigation program. Prior to dye testing or CCTV inspections, the DPW will notify property owners in the affected area.

7.4.1 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.

7.4.2 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. It is important to inform local residents and business owners before dye testing is performed. Police, fire, and local public health staff should also be notified prior to testing in preparation for 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.

7.4.3 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.

7.4.4 CCTV Inspections

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.

7.5 TIMELINE

Using the written procedures and strategies outlined in Section 6, the Town began catchment investigations according to the following timeline:

- Catchment investigations for Problem Outfalls will be started by Year 2 (July 2020) and finished by Year 7 (June 2025).
- Catchment investigations for High and Low Priority Outfalls will be completed by rank, started in Year 3 (July 2021), and finished by Year 10 (June 2028).
- Catchments associated with outfalls or interconnections that had potential sewer input will be completed by Year 7 (June 2025).

7.6 ILLICIT DISCHARGE ELIMINATION

When the specific source of an illicit discharge is identified, the Swampscott 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.

7.7 CONFIRMATORY OUTFALL SCREENING

Within one (1) year of removal of all identified illicit discharges 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.

7.8 STATUS OF OUTFALL SCREENING

Upon completion of all catchment investigations and illicit discharge removal and confirmation (if necessary), each outfall or interconnection will be re-prioritized for screening and scheduled for ongoing screening once every five (5) years. Ongoing screening will consist of dry weather screening and sampling consistent with the procedures described in Section 6 of this plan. Ongoing wet weather screening and sampling will also be conducted at outfalls where wet weather screening was required due to SVFs and will be conducted in accordance with the procedures described in Section 7.3. A schedule for these investigations and screening is in **Table 11**. All sampling results will be reported in the Annual Report.

Table 11: Catchment Investigation Timeline

Tasks	Years to Complete		Year 1-5 (2018-2023)	Year 6 (2024)	Year 7 (2025)	Year 8 (2026)	Year 9 - Year 10 (2027-2028)	Total
Catchment Investigations	5	**Days per Year**	1	12	12	12	24	61
		Catchments per Year	1	12	12	12	24	61
Dry Weather Outfall Screening	5	**Days per Year**	N/A	3	0	0	0	3
		Catchments per Year	48	13	0	0	0	61
Wet Weather Outfall Screening	5	**Days per Year**	0	2	2	2	4	10
		Catchments per Year	0	4	4	5	10	23
Illicit Discharge Detection and Elimination		**Days per Year**	N/A	3	3	3	6	15
Days per Year			N/A	17	17	17	34	85
Status			Completed	Ongoing	Planned			

This timeline assumes that approximately two (2) catchments can be investigated per day. The timeline also purports that each kind of screening task (i.e. catchment investigation vs. outfall screening) requires a separate day of fieldwork. However, some tasks can be completed simultaneously. For example, a catchment investigation can take place at the same time as a dry weather outfall screening, and it may require sampling at two different points in the catchment system depending on if the outfall has flow or not.

On May 17th, 2023, Kleinfelder completed an annual training for Swampscott's DPW staff on how to conduct Catchment Investigations. The training included an investigation of a single catchment. The single catchment that was investigated empties into Outfall 270051. While this catchment consisted of about 34 total drain manhole structures, only eight (8) drain manhole structures and one (1) catch basin were inspected during this investigation. Initially, no flow was seen in any manholes located along both

Puritan Road and Marshall Street due to high tide conditions. Flow was eventually discovered flowing towards the outfall when manholes along Cedar Hill Road were opened and inspected. From here, Kleinfelder and Swampscott's DPW Staff went to the first junction manhole located at the intersection of Cedar Hill Road and Bay View Avenue and determined that flow was not coming from Bay View Avenue, and as such, continued to the next junction manhole located upstream of Cedar Hill Road. The next junction manhole was located in the backyard of 49 Fuller Avenue and flow was found to be flowing from both inlets (Fuller Avenue and Millet Road). Therefore, a sample was collected and tested from a catch basin on Fuller Avenue that had some standing water. Ammonia for this sample was 0.25 mg/L while chlorine and surfactants were non-detectable. As such, the investigation continued toward Millet Road where flow was traced to drain manhole #230135. Another sample was collected and tested. Chlorine and surfactants were not detected, but ammonia was greater than 76 mg/L indicating the presence of a suspected illicit discharge into the storm system and contributing to the discovered flow within this catchment during dry weather conditions. Inspection and testing results and a marked-up field map can be found in **Appendix I**. The Town re-visited this location, and the manhole was dry, suggesting that the suspected source is intermittent. Further investigation and tracing is necessary to verify the source(s) of the suspected illicit discharge. The Town will continue investigations in this area with planned subcontractor support in 2024.

Back in 2020, smoke testing revealed that smoke introduced in the drainage system in this particular area was migrating into the sewer system through structural defects. As such, further assessment of the sewer and drain pipelines also revealed that there were clear and abundant pathways for sewage to exfiltrate from the sewer system and infiltrate into the drainage system. A preliminary design report for areas beyond Stacey's Brook, which also included this particular area of interest, recommended that the sewer pipe in this area be open cut and replaced and that the sewer manholes be lined with cement. The Town will reference these findings and use pertinent information as part of their continued investigation of catchment 270051.

8 TRAINING

Annual IDDE training is available to all employees involved in the IDDE program. This training includes information on how to identify illicit discharges and SSOs and may also include additional training specific to the functions of personnel and their function within the framework of the IDDE program. A training attendance sign-in sheet is provided in **Appendix J.** The frequency and type of training will be included in the Annual Report.

9 ANNUAL REPORT

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
- Number of enforcement notices issued
- All dry weather and wet weather screening and sampling results
- 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.

10 REFERENCES

1. *General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts*. United States Environmental Protection Agency, issued April 4, 2016.
2. *Final Massachusetts Integrated List of Waters for the Clean Water Act 2018-2020 reporting cycle.* Massachusetts Department of Environmental Protection, November 2021.
3. *2018 NPDES MS4 Program Assistance Stormwater System Map Memorandum.* Betsy Frederick, Kleinfelder, June 21, 2018.
4. *Title 40 C.F.R. § 136.* United States Environmental Protection Agency, June 2023

APPENDIX A

IDDE Program Implementation Timeline

Town of Swampscott, MA

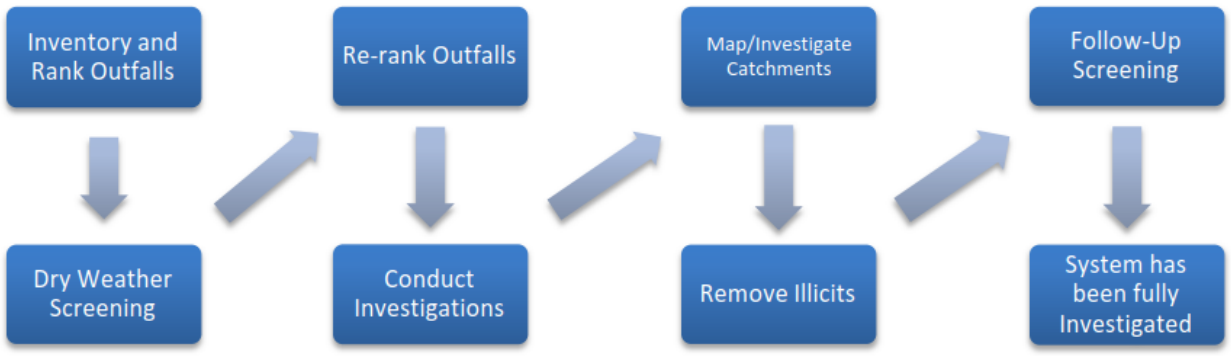
Illicit Discharge Detection and Elimination Program

June 2023

IDDE Program Implementation Timeline

IDDE Program Requirement	Target Completion Date from 2016 MS4 Permit					Status
	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 7 (2025)	Year 10 (2028)	
Written IDDE Program Plan	X					*Completed*
SSO Inventory	X					*Completed*
Written Catchment Investigation Procedure	X					*Completed*
Phase I Mapping		X				*Completed*
Phase II Mapping					X	*In progress*
IDDE Regulatory Mechanism or By-law (if not already in place)	X					*Completed*
Dry Weather Outfall Screening			X			*Completed*
Follow-up Ranking of Outfalls and Interconnections			X			*Completed*
Catchment Investigations – Problem Outfalls				X		**N/A**
Catchment Investigations – all Problem, High and Low Priority Outfalls					X	*In progress*

IDDE Investigation Procedural Framework



APPENDIX B

IDDE Field Map for Consent Decree Background

N

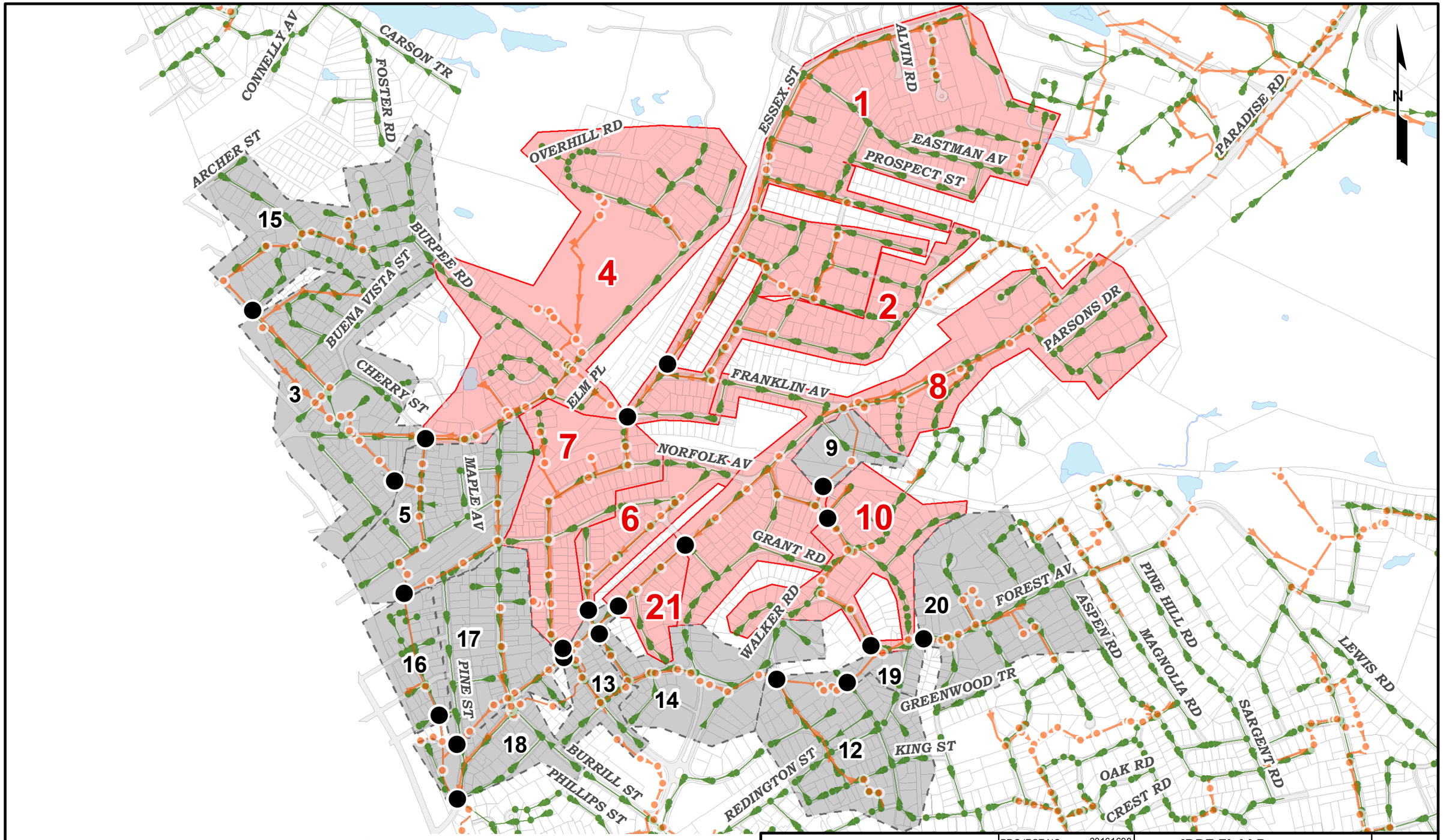
1 inch = 200 feet

LEGEND

- Stacey's Brook IDDE MHs
- Drain MH
- Drain Pipe
- Sewer MH
- Sewer Pipe
- sUnderdrainPipes

APPENDIX C

IDDE Field Program for Consent Decree Background



LEGEND

- Stacey's Brook IDDE MHs
- Drain MH
- Drain Pipe
- Sewer MH
- Sewer Pipe

Project Area

- In Scope (priority)
- Out of Scope

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PROJECT NO.	20161698
DRAWN:	9/24/15
DRAWN BY:	MCC
CHECKED BY:	DTP
FILE NAME:	IDDE Mapbook.mxd

IDDE Field Program
Stacey's Brook Drainage Area
Town of Swampscott, MA

0 600 1,200 Feet

PLATE

APPENDIX D

Legal Authority (IDDE Stormwater Regulation)

COVER

ARTICLE XVIII

ILLICIT DISCHARGES TO MUNICIPAL SEPARATE STORM SEWER SYSTEM

SECTION 1. PURPOSE

The purpose of this Bylaw is to eliminate non-stormwater discharges to the Town of Swampscott's municipal separate storm sewer system. Non-stormwater discharges contain contaminants and supply additional flows to the Town's storm drain system. Both increased and contaminated stormwater runoff are major causes of:

1. impairment of water quality and flow in lakes, ponds, streams, rivers, wetlands and groundwater;
2. contamination of drinking water supplies;
3. alteration or destruction of aquatic and wildlife habitat; and
4. flooding.

Regulation of illicit connections and discharges to the municipal separate storm sewer system is necessary for the protection of the Town's natural resources and municipal facilities, and to safeguard the public health, safety, welfare and the environment.

The objectives of this Bylaw are:

1. To prevent pollutants from entering the Town's municipal separate storm sewer system;
2. To prohibit illicit connections and unauthorized discharges to the municipal separate storm sewer system;
3. To require the removal of all such illicit connections;
4. To comply with State and Federal statutes and regulations relating to stormwater discharges; and
5. To establish the legal authority to ensure compliance with the provisions of this Bylaw through inspection, monitoring, and enforcement.

SECTION 2. DEFINITIONS

For purposes of the administration and enforcement of this Bylaw, the following definitions shall apply:

ENFORCEMENT AUTHORITY: The Director of the Department of Public Works, and Town employees and/or agents designated by the Director of the Department of Public Works to enforce this Bylaw.

CLEAN WATER ACT: The Federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.) as hereafter amended.

DISCHARGE OF POLLUTANTS: The addition from any source of any pollutant or combination of pollutants into the municipal storm drain system or into waters of the United States or Commonwealth from any source.

GROUNDWATER: Water beneath the surface of the ground.

ILLICIT CONNECTION: A surface or subsurface drain or conveyance, which allows an illicit discharge into the municipal storm drain system, including without limitation sewage, process wastewater, or wash water and any connections from indoor drains, sinks, or toilets, regardless of whether said connection was previously allowed or approved before the effective date of this Bylaw.

ILLICIT DISCHARGE: Direct or indirect discharge to the municipal storm drain system that is not composed entirely of stormwater, except as exempted in Section 8. The term does not include a discharge in compliance with an NPDES Storm Water Discharge Permit or a Surface Water Discharge Permit, or resulting from firefighting activities exempted pursuant to Section 8, Subsection (a) of this Bylaw.

IMPERVIOUS SURFACE: Any material or structure on or above the ground that prevents water infiltrating into the underlying soil. Impervious surface includes without limitation roads, paved parking lots, sidewalks, and roof tops.

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) or Municipal Storm Drain System: The system of conveyances designed or used for collecting or conveying stormwater, including any road with a drainage system, street, gutter, curb, inlet, piped storm drain, pumping facility, retention or detention basin, natural or man-made or altered drainage channel, reservoir, and other drainage structure that together comprise the storm drainage system owned or operated by the Town of Swampscott.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORM WATER DISCHARGE PERMIT: A permit issued by United States Environmental Protection Agency or jointly with the Commonwealth of Massachusetts that authorizes and regulates the discharge of pollutants to waters of the United States.

NON-STORMWATER DISCHARGE: Discharge to the municipal storm drain system not composed entirely of stormwater.

PERSON: An individual, partnership, association, firm, company, trust, corporation, agency, authority, department or political subdivision of the Commonwealth or the Federal government, to the extent permitted by law, and any officer, employee, or agent of such person.

POINT SOURCE: Any discernible, confined and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, or container from which pollutants are or may be discharged.

POLLUTANT: Any element or property of sewage, agricultural, industrial or commercial waste, runoff, leachate, heated effluent, or other matter whether originating at a point or nonpoint source, that is or may be introduced into any sewage treatment works or waters of the Commonwealth. Pollutants shall include without limitation:

1. paints, varnishes, and solvents;
2. oil and other automotive fluids;
3. non-hazardous liquid and solid wastes and yard wastes;
4. refuse, rubbish, garbage, litter, or other discarded or abandoned objects, ordnances, accumulations and floatables;
5. pesticides, herbicides, and fertilizers;
6. hazardous materials and wastes;
7. sewage, fecal coliform and pathogens;
8. dissolved and particulate metals;
9. animal wastes;
10. rock, sand, salt, soils;
11. construction wastes and residues; and
12. noxious or offensive matter of any kind.

PROCESS WASTEWATER: Water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any material, intermediate product, finished product, or waste product.

RECHARGE: The process by which groundwater is replenished by precipitation through the percolation of runoff and surface water through the soil.

STORMWATER: Runoff from precipitation or snow melt.

SURFACE WATER DISCHARGE PERMIT: A permit issued by the Massachusetts Department of Environmental Protection ("DEP") that authorizes the discharge of pollutants to waters of the Commonwealth.

TOXIC OR HAZARDOUS MATERIAL OR WASTE: Any material, which because of its quantity, concentration, chemical, corrosive, flammable, reactive, toxic, infectious or radioactive characteristics, either separately or in combination with any substance or substances, constitutes a present or potential threat to human health, safety, welfare, or to the environment. Toxic or hazardous materials include any synthetic organic chemical, petroleum product, heavy metal, radioactive or infectious waste, acid and alkali, and any substance defined as Toxic or Hazardous under as defined under G.L. Ch.21C and Ch.21E, and the regulations at 310 CMR 30.000 and 310 CMR 40.0000.

WASTEWATER: Any sanitary waste, sludge, or septic tank or cesspool overflow, and water that during manufacturing, cleaning or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct or waste product.

WATERCOURSE: A natural or man-made channel through which water flows or a stream of water, including a river, brook or underground stream.

WATERS OF THE COMMONWEALTH: All waters within the jurisdiction of the Commonwealth, including, without limitation, rivers, streams, lakes, ponds, springs, impoundments, estuaries, wetlands, coastal waters, and groundwater.

SECTION 3. APPLICABILITY

This Bylaw shall apply to flows entering the municipally owned storm drainage system.

SECTION 4. AUTHORITY

This Bylaw is adopted under authority granted by the Home Rule Amendment of the Massachusetts Constitution, the Home Rule statutes, and the regulations of the federal Clean Water Act found at 40 CFR 122.34.

SECTION 5. RESPONSIBILITY FOR ADMINISTRATION

The Enforcement Authority shall administer, implement and enforce this Bylaw. Any powers granted to or duties imposed upon the Enforcement Authority may be delegated in writing by the Enforcement Authority to employees or agents of the Enforcement Authority, and to other Town officials and employees.

SECTION 6. REGULATIONS

The Enforcement Authority may promulgate rules and regulations to effectuate the purposes of this Bylaw. Failure by the Enforcement Authority to promulgate such rules and regulations shall not have the effect of suspending or invalidating this Bylaw.

SECTION 7. PROHIBITED ACTIVITIES

a) Illicit Discharges

No person shall dump, discharge, cause or allow to be discharged any pollutant or non-storm water discharge into the municipal separate storm sewer system (MS4).

b) Illicit Connections

No person shall construct, use, allow, maintain or continue any illicit connection to the municipal separate storm sewer system, regardless of whether the connection was permissible under applicable law, regulation or custom at the time of connection.

c) Obstruction of Municipal Separate Storm Sewer System

No person shall obstruct or interfere with the normal flow of storm water into or out of the MS4 without prior written approval from the Enforcement Authority.

d) Yard Wastes

No person shall dump or dispose of yard waste (leaves, grass clippings, etc.) into the municipal storm drain system, or into catch basins which discharge to the storm drain system.

SECTION 8. EXEMPTIONS

a) Discharges or flows resulting from fire-fighting activities or other authorized hydrant use are exempt.

b) The following non-storm water discharges or flows are exempt from the prohibitions of this Bylaw provided that the source is not a significant contributor of a pollutant to the municipal storm drain system:

1. Waterline flushing;

2. Flow from potable water sources;

3. Springs;

4. Natural flow from riparian habitats and wetlands;

5. Diverted stream flow;

6. Rising groundwater;

7. Uncontaminated groundwater infiltration as defined in 40 CFR 35.2005(20), or uncontaminated pumped groundwater;

8. Water from exterior foundation drains, footing drains (not including active groundwater dewatering systems), crawl space pumps, or air conditioning condensation;

9. Discharge from landscape irrigation or lawn watering;

10. Water from individual residential car washing;

11. Discharge from dechlorinated swimming pool water (less than one ppm chlorine) provided the water is allowed to stand for one week following last chlorination prior to draining and the pool is drained in such a way as not to cause a nuisance;

12. Discharge from street sweeping;

13. Dye testing, provided verbal notification is given to the Enforcement Authority prior to the time of the test;

14. Non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order administered under the authority of the United States Environmental Protection Agency or DEP, provided that the discharge is in full compliance with the requirements of the written approval, waiver, or order and applicable laws and regulations; and

15. Discharge for which advanced written approval is received from the Enforcement Authority as necessary to protect public health, safety, welfare or the environment.

SECTION 9. EMERGENCY SUSPENSION OF STORM DRAINAGE SYSTEM ACCESS

The Enforcement Authority may suspend municipal storm drain system access to any person or property without prior written notice when such suspension is necessary to stop an actual or threatened discharge of pollutants that presents imminent risk of harm to the public health, safety,

welfare or the environment. In the event any person fails to comply with an emergency suspension order, the Enforcement Authority may take all reasonable steps to prevent or minimize harm to the public health, safety, welfare or the environment.

SECTION 10. NOTIFICATION OF SPILLS

Notwithstanding other requirements of local, state or federal law, as soon as a person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of or suspects a release of materials at that facility or operation resulting in or which may result in discharge of pollutants to the municipal storm drain system or waters of the Commonwealth, the person shall take all necessary steps to ensure containment and cleanup of the release. In the event of a release of oil or hazardous materials, the person shall immediately notify the Town fire and police departments. In the event of a release of non-hazardous material, the reporting person shall notify the Enforcement Authority no later than the next business day. The reporting person shall provide to the Enforcement Authority written confirmation of all telephone, facsimile or in-person notifications within three business days thereafter. If the discharge of prohibited materials is from a commercial or industrial facility, the facility owner or operator of the facility shall retain on-site a written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three years.

SECTION 11. ENFORCEMENT

a) Enforcement

The Enforcement Authority or an authorized agent of the Enforcement Authority shall enforce this Bylaw, regulations, orders, violation notices, and enforcement orders, and may pursue all civil and criminal remedies for such violations.

b) Entry to Perform Duties

To the extent permitted by state law, or if authorized by the owner or other party in control of the property, the Enforcement Authority may enter upon privately owned property for the purpose of performing its duties under this Bylaw and may make or cause to be made such examinations, surveys or sampling as the Enforcement Authority deems reasonably necessary.

c) Civil Relief

If a person violates the provisions of this Bylaw, regulations, permit, notice, or order issued thereunder, the Enforcement Authority may seek injunctive relief in a court of competent

jurisdiction restraining the person from activities which would create further violations or compelling the person to perform abatement or remediation of the violation.

d) Orders

The Enforcement Authority may issue a written order to enforce the provisions of this Bylaw or the regulations thereunder, which may include: (i) elimination of illicit connections or discharges to the MS4; (ii) performance of monitoring, analyses, and reporting; (iii) that unlawful discharges, practices, or operations shall cease and desist; and (iv) remediation of contamination in connection therewith.

If the enforcing person determines that abatement or remediation of contamination is required, the order shall set forth a deadline by which such abatement or remediation must be completed. Said order shall further advise that, should the violator or property owner fail to abate or perform remediation within the specified deadline, the Town may, at its option, undertake such work, and expenses thereof shall be charged to the violator.

e) Criminal Penalty

Any person who violates any provision of this Bylaw, regulation, order or permit issued thereunder, shall be punished by a fine not to exceed $300.00 per violation. Each day or part thereof that such violation occurs or continues shall constitute a separate offense.

f) Non-Criminal Disposition

As an alternative to criminal prosecution or civil action, the Town may elect to utilize the non-criminal disposition procedure set forth in G.L. Ch. 40, §21D and Article XII, Section 2 of the Town Bylaws, in which case the Enforcement Authority shall be the enforcing person. For non-criminal disposition, the penalty for the first violation shall be $100.00, the penalty for the second violation shall be $200.00, and the penalty for the third and subsequent violations shall be $300.00. Each day or part thereof that such violation occurs or continues shall constitute a separate offense.

g) Appeals

The decisions or orders of the Enforcement Authority shall be final. Further relief shall be to a court of competent jurisdiction.

h) Remedies Not Exclusive

The remedies listed in this Bylaw are not exclusive of any other remedies available under any applicable federal, state or local law.

COVER

SECTION 13. TRANSITIONAL PROVISIONS

Property owners shall have sixty days from the effective date of the Bylaw to comply with its provisions provided good cause is shown for the failure to comply with the Bylaw during that period.

APPENDIX E

Reprioritized Outfall Ranking Inventory and Map (2021)

Town of Swampscott, MA
Illicit Discharge Detection Program
Reprioritized Outfall Ranking
August 2021

Potential Problem Outfalls	
Outfall ID	**Priority Level**

High Ranked Outfalls		
Outfall ID	**Priority Level**	**Rank**
270057.1	HIGH	2
270012	HIGH	3
270051	HIGH	4
270053	HIGH	5
270054	HIGH	6
270066	HIGH	8
270061	HIGH	9
270055	HIGH	10
270049	HIGH	11
270060	HIGH	12
270052	HIGH	13
270058	HIGH	14
270042	HIGH	15
270057	HIGH	16
270056	HIGH	18
270064	HIGH	20
270059	HIGH	21
270050	HIGH	24
270044	HIGH	29
270046	HIGH	30
270048	HIGH	40
270045	HIGH	45
270047	HIGH	49
270040	HIGH	50
270041	HIGH	50

Low Ranked Outfalls		
Outfall ID	**Priority Level**	**Rank**
270068	LOW	1
270063	LOW	7
270065	LOW	17
270062	LOW	19
270067	LOW	22
270002.1	LOW	23
270003	LOW	25
270002	LOW	26
270006	LOW	27
270001	LOW	28
270004.1	LOW	31
270004	LOW	32
270004.2	LOW	33
270028	LOW	34
270027	LOW	35
270031	LOW	36
270022	LOW	37
270021	LOW	38
270038	LOW	39
270024.1	LOW	41
270034.1	LOW	42
270024	LOW	43
270015	LOW	44
270039	LOW	46
270005	LOW	47
270016	LOW	48
270010	LOW	50
270011	LOW	50
270013	LOW	50
270014	LOW	50
270020	LOW	50
270026	LOW	50
270029	LOW	50
270032	LOW	50
270033	LOW	50
270035	LOW	50
270036	LOW	50

SALEM

MARBLEHEAD

LYNN

N

NICHOLS ST
MANSON ST
WINDSOR AV
FOSTER RD
EUREKA AV
ROY ST
BURPEE RD
ESSEX ST
BURRILL ST
PINE ST
THOMAS RD
MONUMENT AV
REDINGTON ST
LYNN SHORE DR
BLNY ST
KING ST
HUMPHREY ST
DANVERS RD
CAPEN RD
EDGEHILL RD
EASTMAN AV
LONGWOOD DR
SUNSET DR
STETSON AV
PARADISE RD
WALKER RD
BANKS RD
FULLER AV
MILLETT LN
MILLETT RD
SUTTON PL
FRANKLIN AV
OAKLEDGE RD
PARSONS DR
ASPEN RD
PINE HILL RD
FOREST AV
NASON RD
LEWIS RD
PLEASANT ST
HEMENWAY RD
BATES RD
ALDEN RD
ROBIN LN
PURITAN RD
PURITAN LN
WINSHAW RD
GALE RD
ATLANTIC RD
PALMER RD
OCEAN AV
BRADLEE AV
BLODGETT AV
PHILLIPS AV
MORTON RD
ATLANTIC AV
MOSTYN ST
DALE ST
STANLEY RD
BELLEVUE RD
LINDEN AV
SALEM ST

LEGEND

Outfall Priority

- HIGH
- LOW
- Water Bodies
- Town Boundary

0 1,000 2,000 Feet

FILENAME: "Swampscott_MS4 Outfalls Priority Ranking - 2021 Update.mxd

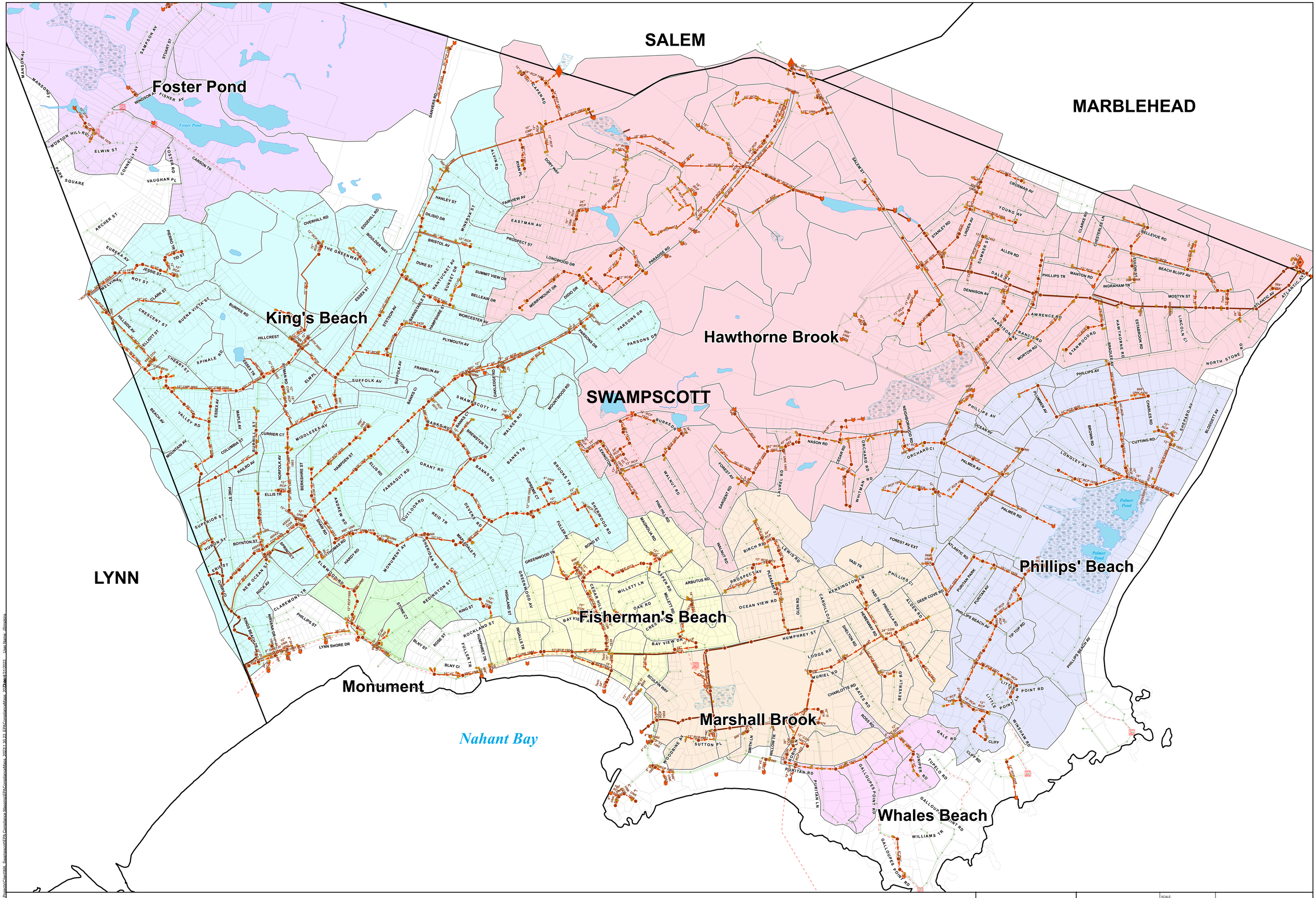
KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

PROJECT NO.	20220949.001A
DRAWN:	9/23/2021
DRAWN BY:	DTP
CHECKED BY:	JR
FILE NAME:	

MS4 Outfalls IDDE Priority 2021 Update

2021 MS4 Program
Town of Swampscott, Massachusetts

SHEET 1



LEGEND

Drain Catchment Areas
- Fisherman's Beach
- Foster Pond
- Hawthorne Brook
- King's Beach
- Marshall Brook
- Monument
- Phillips' Beach
- Whales Beach

- Municipal interconnection
- Drain Manhole
- Catch Basin
- Flow Direction
- Drain Gravity Pipe
- Drain Culvert
- Sewer MH

- Sewer Pump Stations
- Sewer Force Main
- Sewer Gravity Pipe
- Underdrain Pipes
- Pond; River; Stream
- Wetlands
- Parcels
- Subcatchment Delineation

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SCALE: 0 300 Feet

PROJECT NO.	20192126
DRAWN:	1/31/2023
DRAWN BY:	JCS
CHECKED BY:	JVR
FILE NAME:	1:30:01 EPAComplianceMaps_2023

US EPA CONSENT DECREE
COMPLIANCE REPORTING MAPPING

STORMWATER
MS4 MAP
Town of Swampscott, MA

MAP 2B

Document Path: \\arrastore\GIS_Projects\Client\MA_Swampscott\EPA Compliance Mapping\EPAComplianceMaps_2023\1.80.23_EPAComplianceMaps_2023.aprx | Date: 1/31/2023 | User Name: sSpurkins

APPENDIX F

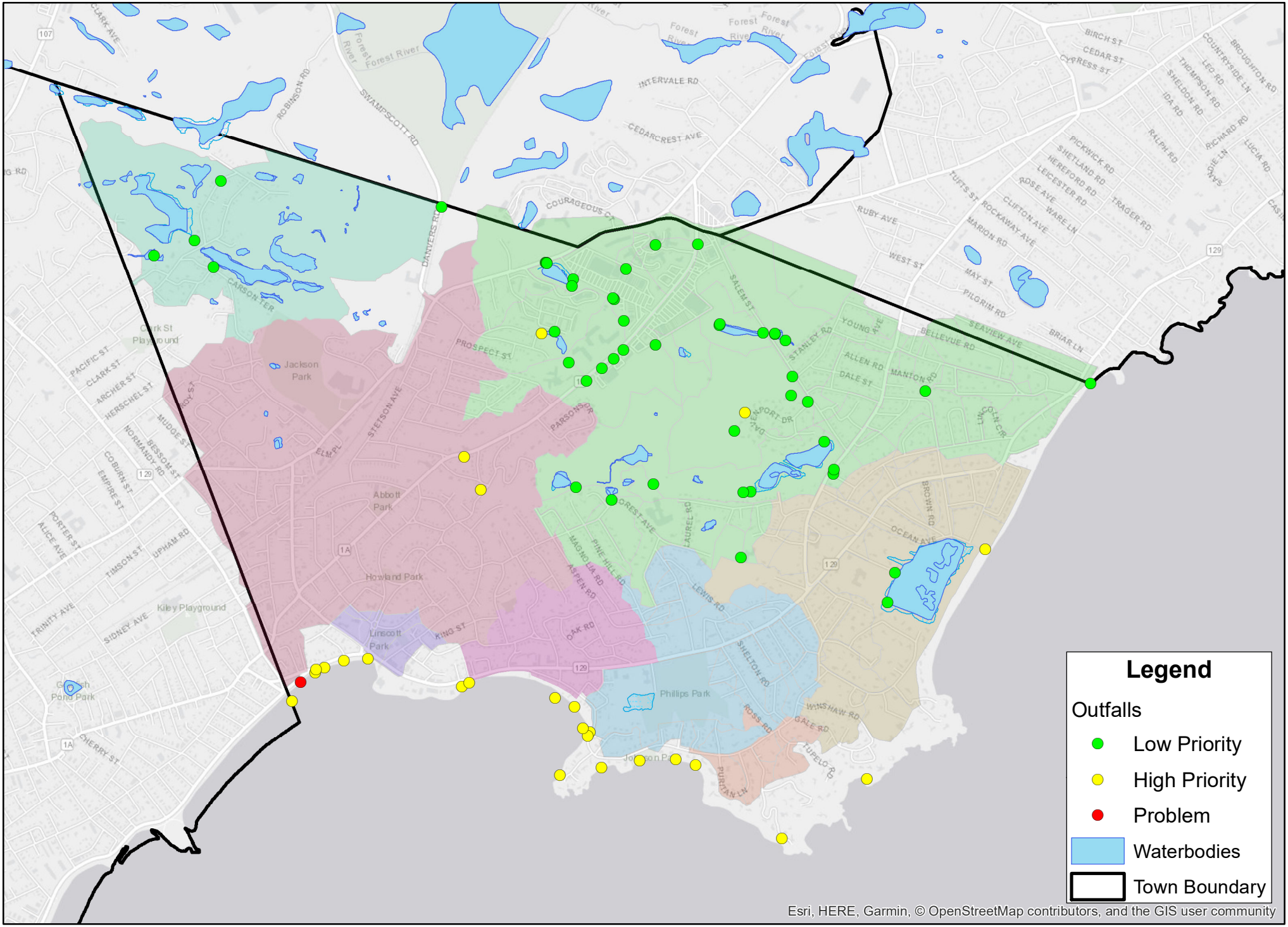
Initial Outfall Ranking Inventory and Map (2019)

Town of Swampscott, MA
Illicit Discharge Detection Program
Initial Outfall Priority Ranking
Jun-19

Potential Problem Outfalls	
Outfall ID	**Priority Level**
270043	PROBLEM

High Ranked Outfalls		
Outfall ID	**Priority Level**	**Rank**
270049	HIGH	2
270057.1	HIGH	3
270054	HIGH	4
270058	HIGH	5
270060	HIGH	6
270050	HIGH	7
270012	HIGH	8
270044	HIGH	9
270051	HIGH	10
270055	HIGH	11
270046	HIGH	12
270052	HIGH	14
270057	HIGH	15
270048	HIGH	16
270053	HIGH	17
270045	HIGH	18
270056	HIGH	19
270059	HIGH	20
270047	HIGH	21
270040	HIGH	22
270041	HIGH	22
270042	HIGH	22
270061	HIGH	25
270066	HIGH	26
270064	HIGH	28

Low Ranked Outfalls		
Outfall ID	**Priority Level**	**Rank**
270002.1	LOW	13
270003	LOW	27
270006	LOW	29
270002	LOW	30
270001	LOW	31
270063	LOW	32
270004.1	LOW	33
270004	LOW	34
270027	LOW	35
270004.2	LOW	36
270028	LOW	37
270034.1	LOW	38
270031	LOW	39
270065	LOW	40
270021	LOW	41
270062	LOW	42
270022	LOW	43
270038	LOW	44
270015	LOW	45
270024	LOW	46
270024.1	LOW	47
270034	LOW	48
270005	LOW	49
270039	LOW	50
270016	LOW	51
270007	LOW	52
270008	LOW	52
270009	LOW	52
270010	LOW	52
270011	LOW	52
270013	LOW	52
270014	LOW	52
270017	LOW	52
270018	LOW	52
270019	LOW	52
270020	LOW	52
270023	LOW	52
270025	LOW	52
270026	LOW	52
270029	LOW	52
270030	LOW	52
270032	LOW	52
270033	LOW	52
270035	LOW	52
270036	LOW	52
270067	LOW	52



Swampscott MS4 Outfalls: IDDE Priority

N

0 0.125 0.25 0.5 0.75 1 Miles

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APPENDIX G

Inspection Field Forms and Sampling Procedures

OUTFALL INVENTORY FIELD SHEET

Section 1: Background Data

City/Town:	Street:	Tax Map #:	Outfall ID: OF-
Owner: ☐ City ☐ State ☐ Private ☐ Other: _____		Nearest House/Utility Pole #:	
Today's date:		Time (Military):	
Investigators:		Form completed by:	
Temperature (°F):	Rainfall (in.): Last 24 hours:	Last 48 hours:	
Northing:	Easting:	GPS Unit:	GPS LMK #:
Rim Elevation:		Invert Elevation:	
Elevation Datum:		Receiving Water:	
Camera:		Photo #s: -- Take 1 Upstream (head on) and 1 Downstream view	

Land Use in Drainage Area (Check all that apply):

☐ Industrial ☐ Open Space

☐ Urban Residential ☐ Institutional

☐ Suburban Residential Other: _____

☐ Commercial Known Industries: _____

Notes (e.g.., origin of outfall, if known):

Section 2: Outfall Description

TYPE	MATERIAL	SHAPE		DIMENSIONS (IN.)	SUBMERGED
☐ Closed Pipe	☐ RCP ☐ CMP ☐ PVC ☐ HDPE ☐ Steel ☐ Other: _____	☐ Circular ☐ Elliptical ☐ Box ☐ Other: _____	☐ Single ☐ Double ☐ Triple ☐ Other: _____	Diameter/Dimensions: _____	In Water: ☐ No ☐ Partially ☐ Fully With Sediment: ☐ No ☐ Partially ☐ Fully
☐ Open drainage	☐ Concrete ☐ Pavement/Scupper ☐ Earthen ☐ rip-rap ☐ Other: _____	☐ Trapezoid ☐ Parabolic ☐ Other: _____		Depth: _____ Top Width: _____ Bottom Width: _____	
Flow Present?	☐ Yes ☐ No	***If No, Skip to Section 3. If Yes, Notify Town and continue field reconnaissance.***			
Flow Description (If present)	☐ Trickle ☐ Moderate ☐ Substantial			Flow Direction (If Present):	

Section 3: Sketch

Outfall Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No *(If No, Skip to Section 5)*

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:	☐ 1 – Faint	☐ 2 – Easily detected	☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:	☐ 1 – Faint colors in outfall flow	☐ 2 – Clearly visible in outfall flow	☐ 3 – Clearly visible in outfall flow
Turbidity	☐	See severity	☐ 1 – Slight cloudiness	☐ 2 – Cloudy	☐ 3 – Opaque
Floatables -Does Not Include Trash!!	☐	☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:	☐ 1 – Few/slight; origin not obvious	☐ 2 – Some; indications of origin (e.g., possible suds or oil sheen)	☐ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present? ☐ Yes ☐ No *(If No, Skip to Section 6)*

INDICATOR	CHECK if Present	DESCRIPTION	COMMENTS
Outfall Damage	☐	☐ Spalling, Cracking or Chipping ☐ Peeling Paint ☐ Corrosion	
Deposits/Stains	☐	☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	
Abnormal Vegetation	☐	☐ Excessive ☐ Inhibited	
Poor pool quality	☐	☐ Odors ☐ Colors ☐ Floatables ☐ Oil Sheen ☐ Suds ☐ Excessive Algae ☐ Other:	
Pipe benthic growth	☐	☐ Brown ☐ Orange ☐ Green ☐ Other:	

Section 6: Potential for Illicit Discharge

☐ Unlikely ☐ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

Section 7: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?

Manhole Inspection Report

MH#

Catchment Area: _____

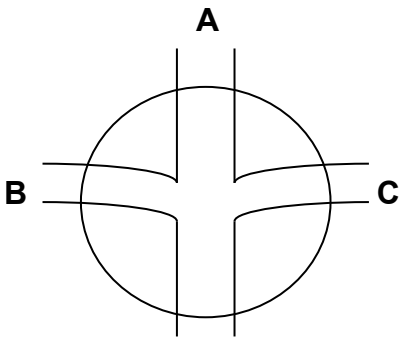
Inspector: _____

Date/Time: _____

Weather: _____

Street/Location: _____

General Comments: _____



(Hold "D" as outlet)

Structural Information:

Cover Size: 24" 30" Other: _____

MH Size: 4' 5' Other: _____

MH Sump: Y / N Sump Depth: _____

MH Channel: Y / N

Weir: Y / N Rim to Top of Weir: _____

Internal Drop: Y / N

Depth to Wet Ring from Rim: _____

General Information:

Manhole Type:	Sanitary ☐	Storm ☐	Combined ☐	Common ☐							
Location of MH:	Roadway ☐	Sidewalk ☐	Roadside ☐	Alley ☐	Easement ☐	Other ☐					
Manhole Material:	Brick ☐	Clay Block ☐	Poured Concrete ☐		Manhole Block ☐	Precast Concrete ☐	Other ☐				
Paved Area Around MH:	Satisfactory ☐		Cracked ☐	☐	Missing Pavement ☐	Vegetation Growth					
Unpaved Area Around MH:	Satisfactory ☐		Eroded ☐								
Odors:											
Recommendations:	No Action ☐	Rebuild ☐	Line Manhole Wall ☐		Reset Frame ☐	Clean / Remove debris from Invert ☐					

Field Test Kit Results:

Pipe (A-F):						
Ammonia, mg/L (Compliant ≤ 0.5 mg/L)						
Surfactants, mg/L (Compliant ≤ 0.25 mg/L)						
Chlorine, mg/L (Compliant < 0.02 mg/L)						

Pipe Information:

	Pipe Size	Material	From / To MH#	Invert Depth (from Rim)	Flow Depth (from Invert)	Debris Depth (from Invert)	Condition	Flow	Clarity of Flow
A.									
B.									
C.									
D.									
E.									
F.									

Ammonia Nitrogen Test Kit

NI-SA (2428700)

DOC326.98.00007

Test preparation

CAUTION: ⚠ Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.

- Put the color disc on the center pin in the color comparator box (numbers to the front).
- Use sunlight or a lamp as a light source to find the color match with the color comparator box.
- Rinse the tubes with sample before the test. Rinse the tubes with deionized water after the test.
- If the color match is between two segments, use the value that is in the middle of the two segments.
- If the color disc becomes wet internally, pull apart the flat plastic sides to open the color disc. Remove the thin inner disc. Dry all parts with a soft cloth. Assemble when fully dry.
- To verify the test accuracy, use a standard solution as the sample.
- This test kit is for seawater. If used for brackish or fresh water, the test kit gives a higher than actual value. The error in brackish water is usually less than 10%. The error in low salinity or fresh water is a maximum 16%.
- This test is very sensitive to contamination. Try to get the same result on a second test. Fully rinse the tubes with fresh sample before the second test. The reagents clean the tubes during the first test.
- To increase the range of this test to 4 mg/L NH_3–N, dilute the sample as follows. Use a 3-mL syringe to add 2.5 mL of sample to each tube. Dilute the sample to the 5-mL mark with deionized water. Use the diluted sample in the test procedure and multiply the result by 2.

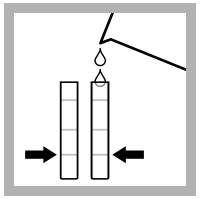
Replacement items

Description	Unit	Item no.
Ammonia Salicylate Reagent Powder Pillows, 5 mL	50/pkg	2395266
Ammonia Cyanurate Reagent Powder Pillows, 5 mL	50/pkg	2395466
Color disc, ammonia nitrogen, salicylate, 0–2.0 mg/L	each	9261300
Color comparator box	each	173200
Glass viewing tubes, glass, 18 mm	6/pkg	173006
Stoppers for 18-mm glass tubes and AccuVac Ampuls	6/pkg	173106

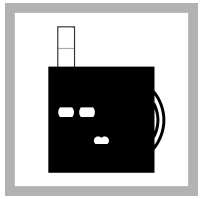
Optional items

Description	Unit	Item no.
Nitrogen ammonia standard solution, 1.0 mg/L NH_3–N	500 mL	189149
Water, deionized	500 mL	27249
Syringe, Luer-Lok® Tip, 3 mL	each	4321300

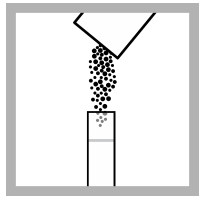
Test procedure—Ammonia-nitrogen (0–2.0 mg/L NH_3–N)



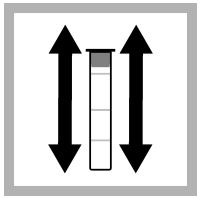
1. Fill two tubes to the first line (5 mL) with sample.



2. Put one tube into the left opening of the color comparator box.

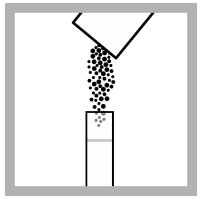


3. Add one Ammonia Salicylate Reagent Powder Pillow to the second tube.

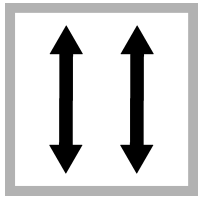


4. Put a stopper on the tube. Shake until the powder fully dissolves.

5. Wait 3 minutes.

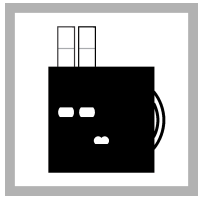


6. Add one Ammonia Cyanurate Reagent Powder Pillow to the same tube. Put a stopper on the tube.

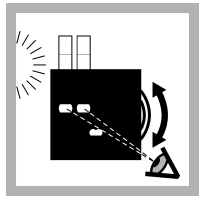


7. Shake until the powder fully dissolves.

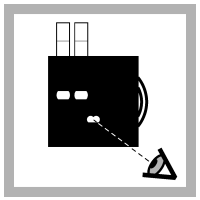
8. Wait 15 minutes. A green color develops.



9. Put the second tube into the color comparator box.



10. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.



11. Read the result in mg/L in the scale window.

Calculate the mg/L NH_3 and mg/L NH_4^+

Ammonia in water is in the form of the ammonium ion (NH_4^+) and un-ionized ammonia (NH_3). NH_3 is toxic to fish. Table 1 shows that the percent of NH_3 increases as the pH and temperature increase. This test kit measures both NH_4^+ and NH_3 as ammonia nitrogen (NH_3–N).

To calculate the mg/L NH_3 in the sample, refer to Table 1 and the equation that follows.

mg/L NH_3 = ((mg/L NH_3–N x percent NH_3 from Table 1) ÷ 100) × 1.2

Example: *The test result was 1.6 mg/L NH_3–N. The sample pH was 7.6 and the sample temperature was 16 °C. The mg/L NH_3 is ((1.6 x 1.16) ÷ 100) × 1.2 = 0.02 mg/L NH_3.*

To calculate the mg/L NH_4^+ in the sample, refer to Table 1 and the equation that follows.

mg/L NH_4^+ = ((mg/L NH_3–N x (100 – percent NH_3 from Table 1)) ÷ 100) × 1.3

Example: *The test result was 1.6 mg/L NH_3–N. The sample pH was 7.6 and the sample temperature was 16 °C. The mg/L NH_4^+ is ((1.6 x (100 – 1.16)) ÷ 100) × 1.3 = 2.056 mg/L NH_4^+.*

Table 1 Percent of NH_3 in water

pH	16 °C	18 °C	20 °C	22 °C	24 °C	26 °C	28 °C	30 °C	32 °C
7.0	0.29	0.34	0.39	0.46	0.52	0.60	0.69	0.80	0.91
7.2	0.46	0.54	0.62	0.82	0.83	0.96	1.10	1.26	1.44
7.4	0.73	0.85	0.98	1.14	1.31	1.50	1.73	1.98	2.26
7.6	1.16	1.34	1.55	1.79	2.06	2.36	2.71	3.10	3.53
7.8	1.82	2.11	2.44	2.81	3.22	3.70	4.23	4.82	5.48
8.0	2.86	3.30	3.81	4.38	5.02	5.74	6.54	7.43	8.42
8.2	4.45	5.14	5.90	6.76	7.72	8.80	9.98	11.29	12.72
8.4	6.88	7.90	9.04	10.31	11.71	13.26	14.95	16.78	18.77
8.6	10.48	11.97	13.61	15.41	17.37	19.50	21.78	24.22	26.80
8.8	15.66	17.73	19.98	22.41	25.00	27.74	30.62	33.62	36.72
9.0	22.73	25.46	28.36	31.40	34.56	37.83	41.16	44.53	47.91
9.2	31.80	35.12	38.55	42.04	45.57	49.09	52.58	55.99	59.31
9.4	42.49	46.18	49.85	53.48	57.02	60.45	63.73	66.85	69.79
9.6	53.94	57.62	61.17	64.56	67.77	70.78	73.58	76.17	78.55
9.8	64.99	68.31	71.40	74.28	76.92	79.33	81.53	83.51	85.30
10.0	74.63	77.35	79.83	82.07	84.08	85.88	87.49	88.92	90.19
10.2	82.34	84.41	86.25	87.88	89.33	90.60	91.73	92.71	93.58

Detergents CHEMets Kit

K-9400/R-9400: 0 - 3 ppm

Test Procedure

1. Rinse the reaction tube with the sample to be tested, and then fill it to the 5 mL mark with the sample.
2. While holding the double-tipped ampoule in a vertical position, snap the upper tip using the tip breaking tool (fig. 1).
3. Invert the ampoule and position the open end over the reaction tube. Snap the upper tip and allow the contents to drain into the reaction tube (fig. 1).
4. Cap the reaction tube and shake it vigorously for **30 seconds**. Allow the tube to stand undisturbed for **1 minute**.
5. Make sure that the flexible tubing is firmly attached to the CHEMet ampoule tip.
6. Insert the CHEMet assembly (tubing first) into the reaction tube making sure that the end of the flexible tubing is at the bottom of the tube. Break the tip of the CHEMet ampoule by gently pressing it against the side of the reaction tube (fig. 2). The ampoule should draw in fluid only from the organic phase (bottom layer).
7. When filling is complete, remove the CHEMet assembly from the reaction tube.

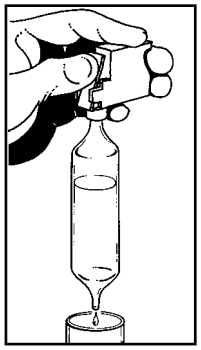


Figure 1

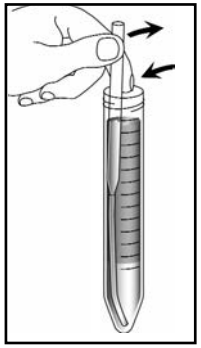


Figure 2

8. Remove the flexible tubing from the CHEMet ampoule and wipe all liquid from the exterior of the ampoule. Place an ampoule cap firmly onto the tip of the CHEMet ampoule. Invert the ampoule several times, allowing the bubble to travel from end to end.
9. Obtain a test result by placing the ampoule, flat end first, into the comparator. Hold the comparator up toward a source of light and view from the bottom. Rotate the comparator until the best color match is found (fig. 3).

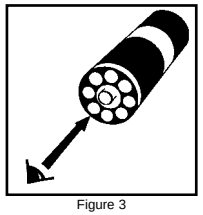


Figure 3

Tip Breaker

The tip breaker opens for easy disposal of the glass tips (pull lever away from body of tip breaker or pull open the side wall). The tip breaker will work most effectively if the tips are emptied out frequently.

Test Method

The Detergents CHEMets®[1] test kit employs the methylene blue extraction method[2,3,4]. Anionic detergents react with methylene blue to form a blue complex that is extracted into an immiscible organic solvent. The intensity of the blue color is directly related to the concentration of "methylene blue active substances (MBAS)" in the sample. Anionic detergents are one of the most prominent methylene blue active substances. Test results are expressed in ppm (mg/Liter) linear alkylbenzene sulfonate (equivalent weight 325).

1. CHEMets is a registered trademark of CHEMetrics, Inc. U.S. Patent No. 3,634,038
2. APHA Standard Methods, 22nd ed., Method 5540 C - 2000
3. EPA Methods for Chemical Analysis of Water and Wastes, Method 425.1 (1983)
4. ASTM D 2330-02, Methylene Blue Active Substances

Safety Information

Read SDS (available at www.chemetrics.com) before performing this test procedure. Wear safety glasses and protective gloves.

CHEMetrics

Simplicity in Water Analysis

www.chemetrics.com
4295 Catlett Road, Midland, VA 22728 U.S.A.
Phone: (800) 356-3072; Fax: (540) 788-4856
E-Mail: orders@chemetrics.com

Feb. 18, Rev. 10

CHLORINE, TOTAL, Low Range (0 to 2.00 mg/L Cl_2)

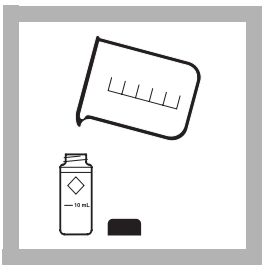
For water, wastewater and seawater

DPD Method* USEPA accepted (powder pillows only)**

Measuring Hints

If the sample temporarily turns yellow after reagent addition or the display shows overrange (flashing **2.20** in display), dilute a fresh sample and repeat the test. A slight loss of chlorine may occur because of the dilution. Multiply the result by the appropriate dilution factor.

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*
** Procedure is equivalent to USEPA method 330.5 for wastewater and Standard Method 4500-Cl G for drinking water.



1. Fill a 10-mL cell to the 10-mL line with sample. Cap.

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*

Note: *Be sure the instrument is in the low range mode. See page 37.*

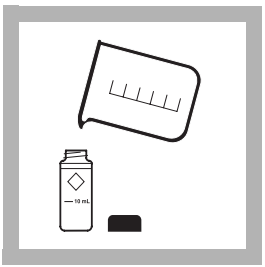
2. Add the contents of one DPD Total Chlorine Powder Pillow to the sample cell (the prepared sample). Cap and gently shake for 20 seconds.

Note: *Gently shaking dissipates bubbles which may form in samples containing dissolved gases.*

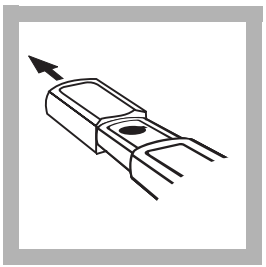
3. Wait 3 minutes. During this period, proceed with *steps 4–8*.

Note: *A pink color will form if chlorine is present.*

Note: *Accuracy is not affected by undissolved powder.*

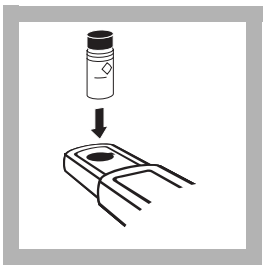


4. Fill a 10-mL sample cell to the 10-mL line with sample (the blank). Cap.



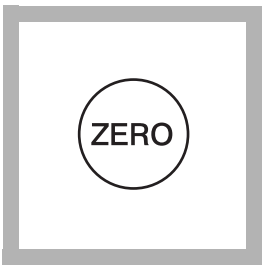
5. Remove the instrument cap.

Note: *For best results, zero the instrument and read the sample under the same lighting conditions.*



6. Place the blank in the cell holder, with the diamond mark facing you. Tightly cover the cell with the instrument cap (flat side should face the back of the instrument).

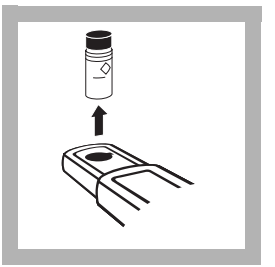
Note: *Wipe liquid off sample cells.*



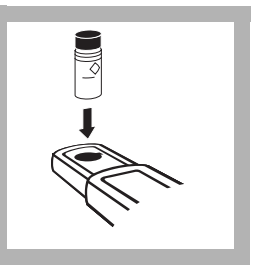
7. Press: **ZERO**

The instrument will turn on and the display will show **- - -** followed by **0.00**.

Note: *The instrument automatically shuts off after 1 minute and stores the last zero in memory. Press* **READ** *to complete the analysis.*

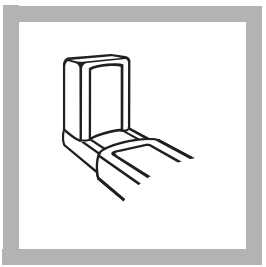


8. Remove the cell from the cell holder.

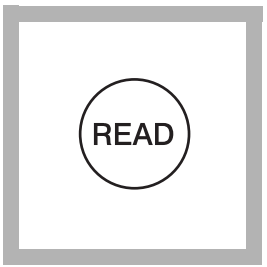


9. Within 3 minutes after the 3-minute reaction period, place the prepared sample in the cell holder.

Note: *Wipe liquid off sample cells.*



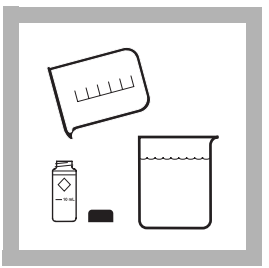
10. Cover the cell with instrument cap.



11. Press: **READ**
The instrument will show **- - -** followed by the result in mg/L total chlorine.

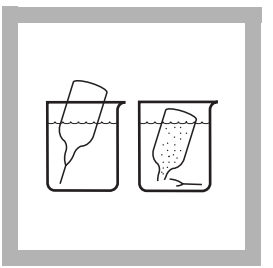
Note: *If the sample temporarily turns yellow after reagent addition or shows overrange (flashing* **2.20***), dilute a fresh sample and repeat the test. Some loss of chlorine may occur. Multiply the result by the dilution factor.*

Using AccuVac® Ampuls



1. Fill a 10-mL sample cell to the 10-mL line with sample (the blank). Cap. Collect at least 40 mL of sample in a 50-mL beaker.

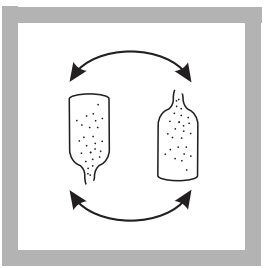
Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*



2. Fill a DPD Total Chlorine Reagent AccuVac Ampul with sample (the prepared sample).

Note: *Keep the tip immersed until the ampule fills completely.*

Note: *Be sure the instrument is in low range. See page 37.*

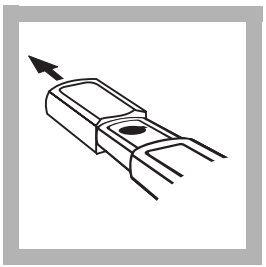


3. Quickly invert the ampule several times to mix. Wipe off any liquid or fingerprints.

Note: *A pink color will develop if chlorine is present.*

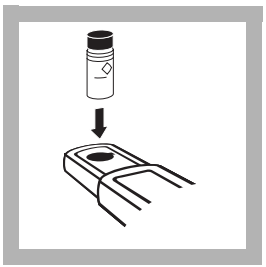
Note: *Accuracy is not affected by undissolved powder.*

4. Wait 3 minutes. During this period, proceed with *steps 5–8*.



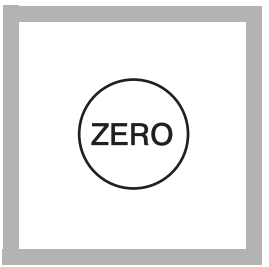
5. Remove the instrument cap.

Note: *For best results, zero and read the sample measurements under the same lighting conditions.*



6. Place the blank in the cell holder with the diamond mark facing you. Tightly cover the cell with the instrument cap (flat side should face the back of the instrument).

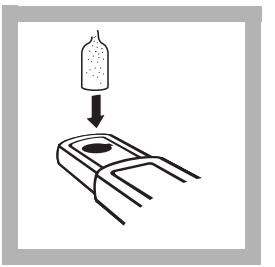
Note: *Wipe liquid off sample cells.*



7. Press: **ZERO**

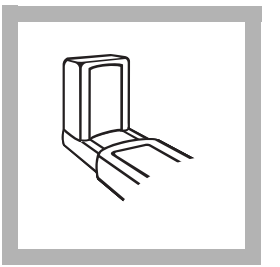
The instrument will turn on and the display will show **- - -** then **0.00**.

Note: *The instrument automatically shuts off after 1 minute and stores the last zero in memory. Press* **READ** *to complete the analysis.*

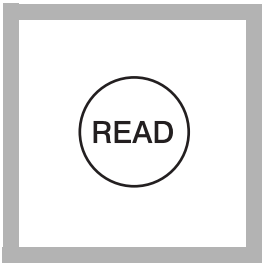


8. Within 3 minutes after the 3-minute reaction period, place the prepared sample in the cell holder.

Note: *Wipe liquid off sample cells.*



9. Cover the ampule with the instrument cap.



10. Press: **READ**

The instrument will show **- - -** followed by the result in mg/L total chlorine.

Note: *If the sample temporarily turns yellow after reagent addition or shows overrange (flashing* **2.20***), dilute a fresh sample and repeat the test. Some loss of chlorine may occur. Multiply the result by the dilution factor.*

Accuracy Check

Standard Additions Method

a. Snap the neck off a Chlorine Standard Solution Voluette® Ampule.

b. Use a TenSette® pipet to add 0.1, 0.2, and 0.3 mL of standard to three 25-mL samples. Swirl gently to mix. (For AccuVac Ampuls, use 50-mL beakers.)

c. Analyze a 10-mL aliquot of each sample as described in the procedure. Each 0.1 mL of standard will cause an incremental increase in chlorine, the exact value depends on the concentration of the Voluette ampule standard. Check the certificate enclosed with the Voluette ampules for this value.

d. If these increases do not occur, call Hach at 800-227-4224. Outside the United States, contact the Hach office or distributor serving you.

Interferences

Samples containing more than the 250 mg/L alkalinity or 150 mg/L acidity as $CaCO_3$ may inhibit full color development, or the color may fade instantly. Neutralize these samples to pH 6–7 with 1 N Sulfuric Acid or 1 N Sodium Hydroxide. Determine the

amount required on a separate 10-mL sample. Add the same amount to the sample to be tested. Correct for the additional volume.

Bromine, iodine, ozone and oxidized forms of manganese and chromium may also react and read as chlorine.

To compensate for the effects of manganese (Mn^{4+}) or chromium (Cr^{6+}), adjust the pH to 6–7 as described above. To a 25-mL sample, add 3 drops of 30 g/L Potassium Iodide Solution, mix, and wait one minute. Add 3 drops of 5 g/L Sodium Arsenite and mix. If chromium is present, allow exactly the same reaction period with DPD for both analyses. Subtract the result of this test from the original analysis to obtain the accurate chlorine concentration.

DPD Total Chlorine Reagent Powder Pillows and AccuVac Ampuls contain a buffer formulation that withstands high levels (at least 1000 mg/L) of hardness without interference.

REQUIRED REAGENTS

Description	Unit	Cat. No.
DPD Total Chlorine Reagent Powder Pillows	100/pkg	21056-69
or		
DPD Total Chlorine Reagent AccuVac® Ampuls	25/pkg	25030-25

REQUIRED APPARATUS (AccuVac® Ampuls)

Beaker, 50 mL	each	500-41

OPTIONAL REAGENTS

Chlorine Standard Solution Voluette® Ampules, 50-75 mg/L, 10 mL	16/pkg	14268-10
Chlorine Standards, secondary, Specv™, 0.0, 0.2, 0.8, and 1.5 mg/L	4/set	26353-00
DPD Total Chlorine Reagent w/dispensing cap	250 tests	21056-29
Potassium Iodide Solution, 30 g/L	100 mL MDB*	343-32
Sodium Arsenite Solution, 5 g/L	100 mL MDB	1047-32
Sodium Hydroxide Standard Solution, 1 N	100 mL MDB	1045-32
Sulfuric Acid Standard Solution, 1 N	100 mL MDB	1270-32
Water, deionized	4 L	272-56

* Marked Dropper Bottle

OPTIONAL APPARATUS

Description	Unit	Cat. No.
AccuVac® Snapper Kit	each	24052-00
Batteries, AAA, alkaline	4/pkg	46743-00
Caps for 10-mL sample cells	12/pkg	24018-12
Cylinder, graduated, 25 mL, poly	each	1081-40
Cylinder, graduated, 100 mL, PMP	each	2172-42
sens*ion*™*1* Basic Portable pH Meter, with electrode	each	51700-10
Pipet, TenSette®, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, For 19700-01 TenSette®	50/pkg	21856-96
Sample Cells, 10-mL with screw caps	6/pkg	24276-06

REPLACEMENT PARTS

Instrument Cap/light shield	each	46704-00
Instrument Manual	each	46760-88

Pro30

USER MANUAL

English

Item #606082
Rev A
Drawing # A606082
July 2011

CONTENTS

WARRANTY

The YSI Professional 30 instrument (Pro30) is warranted for three (3) years from date of purchase by the end user against defects in materials and workmanship, exclusive of batteries and any damage caused by defective batteries. Pro30 cable/probe assemblies are warranted for two (2) years from date of purchase by the end user against defects in material and workmanship. Pro30 instruments & cables are warranted for 90 days from date of purchase by the end user against defects in material and workmanship when purchased by rental agencies for rental purposes. Within the warranty period, YSI will repair or replace, at its sole discretion, free of charge, any product that YSI determines to be covered by this warranty.

To exercise this warranty, call your local YSI representative, or contact YSI Customer Service in Yellow Springs, Ohio at +1 937 767-7241, 800-897-4151 or visit www.YSI.com for a Product Return Form. Send the product and proof of purchase, transportation prepaid, to the Authorized Service Center selected by YSI. Repair or replacement will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days from date of repair or replacement.

LIMITATION OF WARRANTY

This Warranty does not apply to any YSI product damage or failure caused by:

1. Failure to install, operate or use the product in accordance with YSI's written instructions;
2. Abuse or misuse of the product;
3. Failure to maintain the product in accordance with YSI's written instructions or standard industry procedure;
4. Any improper repairs to the product;
5. Use by you of defective or improper components or parts in servicing or repairing the product;
6. Modification of the product in any way not expressly authorized by YSI.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. YSI'S LIABILITY UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT, AND THIS SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY. IN NO EVENT SHALL YSI BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY.

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INTRODUCTION

Thank you for purchasing the YSI Pro30, an instrument from the YSI *Professional Series* product family. The Pro30 measures conductivity and temperature in water. The Pro30 features an impact resistant and waterproof (IP-67) case, a rugged MS-8 (military-spec) cable connector, backlit display, user-selectable sensor options, 50 data set memory, internal barometer and a rubber over-mold case.

The Pro30 provides valuable instructions and prompts near the bottom of the display that will guide you through operation and use. However, reading the entire manual is recommended for a better understanding of the instrument's features.

> ⓘ *The Pro30 cannot communicate to a PC via a Pro Series communications saddle. Connecting the Pro30 to a communication saddle may cause erratic instrument behavior.*

GETTING STARTED

INITIAL INSPECTION

Carefully unpack the instrument and accessories and inspect for damage. Compare received parts with items on the packing list. If any parts or materials are damaged or missing, contact YSI Customer Service at 800-897-4151 (+1 937 767-7241) or the authorized YSI distributor from whom the instrument was purchased.

BATTERY INSTALLATION

The instrument requires 2 alkaline C-cell batteries. Under normal conditions, the average battery life is 425 hours at room temperature without using the back light. A battery symbol  will blink in the lower, left corner of the display to indicate low batteries when approximately 1 hour of battery life remains.

To install or replace the batteries:

1. Turn the instrument off and flip over to view the battery cover on the back.
2. Unscrew the four captive battery cover screws.
3. Remove the battery cover and remove the old batteries if necessary.
4. Install the new batteries, ensuring correct polarity alignment (figure 1).

5. Place the battery cover on the back of the instrument and tighten the four screws. Do not over-tighten.

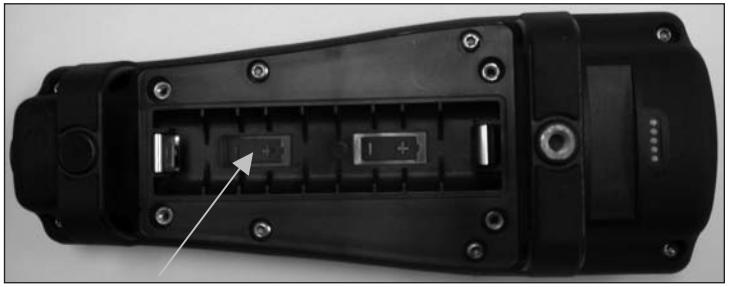


Figure 1. Pro30 with battery cover removed. Notice battery symbols indicating polarities.

> *The waterproof instrument case is sealed at the factory and is not to be opened, except by authorized service technicians. Do not attempt to separate the two halves of the instrument case as this may damage the instrument, break the waterproof seal, and will void the warranty.*

KEY PAD

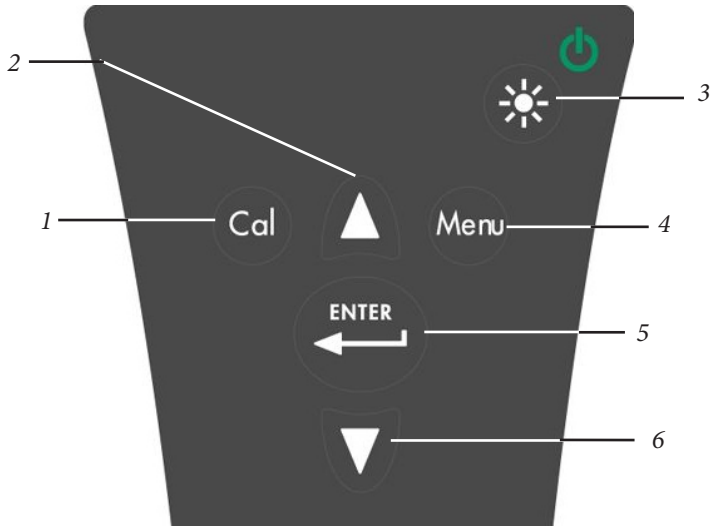


Figure 2, Keypad

Number	*Key*	*Description*
1	Cal	**Calibrate** Press and hold for 3 seconds to calibrate. Opens Calibrate menu from the Run screen.
2	▲	**Up Arrow** Use to navigate through menus, to navigate through box options along the bottom of the Run screen and to increase numerical inputs.
3	⏻ ☀	**Power and Backlight** Press once to turn instrument on. Press a second time to turn backlight on. Press a third time to turn backlight off. Press and hold for 3 seconds to turn instrument off.
4	Menu	**Menu** Use to enter the System Setup menu from the Run screen.
5	ENTER	**Enter** Press to confirm entries and selections.
6	▼	**Down Arrow** Use to navigate through menus, to navigate through box options at the bottom of the Run screen and to decrease numerical inputs.

CONNECTING THE PROBE/CABLE ASSEMBLY TO THE INSTRUMENT

The conductivity and temperature sensors are integral to the cable assembly; therefore, they cannot be removed from the cable.

To connect the cable, align the keys on the cable connector to the slots on the instrument connector. Push together firmly and then twist the outer ring until it locks into place (figure 3). This connection is water-proof.

Figure 3, Note the keyed connector.

RUN SCREEN

Press the power/backlight key to turn the instrument on. The instrument will run through a self test and briefly display a splash screen with system information before displaying the main Run screen (figure 4). The first time the Pro30 is turned on, it will prompt you to select a language; see the First Power On section of this manual for more information.

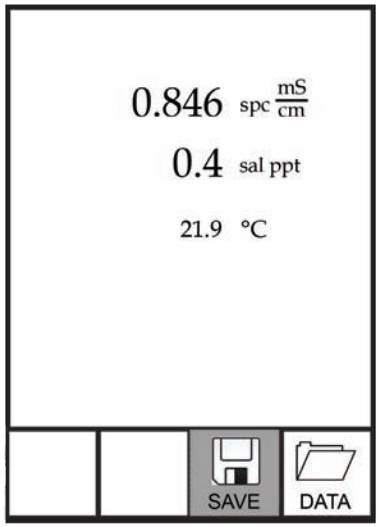


Figure 4, Run screen.

BACKLIGHT

Once the instrument is powered on, pressing the power/backlight key will turn on the display backlight. The backlight will remain on until the key is pressed again or after two minutes of not pressing any key on the keypad.

POWERING OFF

To turn the instrument off, press and hold the power/backlight key for three seconds.

NAVIGATION

The up and down arrow keys allow you to navigate through the functions of the Pro30.

NAVIGATING THE RUN SCREEN

When in the Run screen, the up and down arrow keys will move the highlighted box along the bottom options. Once a box is highlighted, press enter to access the highlighted option.

Description of Run screen box functions from left to right:

Option	*Description*
SAVE	Highlight and press enter to save displayed data to memory.
DATA	Highlight and press enter to view and/or erase saved data.

NAVIGATING THE SYSTEM SETUP MENU

When in the System Setup menu, the up and down arrow keys will move the highlighted bar up and down the system setup options. See the System Setup menu section of this manual for more information about these options.

FIRST POWER ON

The instrument will step through an initial language configuration when powered on for the first time. Use the up or down arrow keys to highlight the

appropriate language then press enter to confirm (figure 5). If an incorrect language is selected, it may be changed in the System Setup menu.

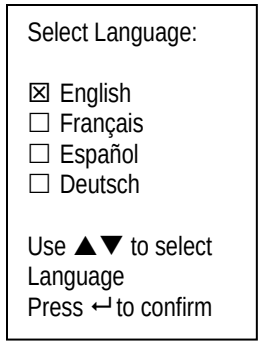


Figure 5, Select language.

After selecting a language, the Run screen will be displayed. The next time the instrument is powered up, the Run screen will display immediately after the splash screen.

SYSTEM SETUP MENU

Press the menu Menu key to access the System Setup menu. The System Setup menu contains multiple screens that are notated as 'pages'. The current page is indicated near the bottom of the display (figure 6).

Use the up and down arrow keys to scroll through menu options and menu pages.

EXITING THE SYSTEM SETUP MENU

To exit the System Setup menu, press the down arrow key until the ESC - Exit box is highlighted, then press enter to return to the Run screen.

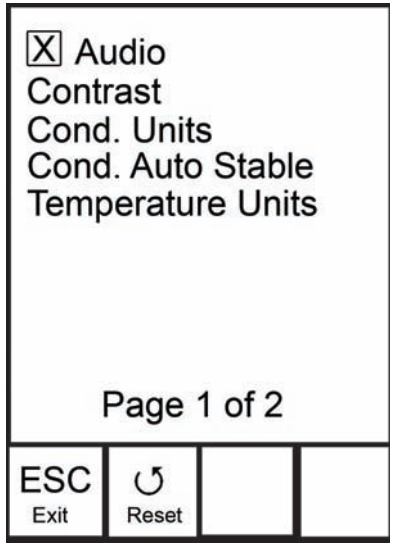


Figure 6, page 1 of System Setup menu. Audio is enabled.

AUDIO

Audio can be enabled or disabled by using the up or down arrow keys to highlight Audio and pressing enter. When enabled, there will be an 'X' in the box next to Audio.

When Audio is enabled, the Pro30 will beep twice to indicate stability when Auto Stable is enabled. The instrument will also beep when a key is pressed. When Audio is disabled, the Pro30 will not beep.

CONTRAST

To adjust the display Contrast, use the up or down arrow keys to highlight Contrast, then press enter. Next, use the up or down arrow keys to adjust the contrast. The up arrow key will darken the contrast and the down arrow key will lighten the contrast. After adjusting the contrast, press enter to save and exit the Contrast adjustment option.

EMERGENCY CONTRAST ADJUSTMENT

If necessary, there is an alternate method of adjusting the contrast. To adjust the contrast, press and hold the menu key, then press the up arrow key to darken the contrast or press the down arrow key to lighten the contrast.

CONDUCTIVITY UNITS (COND. UNITS)

Highlight Cond. Units (Conductivity Units) and press enter to open a submenu that allows you to select the conductivity units to be displayed on the Run screen. Highlight a unit and press enter to enable or disable it. An enabled conductivity unit will have an 'X' in the box next to it. Highlight the ESC-Exit box along the bottom of the display and press enter to save any changes and to close the conductivity units submenu.

There are seven options for displaying conductivity. Only four units can be enabled at the same time:

- COND-mS/cm displays conductivity in milliSiemens per centimeter.
- COND-uS/cm displays conductivity in microSiemens per centimeter.
- SPC-mS/cm displays Specific Conductance in milliSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- SPC-uS/cm displays Specific Conductance in microSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- Sal ppt displays salinity in parts per thousand. The salinity reading is calculated from the instrument's conductivity and temperature values using algorithms found in *Standard Methods for the Examination of Water and Wastewater*.
- TDS g/L displays Total Dissolved Solids in grams per liter. TDS is calculated from conductivity and temperature using a user-selectable TDS constant.
- TDS mg/L displays Total Dissolved Solids in milligrams per liter. TDS is calculated from conductivity and temperature using a user-selectable TDS constant.

Note: 1 milliSiemen = 1,000 microSiemens.

SPECIFIC CONDUCTANCE

The conductivity of a sample is highly dependent on temperature, varying as much as 3% for each change of one degree Celsius (temperature coefficient = 3%/°C). In addition, the temperature coefficient itself varies with the nature of the ionic species present in the sample. Therefore, it is useful to compensate for this temperature dependence in order to quickly compare conductivity readings taken at different temperatures.

The Pro30 can display non-temperature compensated conductivity as well as temperature compensated Specific Conductance. If Specific Conductance is selected, the Pro30 uses the temperature and conductivity values associated with

each measurement to calculate a specific conductance value compensated to a user selected reference temperature, see below. Additionally, the user can select the temperature coefficient from 0% to 4%.

Using the Pro30's default reference temperature and temperature coefficient (25 °C and 1.91%), the calculation is carried out as follows:

$$\text{Specific Conductance (25°C)} = \frac{\text{Conductivity of sample}}{1 + 0.0191 * (T - 25)}$$

T = Temperature of the sample in °C

CONDUCTIVITY AUTO STABLE (COND. AUTO STABLE)

Auto Stable utilizes preset values to indicate when a reading is stable. The preset values are adjustable in the System Setup menu. The user can input a % change in readings (0.0 to 1.9) over 'x' amount of time in seconds (3-19).

Highlight Cond. Auto Stable, then press enter to open the submenu.

Use the up or down arrow keys to highlight the % change or seconds (secs) input field, then press enter to make the highlighted field adjustable. Use the up or down arrow keys to adjust the selected value, then press enter to confirm changes. Once you have confirmed any changes, highlight the ESC-Exit box along the bottom of the display and press enter to close the Auto Stable submenu.

To disable Auto Stable, set the % Change input to 0.0.

When Auto Stable is enabled, an (AS) symbol will display next to the reading on the Run screen and blink during stabilization. When the dissolved oxygen and/or conductivity reading stabilizes based on the Auto Stable settings, the (AS) symbol will display steadily and the instrument will beep twice if Audio is turned on.

TEMPERATURE UNITS

Highlight Temperature Units and press enter to open a submenu that allows you to change the temperature units displayed on the Run screen. Highlight the desired unit (Celsius or Fahrenheit) and press enter to enable. The enabled temperature unit will have an 'X' in the box next to it. Only one unit may be enabled at a time. Highlight the ESC-Exit box and press enter to save any changes and to close the Temperature Units submenu.

SPECIFIC CONDUCTANCE REFERENCE TEMPERATURE (SPC REF. TEMP.)

SPC Ref. Temp. (Specific Conductance Reference Temperature) is the reference temperature used to calculate Specific Conductance. The reference temperature range is 15 and 25 °C. The default value is 25 °C.

To change the reference temperature, highlight SPC Ref. Temp. and press enter to open the submenu. With the reference temperature highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new reference temperature. Next, highlight the ESC-Exit box and press enter to close the submenu.

SPECIFIC CONDUCTANCE TEMPERATURE COEFFICIENT (SPC %/°C)

SPC %/°C (Specific Conductance Temperature Coefficient) is the temperature coefficient used to calculate Specific Conductance. The coefficient range is 0.00 to 4.00. The default value is 1.91% which is based on KCl standards.

To change the temperature coefficient, highlight SPC %/°C and press enter to open the submenu. With the temperature coefficient highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new coefficient. Next, highlight the ESC-Exit box and press enter to close the submenu.

TDS CONSTANT

TDS Constant is a multiplier used to calculate an estimated TDS (Total Dissolved Solids) value from conductivity. The multiplier is used to convert Specific Conductance in mS/cm to TDS in g/L. The Pro30's default value is 0.65. This multiplier is highly dependent on the nature of the ionic species present in the water sample. To be assured of moderate accuracy for the conversion, you must determine a multiplier for the water at your sampling site. Use the following procedure to determine the multiplier for a specific sample:

1. Determine the specific conductance of a water sample from the site;
2. Filter a sample of water from the site;
3. Completely evaporate the water from a carefully measured volume of the filtered sample to yield a dry solid;
4. Accurately weigh the remaining solid;
5. Divide the weight of the solid (in grams) by the volume of water used (in liters) to yield the TDS value in g/L for this site;
6. Divide the TDS value in g/L by the specific conductance of the water in mS/cm to yield the conversion multiplier. Be certain to use the correct units.

If the nature of the ionic species at the site changes between sampling studies, the TDS values will be in error. TDS cannot be calculated accurately from specific conductance unless the make-up of the chemical species in the water remains constant.

To change the TDS Constant in the Pro30, highlight TDS Constant and press enter to open the submenu. With the TDS Constant highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. The input range is 0.30 to 1.00. Press enter to save the new TDS Constant. Next, highlight the ESC-Exit box and press enter to close the submenu.

LANGUAGE

Highlight Language and press enter to open a submenu that allows you to change the language. Highlight the desired language (English, Spanish, German, or French) and press enter to enable. The enabled language will have an 'X' in the box next to it. Highlight ESC-Exit box and press enter to save any changes and to close the Language submenu.

The text in the boxes along the bottom of the Run screen will always be displayed in English regardless of the language enabled in the System Setup menu.

AUTO SHUTOFF

Auto Shutoff allows you to set the instrument to turn off automatically after a period of time. Use the up or down arrow keys to highlight Auto Shutoff, then press enter to open the submenu. Press enter while the minute field is highlighted to make it adjustable. Next, use the up or down arrow keys to adjust the shut off time from 0 to 60 minutes. Press enter to save the new shutoff time. Next, highlight the ESC-Exit box and press enter to close the submenu.

To disable Auto Shutoff, set the Time in Minutes to 0 (zero).

CELL CONSTANT

The Cell Constant displays the cell constant of the conductivity cell. The cell constant is calculated and updated each time a conductivity calibration is performed. The cell constant range is 4.0 to 6.0. Resetting the System Menu resets the cell constant to 5.0.

RESETTING THE SYSTEM SETUP MENU TO FACTORY DEFAULT

To reset the Pro30 settings to factory default, press the down arrow key while in the System Setup menu until the Reset - ↺ box is highlighted, then press enter. The instrument will ask you to confirm the reset. Highlight Yes and press enter to continue with the reset or highlight No and press enter to cancel the reset. A Factory Reset will not affect data saved in the instrument's memory.

The following will be set in the Pro30 after performing a reset:

Parameter	*Reset Defaults*
Audio	On
Contrast	Set to mid range
Conductivity Units	cond uS/cm, spc mS/cm, spc uS/cm and sal ppt
Conductivity Auto Stable	Off (0.0 % Change and 10 seconds)
SPC Reference Temperature	25°C
SPC Temperature Coefficient	1.91%/°C
TDS Constant	0.65
Temperature Units	°C
Language	English
Auto Shutoff	30 minutes
Conductivity Cell Constant	Cell constant reset to 5.0*

*It is recommended to perform a Conductivity calibration after performing a reset.

CALIBRATION

TEMPERATURE

All Pro30 cables have built-in temperature sensors. Temperature calibration is not required nor is it available.

CONDUCTIVITY CALIBRATION

Ensure the conductivity sensor is clean and dry before performing a conductivity, specific conductance or salinity calibration.

> ⓘ *It is not necessary to calibrate conductivity, specific conductance and salinity. Calibrating one of these parameters will simultaneously calibrate the others. YSI recommends calibrating specific conductance for greatest ease.*

CALIBRATING SPECIFIC (SP.) CONDUCTANCE OR CONDUCTIVITY

Note: When calibrating Specific Conductance, the Pro30 uses the factory default values for the Specific Conductance Reference Temperature and the Specific Conductance Temperature Coefficient regardless of what is configured in the System Setup Menu. The default value for the Reference Temperature is 25°C and the default value for the Temperature Coefficient is 1.91%/°C. It is important to note that the Temperature Coefficient of a calibration solution is dependent on the contents of the solution. Therefore, YSI recommends using a traceable calibration solution made of KCl (potassium chloride) when calibrating Specific Conductance since these solutions typically have a Temperature Coefficient of 1.91%/°C. Additionally, be sure to enter the value of the solution as it is listed for 25°C when calibrating Specific Conductance.

1. Fill a clean container (i.e. plastic cup or glass beaker) with fresh, traceable conductivity calibration solution and place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable (figure 7). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.

Figure 7, solution above two holes near cable.

2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight the desired calibration method, Sp. Conductance or Conductivity, and press enter.
3. Highlight the units you wish to calibrate, either uS/cm or mS/cm, and press enter. 1 mS = 1,000 uS. Next, use the up or down arrow key to adjust the value on the display to match the value of the conductivity calibration solution. If calibrating conductivity, it is necessary to look up the value of the solution at the current temperature and enter that value into the Pro30. Most conductivity solutions are labeled with a value at 25°C. If calibrating specific conductance, enter the value listed for 25°C. Depressing either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro30 will remember the entered calibration value and display it the next time a conductivity calibration is performed.
4. Press enter to complete the calibration. Or, press Cal to cancel the calibration and return to the Run screen.
5. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
6. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting guide for possible solutions.

CALIBRATING IN SALINITY

1. Fill a clean container (i.e. plastic cup or glass beaker) with fresh, traceable salinity calibration solution and place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable (figure 7). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.
2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight Salinity and press enter.
3. Use the up or down arrow key to adjust the value on the display to match the value of the salinity solution. Depressing either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro30 will remember the entered calibration value and display it the next time a salinity calibration is performed.
4. Press enter to complete the calibration. Or, press Cal to cancel the calibration and return to the Run screen.
5. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
6. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting guide for possible solutions.

TAKING MEASUREMENTS

Before taking measurements, be sure the instrument has been calibrated to ensure the most accurate readings. Place the probe in the sample to be measured and give the probe a quick shake to release any air bubbles. Be sure the conductivity sensor is completely submerged in the sample. The two holes near the cable should be covered by the sample for accurate conductivity readings (figure 7). Allow the temperature readings to stabilize.

SAVING AND VIEWING DATA

The Pro30 can store 50 data sets in non-volatile memory for later viewing. A data set includes the values currently on the display, i.e. temperature, dissolved oxygen and two conductivity parameters. Each data point is referenced with a data set number, 01 through 50.

SAVING DATA

> *The Pro30 can not communicate to a PC via a Pro Series communications saddle. Connecting the Pro30 to a communication saddle may cause erratic instrument behavior.*

From the Run screen, use the up or down arrow keys to highlight the Save box and press enter to save the current readings. The instrument will indicate the data set is saved and display the saved data set's number (figure 8).

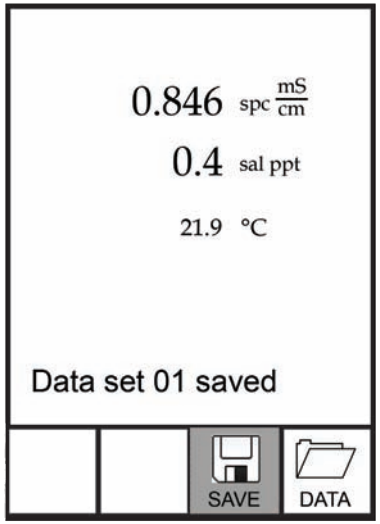


Figure 8, data set saved.

The instrument will display 'Memory Full' if all 50 data sets have been saved and you attempt to save another data set.

VIEWING AND ERASING SAVED DATA - DATA MODE

Data mode allows you to view and erase saved data. From the Run screen, use the up or down arrow keys to highlight Data and press enter to access Data mode. Note that the function boxes at the bottom of the display are different in Data mode (figure 9).

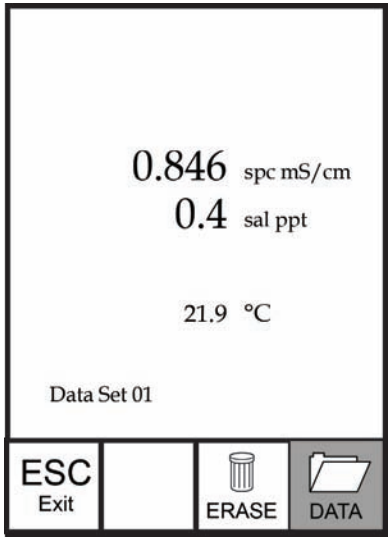


Figure 9, Data mode.

VIEWING DATA

Once in Data mode, use the up and down arrow keys to view saved data sets in sequential order or press enter to access the bottom functions. After accessing the bottom functions, highlight the Data box and press enter to regain access to viewing data. The data set displayed is indicated by the data set number, 01 through 50.

ERASING DATA

While viewing saved data, press the enter key to access the function boxes at the bottom of the display. Next, use the up or down arrow keys to highlight Erase, then press enter. The instrument will give you the option to erase one data set or all data sets (figure 10).

Figure 10, Erase data mode.

Use the up or down arrow key to select Erase Data Set, Erase All Sets or the ESC-Exit function box, then press enter to confirm.

Select ESC-Exit and press enter to exit Erase mode without erasing any data.

Select Erase Data Set and press enter to erase the data set that was displayed before entering Erase mode. For example, if data set 12 was displayed before entering erase mode, and Erase Data Set is selected, Data Set 12 will be erased from memory and the data sets AFTER that number will move up to keep them sequential. For example, if there are15 records and number 12 is erased then 13 becomes 12, 14 becomes 13, and 15 becomes 14. The instrument will return to Data mode after erasing one data set.

Select Erase All Data Sets and press enter to clear the Pro30 memory and return to Data mode.

EXITING DATA MODE

While in Data mode, press enter to access the bottom functions. Next, highlight the ESC-Exit box and press enter to return to the Run screen.

CARE, MAINTENANCE AND STORAGE

This section describes the proper procedures for care, maintenance and storage of the instrument. The goal is to maximize their lifetime and minimize down-time associated with improper instrument usage.

GENERAL MAINTENANCE

GENERAL MAINTENANCE - GASKET

The instrument utilizes a gasket as a seal to prevent water from entering the battery compartment. Following the recommended procedures will help keep the instrument functioning properly.

If the gasket and sealing surfaces are not maintained properly, it is possible that water can enter the battery compartment. If water enters this area, it can severely damage the battery terminals causing loss of battery power and corrosion to the battery terminals. Therefore, when the battery compartment lid is removed, the gasket that provides the seal should be carefully inspected for contamination (i.e. debris, grit, etc.) and cleaned with water and mild detergent if necessary.

SENSOR MAINTENANCE

SENSOR MAINTENANCE - TEMPERATURE

You must keep the temperature sensor free of build up. Other than that, no additional maintenance is required. A toothbrush can be used to scrub the temperature sensor if needed.

SENSOR MAINTENANCE - CONDUCTIVITY

The openings that allow sample access to the conductivity electrodes should be cleaned regularly. The small cleaning brush included in the Maintenance Kit is intended for this purpose. Dip the brush in clean water and insert it into each hole 10 to 12 times. In the event that deposits have formed on the electrodes, it may be necessary to use a mild detergent (laboratory grade soap or bathroom foaming tile cleaner) with the brush. Rinse thoroughly with clean water, then check the response and accuracy of the conductivity cell with a calibration solution.

SENSOR STORAGE

SHORT AND LONG TERM STORAGE

For both short and long term storage, the conductivity sensor should be stored clean and dry.

Remove the batteries from the instrument when storing it for long periods of time (>30 days).

Long Term Storage Temperature: -5 to 70°C (23 to 158°F)

TROUBLESHOOTING

Symptom	*Possible Solution*
Instrument will not turn on, a battery symbol appears, or "Critical Shutdown" displays on the screen.	1. Low battery voltage, replace batteries. 2. Batteries installed incorrectly, check battery polarity. 3. Return system for service.
Temperature values display Over or Undr on Run screen.	1. Sample temperature is less than -5° C or more than +55°C. Increase or decrease the sample temperature to bring within the allowable range. 2. Contact YSI Tech Support.
Instrument will not calibrate the Conductivity sensor; instrument displays "Calibration Over", "Calibration Under", or "Unstable Reading" during calibration.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the calibration solution is above the two holes near the cable, see figure 8. 3. Verify the calibration solution is not expired or contaminated. Try a new bottle of solution. 4. Ensure you are entering in the correct value for the solution according to the measurement units. 1 mS = 1,000 uS. 5. Allow sufficient stabilization time for conductivity and temperature AND wait at least 3 seconds before confirming a calibration. 6. Contact YSI Tech Support.

Symptom	*Possible Solution*
Conductivity readings are inaccurate.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the sample is above the two holes near the cable, see figure 8. 3. Verify calibration. 4. Verify temperature readings are accurate. 5. Verify the correct units are setup in the System Setup menu, i.e. uS vs mS and Conductivity vs. Specific Conductance. 6. Contact YSI Tech Support.
Conductivity values display Over or Undr on Run screen.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the sample is above the two holes near the cable, see figure 8 3. Verify calibration. 4. Verify temperature readings are accurate. 5. Sample conductivity is outside the measurement range of the instrument, i.e. 0-200 mS. 6. Contact YSI Tech Support.

SPECIFICATIONS

These specifications represent typical performance and are subject to change without notice. For the latest product specification information, please visit YSI's website at www.ysi.com or contact YSI Tech Support.

Parameter	*Range*	*Resolution*	*Accuracy*
Temperature	-5 to 55°C	0.1°C	± 0.2°C
Conductivity	0-500 uS/cm 0-5 mS/cm 0-50 mS/cm 0-200 mS/cm (auto ranging)	0.0001 to 0.1 mS/cm; 0.1 to 0 uS/cm (range dependent)	Instrument only: ± 0.5% of the reading or 1 uS/cm, whichever is greater. Instrument with 1 or 4 meter cables: ± 1.0% of the reading or 1 uS/cm, whichever is greater. Instrument with 10, 20, or 30 meter cables: ± 2.0% of the reading or 1 uS/cm, whichever is greater.
Salinity	0 to 70 ppt	0.1 ppt	± 1.0% of the reading or ± 0.1 ppt, whichever is greater.
Total Dissolved Solids (TDS)	0 to 100 g/L. TDS Constant range: 0.3 to 1.00 (0.65 default)	0.0001 to 0.1 g/L (range dependent)	Dependent on accuracy of temperature, conductivity and TDS Constant.

ACCESSORIES / PART NUMBERS

Part Number	*Description*
6050030	Pro30 Instrument
60530-1, -4, -10, -20, or -30	1, 4, 10, 20, 30-meter cable assembly*
603077	Flow cell
603056	Flow cell mounting spike
603075	Carrying case, soft-sided
603074	Carrying case, hard-sided
603069	Belt clip
063517	Ultra clamp for instrument
063507	Tripod for instrument
603062	Cable management kit, included with all cables longer then 1 meter.
605978	Cable weight, 4.9 oz, stackable
603070	Shoulder strap
060907	Conductivity Calibration Solution, 1,000 µS/cm. 1 box of 8 pints.
060911	Conductivity Calibration Solution, 10,000 µS/cm. 1 box of 8 pints.
060660	Conductivity Calibration Solution, 50,000 µS/cm. 1 box of 8 pints.
065274	Conductivity Calibration Solution, 100,000 µS/cm. 1 box of 8 pints.

*All cables include a temperature and conductivity sensor.

DECLARATION OF CONFORMITY

The undersigned hereby declares on behalf of the named manufacturer under our sole responsibility that the listed product conforms to the requirements for the listed European Council Directive(s) and carries the CE mark accordingly.

Manufacturer:	YSI Incorporated 1725 Brannum Lane Yellow Springs, OH 45387 USA
Product Name:	Pro30 Water Quality Instrument
Model Numbers	
Instrument/Accessory:	Pro30 (6050030)
Probe/Cable Assemblies:	60530-1, -4, -10, -20, and -30
Conforms to the following:	
Directives:	IEC 61326-1:2005 RoHS 2002/95/EC WEEE 2002/96/EC IP-67 Protection per ANSI/IEC 60529-2004
Harmonized Standards:	• EN61326-1:2006 (IEC 61326-1:2005) Basic Immunity
Supplementary Information:	All performance met the operation criteria as follows: 1. ESD, IEC 61000-4-2:2001, Performance Criterion B 2. Radiated Immunity, IEC 61000-4-3, Performance Criterion A 3. Electrical Fast Transient (EFT), IEC 61000-4-4:2004, +Corr. 1:2006 + Corr. 2:2007, Performance Criterion B 4. Radio Frequency, Continuous Conducted Immunity, IEC61000-4-6, Performance Criterion A 5. Radiated Emissions, EN 61326-1:2006 (IEC61326-1:2005) Class B
Authorized EU Representative	YSI Hydrodata Ltd Unit 2 Focal Point, Lacerta Court, Works Road Letchworth, Hertfordshire, SG6 1FJ UK

Signed: Lisa M. Abel Date: 27 June 2011
Title: Director of Quality

RECYCLING

YSI is committed to reducing the environmental footprint in the course of doing business. Even though materials reduction is the ultimate goal, we know there must be a concerted effort to responsibly deal with materials after they've served a long, productive life-cycle. YSI's recycling program ensures that old equipment is processed in an environmentally friendly way, reducing the amount of materials going to landfills.

- Printed Circuit Boards are sent to facilities that process and reclaim as much material for recycling as possible.
- Plastics enter a material recycling process and are not incinerated or sent to landfills.
- Batteries are removed and sent to battery recyclers for dedicated metals.

When the time comes for you to recycle, follow the easy steps outlined at www.ysi.com.

BATTERY DISPOSAL

The Pro30 is powered by alkaline batteries which the user must remove and dispose of when the batteries no longer power the instrument. Disposal requirements vary by country and region, and users are expected to understand and follow the battery disposal requirements for their specific locale.

CONTACT INFORMATION

ORDERING AND TECHNICAL SUPPORT

Telephone: 800 897 4151 (USA)
+1 937 767 7241 (Globally)
Monday through Friday, 8:00 AM to 5:00 ET

Fax: +1 937 767 9353 (orders)
+1 937 767 1058 (technical support)

Email: environmental@ysi.com
Mail: YSI Incorporated
1725 Brannum Lane
Yellow Springs, OH 45387 USA

Internet: www.ysi.com

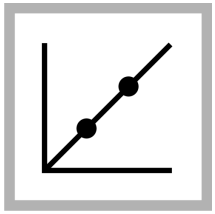
When placing an order please have the following available:
1.) YSI account number (if available)
2.) Name and phone number
3.) Purchase Order or Credit Card number
4.) Model Number or brief description
5.) Billing and shipping addresses
6.) Quantity

SERVICE INFORMATION

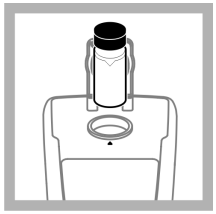
YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit www.ysi.com and click 'Support' or contact YSI Technical Support directly at 800-897-4151 (+1 937-767-7241).

When returning a product for service, include the Product Return form with cleaning certification. The form must be completely filled out for a YSI Service Center to accept the instrument for service. The form may be downloaded from www.ysi.com by clicking on the 'Support".

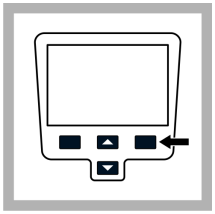
Item # 606082
Rev A
Drawing # A606082
July 2011



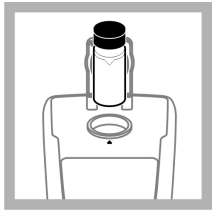
1. Push the **CALIBRATION** key to enter the Calibration mode. Follow the instructions on the display.
Note: *Gently invert each standard before inserting the standard.*



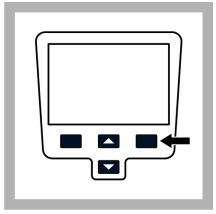
2. Insert the 20 NTU StablCal Standard and close the lid.
Note: *The standard to be inserted is bordered.*



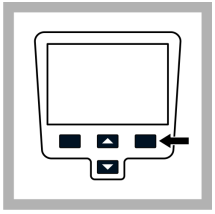
3. Push **Read**. The display shows Stabilizing and then shows the result.



4. Repeat Step 2 and 3 with the 100 NTU and 800 NTU StablCal Standard.
Note: *Push **Done** to complete a 2 point calibration.*



5. Push **Done** to review the calibration details.



6. Push **Store** to save the results.
After a calibration is complete, the meter automatically goes into the Verify Cal mode. Refer to Calibration verification (Verify Cal) on page 16.

Turbidity measurement

⚠ WARNING

Potential explosion and fire hazard. This turbidimeter is designed for water based samples. Do not measure solvent or combustible based samples.

Readings can be taken with the Normal reading mode, Signal Average mode or in the Rapidly Settling Turbidity mode. Refer to Reading modes on page 16 for more information. For accurate turbidity readings use clean sample cells and remove air bubbles (degassing).

Measurement notes

Proper measurement techniques are important in minimizing the effects of instrument variation, stray light and air bubbles. Use the following measurement notes for proper measurements.

Instrument

- Make sure that the meter is placed on a level, stationary surface during the measurement.
  Note: *Do not hold the meter in the hand during measurement.*
- Always close the sample compartment lid during measurement, calibration and storage.
- Remove sample cell and batteries from the instrument if the instrument is stored for an extended time period (more than a month).
- Keep the sample compartment lid closed to prevent the entry of dust and dirt.

Sample cells

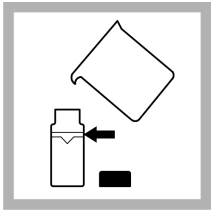
- Always cap the sample cell to prevent spillage of the sample into the instrument.
- Always use clean sample cells in good condition. Dirty, scratched or damaged cells can cause inaccurate readings.
- Make sure that cold samples do not “fog” the sample cell.
- Store sample cells filled with distilled or deionized water and cap tightly.

Measurement

- Measure samples immediately to prevent temperature changes and settling. Before a measurement is taken, always make sure that the sample is homogeneous throughout.
- Avoid sample dilution when possible.
- Avoid operation in direct sunlight.

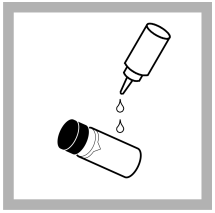
Turbidity measurement procedure

Note: *Before a measurement is taken, always make sure that the sample is homogeneous throughout.*



1. Collect a representative sample in a clean container. Fill a sample cell to the line (about 15 mL). Take care to handle the sample cell by the top. Cap the cell.

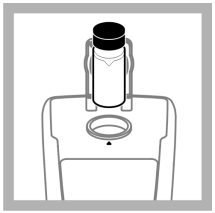
2. Wipe the cell with a soft, lint-free cloth to remove water spots and fingerprints.



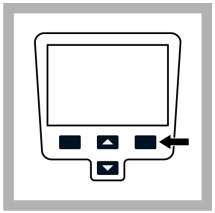
3. Apply a thin film of silicone oil. Wipe with a soft cloth to obtain an even film over the entire surface (Apply silicone oil to a sample cell on page 17).

4. Push the **Power** key to turn the meter on. Place the instrument on a flat, sturdy surface.

Note: *Do not hold the instrument while making measurements.*



5. Gently invert and then insert the sample cell in the instrument cell compartment so the diamond or orientation mark aligns with the raised orientation mark in front of the cell compartment. Close the lid.



6. Push **Read**. The display shows Stabilizing then the turbidity in NTU (FNU). The result is shown and stored automatically (Refer to Data management on page 11)

Data management

About stored data

The following types of data are stored in the data log:

- Reading Log: stores automatically each time a sample reading is taken (500 records).
- Calibration Log: stores only when **Store** is selected at the end of a calibration (25 records).
- Verify Cal Log: stores only after **Done** is selected at the end of a verification calibration (250 records).

When the data log becomes full, the oldest data point is deleted when more data is added to the log.

View data log

The data log contains Reading Log, Calibration Log and Verify Cal log. All logs can be sorted by date.

Ammonia Nitrogen Test Kit

NI-SA (2428700)

DOC326.98.00007

Test preparation

CAUTION: ⚠ Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.

- Put the color disc on the center pin in the color comparator box (numbers to the front).
- Use sunlight or a lamp as a light source to find the color match with the color comparator box.
- Rinse the tubes with sample before the test. Rinse the tubes with deionized water after the test.
- If the color match is between two segments, use the value that is in the middle of the two segments.
- If the color disc becomes wet internally, pull apart the flat plastic sides to open the color disc. Remove the thin inner disc. Dry all parts with a soft cloth. Assemble when fully dry.
- To verify the test accuracy, use a standard solution as the sample.
- This test kit is for seawater. If used for brackish or fresh water, the test kit gives a higher than actual value. The error in brackish water is usually less than 10%. The error in low salinity or fresh water is a maximum 16%.
- This test is very sensitive to contamination. Try to get the same result on a second test. Fully rinse the tubes with fresh sample before the second test. The reagents clean the tubes during the first test.
- To increase the range of this test to 4 mg/L NH_3–N, dilute the sample as follows. Use a 3-mL syringe to add 2.5 mL of sample to each tube. Dilute the sample to the 5-mL mark with deionized water. Use the diluted sample in the test procedure and multiply the result by 2.

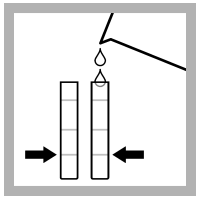
Replacement items

Description	Unit	Item no.
Ammonia Salicylate Reagent Powder Pillows, 5 mL	50/pkg	2395266
Ammonia Cyanurate Reagent Powder Pillows, 5 mL	50/pkg	2395466
Color disc, ammonia nitrogen, salicylate, 0–2.0 mg/L	each	9261300
Color comparator box	each	173200
Glass viewing tubes, glass, 18 mm	6/pkg	173006
Stoppers for 18-mm glass tubes and AccuVac Ampuls	6/pkg	173106

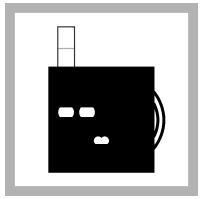
Optional items

Description	Unit	Item no.
Nitrogen ammonia standard solution, 1.0 mg/L NH_3–N	500 mL	189149
Water, deionized	500 mL	27249
Syringe, Luer-Lok® Tip, 3 mL	each	4321300

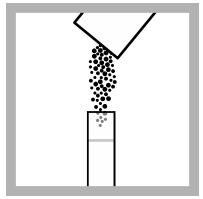
Test procedure—Ammonia-nitrogen (0–2.0 mg/L NH_3–N)



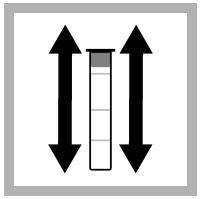
1. Fill two tubes to the first line (5 mL) with sample.



2. Put one tube into the left opening of the color comparator box.

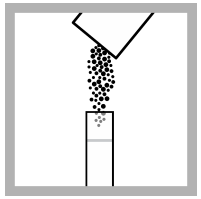


3. Add one Ammonia Salicylate Reagent Powder Pillow to the second tube.

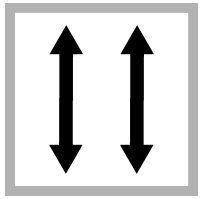


4. Put a stopper on the tube. Shake until the powder fully dissolves.

5. Wait 3 minutes.

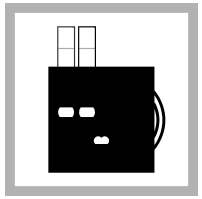


6. Add one Ammonia Cyanurate Reagent Powder Pillow to the same tube. Put a stopper on the tube.

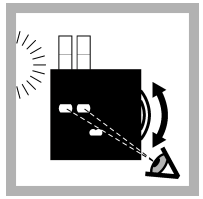


7. Shake until the powder fully dissolves.

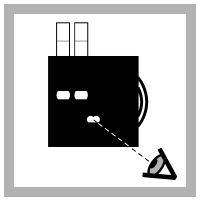
8. Wait 15 minutes. A green color develops.



9. Put the second tube into the color comparator box.



10. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.



11. Read the result in mg/L in the scale window.

Calculate the mg/L NH_3 and mg/L NH_4^+

Ammonia in water is in the form of the ammonium ion (NH_4^+) and un-ionized ammonia (NH_3). NH_3 is toxic to fish. Table 1 shows that the percent of NH_3 increases as the pH and temperature increase. This test kit measures both NH_4^+ and NH_3 as ammonia nitrogen (NH_3–N).

To calculate the mg/L NH_3 in the sample, refer to Table 1 and the equation that follows.

mg/L NH_3 = ((mg/L NH_3–N x percent NH_3 from Table 1) ÷ 100) × 1.2

Example: *The test result was 1.6 mg/L NH_3–N. The sample pH was 7.6 and the sample temperature was 16 °C. The mg/L NH_3 is ((1.6 x 1.16) ÷ 100) × 1.2 = 0.02 mg/L NH_3.*

To calculate the mg/L NH_4^+ in the sample, refer to Table 1 and the equation that follows.

mg/L NH_4^+ = ((mg/L NH_3–N x (100 – percent NH_3 from Table 1)) ÷ 100) × 1.3

Example: *The test result was 1.6 mg/L NH_3–N. The sample pH was 7.6 and the sample temperature was 16 °C. The mg/L NH_4^+ is ((1.6 x (100 – 1.16)) ÷ 100) × 1.3 = 2.056 mg/L NH_4^+.*

Table 1 Percent of NH_3 in water

pH	16 °C	18 °C	20 °C	22 °C	24 °C	26 °C	28 °C	30 °C	32 °C
7.0	0.29	0.34	0.39	0.46	0.52	0.60	0.69	0.80	0.91
7.2	0.46	0.54	0.62	0.82	0.83	0.96	1.10	1.26	1.44
7.4	0.73	0.85	0.98	1.14	1.31	1.50	1.73	1.98	2.26
7.6	1.16	1.34	1.55	1.79	2.06	2.36	2.71	3.10	3.53
7.8	1.82	2.11	2.44	2.81	3.22	3.70	4.23	4.82	5.48
8.0	2.86	3.30	3.81	4.38	5.02	5.74	6.54	7.43	8.42
8.2	4.45	5.14	5.90	6.76	7.72	8.80	9.98	11.29	12.72
8.4	6.88	7.90	9.04	10.31	11.71	13.26	14.95	16.78	18.77
8.6	10.48	11.97	13.61	15.41	17.37	19.50	21.78	24.22	26.80
8.8	15.66	17.73	19.98	22.41	25.00	27.74	30.62	33.62	36.72
9.0	22.73	25.46	28.36	31.40	34.56	37.83	41.16	44.53	47.91
9.2	31.80	35.12	38.55	42.04	45.57	49.09	52.58	55.99	59.31
9.4	42.49	46.18	49.85	53.48	57.02	60.45	63.73	66.85	69.79
9.6	53.94	57.62	61.17	64.56	67.77	70.78	73.58	76.17	78.55
9.8	64.99	68.31	71.40	74.28	76.92	79.33	81.53	83.51	85.30
10.0	74.63	77.35	79.83	82.07	84.08	85.88	87.49	88.92	90.19
10.2	82.34	84.41	86.25	87.88	89.33	90.60	91.73	92.71	93.58

Detergents CHEMets Kit

K-9400/R-9400: 0 - 3 ppm

Test Procedure

1. Rinse the reaction tube with the sample to be tested, and then fill it to the 5 mL mark with the sample.
2. While holding the double-tipped ampoule in a vertical position, snap the upper tip using the tip breaking tool (fig. 1).
3. Invert the ampoule and position the open end over the reaction tube. Snap the upper tip and allow the contents to drain into the reaction tube (fig. 1).
4. Cap the reaction tube and shake it vigorously for **30 seconds**. Allow the tube to stand undisturbed for **1 minute**.
5. Make sure that the flexible tubing is firmly attached to the CHEMet ampoule tip.
6. Insert the CHEMet assembly (tubing first) into the reaction tube making sure that the end of the flexible tubing is at the bottom of the tube. Break the tip of the CHEMet ampoule by gently pressing it against the side of the reaction tube (fig. 2). The ampoule should draw in fluid only from the organic phase (bottom layer).
7. When filling is complete, remove the CHEMet assembly from the reaction tube.

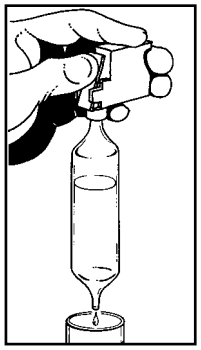


Figure 1

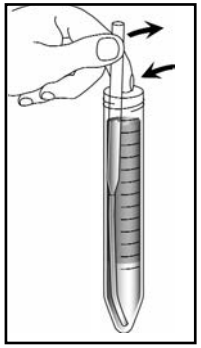


Figure 2

8. Remove the flexible tubing from the CHEMet ampoule and wipe all liquid from the exterior of the ampoule. Place an ampoule cap firmly onto the tip of the CHEMet ampoule. Invert the ampoule several times, allowing the bubble to travel from end to end.
9. Obtain a test result by placing the ampoule, flat end first, into the comparator. Hold the comparator up toward a source of light and view from the bottom. Rotate the comparator until the best color match is found (fig. 3).

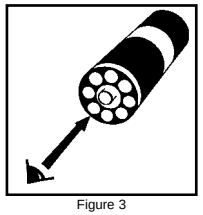


Figure 3

Tip Breaker

The tip breaker opens for easy disposal of the glass tips (pull lever away from body of tip breaker or pull open the side wall). The tip breaker will work most effectively if the tips are emptied out frequently.

Test Method

The Detergents CHEMets®[1] test kit employs the methylene blue extraction method[2,3,4]. Anionic detergents react with methylene blue to form a blue complex that is extracted into an immiscible organic solvent. The intensity of the blue color is directly related to the concentration of "methylene blue active substances (MBAS)" in the sample. Anionic detergents are one of the most prominent methylene blue active substances. Test results are expressed in ppm (mg/Liter) linear alkylbenzene sulfonate (equivalent weight 325).

1. CHEMets is a registered trademark of CHEMetrics, Inc. U.S. Patent No. 3,634,038
2. APHA Standard Methods, 22nd ed., Method 5540 C - 2000
3. EPA Methods for Chemical Analysis of Water and Wastes, Method 425.1 (1983)
4. ASTM D 2330-02, Methylene Blue Active Substances

Safety Information

Read SDS (available at www.chemetrics.com) before performing this test procedure. Wear safety glasses and protective gloves.

CHEMetrics

Simplicity in Water Analysis

www.chemetrics.com
4295 Catlett Road, Midland, VA 22728 U.S.A.
Phone: (800) 356-3072; Fax: (540) 788-4856
E-Mail: orders@chemetrics.com

Feb. 18, Rev. 10

CHLORINE, TOTAL, Low Range (0 to 2.00 mg/L Cl_2)

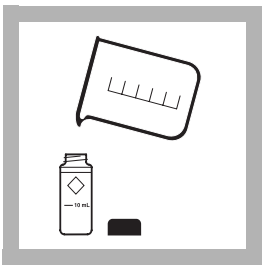
For water, wastewater and seawater

DPD Method* USEPA accepted (powder pillows only)**

Measuring Hints

If the sample temporarily turns yellow after reagent addition or the display shows overrange (flashing **2.20** in display), dilute a fresh sample and repeat the test. A slight loss of chlorine may occur because of the dilution. Multiply the result by the appropriate dilution factor.

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*
** Procedure is equivalent to USEPA method 330.5 for wastewater and Standard Method 4500-Cl G for drinking water.



1. Fill a 10-mL cell to the 10-mL line with sample. Cap.

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*

Note: *Be sure the instrument is in the low range mode. See page 37.*

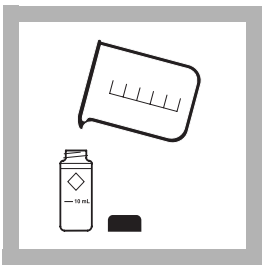
2. Add the contents of one DPD Total Chlorine Powder Pillow to the sample cell (the prepared sample). Cap and gently shake for 20 seconds.

Note: *Gently shaking dissipates bubbles which may form in samples containing dissolved gases.*

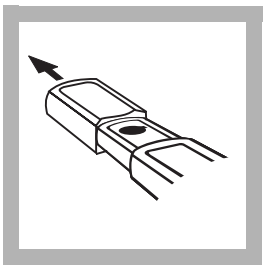
3. Wait 3 minutes. During this period, proceed with *steps 4–8*.

Note: *A pink color will form if chlorine is present.*

Note: *Accuracy is not affected by undissolved powder.*

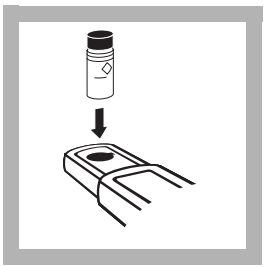


4. Fill a 10-mL sample cell to the 10-mL line with sample (the blank). Cap.



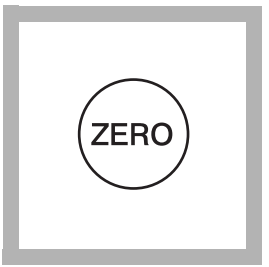
5. Remove the instrument cap.

Note: *For best results, zero the instrument and read the sample under the same lighting conditions.*



6. Place the blank in the cell holder, with the diamond mark facing you. Tightly cover the cell with the instrument cap (flat side should face the back of the instrument).

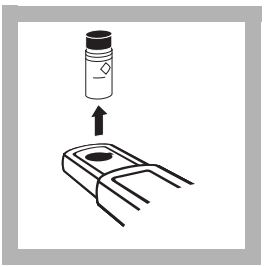
Note: *Wipe liquid off sample cells.*



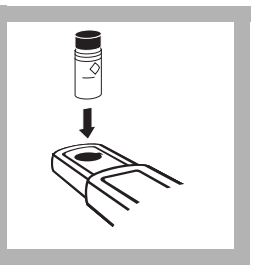
7. Press: **ZERO**

The instrument will turn on and the display will show **- - -** followed by **0.00**.

Note: *The instrument automatically shuts off after 1 minute and stores the last zero in memory. Press* **READ** *to complete the analysis.*

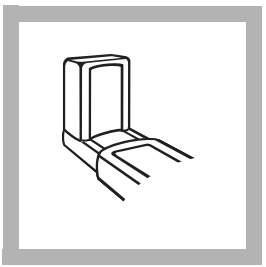


8. Remove the cell from the cell holder.

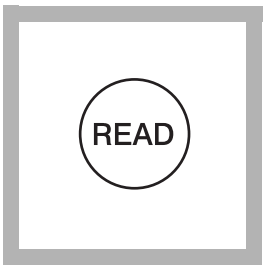


9. Within 3 minutes after the 3-minute reaction period, place the prepared sample in the cell holder.

Note: *Wipe liquid off sample cells.*



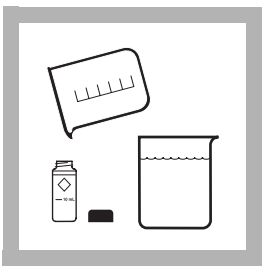
10. Cover the cell with instrument cap.



11. Press: **READ**
The instrument will show **- - -** followed by the result in mg/L total chlorine.

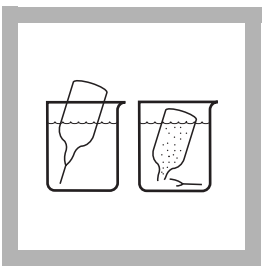
Note: *If the sample temporarily turns yellow after reagent addition or shows overrange (flashing* **2.20***), dilute a fresh sample and repeat the test. Some loss of chlorine may occur. Multiply the result by the dilution factor.*

Using AccuVac® Ampuls



1. Fill a 10-mL sample cell to the 10-mL line with sample (the blank). Cap. Collect at least 40 mL of sample in a 50-mL beaker.

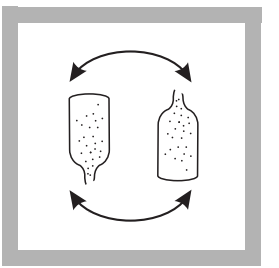
Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*



2. Fill a DPD Total Chlorine Reagent AccuVac Ampul with sample (the prepared sample).

Note: *Keep the tip immersed until the ampule fills completely.*

Note: *Be sure the instrument is in low range. See page 37.*

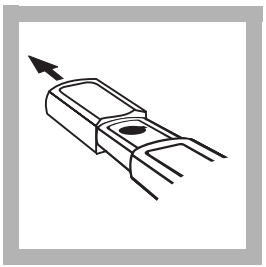


3. Quickly invert the ampule several times to mix. Wipe off any liquid or fingerprints.

Note: *A pink color will develop if chlorine is present.*

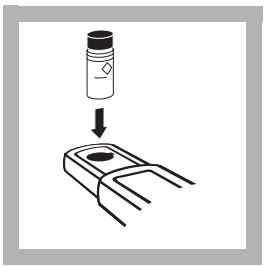
Note: *Accuracy is not affected by undissolved powder.*

4. Wait 3 minutes. During this period, proceed with *steps 5–8*.



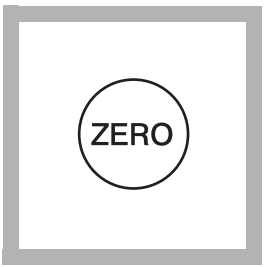
5. Remove the instrument cap.

Note: *For best results, zero and read the sample measurements under the same lighting conditions.*



6. Place the blank in the cell holder with the diamond mark facing you. Tightly cover the cell with the instrument cap (flat side should face the back of the instrument).

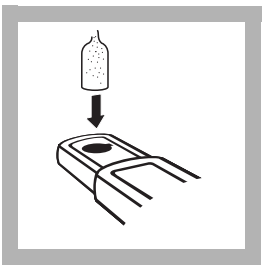
Note: *Wipe liquid off sample cells.*



7. Press: **ZERO**

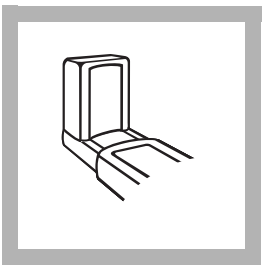
The instrument will turn on and the display will show **- - -** then **0.00**.

Note: *The instrument automatically shuts off after 1 minute and stores the last zero in memory. Press* **READ** *to complete the analysis.*

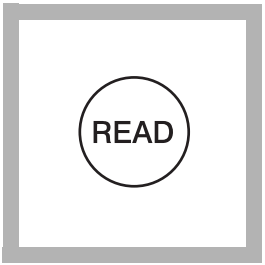


8. Within 3 minutes after the 3-minute reaction period, place the prepared sample in the cell holder.

Note: *Wipe liquid off sample cells.*



9. Cover the ampule with the instrument cap.



10. Press: **READ**

The instrument will show **- - -** followed by the result in mg/L total chlorine.

Note: *If the sample temporarily turns yellow after reagent addition or shows overrange (flashing* **2.20***), dilute a fresh sample and repeat the test. Some loss of chlorine may occur. Multiply the result by the dilution factor.*

Accuracy Check

Standard Additions Method

a. Snap the neck off a Chlorine Standard Solution Voluette® Ampule.

b. Use a TenSette® pipet to add 0.1, 0.2, and 0.3 mL of standard to three 25-mL samples. Swirl gently to mix. (For AccuVac Ampuls, use 50-mL beakers.)

c. Analyze a 10-mL aliquot of each sample as described in the procedure. Each 0.1 mL of standard will cause an incremental increase in chlorine, the exact value depends on the concentration of the Voluette ampule standard. Check the certificate enclosed with the Voluette ampules for this value.

d. If these increases do not occur, call Hach at 800-227-4224. Outside the United States, contact the Hach office or distributor serving you.

Interferences

Samples containing more than the 250 mg/L alkalinity or 150 mg/L acidity as $CaCO_3$ may inhibit full color development, or the color may fade instantly. Neutralize these samples to pH 6–7 with 1 N Sulfuric Acid or 1 N Sodium Hydroxide. Determine the

amount required on a separate 10-mL sample. Add the same amount to the sample to be tested. Correct for the additional volume.

Bromine, iodine, ozone and oxidized forms of manganese and chromium may also react and read as chlorine.

To compensate for the effects of manganese (Mn^{4+}) or chromium (Cr^{6+}), adjust the pH to 6–7 as described above. To a 25-mL sample, add 3 drops of 30 g/L Potassium Iodide Solution, mix, and wait one minute. Add 3 drops of 5 g/L Sodium Arsenite and mix. If chromium is present, allow exactly the same reaction period with DPD for both analyses. Subtract the result of this test from the original analysis to obtain the accurate chlorine concentration.

DPD Total Chlorine Reagent Powder Pillows and AccuVac Ampuls contain a buffer formulation that withstands high levels (at least 1000 mg/L) of hardness without interference.

REQUIRED REAGENTS

Description	Unit	Cat. No.
DPD Total Chlorine Reagent Powder Pillows	100/pkg	21056-69
or		
DPD Total Chlorine Reagent AccuVac® Ampuls	25/pkg	25030-25

REQUIRED APPARATUS (AccuVac® Ampuls)

Beaker, 50 mL	each	500-41

OPTIONAL REAGENTS

Chlorine Standard Solution Voluette® Ampules, 50-75 mg/L, 10 mL	16/pkg	14268-10
Chlorine Standards, secondary, Specv™, 0.0, 0.2, 0.8, and 1.5 mg/L	4/set	26353-00
DPD Total Chlorine Reagent w/dispensing cap	250 tests	21056-29
Potassium Iodide Solution, 30 g/L	100 mL MDB*	343-32
Sodium Arsenite Solution, 5 g/L	100 mL MDB	1047-32
Sodium Hydroxide Standard Solution, 1 N	100 mL MDB	1045-32
Sulfuric Acid Standard Solution, 1 N	100 mL MDB	1270-32
Water, deionized	4 L	272-56

* Marked Dropper Bottle

OPTIONAL APPARATUS

Description	Unit	Cat. No.
AccuVac® Snapper Kit	each	24052-00
Batteries, AAA, alkaline	4/pkg	46743-00
Caps for 10-mL sample cells	12/pkg	24018-12
Cylinder, graduated, 25 mL, poly	each	1081-40
Cylinder, graduated, 100 mL, PMP	each	2172-42
sens*ion*™*1* Basic Portable pH Meter, with electrode	each	51700-10
Pipet, TenSette®, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, For 19700-01 TenSette®	50/pkg	21856-96
Sample Cells, 10-mL with screw caps	6/pkg	24276-06

REPLACEMENT PARTS

Instrument Cap/light shield	each	46704-00
Instrument Manual	each	46760-88

Pro30

USER MANUAL

English

Item #606082
Rev A
Drawing # A606082
July 2011

CONTENTS

WARRANTY

The YSI Professional 30 instrument (Pro30) is warranted for three (3) years from date of purchase by the end user against defects in materials and workmanship, exclusive of batteries and any damage caused by defective batteries. Pro30 cable/probe assemblies are warranted for two (2) years from date of purchase by the end user against defects in material and workmanship. Pro30 instruments & cables are warranted for 90 days from date of purchase by the end user against defects in material and workmanship when purchased by rental agencies for rental purposes. Within the warranty period, YSI will repair or replace, at its sole discretion, free of charge, any product that YSI determines to be covered by this warranty.

To exercise this warranty, call your local YSI representative, or contact YSI Customer Service in Yellow Springs, Ohio at +1 937 767-7241, 800-897-4151 or visit www.YSI.com for a Product Return Form. Send the product and proof of purchase, transportation prepaid, to the Authorized Service Center selected by YSI. Repair or replacement will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days from date of repair or replacement.

LIMITATION OF WARRANTY

This Warranty does not apply to any YSI product damage or failure caused by:

1. Failure to install, operate or use the product in accordance with YSI's written instructions;
2. Abuse or misuse of the product;
3. Failure to maintain the product in accordance with YSI's written instructions or standard industry procedure;
4. Any improper repairs to the product;
5. Use by you of defective or improper components or parts in servicing or repairing the product;
6. Modification of the product in any way not expressly authorized by YSI.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. YSI'S LIABILITY UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT, AND THIS SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY. IN NO EVENT SHALL YSI BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY.

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INTRODUCTION

Thank you for purchasing the YSI Pro30, an instrument from the YSI *Professional Series* product family. The Pro30 measures conductivity and temperature in water. The Pro30 features an impact resistant and waterproof (IP-67) case, a rugged MS-8 (military-spec) cable connector, backlit display, user-selectable sensor options, 50 data set memory, internal barometer and a rubber over-mold case.

The Pro30 provides valuable instructions and prompts near the bottom of the display that will guide you through operation and use. However, reading the entire manual is recommended for a better understanding of the instrument's features.

> ⓘ *The Pro30 cannot communicate to a PC via a Pro Series communications saddle. Connecting the Pro30 to a communication saddle may cause erratic instrument behavior.*

GETTING STARTED

INITIAL INSPECTION

Carefully unpack the instrument and accessories and inspect for damage. Compare received parts with items on the packing list. If any parts or materials are damaged or missing, contact YSI Customer Service at 800-897-4151 (+1 937 767-7241) or the authorized YSI distributor from whom the instrument was purchased.

BATTERY INSTALLATION

The instrument requires 2 alkaline C-cell batteries. Under normal conditions, the average battery life is 425 hours at room temperature without using the back light. A battery symbol  will blink in the lower, left corner of the display to indicate low batteries when approximately 1 hour of battery life remains.

To install or replace the batteries:

1. Turn the instrument off and flip over to view the battery cover on the back.
2. Unscrew the four captive battery cover screws.
3. Remove the battery cover and remove the old batteries if necessary.
4. Install the new batteries, ensuring correct polarity alignment (figure 1).

5. Place the battery cover on the back of the instrument and tighten the four screws. Do not over-tighten.

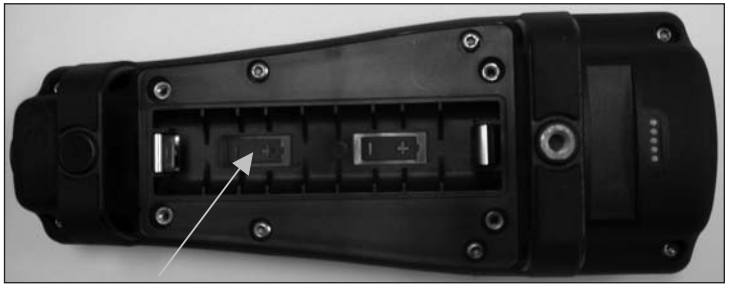


Figure 1. Pro30 with battery cover removed. Notice battery symbols indicating polarities.

> *The waterproof instrument case is sealed at the factory and is not to be opened, except by authorized service technicians. Do not attempt to separate the two halves of the instrument case as this may damage the instrument, break the waterproof seal, and will void the warranty.*

KEY PAD

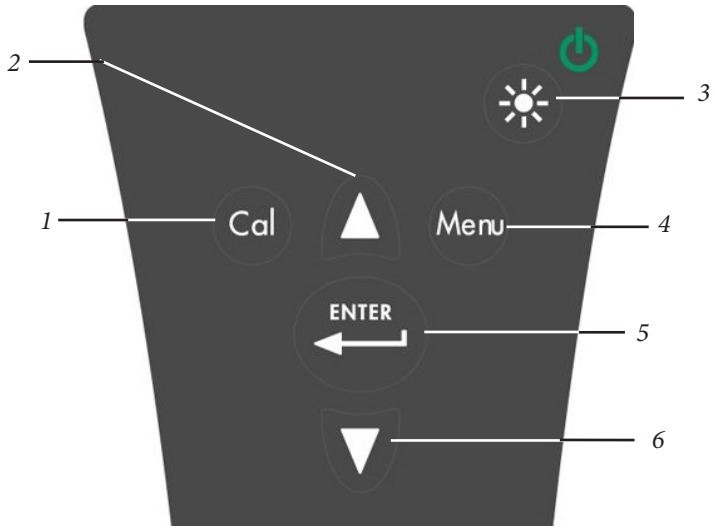


Figure 2, Keypad

Number	*Key*	*Description*
1	Cal	**Calibrate** Press and hold for 3 seconds to calibrate. Opens Calibrate menu from the Run screen.
2	▲	**Up Arrow** Use to navigate through menus, to navigate through box options along the bottom of the Run screen and to increase numerical inputs.
3	⏻ ☀	**Power and Backlight** Press once to turn instrument on. Press a second time to turn backlight on. Press a third time to turn backlight off. Press and hold for 3 seconds to turn instrument off.
4	Menu	**Menu** Use to enter the System Setup menu from the Run screen.
5	ENTER	**Enter** Press to confirm entries and selections.
6	▼	**Down Arrow** Use to navigate through menus, to navigate through box options at the bottom of the Run screen and to decrease numerical inputs.

CONNECTING THE PROBE/CABLE ASSEMBLY TO THE INSTRUMENT

The conductivity and temperature sensors are integral to the cable assembly; therefore, they cannot be removed from the cable.

To connect the cable, align the keys on the cable connector to the slots on the instrument connector. Push together firmly and then twist the outer ring until it locks into place (figure 3). This connection is water-proof.

Figure 3, Note the keyed connector.

RUN SCREEN

Press the power/backlight key to turn the instrument on. The instrument will run through a self test and briefly display a splash screen with system information before displaying the main Run screen (figure 4). The first time the Pro30 is turned on, it will prompt you to select a language; see the First Power On section of this manual for more information.

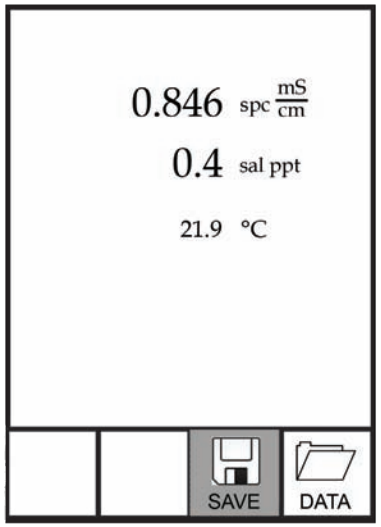


Figure 4, Run screen.

BACKLIGHT

Once the instrument is powered on, pressing the power/backlight key will turn on the display backlight. The backlight will remain on until the key is pressed again or after two minutes of not pressing any key on the keypad.

POWERING OFF

To turn the instrument off, press and hold the power/backlight key for three seconds.

NAVIGATION

The up and down arrow keys allow you to navigate through the functions of the Pro30.

NAVIGATING THE RUN SCREEN

When in the Run screen, the up and down arrow keys will move the highlighted box along the bottom options. Once a box is highlighted, press enter to access the highlighted option.

Description of Run screen box functions from left to right:

Option	*Description*
SAVE	Highlight and press enter to save displayed data to memory.
DATA	Highlight and press enter to view and/or erase saved data.

NAVIGATING THE SYSTEM SETUP MENU

When in the System Setup menu, the up and down arrow keys will move the highlighted bar up and down the system setup options. See the System Setup menu section of this manual for more information about these options.

FIRST POWER ON

The instrument will step through an initial language configuration when powered on for the first time. Use the up or down arrow keys to highlight the

appropriate language then press enter to confirm (figure 5). If an incorrect language is selected, it may be changed in the System Setup menu.

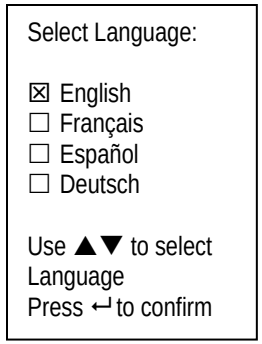


Figure 5, Select language.

After selecting a language, the Run screen will be displayed. The next time the instrument is powered up, the Run screen will display immediately after the splash screen.

SYSTEM SETUP MENU

Press the menu Menu key to access the System Setup menu. The System Setup menu contains multiple screens that are notated as 'pages'. The current page is indicated near the bottom of the display (figure 6).

Use the up and down arrow keys to scroll through menu options and menu pages.

EXITING THE SYSTEM SETUP MENU

To exit the System Setup menu, press the down arrow key until the ESC - Exit box is highlighted, then press enter to return to the Run screen.

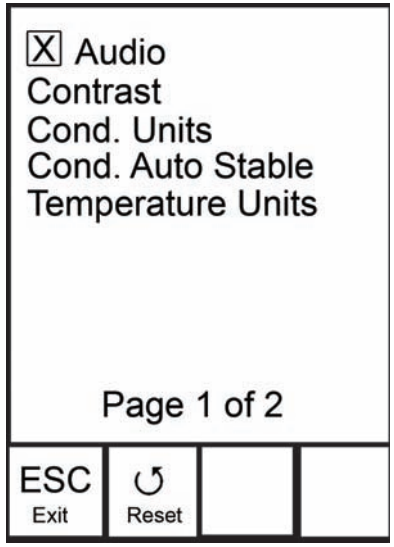


Figure 6, page 1 of System Setup menu. Audio is enabled.

AUDIO

Audio can be enabled or disabled by using the up or down arrow keys to highlight Audio and pressing enter. When enabled, there will be an 'X' in the box next to Audio.

When Audio is enabled, the Pro30 will beep twice to indicate stability when Auto Stable is enabled. The instrument will also beep when a key is pressed. When Audio is disabled, the Pro30 will not beep.

CONTRAST

To adjust the display Contrast, use the up or down arrow keys to highlight Contrast, then press enter. Next, use the up or down arrow keys to adjust the contrast. The up arrow key will darken the contrast and the down arrow key will lighten the contrast. After adjusting the contrast, press enter to save and exit the Contrast adjustment option.

EMERGENCY CONTRAST ADJUSTMENT

If necessary, there is an alternate method of adjusting the contrast. To adjust the contrast, press and hold the menu key, then press the up arrow key to darken the contrast or press the down arrow key to lighten the contrast.

CONDUCTIVITY UNITS (COND. UNITS)

Highlight Cond. Units (Conductivity Units) and press enter to open a submenu that allows you to select the conductivity units to be displayed on the Run screen. Highlight a unit and press enter to enable or disable it. An enabled conductivity unit will have an 'X' in the box next to it. Highlight the ESC-Exit box along the bottom of the display and press enter to save any changes and to close the conductivity units submenu.

There are seven options for displaying conductivity. Only four units can be enabled at the same time:

- COND-mS/cm displays conductivity in milliSiemens per centimeter.
- COND-uS/cm displays conductivity in microSiemens per centimeter.
- SPC-mS/cm displays Specific Conductance in milliSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- SPC-uS/cm displays Specific Conductance in microSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- Sal ppt displays salinity in parts per thousand. The salinity reading is calculated from the instrument's conductivity and temperature values using algorithms found in *Standard Methods for the Examination of Water and Wastewater*.
- TDS g/L displays Total Dissolved Solids in grams per liter. TDS is calculated from conductivity and temperature using a user-selectable TDS constant.
- TDS mg/L displays Total Dissolved Solids in milligrams per liter. TDS is calculated from conductivity and temperature using a user-selectable TDS constant.

Note: 1 milliSiemen = 1,000 microSiemens.

SPECIFIC CONDUCTANCE

The conductivity of a sample is highly dependent on temperature, varying as much as 3% for each change of one degree Celsius (temperature coefficient = 3%/°C). In addition, the temperature coefficient itself varies with the nature of the ionic species present in the sample. Therefore, it is useful to compensate for this temperature dependence in order to quickly compare conductivity readings taken at different temperatures.

The Pro30 can display non-temperature compensated conductivity as well as temperature compensated Specific Conductance. If Specific Conductance is selected, the Pro30 uses the temperature and conductivity values associated with

each measurement to calculate a specific conductance value compensated to a user selected reference temperature, see below. Additionally, the user can select the temperature coefficient from 0% to 4%.

Using the Pro30's default reference temperature and temperature coefficient (25 °C and 1.91%), the calculation is carried out as follows:

$$\text{Specific Conductance (25°C)} = \frac{\text{Conductivity of sample}}{1 + 0.0191 * (T - 25)}$$

T = Temperature of the sample in °C

CONDUCTIVITY AUTO STABLE (COND. AUTO STABLE)

Auto Stable utilizes preset values to indicate when a reading is stable. The preset values are adjustable in the System Setup menu. The user can input a % change in readings (0.0 to 1.9) over 'x' amount of time in seconds (3-19).

Highlight Cond. Auto Stable, then press enter to open the submenu.

Use the up or down arrow keys to highlight the % change or seconds (secs) input field, then press enter to make the highlighted field adjustable. Use the up or down arrow keys to adjust the selected value, then press enter to confirm changes. Once you have confirmed any changes, highlight the ESC-Exit box along the bottom of the display and press enter to close the Auto Stable submenu.

To disable Auto Stable, set the % Change input to 0.0.

When Auto Stable is enabled, an (AS) symbol will display next to the reading on the Run screen and blink during stabilization. When the dissolved oxygen and/or conductivity reading stabilizes based on the Auto Stable settings, the (AS) symbol will display steadily and the instrument will beep twice if Audio is turned on.

TEMPERATURE UNITS

Highlight Temperature Units and press enter to open a submenu that allows you to change the temperature units displayed on the Run screen. Highlight the desired unit (Celsius or Fahrenheit) and press enter to enable. The enabled temperature unit will have an 'X' in the box next to it. Only one unit may be enabled at a time. Highlight the ESC-Exit box and press enter to save any changes and to close the Temperature Units submenu.

SPECIFIC CONDUCTANCE REFERENCE TEMPERATURE (SPC REF. TEMP.)

SPC Ref. Temp. (Specific Conductance Reference Temperature) is the reference temperature used to calculate Specific Conductance. The reference temperature range is 15 and 25 °C. The default value is 25 °C.

To change the reference temperature, highlight SPC Ref. Temp. and press enter to open the submenu. With the reference temperature highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new reference temperature. Next, highlight the ESC-Exit box and press enter to close the submenu.

SPECIFIC CONDUCTANCE TEMPERATURE COEFFICIENT (SPC %/°C)

SPC %/°C (Specific Conductance Temperature Coefficient) is the temperature coefficient used to calculate Specific Conductance. The coefficient range is 0.00 to 4.00. The default value is 1.91% which is based on KCl standards.

To change the temperature coefficient, highlight SPC %/°C and press enter to open the submenu. With the temperature coefficient highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new coefficient. Next, highlight the ESC-Exit box and press enter to close the submenu.

TDS CONSTANT

TDS Constant is a multiplier used to calculate an estimated TDS (Total Dissolved Solids) value from conductivity. The multiplier is used to convert Specific Conductance in mS/cm to TDS in g/L. The Pro30's default value is 0.65. This multiplier is highly dependent on the nature of the ionic species present in the water sample. To be assured of moderate accuracy for the conversion, you must determine a multiplier for the water at your sampling site. Use the following procedure to determine the multiplier for a specific sample:

1. Determine the specific conductance of a water sample from the site;
2. Filter a sample of water from the site;
3. Completely evaporate the water from a carefully measured volume of the filtered sample to yield a dry solid;
4. Accurately weigh the remaining solid;
5. Divide the weight of the solid (in grams) by the volume of water used (in liters) to yield the TDS value in g/L for this site;
6. Divide the TDS value in g/L by the specific conductance of the water in mS/cm to yield the conversion multiplier. Be certain to use the correct units.

If the nature of the ionic species at the site changes between sampling studies, the TDS values will be in error. TDS cannot be calculated accurately from specific conductance unless the make-up of the chemical species in the water remains constant.

To change the TDS Constant in the Pro30, highlight TDS Constant and press enter to open the submenu. With the TDS Constant highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. The input range is 0.30 to 1.00. Press enter to save the new TDS Constant. Next, highlight the ESC-Exit box and press enter to close the submenu.

LANGUAGE

Highlight Language and press enter to open a submenu that allows you to change the language. Highlight the desired language (English, Spanish, German, or French) and press enter to enable. The enabled language will have an 'X' in the box next to it. Highlight ESC-Exit box and press enter to save any changes and to close the Language submenu.

The text in the boxes along the bottom of the Run screen will always be displayed in English regardless of the language enabled in the System Setup menu.

AUTO SHUTOFF

Auto Shutoff allows you to set the instrument to turn off automatically after a period of time. Use the up or down arrow keys to highlight Auto Shutoff, then press enter to open the submenu. Press enter while the minute field is highlighted to make it adjustable. Next, use the up or down arrow keys to adjust the shut off time from 0 to 60 minutes. Press enter to save the new shutoff time. Next, highlight the ESC-Exit box and press enter to close the submenu.

To disable Auto Shutoff, set the Time in Minutes to 0 (zero).

CELL CONSTANT

The Cell Constant displays the cell constant of the conductivity cell. The cell constant is calculated and updated each time a conductivity calibration is performed. The cell constant range is 4.0 to 6.0. Resetting the System Menu resets the cell constant to 5.0.

RESETTING THE SYSTEM SETUP MENU TO FACTORY DEFAULT

To reset the Pro30 settings to factory default, press the down arrow key while in the System Setup menu until the Reset - ↺ box is highlighted, then press enter. The instrument will ask you to confirm the reset. Highlight Yes and press enter to continue with the reset or highlight No and press enter to cancel the reset. A Factory Reset will not affect data saved in the instrument's memory.

The following will be set in the Pro30 after performing a reset:

Parameter	*Reset Defaults*
Audio	On
Contrast	Set to mid range
Conductivity Units	cond uS/cm, spc mS/cm, spc uS/cm and sal ppt
Conductivity Auto Stable	Off (0.0 % Change and 10 seconds)
SPC Reference Temperature	25°C
SPC Temperature Coefficient	1.91%/°C
TDS Constant	0.65
Temperature Units	°C
Language	English
Auto Shutoff	30 minutes
Conductivity Cell Constant	Cell constant reset to 5.0*

*It is recommended to perform a Conductivity calibration after performing a reset.

CALIBRATION

TEMPERATURE

All Pro30 cables have built-in temperature sensors. Temperature calibration is not required nor is it available.

CONDUCTIVITY CALIBRATION

Ensure the conductivity sensor is clean and dry before performing a conductivity, specific conductance or salinity calibration.

> ⓘ *It is not necessary to calibrate conductivity, specific conductance and salinity. Calibrating one of these parameters will simultaneously calibrate the others. YSI recommends calibrating specific conductance for greatest ease.*

CALIBRATING SPECIFIC (SP.) CONDUCTANCE OR CONDUCTIVITY

Note: When calibrating Specific Conductance, the Pro30 uses the factory default values for the Specific Conductance Reference Temperature and the Specific Conductance Temperature Coefficient regardless of what is configured in the System Setup Menu. The default value for the Reference Temperature is 25°C and the default value for the Temperature Coefficient is 1.91%/°C. It is important to note that the Temperature Coefficient of a calibration solution is dependent on the contents of the solution. Therefore, YSI recommends using a traceable calibration solution made of KCl (potassium chloride) when calibrating Specific Conductance since these solutions typically have a Temperature Coefficient of 1.91%/°C. Additionally, be sure to enter the value of the solution as it is listed for 25°C when calibrating Specific Conductance.

1. Fill a clean container (i.e. plastic cup or glass beaker) with fresh, traceable conductivity calibration solution and place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable (figure 7). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.

Figure 7, solution above two holes near cable.

2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight the desired calibration method, Sp. Conductance or Conductivity, and press enter.
3. Highlight the units you wish to calibrate, either uS/cm or mS/cm, and press enter. 1 mS = 1,000 uS. Next, use the up or down arrow key to adjust the value on the display to match the value of the conductivity calibration solution. If calibrating conductivity, it is necessary to look up the value of the solution at the current temperature and enter that value into the Pro30. Most conductivity solutions are labeled with a value at 25°C. If calibrating specific conductance, enter the value listed for 25°C. Depressing either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro30 will remember the entered calibration value and display it the next time a conductivity calibration is performed.
4. Press enter to complete the calibration. Or, press Cal to cancel the calibration and return to the Run screen.
5. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
6. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting guide for possible solutions.

CALIBRATING IN SALINITY

1. Fill a clean container (i.e. plastic cup or glass beaker) with fresh, traceable salinity calibration solution and place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable (figure 7). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.
2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight Salinity and press enter.
3. Use the up or down arrow key to adjust the value on the display to match the value of the salinity solution. Depressing either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro30 will remember the entered calibration value and display it the next time a salinity calibration is performed.
4. Press enter to complete the calibration. Or, press Cal to cancel the calibration and return to the Run screen.
5. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
6. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting guide for possible solutions.

TAKING MEASUREMENTS

Before taking measurements, be sure the instrument has been calibrated to ensure the most accurate readings. Place the probe in the sample to be measured and give the probe a quick shake to release any air bubbles. Be sure the conductivity sensor is completely submerged in the sample. The two holes near the cable should be covered by the sample for accurate conductivity readings (figure 7). Allow the temperature readings to stabilize.

SAVING AND VIEWING DATA

The Pro30 can store 50 data sets in non-volatile memory for later viewing. A data set includes the values currently on the display, i.e. temperature, dissolved oxygen and two conductivity parameters. Each data point is referenced with a data set number, 01 through 50.

SAVING DATA

> *The Pro30 can not communicate to a PC via a Pro Series communications saddle. Connecting the Pro30 to a communication saddle may cause erratic instrument behavior.*

From the Run screen, use the up or down arrow keys to highlight the Save box and press enter to save the current readings. The instrument will indicate the data set is saved and display the saved data set's number (figure 8).

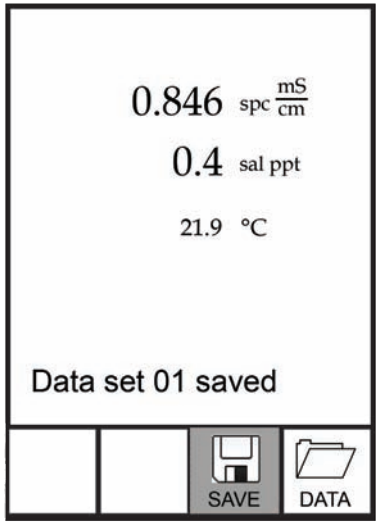


Figure 8, data set saved.

The instrument will display 'Memory Full' if all 50 data sets have been saved and you attempt to save another data set.

VIEWING AND ERASING SAVED DATA - DATA MODE

Data mode allows you to view and erase saved data. From the Run screen, use the up or down arrow keys to highlight Data and press enter to access Data mode. Note that the function boxes at the bottom of the display are different in Data mode (figure 9).

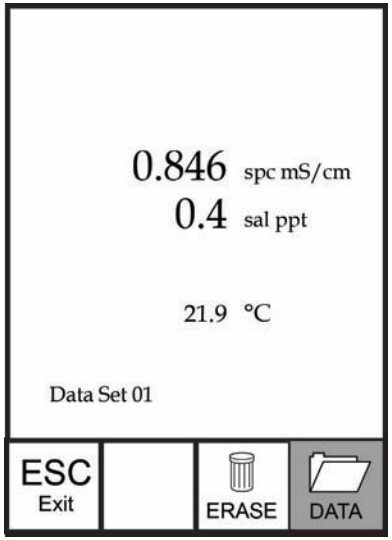


Figure 9, Data mode.

VIEWING DATA

Once in Data mode, use the up and down arrow keys to view saved data sets in sequential order or press enter to access the bottom functions. After accessing the bottom functions, highlight the Data box and press enter to regain access to viewing data. The data set displayed is indicated by the data set number, 01 through 50.

ERASING DATA

While viewing saved data, press the enter key to access the function boxes at the bottom of the display. Next, use the up or down arrow keys to highlight Erase, then press enter. The instrument will give you the option to erase one data set or all data sets (figure 10).

Figure 10, Erase data mode.

Use the up or down arrow key to select Erase Data Set, Erase All Sets or the ESC-Exit function box, then press enter to confirm.

Select ESC-Exit and press enter to exit Erase mode without erasing any data.

Select Erase Data Set and press enter to erase the data set that was displayed before entering Erase mode. For example, if data set 12 was displayed before entering erase mode, and Erase Data Set is selected, Data Set 12 will be erased from memory and the data sets AFTER that number will move up to keep them sequential. For example, if there are15 records and number 12 is erased then 13 becomes 12, 14 becomes 13, and 15 becomes 14. The instrument will return to Data mode after erasing one data set.

Select Erase All Data Sets and press enter to clear the Pro30 memory and return to Data mode.

EXITING DATA MODE

While in Data mode, press enter to access the bottom functions. Next, highlight the ESC-Exit box and press enter to return to the Run screen.

CARE, MAINTENANCE AND STORAGE

This section describes the proper procedures for care, maintenance and storage of the instrument. The goal is to maximize their lifetime and minimize down-time associated with improper instrument usage.

GENERAL MAINTENANCE

GENERAL MAINTENANCE - GASKET

The instrument utilizes a gasket as a seal to prevent water from entering the battery compartment. Following the recommended procedures will help keep the instrument functioning properly.

If the gasket and sealing surfaces are not maintained properly, it is possible that water can enter the battery compartment. If water enters this area, it can severely damage the battery terminals causing loss of battery power and corrosion to the battery terminals. Therefore, when the battery compartment lid is removed, the gasket that provides the seal should be carefully inspected for contamination (i.e. debris, grit, etc.) and cleaned with water and mild detergent if necessary.

SENSOR MAINTENANCE

SENSOR MAINTENANCE - TEMPERATURE

You must keep the temperature sensor free of build up. Other than that, no additional maintenance is required. A toothbrush can be used to scrub the temperature sensor if needed.

SENSOR MAINTENANCE - CONDUCTIVITY

The openings that allow sample access to the conductivity electrodes should be cleaned regularly. The small cleaning brush included in the Maintenance Kit is intended for this purpose. Dip the brush in clean water and insert it into each hole 10 to 12 times. In the event that deposits have formed on the electrodes, it may be necessary to use a mild detergent (laboratory grade soap or bathroom foaming tile cleaner) with the brush. Rinse thoroughly with clean water, then check the response and accuracy of the conductivity cell with a calibration solution.

SENSOR STORAGE

SHORT AND LONG TERM STORAGE

For both short and long term storage, the conductivity sensor should be stored clean and dry.

Remove the batteries from the instrument when storing it for long periods of time (>30 days).

Long Term Storage Temperature: -5 to 70°C (23 to 158°F)

TROUBLESHOOTING

Symptom	*Possible Solution*
Instrument will not turn on, a battery symbol appears, or "Critical Shutdown" displays on the screen.	1. Low battery voltage, replace batteries. 2. Batteries installed incorrectly, check battery polarity. 3. Return system for service.
Temperature values display Over or Undr on Run screen.	1. Sample temperature is less than -5° C or more than +55°C. Increase or decrease the sample temperature to bring within the allowable range. 2. Contact YSI Tech Support.
Instrument will not calibrate the Conductivity sensor; instrument displays "Calibration Over", "Calibration Under", or "Unstable Reading" during calibration.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the calibration solution is above the two holes near the cable, see figure 8. 3. Verify the calibration solution is not expired or contaminated. Try a new bottle of solution. 4. Ensure you are entering in the correct value for the solution according to the measurement units. 1 mS = 1,000 uS. 5. Allow sufficient stabilization time for conductivity and temperature AND wait at least 3 seconds before confirming a calibration. 6. Contact YSI Tech Support.

Symptom	*Possible Solution*
Conductivity readings are inaccurate.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the sample is above the two holes near the cable, see figure 8. 3. Verify calibration. 4. Verify temperature readings are accurate. 5. Verify the correct units are setup in the System Setup menu, i.e. uS vs mS and Conductivity vs. Specific Conductance. 6. Contact YSI Tech Support.
Conductivity values display Over or Undr on Run screen.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the sample is above the two holes near the cable, see figure 8 3. Verify calibration. 4. Verify temperature readings are accurate. 5. Sample conductivity is outside the measurement range of the instrument, i.e. 0-200 mS. 6. Contact YSI Tech Support.

SPECIFICATIONS

These specifications represent typical performance and are subject to change without notice. For the latest product specification information, please visit YSI's website at www.ysi.com or contact YSI Tech Support.

Parameter	*Range*	*Resolution*	*Accuracy*
Temperature	-5 to 55°C	0.1°C	± 0.2°C
Conductivity	0-500 uS/cm 0-5 mS/cm 0-50 mS/cm 0-200 mS/cm (auto ranging)	0.0001 to 0.1 mS/cm; 0.1 to 0 uS/cm (range dependent)	Instrument only: ± 0.5% of the reading or 1 uS/cm, whichever is greater. Instrument with 1 or 4 meter cables: ± 1.0% of the reading or 1 uS/cm, whichever is greater. Instrument with 10, 20, or 30 meter cables: ± 2.0% of the reading or 1 uS/cm, whichever is greater.
Salinity	0 to 70 ppt	0.1 ppt	± 1.0% of the reading or ± 0.1 ppt, whichever is greater.
Total Dissolved Solids (TDS)	0 to 100 g/L. TDS Constant range: 0.3 to 1.00 (0.65 default)	0.0001 to 0.1 g/L (range dependent)	Dependent on accuracy of temperature, conductivity and TDS Constant.

ACCESSORIES / PART NUMBERS

Part Number	*Description*
6050030	Pro30 Instrument
60530-1, -4, -10, -20, or -30	1, 4, 10, 20, 30-meter cable assembly*
603077	Flow cell
603056	Flow cell mounting spike
603075	Carrying case, soft-sided
603074	Carrying case, hard-sided
603069	Belt clip
063517	Ultra clamp for instrument
063507	Tripod for instrument
603062	Cable management kit, included with all cables longer then 1 meter.
605978	Cable weight, 4.9 oz, stackable
603070	Shoulder strap
060907	Conductivity Calibration Solution, 1,000 µS/cm. 1 box of 8 pints.
060911	Conductivity Calibration Solution, 10,000 µS/cm. 1 box of 8 pints.
060660	Conductivity Calibration Solution, 50,000 µS/cm. 1 box of 8 pints.
065274	Conductivity Calibration Solution, 100,000 µS/cm. 1 box of 8 pints.

*All cables include a temperature and conductivity sensor.

DECLARATION OF CONFORMITY

The undersigned hereby declares on behalf of the named manufacturer under our sole responsibility that the listed product conforms to the requirements for the listed European Council Directive(s) and carries the CE mark accordingly.

Manufacturer:	YSI Incorporated 1725 Brannum Lane Yellow Springs, OH 45387 USA
Product Name:	Pro30 Water Quality Instrument
Model Numbers	
Instrument/Accessory:	Pro30 (6050030)
Probe/Cable Assemblies:	60530-1, -4, -10, -20, and -30
Conforms to the following:	
Directives:	IEC 61326-1:2005 RoHS 2002/95/EC WEEE 2002/96/EC IP-67 Protection per ANSI/IEC 60529-2004
Harmonized Standards:	• EN61326-1:2006 (IEC 61326-1:2005) Basic Immunity
Supplementary Information:	All performance met the operation criteria as follows: 1. ESD, IEC 61000-4-2:2001, Performance Criterion B 2. Radiated Immunity, IEC 61000-4-3, Performance Criterion A 3. Electrical Fast Transient (EFT), IEC 61000-4-4:2004, +Corr. 1:2006 + Corr. 2:2007, Performance Criterion B 4. Radio Frequency, Continuous Conducted Immunity, IEC61000-4-6, Performance Criterion A 5. Radiated Emissions, EN 61326-1:2006 (IEC61326-1:2005) Class B
Authorized EU Representative	YSI Hydrodata Ltd Unit 2 Focal Point, Lacerta Court, Works Road Letchworth, Hertfordshire, SG6 1FJ UK

Signed: Lisa M. Abel Date: 27 June 2011
Title: Director of Quality

RECYCLING

YSI is committed to reducing the environmental footprint in the course of doing business. Even though materials reduction is the ultimate goal, we know there must be a concerted effort to responsibly deal with materials after they've served a long, productive life-cycle. YSI's recycling program ensures that old equipment is processed in an environmentally friendly way, reducing the amount of materials going to landfills.

- Printed Circuit Boards are sent to facilities that process and reclaim as much material for recycling as possible.
- Plastics enter a material recycling process and are not incinerated or sent to landfills.
- Batteries are removed and sent to battery recyclers for dedicated metals.

When the time comes for you to recycle, follow the easy steps outlined at www.ysi.com.

BATTERY DISPOSAL

The Pro30 is powered by alkaline batteries which the user must remove and dispose of when the batteries no longer power the instrument. Disposal requirements vary by country and region, and users are expected to understand and follow the battery disposal requirements for their specific locale.

CONTACT INFORMATION

ORDERING AND TECHNICAL SUPPORT

Telephone: 800 897 4151 (USA)
+1 937 767 7241 (Globally)
Monday through Friday, 8:00 AM to 5:00 ET

Fax: +1 937 767 9353 (orders)
+1 937 767 1058 (technical support)

Email: environmental@ysi.com
Mail: YSI Incorporated
1725 Brannum Lane
Yellow Springs, OH 45387 USA

Internet: www.ysi.com

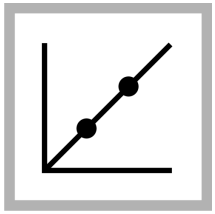
When placing an order please have the following available:
1.) YSI account number (if available)
2.) Name and phone number
3.) Purchase Order or Credit Card number
4.) Model Number or brief description
5.) Billing and shipping addresses
6.) Quantity

SERVICE INFORMATION

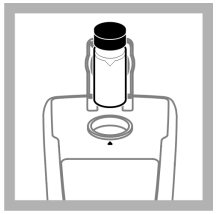
YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit www.ysi.com and click 'Support' or contact YSI Technical Support directly at 800-897-4151 (+1 937-767-7241).

When returning a product for service, include the Product Return form with cleaning certification. The form must be completely filled out for a YSI Service Center to accept the instrument for service. The form may be downloaded from www.ysi.com by clicking on the 'Support".

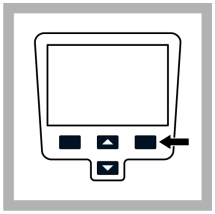
Item # 606082
Rev A
Drawing # A606082
July 2011



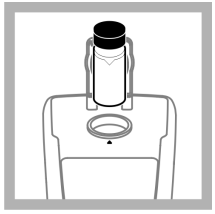
1. Push the **CALIBRATION** key to enter the Calibration mode. Follow the instructions on the display.
Note: *Gently invert each standard before inserting the standard.*



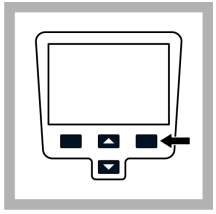
2. Insert the 20 NTU StablCal Standard and close the lid.
Note: *The standard to be inserted is bordered.*



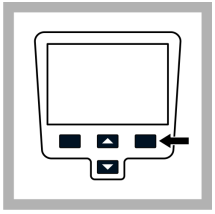
3. Push **Read**. The display shows Stabilizing and then shows the result.



4. Repeat Step 2 and 3 with the 100 NTU and 800 NTU StablCal Standard.
Note: *Push **Done** to complete a 2 point calibration.*



5. Push **Done** to review the calibration details.



6. Push **Store** to save the results.
After a calibration is complete, the meter automatically goes into the Verify Cal mode. Refer to Calibration verification (Verify Cal) on page 16.

Turbidity measurement

⚠ WARNING

Potential explosion and fire hazard. This turbidimeter is designed for water based samples. Do not measure solvent or combustible based samples.

Readings can be taken with the Normal reading mode, Signal Average mode or in the Rapidly Settling Turbidity mode. Refer to Reading modes on page 16 for more information. For accurate turbidity readings use clean sample cells and remove air bubbles (degassing).

Measurement notes

Proper measurement techniques are important in minimizing the effects of instrument variation, stray light and air bubbles. Use the following measurement notes for proper measurements.

Instrument

- Make sure that the meter is placed on a level, stationary surface during the measurement.
  Note: *Do not hold the meter in the hand during measurement.*
- Always close the sample compartment lid during measurement, calibration and storage.
- Remove sample cell and batteries from the instrument if the instrument is stored for an extended time period (more than a month).
- Keep the sample compartment lid closed to prevent the entry of dust and dirt.

Sample cells

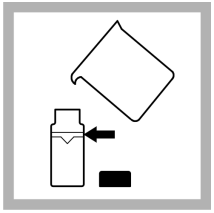
- Always cap the sample cell to prevent spillage of the sample into the instrument.
- Always use clean sample cells in good condition. Dirty, scratched or damaged cells can cause inaccurate readings.
- Make sure that cold samples do not “fog” the sample cell.
- Store sample cells filled with distilled or deionized water and cap tightly.

Measurement

- Measure samples immediately to prevent temperature changes and settling. Before a measurement is taken, always make sure that the sample is homogeneous throughout.
- Avoid sample dilution when possible.
- Avoid operation in direct sunlight.

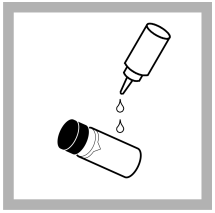
Turbidity measurement procedure

Note: *Before a measurement is taken, always make sure that the sample is homogeneous throughout.*



1. Collect a representative sample in a clean container. Fill a sample cell to the line (about 15 mL). Take care to handle the sample cell by the top. Cap the cell.

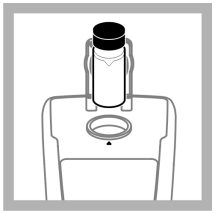
2. Wipe the cell with a soft, lint-free cloth to remove water spots and fingerprints.



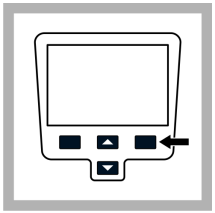
3. Apply a thin film of silicone oil. Wipe with a soft cloth to obtain an even film over the entire surface (Apply silicone oil to a sample cell on page 17).

4. Push the **Power** key to turn the meter on. Place the instrument on a flat, sturdy surface.

Note: *Do not hold the instrument while making measurements.*



5. Gently invert and then insert the sample cell in the instrument cell compartment so the diamond or orientation mark aligns with the raised orientation mark in front of the cell compartment. Close the lid.



6. Push **Read**. The display shows Stabilizing then the turbidity in NTU (FNU). The result is shown and stored automatically (Refer to Data management on page 11)

Data management

About stored data

The following types of data are stored in the data log:

- Reading Log: stores automatically each time a sample reading is taken (500 records).
- Calibration Log: stores only when **Store** is selected at the end of a calibration (25 records).
- Verify Cal Log: stores only after **Done** is selected at the end of a verification calibration (250 records).

When the data log becomes full, the oldest data point is deleted when more data is added to the log.

View data log

The data log contains Reading Log, Calibration Log and Verify Cal log. All logs can be sorted by date.

Ammonia Nitrogen Test Kit

NI-SA (2428700)

DOC326.98.00007

Test preparation

CAUTION: ⚠ Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.

- Put the color disc on the center pin in the color comparator box (numbers to the front).
- Use sunlight or a lamp as a light source to find the color match with the color comparator box.
- Rinse the tubes with sample before the test. Rinse the tubes with deionized water after the test.
- If the color match is between two segments, use the value that is in the middle of the two segments.
- If the color disc becomes wet internally, pull apart the flat plastic sides to open the color disc. Remove the thin inner disc. Dry all parts with a soft cloth. Assemble when fully dry.
- To verify the test accuracy, use a standard solution as the sample.
- This test kit is for seawater. If used for brackish or fresh water, the test kit gives a higher than actual value. The error in brackish water is usually less than 10%. The error in low salinity or fresh water is a maximum 16%.
- This test is very sensitive to contamination. Try to get the same result on a second test. Fully rinse the tubes with fresh sample before the second test. The reagents clean the tubes during the first test.
- To increase the range of this test to 4 mg/L NH_3–N, dilute the sample as follows. Use a 3-mL syringe to add 2.5 mL of sample to each tube. Dilute the sample to the 5-mL mark with deionized water. Use the diluted sample in the test procedure and multiply the result by 2.

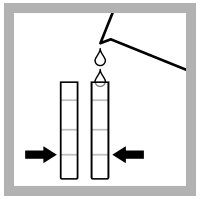
Replacement items

Description	Unit	Item no.
Ammonia Salicylate Reagent Powder Pillows, 5 mL	50/pkg	2395266
Ammonia Cyanurate Reagent Powder Pillows, 5 mL	50/pkg	2395466
Color disc, ammonia nitrogen, salicylate, 0–2.0 mg/L	each	9261300
Color comparator box	each	173200
Glass viewing tubes, glass, 18 mm	6/pkg	173006
Stoppers for 18-mm glass tubes and AccuVac Ampuls	6/pkg	173106

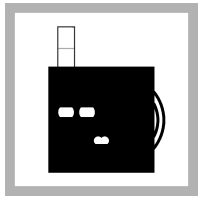
Optional items

Description	Unit	Item no.
Nitrogen ammonia standard solution, 1.0 mg/L NH_3–N	500 mL	189149
Water, deionized	500 mL	27249
Syringe, Luer-Lok® Tip, 3 mL	each	4321300

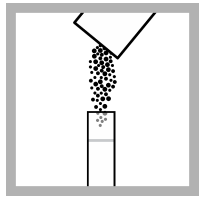
Test procedure—Ammonia-nitrogen (0–2.0 mg/L NH_3–N)



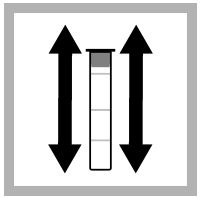
1. Fill two tubes to the first line (5 mL) with sample.



2. Put one tube into the left opening of the color comparator box.

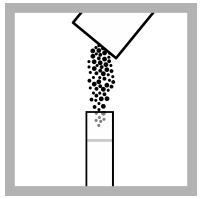


3. Add one Ammonia Salicylate Reagent Powder Pillow to the second tube.

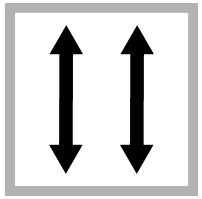


4. Put a stopper on the tube. Shake until the powder fully dissolves.

5. Wait 3 minutes.

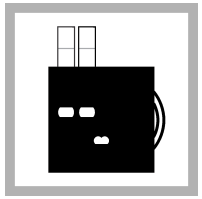


6. Add one Ammonia Cyanurate Reagent Powder Pillow to the same tube. Put a stopper on the tube.

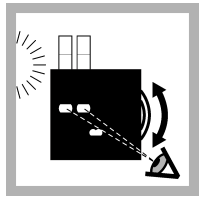


7. Shake until the powder fully dissolves.

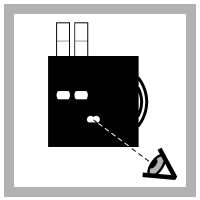
8. Wait 15 minutes. A green color develops.



9. Put the second tube into the color comparator box.



10. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.



11. Read the result in mg/L in the scale window.

Calculate the mg/L NH_3 and mg/L NH_4^+

Ammonia in water is in the form of the ammonium ion (NH_4^+) and un-ionized ammonia (NH_3). NH_3 is toxic to fish. Table 1 shows that the percent of NH_3 increases as the pH and temperature increase. This test kit measures both NH_4^+ and NH_3 as ammonia nitrogen (NH_3–N).

To calculate the mg/L NH_3 in the sample, refer to Table 1 and the equation that follows.

mg/L NH_3 = ((mg/L NH_3–N x percent NH_3 from Table 1) ÷ 100) × 1.2

Example: *The test result was 1.6 mg/L NH_3–N. The sample pH was 7.6 and the sample temperature was 16 °C. The mg/L NH_3 is ((1.6 x 1.16) ÷ 100) × 1.2 = 0.02 mg/L NH_3.*

To calculate the mg/L NH_4^+ in the sample, refer to Table 1 and the equation that follows.

mg/L NH_4^+ = ((mg/L NH_3–N x (100 – percent NH_3 from Table 1)) ÷ 100) × 1.3

Example: *The test result was 1.6 mg/L NH_3–N. The sample pH was 7.6 and the sample temperature was 16 °C. The mg/L NH_4^+ is ((1.6 x (100 – 1.16)) ÷ 100) × 1.3 = 2.056 mg/L NH_4^+.*

Table 1 Percent of NH_3 in water

pH	16 °C	18 °C	20 °C	22 °C	24 °C	26 °C	28 °C	30 °C	32 °C
7.0	0.29	0.34	0.39	0.46	0.52	0.60	0.69	0.80	0.91
7.2	0.46	0.54	0.62	0.82	0.83	0.96	1.10	1.26	1.44
7.4	0.73	0.85	0.98	1.14	1.31	1.50	1.73	1.98	2.26
7.6	1.16	1.34	1.55	1.79	2.06	2.36	2.71	3.10	3.53
7.8	1.82	2.11	2.44	2.81	3.22	3.70	4.23	4.82	5.48
8.0	2.86	3.30	3.81	4.38	5.02	5.74	6.54	7.43	8.42
8.2	4.45	5.14	5.90	6.76	7.72	8.80	9.98	11.29	12.72
8.4	6.88	7.90	9.04	10.31	11.71	13.26	14.95	16.78	18.77
8.6	10.48	11.97	13.61	15.41	17.37	19.50	21.78	24.22	26.80
8.8	15.66	17.73	19.98	22.41	25.00	27.74	30.62	33.62	36.72
9.0	22.73	25.46	28.36	31.40	34.56	37.83	41.16	44.53	47.91
9.2	31.80	35.12	38.55	42.04	45.57	49.09	52.58	55.99	59.31
9.4	42.49	46.18	49.85	53.48	57.02	60.45	63.73	66.85	69.79
9.6	53.94	57.62	61.17	64.56	67.77	70.78	73.58	76.17	78.55
9.8	64.99	68.31	71.40	74.28	76.92	79.33	81.53	83.51	85.30
10.0	74.63	77.35	79.83	82.07	84.08	85.88	87.49	88.92	90.19
10.2	82.34	84.41	86.25	87.88	89.33	90.60	91.73	92.71	93.58

Detergents CHEMets Kit

K-9400/R-9400: 0 - 3 ppm

Test Procedure

1. Rinse the reaction tube with the sample to be tested, and then fill it to the 5 mL mark with the sample.
2. While holding the double-tipped ampoule in a vertical position, snap the upper tip using the tip breaking tool (fig. 1).
3. Invert the ampoule and position the open end over the reaction tube. Snap the upper tip and allow the contents to drain into the reaction tube (fig. 1).
4. Cap the reaction tube and shake it vigorously for **30 seconds**. Allow the tube to stand undisturbed for **1 minute**.
5. Make sure that the flexible tubing is firmly attached to the CHEMet ampoule tip.
6. Insert the CHEMet assembly (tubing first) into the reaction tube making sure that the end of the flexible tubing is at the bottom of the tube. Break the tip of the CHEMet ampoule by gently pressing it against the side of the reaction tube (fig. 2). The ampoule should draw in fluid only from the organic phase (bottom layer).
7. When filling is complete, remove the CHEMet assembly from the reaction tube.

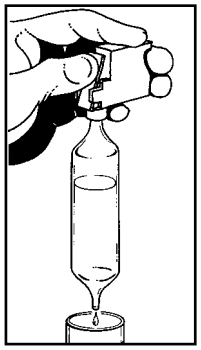


Figure 1

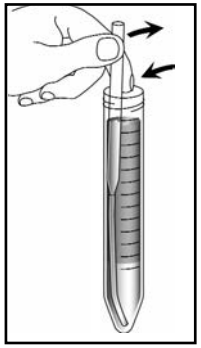


Figure 2

8. Remove the flexible tubing from the CHEMet ampoule and wipe all liquid from the exterior of the ampoule. Place an ampoule cap firmly onto the tip of the CHEMet ampoule. Invert the ampoule several times, allowing the bubble to travel from end to end.
9. Obtain a test result by placing the ampoule, flat end first, into the comparator. Hold the comparator up toward a source of light and view from the bottom. Rotate the comparator until the best color match is found (fig. 3).

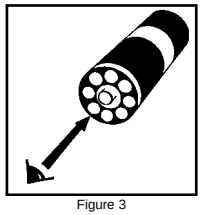


Figure 3

Tip Breaker

The tip breaker opens for easy disposal of the glass tips (pull lever away from body of tip breaker or pull open the side wall). The tip breaker will work most effectively if the tips are emptied out frequently.

Test Method

The Detergents CHEMets®[1] test kit employs the methylene blue extraction method[2,3,4]. Anionic detergents react with methylene blue to form a blue complex that is extracted into an immiscible organic solvent. The intensity of the blue color is directly related to the concentration of "methylene blue active substances (MBAS)" in the sample. Anionic detergents are one of the most prominent methylene blue active substances. Test results are expressed in ppm (mg/Liter) linear alkylbenzene sulfonate (equivalent weight 325).

1. CHEMets is a registered trademark of CHEMetrics, Inc. U.S. Patent No. 3,634,038
2. APHA Standard Methods, 22nd ed., Method 5540 C - 2000
3. EPA Methods for Chemical Analysis of Water and Wastes, Method 425.1 (1983)
4. ASTM D 2330-02, Methylene Blue Active Substances

Safety Information

Read SDS (available at www.chemetrics.com) before performing this test procedure. Wear safety glasses and protective gloves.

CHEMetrics

Simplicity in Water Analysis

www.chemetrics.com
4295 Catlett Road, Midland, VA 22728 U.S.A.
Phone: (800) 356-3072; Fax: (540) 788-4856
E-Mail: orders@chemetrics.com

Feb. 18, Rev. 10

CHLORINE, TOTAL, Low Range (0 to 2.00 mg/L Cl_2)

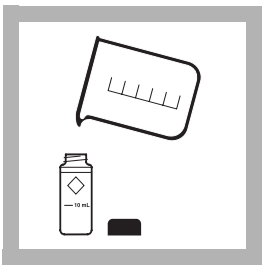
For water, wastewater and seawater

DPD Method* USEPA accepted (powder pillows only)**

Measuring Hints

If the sample temporarily turns yellow after reagent addition or the display shows overrange (flashing **2.20** in display), dilute a fresh sample and repeat the test. A slight loss of chlorine may occur because of the dilution. Multiply the result by the appropriate dilution factor.

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*
** Procedure is equivalent to USEPA method 330.5 for wastewater and Standard Method 4500-Cl G for drinking water.



1. Fill a 10-mL cell to the 10-mL line with sample. Cap.

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*

Note: *Be sure the instrument is in the low range mode. See page 37.*

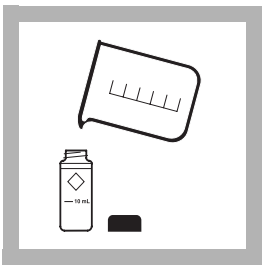
2. Add the contents of one DPD Total Chlorine Powder Pillow to the sample cell (the prepared sample). Cap and gently shake for 20 seconds.

Note: *Gently shaking dissipates bubbles which may form in samples containing dissolved gases.*

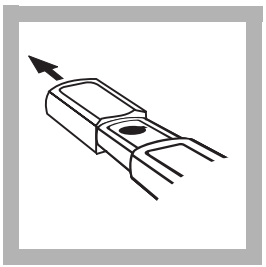
3. Wait 3 minutes. During this period, proceed with *steps 4–8*.

Note: *A pink color will form if chlorine is present.*

Note: *Accuracy is not affected by undissolved powder.*

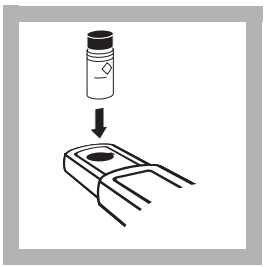


4. Fill a 10-mL sample cell to the 10-mL line with sample (the blank). Cap.



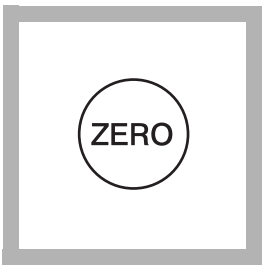
5. Remove the instrument cap.

Note: *For best results, zero the instrument and read the sample under the same lighting conditions.*



6. Place the blank in the cell holder, with the diamond mark facing you. Tightly cover the cell with the instrument cap (flat side should face the back of the instrument).

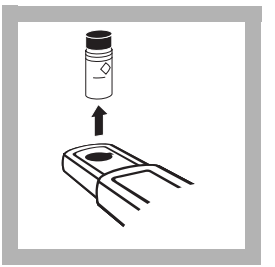
Note: *Wipe liquid off sample cells.*



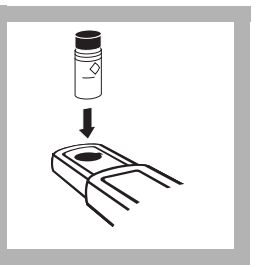
7. Press: **ZERO**

The instrument will turn on and the display will show **- - -** followed by **0.00**.

Note: *The instrument automatically shuts off after 1 minute and stores the last zero in memory. Press* **READ** *to complete the analysis.*

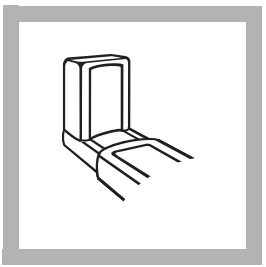


8. Remove the cell from the cell holder.

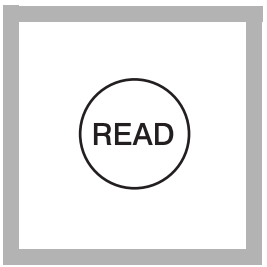


9. Within 3 minutes after the 3-minute reaction period, place the prepared sample in the cell holder.

Note: *Wipe liquid off sample cells.*



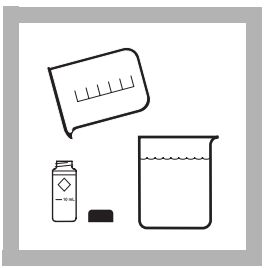
10. Cover the cell with instrument cap.



11. Press: **READ**
The instrument will show **- - -** followed by the result in mg/L total chlorine.

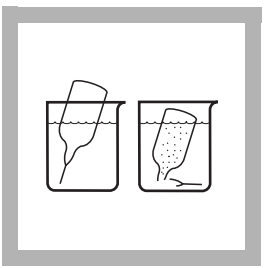
Note: *If the sample temporarily turns yellow after reagent addition or shows overrange (flashing* **2.20***), dilute a fresh sample and repeat the test. Some loss of chlorine may occur. Multiply the result by the dilution factor.*

Using AccuVac® Ampuls



1. Fill a 10-mL sample cell to the 10-mL line with sample (the blank). Cap. Collect at least 40 mL of sample in a 50-mL beaker.

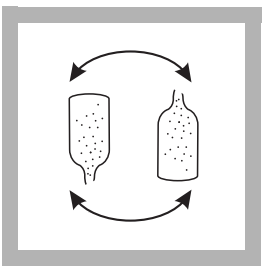
Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*



2. Fill a DPD Total Chlorine Reagent AccuVac Ampul with sample (the prepared sample).

Note: *Keep the tip immersed until the ampule fills completely.*

Note: *Be sure the instrument is in low range. See page 37.*

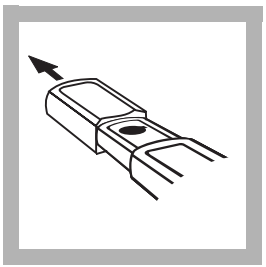


3. Quickly invert the ampule several times to mix. Wipe off any liquid or fingerprints.

Note: *A pink color will develop if chlorine is present.*

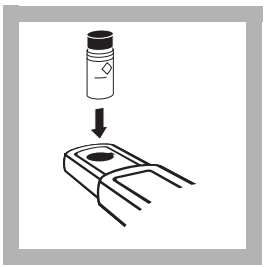
Note: *Accuracy is not affected by undissolved powder.*

4. Wait 3 minutes. During this period, proceed with *steps 5–8*.



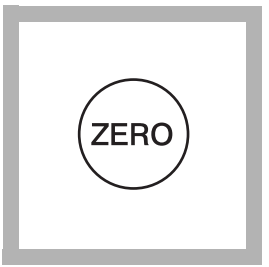
5. Remove the instrument cap.

Note: *For best results, zero and read the sample measurements under the same lighting conditions.*



6. Place the blank in the cell holder with the diamond mark facing you. Tightly cover the cell with the instrument cap (flat side should face the back of the instrument).

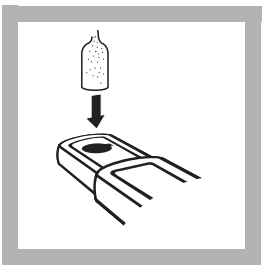
Note: *Wipe liquid off sample cells.*



7. Press: **ZERO**

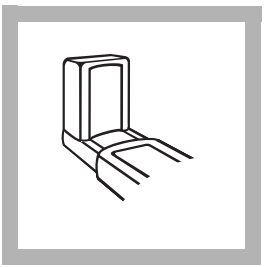
The instrument will turn on and the display will show **- - -** then **0.00**.

Note: *The instrument automatically shuts off after 1 minute and stores the last zero in memory. Press* **READ** *to complete the analysis.*

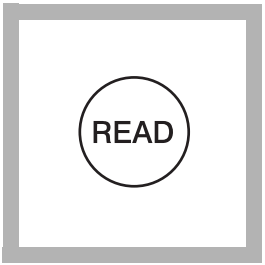


8. Within 3 minutes after the 3-minute reaction period, place the prepared sample in the cell holder.

Note: *Wipe liquid off sample cells.*



9. Cover the ampule with the instrument cap.



10. Press: **READ**

The instrument will show **- - -** followed by the result in mg/L total chlorine.

Note: *If the sample temporarily turns yellow after reagent addition or shows overrange (flashing* **2.20***), dilute a fresh sample and repeat the test. Some loss of chlorine may occur. Multiply the result by the dilution factor.*

Accuracy Check

Standard Additions Method

a. Snap the neck off a Chlorine Standard Solution Voluette® Ampule.

b. Use a TenSette® pipet to add 0.1, 0.2, and 0.3 mL of standard to three 25-mL samples. Swirl gently to mix. (For AccuVac Ampuls, use 50-mL beakers.)

c. Analyze a 10-mL aliquot of each sample as described in the procedure. Each 0.1 mL of standard will cause an incremental increase in chlorine, the exact value depends on the concentration of the Voluette ampule standard. Check the certificate enclosed with the Voluette ampules for this value.

d. If these increases do not occur, call Hach at 800-227-4224. Outside the United States, contact the Hach office or distributor serving you.

Interferences

Samples containing more than the 250 mg/L alkalinity or 150 mg/L acidity as $CaCO_3$ may inhibit full color development, or the color may fade instantly. Neutralize these samples to pH 6–7 with 1 N Sulfuric Acid or 1 N Sodium Hydroxide. Determine the

amount required on a separate 10-mL sample. Add the same amount to the sample to be tested. Correct for the additional volume.

Bromine, iodine, ozone and oxidized forms of manganese and chromium may also react and read as chlorine.

To compensate for the effects of manganese (Mn^{4+}) or chromium (Cr^{6+}), adjust the pH to 6–7 as described above. To a 25-mL sample, add 3 drops of 30 g/L Potassium Iodide Solution, mix, and wait one minute. Add 3 drops of 5 g/L Sodium Arsenite and mix. If chromium is present, allow exactly the same reaction period with DPD for both analyses. Subtract the result of this test from the original analysis to obtain the accurate chlorine concentration.

DPD Total Chlorine Reagent Powder Pillows and AccuVac Ampuls contain a buffer formulation that withstands high levels (at least 1000 mg/L) of hardness without interference.

REQUIRED REAGENTS

Description	Unit	Cat. No.
DPD Total Chlorine Reagent Powder Pillows	100/pkg	21056-69
or		
DPD Total Chlorine Reagent AccuVac® Ampuls	25/pkg	25030-25

REQUIRED APPARATUS (AccuVac® Ampuls)

Beaker, 50 mL	each	500-41

OPTIONAL REAGENTS

Chlorine Standard Solution Voluette® Ampules, 50-75 mg/L, 10 mL	16/pkg	14268-10
Chlorine Standards, secondary, Specv™, 0.0, 0.2, 0.8, and 1.5 mg/L	4/set	26353-00
DPD Total Chlorine Reagent w/dispensing cap	250 tests	21056-29
Potassium Iodide Solution, 30 g/L	100 mL MDB*	343-32
Sodium Arsenite Solution, 5 g/L	100 mL MDB	1047-32
Sodium Hydroxide Standard Solution, 1 N	100 mL MDB	1045-32
Sulfuric Acid Standard Solution, 1 N	100 mL MDB	1270-32
Water, deionized	4 L	272-56

* Marked Dropper Bottle

OPTIONAL APPARATUS

Description	Unit	Cat. No.
AccuVac® Snapper Kit	each	24052-00
Batteries, AAA, alkaline	4/pkg	46743-00
Caps for 10-mL sample cells	12/pkg	24018-12
Cylinder, graduated, 25 mL, poly	each	1081-40
Cylinder, graduated, 100 mL, PMP	each	2172-42
sens*ion*™*1* Basic Portable pH Meter, with electrode	each	51700-10
Pipet, TenSette®, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, For 19700-01 TenSette®	50/pkg	21856-96
Sample Cells, 10-mL with screw caps	6/pkg	24276-06

REPLACEMENT PARTS

Instrument Cap/light shield	each	46704-00
Instrument Manual	each	46760-88

Pro30

USER MANUAL

English

Item #606082
Rev A
Drawing # A606082
July 2011

CONTENTS

WARRANTY

The YSI Professional 30 instrument (Pro30) is warranted for three (3) years from date of purchase by the end user against defects in materials and workmanship, exclusive of batteries and any damage caused by defective batteries. Pro30 cable/probe assemblies are warranted for two (2) years from date of purchase by the end user against defects in material and workmanship. Pro30 instruments & cables are warranted for 90 days from date of purchase by the end user against defects in material and workmanship when purchased by rental agencies for rental purposes. Within the warranty period, YSI will repair or replace, at its sole discretion, free of charge, any product that YSI determines to be covered by this warranty.

To exercise this warranty, call your local YSI representative, or contact YSI Customer Service in Yellow Springs, Ohio at +1 937 767-7241, 800-897-4151 or visit www.YSI.com for a Product Return Form. Send the product and proof of purchase, transportation prepaid, to the Authorized Service Center selected by YSI. Repair or replacement will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days from date of repair or replacement.

LIMITATION OF WARRANTY

This Warranty does not apply to any YSI product damage or failure caused by:

1. Failure to install, operate or use the product in accordance with YSI's written instructions;
2. Abuse or misuse of the product;
3. Failure to maintain the product in accordance with YSI's written instructions or standard industry procedure;
4. Any improper repairs to the product;
5. Use by you of defective or improper components or parts in servicing or repairing the product;
6. Modification of the product in any way not expressly authorized by YSI.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. YSI'S LIABILITY UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT, AND THIS SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY. IN NO EVENT SHALL YSI BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY.

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INTRODUCTION

Thank you for purchasing the YSI Pro30, an instrument from the YSI *Professional Series* product family. The Pro30 measures conductivity and temperature in water. The Pro30 features an impact resistant and waterproof (IP-67) case, a rugged MS-8 (military-spec) cable connector, backlit display, user-selectable sensor options, 50 data set memory, internal barometer and a rubber over-mold case.

The Pro30 provides valuable instructions and prompts near the bottom of the display that will guide you through operation and use. However, reading the entire manual is recommended for a better understanding of the instrument's features.

> ⓘ *The Pro30 cannot communicate to a PC via a Pro Series communications saddle. Connecting the Pro30 to a communication saddle may cause erratic instrument behavior.*

GETTING STARTED

INITIAL INSPECTION

Carefully unpack the instrument and accessories and inspect for damage. Compare received parts with items on the packing list. If any parts or materials are damaged or missing, contact YSI Customer Service at 800-897-4151 (+1 937 767-7241) or the authorized YSI distributor from whom the instrument was purchased.

BATTERY INSTALLATION

The instrument requires 2 alkaline C-cell batteries. Under normal conditions, the average battery life is 425 hours at room temperature without using the back light. A battery symbol  will blink in the lower, left corner of the display to indicate low batteries when approximately 1 hour of battery life remains.

To install or replace the batteries:

1. Turn the instrument off and flip over to view the battery cover on the back.
2. Unscrew the four captive battery cover screws.
3. Remove the battery cover and remove the old batteries if necessary.
4. Install the new batteries, ensuring correct polarity alignment (figure 1).

5. Place the battery cover on the back of the instrument and tighten the four screws. Do not over-tighten.

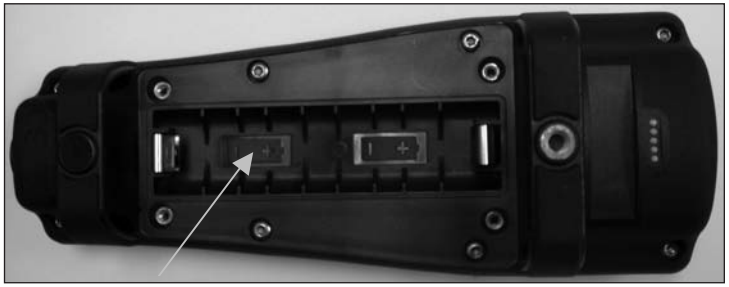


Figure 1. Pro30 with battery cover removed. Notice battery symbols indicating polarities.

> *The waterproof instrument case is sealed at the factory and is not to be opened, except by authorized service technicians. Do not attempt to separate the two halves of the instrument case as this may damage the instrument, break the waterproof seal, and will void the warranty.*

KEY PAD

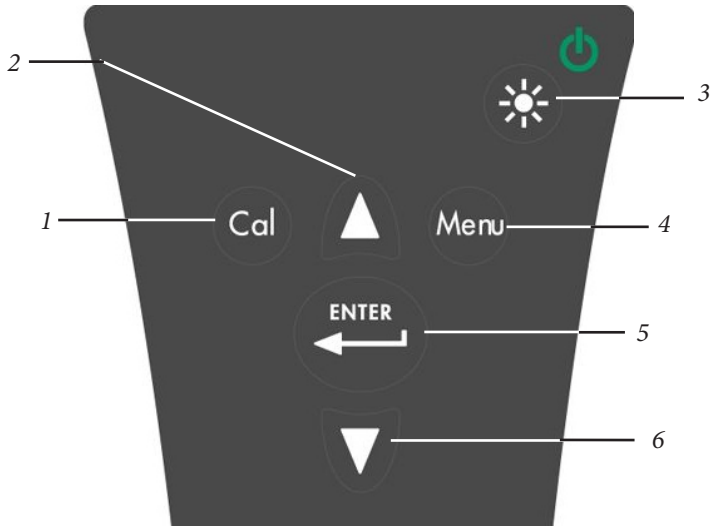


Figure 2, Keypad

Number	*Key*	*Description*
1	Cal	**Calibrate** Press and hold for 3 seconds to calibrate. Opens Calibrate menu from the Run screen.
2	▲	**Up Arrow** Use to navigate through menus, to navigate through box options along the bottom of the Run screen and to increase numerical inputs.
3	⏻ ☀	**Power and Backlight** Press once to turn instrument on. Press a second time to turn backlight on. Press a third time to turn backlight off. Press and hold for 3 seconds to turn instrument off.
4	Menu	**Menu** Use to enter the System Setup menu from the Run screen.
5	ENTER	**Enter** Press to confirm entries and selections.
6	▼	**Down Arrow** Use to navigate through menus, to navigate through box options at the bottom of the Run screen and to decrease numerical inputs.

CONNECTING THE PROBE/CABLE ASSEMBLY TO THE INSTRUMENT

The conductivity and temperature sensors are integral to the cable assembly; therefore, they cannot be removed from the cable.

To connect the cable, align the keys on the cable connector to the slots on the instrument connector. Push together firmly and then twist the outer ring until it locks into place (figure 3). This connection is water-proof.

Figure 3, Note the keyed connector.

RUN SCREEN

Press the power/backlight key to turn the instrument on. The instrument will run through a self test and briefly display a splash screen with system information before displaying the main Run screen (figure 4). The first time the Pro30 is turned on, it will prompt you to select a language; see the First Power On section of this manual for more information.

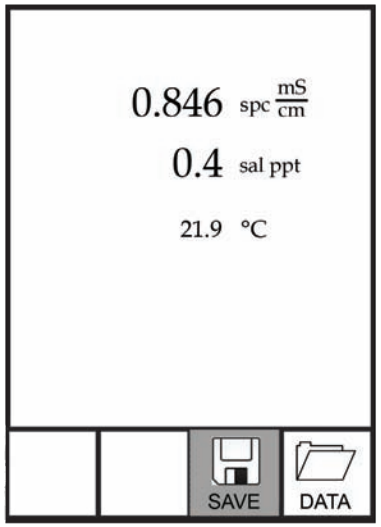


Figure 4, Run screen.

BACKLIGHT

Once the instrument is powered on, pressing the power/backlight key will turn on the display backlight. The backlight will remain on until the key is pressed again or after two minutes of not pressing any key on the keypad.

POWERING OFF

To turn the instrument off, press and hold the power/backlight key for three seconds.

NAVIGATION

The up and down arrow keys allow you to navigate through the functions of the Pro30.

NAVIGATING THE RUN SCREEN

When in the Run screen, the up and down arrow keys will move the highlighted box along the bottom options. Once a box is highlighted, press enter to access the highlighted option.

Description of Run screen box functions from left to right:

Option	*Description*
SAVE	Highlight and press enter to save displayed data to memory.
DATA	Highlight and press enter to view and/or erase saved data.

NAVIGATING THE SYSTEM SETUP MENU

When in the System Setup menu, the up and down arrow keys will move the highlighted bar up and down the system setup options. See the System Setup menu section of this manual for more information about these options.

FIRST POWER ON

The instrument will step through an initial language configuration when powered on for the first time. Use the up or down arrow keys to highlight the

appropriate language then press enter to confirm (figure 5). If an incorrect language is selected, it may be changed in the System Setup menu.

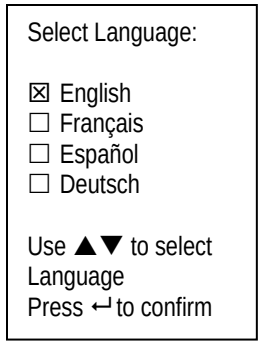


Figure 5, Select language.

After selecting a language, the Run screen will be displayed. The next time the instrument is powered up, the Run screen will display immediately after the splash screen.

SYSTEM SETUP MENU

Press the menu Menu key to access the System Setup menu. The System Setup menu contains multiple screens that are notated as 'pages'. The current page is indicated near the bottom of the display (figure 6).

Use the up and down arrow keys to scroll through menu options and menu pages.

EXITING THE SYSTEM SETUP MENU

To exit the System Setup menu, press the down arrow key until the ESC - Exit box is highlighted, then press enter to return to the Run screen.

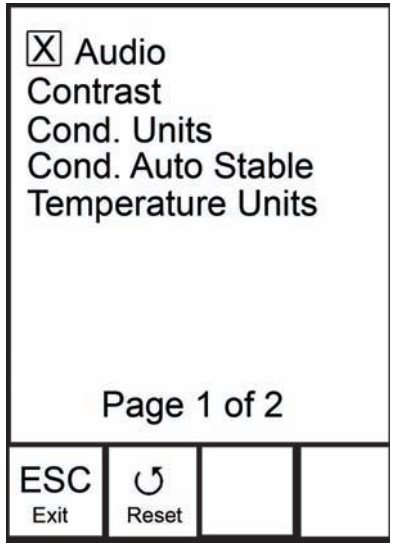


Figure 6, page 1 of System Setup menu. Audio is enabled.

AUDIO

Audio can be enabled or disabled by using the up or down arrow keys to highlight Audio and pressing enter. When enabled, there will be an 'X' in the box next to Audio.

When Audio is enabled, the Pro30 will beep twice to indicate stability when Auto Stable is enabled. The instrument will also beep when a key is pressed. When Audio is disabled, the Pro30 will not beep.

CONTRAST

To adjust the display Contrast, use the up or down arrow keys to highlight Contrast, then press enter. Next, use the up or down arrow keys to adjust the contrast. The up arrow key will darken the contrast and the down arrow key will lighten the contrast. After adjusting the contrast, press enter to save and exit the Contrast adjustment option.

EMERGENCY CONTRAST ADJUSTMENT

If necessary, there is an alternate method of adjusting the contrast. To adjust the contrast, press and hold the menu key, then press the up arrow key to darken the contrast or press the down arrow key to lighten the contrast.

CONDUCTIVITY UNITS (COND. UNITS)

Highlight Cond. Units (Conductivity Units) and press enter to open a submenu that allows you to select the conductivity units to be displayed on the Run screen. Highlight a unit and press enter to enable or disable it. An enabled conductivity unit will have an 'X' in the box next to it. Highlight the ESC-Exit box along the bottom of the display and press enter to save any changes and to close the conductivity units submenu.

There are seven options for displaying conductivity. Only four units can be enabled at the same time:

- COND-mS/cm displays conductivity in milliSiemens per centimeter.
- COND-uS/cm displays conductivity in microSiemens per centimeter.
- SPC-mS/cm displays Specific Conductance in milliSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- SPC-uS/cm displays Specific Conductance in microSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- Sal ppt displays salinity in parts per thousand. The salinity reading is calculated from the instrument's conductivity and temperature values using algorithms found in *Standard Methods for the Examination of Water and Wastewater*.
- TDS g/L displays Total Dissolved Solids in grams per liter. TDS is calculated from conductivity and temperature using a user-selectable TDS constant.
- TDS mg/L displays Total Dissolved Solids in milligrams per liter. TDS is calculated from conductivity and temperature using a user-selectable TDS constant.

Note: 1 milliSiemen = 1,000 microSiemens.

SPECIFIC CONDUCTANCE

The conductivity of a sample is highly dependent on temperature, varying as much as 3% for each change of one degree Celsius (temperature coefficient = 3%/°C). In addition, the temperature coefficient itself varies with the nature of the ionic species present in the sample. Therefore, it is useful to compensate for this temperature dependence in order to quickly compare conductivity readings taken at different temperatures.

The Pro30 can display non-temperature compensated conductivity as well as temperature compensated Specific Conductance. If Specific Conductance is selected, the Pro30 uses the temperature and conductivity values associated with

each measurement to calculate a specific conductance value compensated to a user selected reference temperature, see below. Additionally, the user can select the temperature coefficient from 0% to 4%.

Using the Pro30's default reference temperature and temperature coefficient (25 °C and 1.91%), the calculation is carried out as follows:

$$\text{Specific Conductance (25°C)} = \frac{\text{Conductivity of sample}}{1 + 0.0191 * (T - 25)}$$

T = Temperature of the sample in °C

CONDUCTIVITY AUTO STABLE (COND. AUTO STABLE)

Auto Stable utilizes preset values to indicate when a reading is stable. The preset values are adjustable in the System Setup menu. The user can input a % change in readings (0.0 to 1.9) over 'x' amount of time in seconds (3-19).

Highlight Cond. Auto Stable, then press enter to open the submenu.

Use the up or down arrow keys to highlight the % change or seconds (secs) input field, then press enter to make the highlighted field adjustable. Use the up or down arrow keys to adjust the selected value, then press enter to confirm changes. Once you have confirmed any changes, highlight the ESC-Exit box along the bottom of the display and press enter to close the Auto Stable submenu.

To disable Auto Stable, set the % Change input to 0.0.

When Auto Stable is enabled, an (AS) symbol will display next to the reading on the Run screen and blink during stabilization. When the dissolved oxygen and/or conductivity reading stabilizes based on the Auto Stable settings, the (AS) symbol will display steadily and the instrument will beep twice if Audio is turned on.

TEMPERATURE UNITS

Highlight Temperature Units and press enter to open a submenu that allows you to change the temperature units displayed on the Run screen. Highlight the desired unit (Celsius or Fahrenheit) and press enter to enable. The enabled temperature unit will have an 'X' in the box next to it. Only one unit may be enabled at a time. Highlight the ESC-Exit box and press enter to save any changes and to close the Temperature Units submenu.

SPECIFIC CONDUCTANCE REFERENCE TEMPERATURE (SPC REF. TEMP.)

SPC Ref. Temp. (Specific Conductance Reference Temperature) is the reference temperature used to calculate Specific Conductance. The reference temperature range is 15 and 25 °C. The default value is 25 °C.

To change the reference temperature, highlight SPC Ref. Temp. and press enter to open the submenu. With the reference temperature highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new reference temperature. Next, highlight the ESC-Exit box and press enter to close the submenu.

SPECIFIC CONDUCTANCE TEMPERATURE COEFFICIENT (SPC %/°C)

SPC %/°C (Specific Conductance Temperature Coefficient) is the temperature coefficient used to calculate Specific Conductance. The coefficient range is 0.00 to 4.00. The default value is 1.91% which is based on KCl standards.

To change the temperature coefficient, highlight SPC %/°C and press enter to open the submenu. With the temperature coefficient highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new coefficient. Next, highlight the ESC-Exit box and press enter to close the submenu.

TDS CONSTANT

TDS Constant is a multiplier used to calculate an estimated TDS (Total Dissolved Solids) value from conductivity. The multiplier is used to convert Specific Conductance in mS/cm to TDS in g/L. The Pro30's default value is 0.65. This multiplier is highly dependent on the nature of the ionic species present in the water sample. To be assured of moderate accuracy for the conversion, you must determine a multiplier for the water at your sampling site. Use the following procedure to determine the multiplier for a specific sample:

1. Determine the specific conductance of a water sample from the site;
2. Filter a sample of water from the site;
3. Completely evaporate the water from a carefully measured volume of the filtered sample to yield a dry solid;
4. Accurately weigh the remaining solid;
5. Divide the weight of the solid (in grams) by the volume of water used (in liters) to yield the TDS value in g/L for this site;
6. Divide the TDS value in g/L by the specific conductance of the water in mS/cm to yield the conversion multiplier. Be certain to use the correct units.

If the nature of the ionic species at the site changes between sampling studies, the TDS values will be in error. TDS cannot be calculated accurately from specific conductance unless the make-up of the chemical species in the water remains constant.

To change the TDS Constant in the Pro30, highlight TDS Constant and press enter to open the submenu. With the TDS Constant highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. The input range is 0.30 to 1.00. Press enter to save the new TDS Constant. Next, highlight the ESC-Exit box and press enter to close the submenu.

LANGUAGE

Highlight Language and press enter to open a submenu that allows you to change the language. Highlight the desired language (English, Spanish, German, or French) and press enter to enable. The enabled language will have an 'X' in the box next to it. Highlight ESC-Exit box and press enter to save any changes and to close the Language submenu.

The text in the boxes along the bottom of the Run screen will always be displayed in English regardless of the language enabled in the System Setup menu.

AUTO SHUTOFF

Auto Shutoff allows you to set the instrument to turn off automatically after a period of time. Use the up or down arrow keys to highlight Auto Shutoff, then press enter to open the submenu. Press enter while the minute field is highlighted to make it adjustable. Next, use the up or down arrow keys to adjust the shut off time from 0 to 60 minutes. Press enter to save the new shutoff time. Next, highlight the ESC-Exit box and press enter to close the submenu.

To disable Auto Shutoff, set the Time in Minutes to 0 (zero).

CELL CONSTANT

The Cell Constant displays the cell constant of the conductivity cell. The cell constant is calculated and updated each time a conductivity calibration is performed. The cell constant range is 4.0 to 6.0. Resetting the System Menu resets the cell constant to 5.0.

RESETTING THE SYSTEM SETUP MENU TO FACTORY DEFAULT

To reset the Pro30 settings to factory default, press the down arrow key while in the System Setup menu until the Reset - ↺ box is highlighted, then press enter. The instrument will ask you to confirm the reset. Highlight Yes and press enter to continue with the reset or highlight No and press enter to cancel the reset. A Factory Reset will not affect data saved in the instrument's memory.

The following will be set in the Pro30 after performing a reset:

Parameter	*Reset Defaults*
Audio	On
Contrast	Set to mid range
Conductivity Units	cond uS/cm, spc mS/cm, spc uS/cm and sal ppt
Conductivity Auto Stable	Off (0.0 % Change and 10 seconds)
SPC Reference Temperature	25°C
SPC Temperature Coefficient	1.91%/°C
TDS Constant	0.65
Temperature Units	°C
Language	English
Auto Shutoff	30 minutes
Conductivity Cell Constant	Cell constant reset to 5.0*

*It is recommended to perform a Conductivity calibration after performing a reset.

CALIBRATION

TEMPERATURE

All Pro30 cables have built-in temperature sensors. Temperature calibration is not required nor is it available.

CONDUCTIVITY CALIBRATION

Ensure the conductivity sensor is clean and dry before performing a conductivity, specific conductance or salinity calibration.

> ⓘ *It is not necessary to calibrate conductivity, specific conductance and salinity. Calibrating one of these parameters will simultaneously calibrate the others. YSI recommends calibrating specific conductance for greatest ease.*

CALIBRATING SPECIFIC (SP.) CONDUCTANCE OR CONDUCTIVITY

Note: When calibrating Specific Conductance, the Pro30 uses the factory default values for the Specific Conductance Reference Temperature and the Specific Conductance Temperature Coefficient regardless of what is configured in the System Setup Menu. The default value for the Reference Temperature is 25°C and the default value for the Temperature Coefficient is 1.91%/°C. It is important to note that the Temperature Coefficient of a calibration solution is dependent on the contents of the solution. Therefore, YSI recommends using a traceable calibration solution made of KCl (potassium chloride) when calibrating Specific Conductance since these solutions typically have a Temperature Coefficient of 1.91%/°C. Additionally, be sure to enter the value of the solution as it is listed for 25°C when calibrating Specific Conductance.

1. Fill a clean container (i.e. plastic cup or glass beaker) with fresh, traceable conductivity calibration solution and place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable (figure 7). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.

Figure 7, solution above two holes near cable.

2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight the desired calibration method, Sp. Conductance or Conductivity, and press enter.
3. Highlight the units you wish to calibrate, either uS/cm or mS/cm, and press enter. 1 mS = 1,000 uS. Next, use the up or down arrow key to adjust the value on the display to match the value of the conductivity calibration solution. If calibrating conductivity, it is necessary to look up the value of the solution at the current temperature and enter that value into the Pro30. Most conductivity solutions are labeled with a value at 25°C. If calibrating specific conductance, enter the value listed for 25°C. Depressing either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro30 will remember the entered calibration value and display it the next time a conductivity calibration is performed.
4. Press enter to complete the calibration. Or, press Cal to cancel the calibration and return to the Run screen.
5. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
6. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting guide for possible solutions.

CALIBRATING IN SALINITY

1. Fill a clean container (i.e. plastic cup or glass beaker) with fresh, traceable salinity calibration solution and place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable (figure 7). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.
2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight Salinity and press enter.
3. Use the up or down arrow key to adjust the value on the display to match the value of the salinity solution. Depressing either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro30 will remember the entered calibration value and display it the next time a salinity calibration is performed.
4. Press enter to complete the calibration. Or, press Cal to cancel the calibration and return to the Run screen.
5. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
6. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting guide for possible solutions.

TAKING MEASUREMENTS

Before taking measurements, be sure the instrument has been calibrated to ensure the most accurate readings. Place the probe in the sample to be measured and give the probe a quick shake to release any air bubbles. Be sure the conductivity sensor is completely submerged in the sample. The two holes near the cable should be covered by the sample for accurate conductivity readings (figure 7). Allow the temperature readings to stabilize.

SAVING AND VIEWING DATA

The Pro30 can store 50 data sets in non-volatile memory for later viewing. A data set includes the values currently on the display, i.e. temperature, dissolved oxygen and two conductivity parameters. Each data point is referenced with a data set number, 01 through 50.

SAVING DATA

> *The Pro30 can not communicate to a PC via a Pro Series communications saddle. Connecting the Pro30 to a communication saddle may cause erratic instrument behavior.*

From the Run screen, use the up or down arrow keys to highlight the Save box and press enter to save the current readings. The instrument will indicate the data set is saved and display the saved data set's number (figure 8).

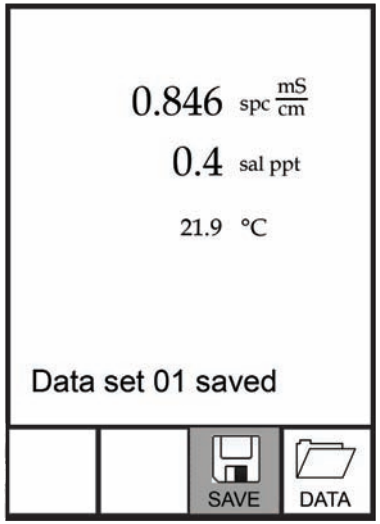


Figure 8, data set saved.

The instrument will display 'Memory Full' if all 50 data sets have been saved and you attempt to save another data set.

VIEWING AND ERASING SAVED DATA - DATA MODE

Data mode allows you to view and erase saved data. From the Run screen, use the up or down arrow keys to highlight Data and press enter to access Data mode. Note that the function boxes at the bottom of the display are different in Data mode (figure 9).

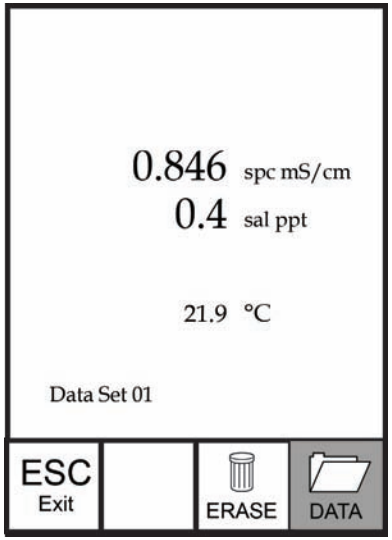


Figure 9, Data mode.

VIEWING DATA

Once in Data mode, use the up and down arrow keys to view saved data sets in sequential order or press enter to access the bottom functions. After accessing the bottom functions, highlight the Data box and press enter to regain access to viewing data. The data set displayed is indicated by the data set number, 01 through 50.

ERASING DATA

While viewing saved data, press the enter key to access the function boxes at the bottom of the display. Next, use the up or down arrow keys to highlight Erase, then press enter. The instrument will give you the option to erase one data set or all data sets (figure 10).

Figure 10, Erase data mode.

Use the up or down arrow key to select Erase Data Set, Erase All Sets or the ESC-Exit function box, then press enter to confirm.

Select ESC-Exit and press enter to exit Erase mode without erasing any data.

Select Erase Data Set and press enter to erase the data set that was displayed before entering Erase mode. For example, if data set 12 was displayed before entering erase mode, and Erase Data Set is selected, Data Set 12 will be erased from memory and the data sets AFTER that number will move up to keep them sequential. For example, if there are15 records and number 12 is erased then 13 becomes 12, 14 becomes 13, and 15 becomes 14. The instrument will return to Data mode after erasing one data set.

Select Erase All Data Sets and press enter to clear the Pro30 memory and return to Data mode.

EXITING DATA MODE

While in Data mode, press enter to access the bottom functions. Next, highlight the ESC-Exit box and press enter to return to the Run screen.

CARE, MAINTENANCE AND STORAGE

This section describes the proper procedures for care, maintenance and storage of the instrument. The goal is to maximize their lifetime and minimize down-time associated with improper instrument usage.

GENERAL MAINTENANCE

GENERAL MAINTENANCE - GASKET

The instrument utilizes a gasket as a seal to prevent water from entering the battery compartment. Following the recommended procedures will help keep the instrument functioning properly.

If the gasket and sealing surfaces are not maintained properly, it is possible that water can enter the battery compartment. If water enters this area, it can severely damage the battery terminals causing loss of battery power and corrosion to the battery terminals. Therefore, when the battery compartment lid is removed, the gasket that provides the seal should be carefully inspected for contamination (i.e. debris, grit, etc.) and cleaned with water and mild detergent if necessary.

SENSOR MAINTENANCE

SENSOR MAINTENANCE - TEMPERATURE

You must keep the temperature sensor free of build up. Other than that, no additional maintenance is required. A toothbrush can be used to scrub the temperature sensor if needed.

SENSOR MAINTENANCE - CONDUCTIVITY

The openings that allow sample access to the conductivity electrodes should be cleaned regularly. The small cleaning brush included in the Maintenance Kit is intended for this purpose. Dip the brush in clean water and insert it into each hole 10 to 12 times. In the event that deposits have formed on the electrodes, it may be necessary to use a mild detergent (laboratory grade soap or bathroom foaming tile cleaner) with the brush. Rinse thoroughly with clean water, then check the response and accuracy of the conductivity cell with a calibration solution.

SENSOR STORAGE

SHORT AND LONG TERM STORAGE

For both short and long term storage, the conductivity sensor should be stored clean and dry.

Remove the batteries from the instrument when storing it for long periods of time (>30 days).

Long Term Storage Temperature: -5 to 70°C (23 to 158°F)

TROUBLESHOOTING

Symptom	*Possible Solution*
Instrument will not turn on, a battery symbol appears, or "Critical Shutdown" displays on the screen.	1. Low battery voltage, replace batteries. 2. Batteries installed incorrectly, check battery polarity. 3. Return system for service.
Temperature values display Over or Undr on Run screen.	1. Sample temperature is less than -5° C or more than +55°C. Increase or decrease the sample temperature to bring within the allowable range. 2. Contact YSI Tech Support.
Instrument will not calibrate the Conductivity sensor; instrument displays "Calibration Over", "Calibration Under", or "Unstable Reading" during calibration.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the calibration solution is above the two holes near the cable, see figure 8. 3. Verify the calibration solution is not expired or contaminated. Try a new bottle of solution. 4. Ensure you are entering in the correct value for the solution according to the measurement units. 1 mS = 1,000 uS. 5. Allow sufficient stabilization time for conductivity and temperature AND wait at least 3 seconds before confirming a calibration. 6. Contact YSI Tech Support.

Symptom	*Possible Solution*
Conductivity readings are inaccurate.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the sample is above the two holes near the cable, see figure 8. 3. Verify calibration. 4. Verify temperature readings are accurate. 5. Verify the correct units are setup in the System Setup menu, i.e. uS vs mS and Conductivity vs. Specific Conductance. 6. Contact YSI Tech Support.
Conductivity values display Over or Undr on Run screen.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the sample is above the two holes near the cable, see figure 8 3. Verify calibration. 4. Verify temperature readings are accurate. 5. Sample conductivity is outside the measurement range of the instrument, i.e. 0-200 mS. 6. Contact YSI Tech Support.

SPECIFICATIONS

These specifications represent typical performance and are subject to change without notice. For the latest product specification information, please visit YSI's website at www.ysi.com or contact YSI Tech Support.

Parameter	*Range*	*Resolution*	*Accuracy*
Temperature	-5 to 55°C	0.1°C	± 0.2°C
Conductivity	0-500 uS/cm 0-5 mS/cm 0-50 mS/cm 0-200 mS/cm (auto ranging)	0.0001 to 0.1 mS/cm; 0.1 to 0 uS/cm (range dependent)	Instrument only: ± 0.5% of the reading or 1 uS/cm, whichever is greater. Instrument with 1 or 4 meter cables: ± 1.0% of the reading or 1 uS/cm, whichever is greater. Instrument with 10, 20, or 30 meter cables: ± 2.0% of the reading or 1 uS/cm, whichever is greater.
Salinity	0 to 70 ppt	0.1 ppt	± 1.0% of the reading or ± 0.1 ppt, whichever is greater.
Total Dissolved Solids (TDS)	0 to 100 g/L. TDS Constant range: 0.3 to 1.00 (0.65 default)	0.0001 to 0.1 g/L (range dependent)	Dependent on accuracy of temperature, conductivity and TDS Constant.

ACCESSORIES / PART NUMBERS

Part Number	*Description*
6050030	Pro30 Instrument
60530-1, -4, -10, -20, or -30	1, 4, 10, 20, 30-meter cable assembly*
603077	Flow cell
603056	Flow cell mounting spike
603075	Carrying case, soft-sided
603074	Carrying case, hard-sided
603069	Belt clip
063517	Ultra clamp for instrument
063507	Tripod for instrument
603062	Cable management kit, included with all cables longer then 1 meter.
605978	Cable weight, 4.9 oz, stackable
603070	Shoulder strap
060907	Conductivity Calibration Solution, 1,000 µS/cm. 1 box of 8 pints.
060911	Conductivity Calibration Solution, 10,000 µS/cm. 1 box of 8 pints.
060660	Conductivity Calibration Solution, 50,000 µS/cm. 1 box of 8 pints.
065274	Conductivity Calibration Solution, 100,000 µS/cm. 1 box of 8 pints.

*All cables include a temperature and conductivity sensor.

DECLARATION OF CONFORMITY

The undersigned hereby declares on behalf of the named manufacturer under our sole responsibility that the listed product conforms to the requirements for the listed European Council Directive(s) and carries the CE mark accordingly.

Manufacturer:	YSI Incorporated 1725 Brannum Lane Yellow Springs, OH 45387 USA
Product Name:	Pro30 Water Quality Instrument
Model Numbers	
Instrument/Accessory:	Pro30 (6050030)
Probe/Cable Assemblies:	60530-1, -4, -10, -20, and -30
Conforms to the following:	
Directives:	IEC 61326-1:2005 RoHS 2002/95/EC WEEE 2002/96/EC IP-67 Protection per ANSI/IEC 60529-2004
Harmonized Standards:	• EN61326-1:2006 (IEC 61326-1:2005) Basic Immunity
Supplementary Information:	All performance met the operation criteria as follows: 1. ESD, IEC 61000-4-2:2001, Performance Criterion B 2. Radiated Immunity, IEC 61000-4-3, Performance Criterion A 3. Electrical Fast Transient (EFT), IEC 61000-4-4:2004, +Corr. 1:2006 + Corr. 2:2007, Performance Criterion B 4. Radio Frequency, Continuous Conducted Immunity, IEC61000-4-6, Performance Criterion A 5. Radiated Emissions, EN 61326-1:2006 (IEC61326-1:2005) Class B
Authorized EU Representative	YSI Hydrodata Ltd Unit 2 Focal Point, Lacerta Court, Works Road Letchworth, Hertfordshire, SG6 1FJ UK

Signed: Lisa M. Abel Date: 27 June 2011
Title: Director of Quality

RECYCLING

YSI is committed to reducing the environmental footprint in the course of doing business. Even though materials reduction is the ultimate goal, we know there must be a concerted effort to responsibly deal with materials after they've served a long, productive life-cycle. YSI's recycling program ensures that old equipment is processed in an environmentally friendly way, reducing the amount of materials going to landfills.

- Printed Circuit Boards are sent to facilities that process and reclaim as much material for recycling as possible.
- Plastics enter a material recycling process and are not incinerated or sent to landfills.
- Batteries are removed and sent to battery recyclers for dedicated metals.

When the time comes for you to recycle, follow the easy steps outlined at www.ysi.com.

BATTERY DISPOSAL

The Pro30 is powered by alkaline batteries which the user must remove and dispose of when the batteries no longer power the instrument. Disposal requirements vary by country and region, and users are expected to understand and follow the battery disposal requirements for their specific locale.

CONTACT INFORMATION

ORDERING AND TECHNICAL SUPPORT

Telephone: 800 897 4151 (USA)
+1 937 767 7241 (Globally)
Monday through Friday, 8:00 AM to 5:00 ET

Fax: +1 937 767 9353 (orders)
+1 937 767 1058 (technical support)

Email: environmental@ysi.com
Mail: YSI Incorporated
1725 Brannum Lane
Yellow Springs, OH 45387 USA

Internet: www.ysi.com

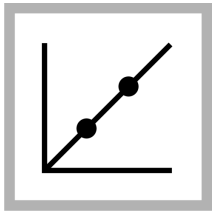
When placing an order please have the following available:
1.) YSI account number (if available)
2.) Name and phone number
3.) Purchase Order or Credit Card number
4.) Model Number or brief description
5.) Billing and shipping addresses
6.) Quantity

SERVICE INFORMATION

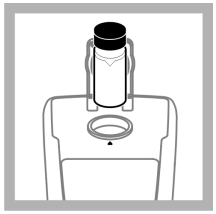
YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit www.ysi.com and click 'Support' or contact YSI Technical Support directly at 800-897-4151 (+1 937-767-7241).

When returning a product for service, include the Product Return form with cleaning certification. The form must be completely filled out for a YSI Service Center to accept the instrument for service. The form may be downloaded from www.ysi.com by clicking on the 'Support".

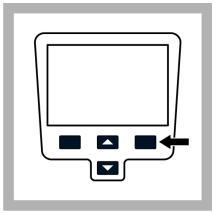
Item # 606082
Rev A
Drawing # A606082
July 2011



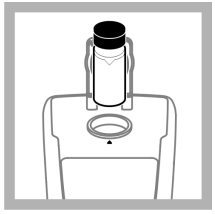
1. Push the **CALIBRATION** key to enter the Calibration mode. Follow the instructions on the display.
Note: *Gently invert each standard before inserting the standard.*



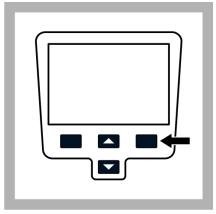
2. Insert the 20 NTU StablCal Standard and close the lid.
Note: *The standard to be inserted is bordered.*



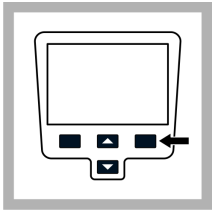
3. Push **Read**. The display shows Stabilizing and then shows the result.



4. Repeat Step 2 and 3 with the 100 NTU and 800 NTU StablCal Standard.
Note: *Push **Done** to complete a 2 point calibration.*



5. Push **Done** to review the calibration details.



6. Push **Store** to save the results.
After a calibration is complete, the meter automatically goes into the Verify Cal mode. Refer to Calibration verification (Verify Cal) on page 16.

Turbidity measurement

⚠ WARNING

Potential explosion and fire hazard. This turbidimeter is designed for water based samples. Do not measure solvent or combustible based samples.

Readings can be taken with the Normal reading mode, Signal Average mode or in the Rapidly Settling Turbidity mode. Refer to Reading modes on page 16 for more information. For accurate turbidity readings use clean sample cells and remove air bubbles (degassing).

Measurement notes

Proper measurement techniques are important in minimizing the effects of instrument variation, stray light and air bubbles. Use the following measurement notes for proper measurements.

Instrument

- Make sure that the meter is placed on a level, stationary surface during the measurement.
  Note: *Do not hold the meter in the hand during measurement.*
- Always close the sample compartment lid during measurement, calibration and storage.
- Remove sample cell and batteries from the instrument if the instrument is stored for an extended time period (more than a month).
- Keep the sample compartment lid closed to prevent the entry of dust and dirt.

Sample cells

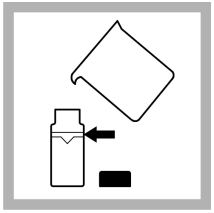
- Always cap the sample cell to prevent spillage of the sample into the instrument.
- Always use clean sample cells in good condition. Dirty, scratched or damaged cells can cause inaccurate readings.
- Make sure that cold samples do not “fog” the sample cell.
- Store sample cells filled with distilled or deionized water and cap tightly.

Measurement

- Measure samples immediately to prevent temperature changes and settling. Before a measurement is taken, always make sure that the sample is homogeneous throughout.
- Avoid sample dilution when possible.
- Avoid operation in direct sunlight.

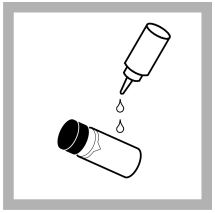
Turbidity measurement procedure

Note: *Before a measurement is taken, always make sure that the sample is homogeneous throughout.*



1. Collect a representative sample in a clean container. Fill a sample cell to the line (about 15 mL). Take care to handle the sample cell by the top. Cap the cell.

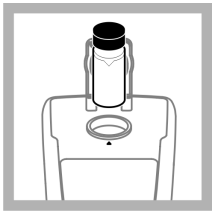
2. Wipe the cell with a soft, lint-free cloth to remove water spots and fingerprints.



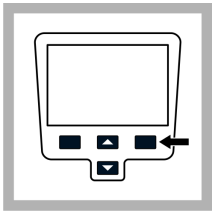
3. Apply a thin film of silicone oil. Wipe with a soft cloth to obtain an even film over the entire surface (Apply silicone oil to a sample cell on page 17).

4. Push the **Power** key to turn the meter on. Place the instrument on a flat, sturdy surface.

Note: *Do not hold the instrument while making measurements.*



5. Gently invert and then insert the sample cell in the instrument cell compartment so the diamond or orientation mark aligns with the raised orientation mark in front of the cell compartment. Close the lid.



6. Push **Read**. The display shows Stabilizing then the turbidity in NTU (FNU). The result is shown and stored automatically (Refer to Data management on page 11)

Data management

About stored data

The following types of data are stored in the data log:

- Reading Log: stores automatically each time a sample reading is taken (500 records).
- Calibration Log: stores only when **Store** is selected at the end of a calibration (25 records).
- Verify Cal Log: stores only after **Done** is selected at the end of a verification calibration (250 records).

When the data log becomes full, the oldest data point is deleted when more data is added to the log.

View data log

The data log contains Reading Log, Calibration Log and Verify Cal log. All logs can be sorted by date.

OUTFALL INVENTORY FIELD SHEET

Section 1: Background Data

City/Town:	Street:	Tax Map #:	Outfall ID: OF-
Owner: ☐ City ☐ State ☐ Private ☐ Other: _____		Nearest House/Utility Pole #:	
Today's date:		Time (Military):	
Investigators:		Form completed by:	
Temperature (°F):	Rainfall (in.): Last 24 hours:	Last 48 hours:	
Northing:	Easting:	GPS Unit:	GPS LMK #:
Rim Elevation:		Invert Elevation:	
Elevation Datum:		Receiving Water:	
Camera:		Photo #s: -- Take 1 Upstream (head on) and 1 Downstream view	

Land Use in Drainage Area (Check all that apply):

☐ Industrial ☐ Open Space

☐ Urban Residential ☐ Institutional

☐ Suburban Residential Other: _____

☐ Commercial Known Industries: _____

Notes (e.g.., origin of outfall, if known):

Section 2: Outfall Description

TYPE	MATERIAL	SHAPE		DIMENSIONS (IN.)	SUBMERGED
☐ Closed Pipe	☐ RCP ☐ CMP ☐ PVC ☐ HDPE ☐ Steel ☐ Other: _____	☐ Circular ☐ Elliptical ☐ Box ☐ Other: _____	☐ Single ☐ Double ☐ Triple ☐ Other: _____	Diameter/Dimensions: _____	In Water: ☐ No ☐ Partially ☐ Fully With Sediment: ☐ No ☐ Partially ☐ Fully
☐ Open drainage	☐ Concrete ☐ Pavement/Scupper ☐ Earthen ☐ rip-rap ☐ Other: _____	☐ Trapezoid ☐ Parabolic ☐ Other: _____		Depth: _____ Top Width: _____ Bottom Width: _____	
Flow Present?	☐ Yes ☐ No	***If No, Skip to Section 3. If Yes, Notify Town and continue field reconnaissance.***			
Flow Description (If present)	☐ Trickle ☐ Moderate ☐ Substantial			Flow Direction (If Present):	

Section 3: Sketch

Outfall Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No *(If No, Skip to Section 5)*

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:	☐ 1 – Faint	☐ 2 – Easily detected	☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:	☐ 1 – Faint colors in outfall flow	☐ 2 – Clearly visible in outfall flow	☐ 3 – Clearly visible in outfall flow
Turbidity	☐	See severity	☐ 1 – Slight cloudiness	☐ 2 – Cloudy	☐ 3 – Opaque
Floatables -Does Not Include Trash!!	☐	☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:	☐ 1 – Few/slight; origin not obvious	☐ 2 – Some; indications of origin (e.g., possible suds or oil sheen)	☐ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present? ☐ Yes ☐ No *(If No, Skip to Section 6)*

INDICATOR	CHECK if Present	DESCRIPTION	COMMENTS
Outfall Damage	☐	☐ Spalling, Cracking or Chipping ☐ Peeling Paint ☐ Corrosion	
Deposits/Stains	☐	☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	
Abnormal Vegetation	☐	☐ Excessive ☐ Inhibited	
Poor pool quality	☐	☐ Odors ☐ Colors ☐ Floatables ☐ Oil Sheen ☐ Suds ☐ Excessive Algae ☐ Other:	
Pipe benthic growth	☐	☐ Brown ☐ Orange ☐ Green ☐ Other:	

Section 6: Potential for Illicit Discharge

☐ Unlikely ☐ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

Section 7: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?

Ammonia Nitrogen Test Kit

NI-SA (2428700)

DOC326.98.00007

Test preparation

CAUTION: ⚠ Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.

- Put the color disc on the center pin in the color comparator box (numbers to the front).
- Use sunlight or a lamp as a light source to find the color match with the color comparator box.
- Rinse the tubes with sample before the test. Rinse the tubes with deionized water after the test.
- If the color match is between two segments, use the value that is in the middle of the two segments.
- If the color disc becomes wet internally, pull apart the flat plastic sides to open the color disc. Remove the thin inner disc. Dry all parts with a soft cloth. Assemble when fully dry.
- To verify the test accuracy, use a standard solution as the sample.
- This test kit is for seawater. If used for brackish or fresh water, the test kit gives a higher than actual value. The error in brackish water is usually less than 10%. The error in low salinity or fresh water is a maximum 16%.
- This test is very sensitive to contamination. Try to get the same result on a second test. Fully rinse the tubes with fresh sample before the second test. The reagents clean the tubes during the first test.
- To increase the range of this test to 4 mg/L NH_3–N, dilute the sample as follows. Use a 3-mL syringe to add 2.5 mL of sample to each tube. Dilute the sample to the 5-mL mark with deionized water. Use the diluted sample in the test procedure and multiply the result by 2.

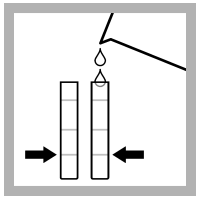
Replacement items

Description	Unit	Item no.
Ammonia Salicylate Reagent Powder Pillows, 5 mL	50/pkg	2395266
Ammonia Cyanurate Reagent Powder Pillows, 5 mL	50/pkg	2395466
Color disc, ammonia nitrogen, salicylate, 0–2.0 mg/L	each	9261300
Color comparator box	each	173200
Glass viewing tubes, glass, 18 mm	6/pkg	173006
Stoppers for 18-mm glass tubes and AccuVac Ampuls	6/pkg	173106

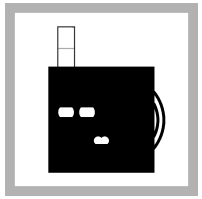
Optional items

Description	Unit	Item no.
Nitrogen ammonia standard solution, 1.0 mg/L NH_3–N	500 mL	189149
Water, deionized	500 mL	27249
Syringe, Luer-Lok® Tip, 3 mL	each	4321300

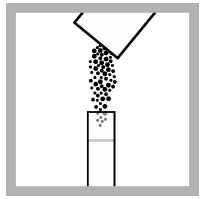
Test procedure—Ammonia-nitrogen (0–2.0 mg/L NH_3–N)



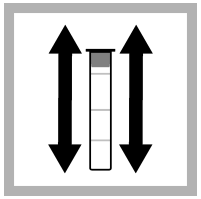
1. Fill two tubes to the first line (5 mL) with sample.



2. Put one tube into the left opening of the color comparator box.

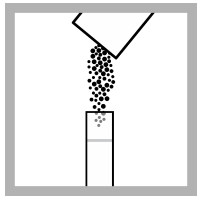


3. Add one Ammonia Salicylate Reagent Powder Pillow to the second tube.

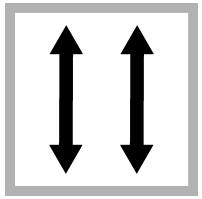


4. Put a stopper on the tube. Shake until the powder fully dissolves.

5. Wait 3 minutes.

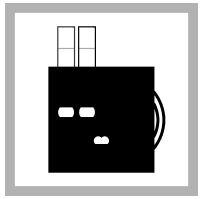


6. Add one Ammonia Cyanurate Reagent Powder Pillow to the same tube. Put a stopper on the tube.

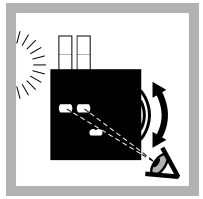


7. Shake until the powder fully dissolves.

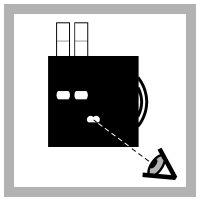
8. Wait 15 minutes. A green color develops.



9. Put the second tube into the color comparator box.



10. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.



11. Read the result in mg/L in the scale window.

Calculate the mg/L NH_3 and mg/L NH_4^+

Ammonia in water is in the form of the ammonium ion (NH_4^+) and un-ionized ammonia (NH_3). NH_3 is toxic to fish. Table 1 shows that the percent of NH_3 increases as the pH and temperature increase. This test kit measures both NH_4^+ and NH_3 as ammonia nitrogen (NH_3–N).

To calculate the mg/L NH_3 in the sample, refer to Table 1 and the equation that follows.

mg/L NH_3 = ((mg/L NH_3–N x percent NH_3 from Table 1) ÷ 100) × 1.2

Example: *The test result was 1.6 mg/L NH_3–N. The sample pH was 7.6 and the sample temperature was 16 °C. The mg/L NH_3 is ((1.6 x 1.16) ÷ 100) × 1.2 = 0.02 mg/L NH_3.*

To calculate the mg/L NH_4^+ in the sample, refer to Table 1 and the equation that follows.

mg/L NH_4^+ = ((mg/L NH_3–N x (100 – percent NH_3 from Table 1)) ÷ 100) × 1.3

Example: *The test result was 1.6 mg/L NH_3–N. The sample pH was 7.6 and the sample temperature was 16 °C. The mg/L NH_4^+ is ((1.6 x (100 – 1.16)) ÷ 100) × 1.3 = 2.056 mg/L NH_4^+.*

Table 1 Percent of NH_3 in water

pH	16 °C	18 °C	20 °C	22 °C	24 °C	26 °C	28 °C	30 °C	32 °C
7.0	0.29	0.34	0.39	0.46	0.52	0.60	0.69	0.80	0.91
7.2	0.46	0.54	0.62	0.82	0.83	0.96	1.10	1.26	1.44
7.4	0.73	0.85	0.98	1.14	1.31	1.50	1.73	1.98	2.26
7.6	1.16	1.34	1.55	1.79	2.06	2.36	2.71	3.10	3.53
7.8	1.82	2.11	2.44	2.81	3.22	3.70	4.23	4.82	5.48
8.0	2.86	3.30	3.81	4.38	5.02	5.74	6.54	7.43	8.42
8.2	4.45	5.14	5.90	6.76	7.72	8.80	9.98	11.29	12.72
8.4	6.88	7.90	9.04	10.31	11.71	13.26	14.95	16.78	18.77
8.6	10.48	11.97	13.61	15.41	17.37	19.50	21.78	24.22	26.80
8.8	15.66	17.73	19.98	22.41	25.00	27.74	30.62	33.62	36.72
9.0	22.73	25.46	28.36	31.40	34.56	37.83	41.16	44.53	47.91
9.2	31.80	35.12	38.55	42.04	45.57	49.09	52.58	55.99	59.31
9.4	42.49	46.18	49.85	53.48	57.02	60.45	63.73	66.85	69.79
9.6	53.94	57.62	61.17	64.56	67.77	70.78	73.58	76.17	78.55
9.8	64.99	68.31	71.40	74.28	76.92	79.33	81.53	83.51	85.30
10.0	74.63	77.35	79.83	82.07	84.08	85.88	87.49	88.92	90.19
10.2	82.34	84.41	86.25	87.88	89.33	90.60	91.73	92.71	93.58

Detergents CHEMets Kit

K-9400/R-9400: 0 - 3 ppm

Test Procedure

1. Rinse the reaction tube with the sample to be tested, and then fill it to the 5 mL mark with the sample.
2. While holding the double-tipped ampoule in a vertical position, snap the upper tip using the tip breaking tool (fig. 1).
3. Invert the ampoule and position the open end over the reaction tube. Snap the upper tip and allow the contents to drain into the reaction tube (fig. 1).
4. Cap the reaction tube and shake it vigorously for **30 seconds**. Allow the tube to stand undisturbed for **1 minute**.
5. Make sure that the flexible tubing is firmly attached to the CHEMet ampoule tip.
6. Insert the CHEMet assembly (tubing first) into the reaction tube making sure that the end of the flexible tubing is at the bottom of the tube. Break the tip of the CHEMet ampoule by gently pressing it against the side of the reaction tube (fig. 2). The ampoule should draw in fluid only from the organic phase (bottom layer).
7. When filling is complete, remove the CHEMet assembly from the reaction tube.

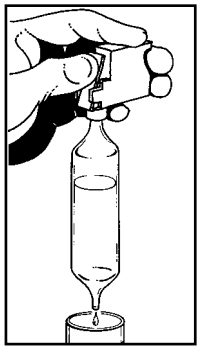


Figure 1

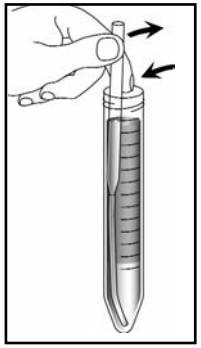


Figure 2

8. Remove the flexible tubing from the CHEMet ampoule and wipe all liquid from the exterior of the ampoule. Place an ampoule cap firmly onto the tip of the CHEMet ampoule. Invert the ampoule several times, allowing the bubble to travel from end to end.
9. Obtain a test result by placing the ampoule, flat end first, into the comparator. Hold the comparator up toward a source of light and view from the bottom. Rotate the comparator until the best color match is found (fig. 3).

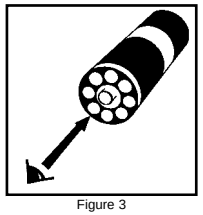


Figure 3

Tip Breaker

The tip breaker opens for easy disposal of the glass tips (pull lever away from body of tip breaker or pull open the side wall). The tip breaker will work most effectively if the tips are emptied out frequently.

Test Method

The Detergents CHEMets®[1] test kit employs the methylene blue extraction method[2,3,4]. Anionic detergents react with methylene blue to form a blue complex that is extracted into an immiscible organic solvent. The intensity of the blue color is directly related to the concentration of "methylene blue active substances (MBAS)" in the sample. Anionic detergents are one of the most prominent methylene blue active substances. Test results are expressed in ppm (mg/Liter) linear alkylbenzene sulfonate (equivalent weight 325).

1. CHEMets is a registered trademark of CHEMetrics, Inc. U.S. Patent No. 3,634,038
2. APHA Standard Methods, 22nd ed., Method 5540 C - 2000
3. EPA Methods for Chemical Analysis of Water and Wastes, Method 425.1 (1983)
4. ASTM D 2330-02, Methylene Blue Active Substances

Safety Information

Read SDS (available at www.chemetrics.com) before performing this test procedure. Wear safety glasses and protective gloves.

CHEMetrics

Simplicity in Water Analysis

www.chemetrics.com
4295 Catlett Road, Midland, VA 22728 U.S.A.
Phone: (800) 356-3072; Fax: (540) 788-4856
E-Mail: orders@chemetrics.com

Feb. 18, Rev. 10

CHLORINE, TOTAL, Low Range (0 to 2.00 mg/L Cl_2)

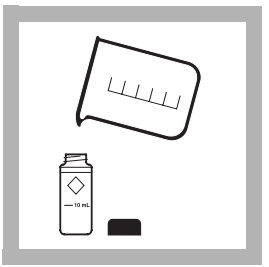
For water, wastewater and seawater

DPD Method* USEPA accepted (powder pillows only)**

Measuring Hints

If the sample temporarily turns yellow after reagent addition or the display shows overrange (flashing **2.20** in display), dilute a fresh sample and repeat the test. A slight loss of chlorine may occur because of the dilution. Multiply the result by the appropriate dilution factor.

* Adapted from *Standard Methods for the Examination of Water and Wastewater.*
** Procedure is equivalent to USEPA method 330.5 for wastewater and Standard Method 4500-Cl G for drinking water.



1. Fill a 10-mL cell to the 10-mL line with sample. Cap.

Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*

Note: *Be sure the instrument is in the low range mode. See page 37.*

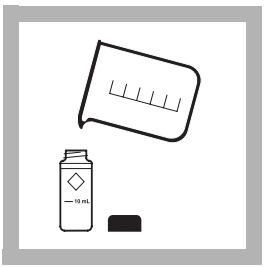
2. Add the contents of one DPD Total Chlorine Powder Pillow to the sample cell (the prepared sample). Cap and gently shake for 20 seconds.

Note: *Gently shaking dissipates bubbles which may form in samples containing dissolved gases.*

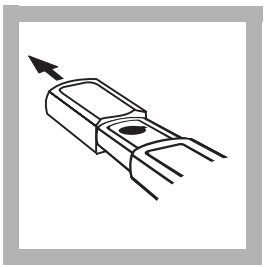
3. Wait 3 minutes. During this period, proceed with *steps 4–8*.

Note: *A pink color will form if chlorine is present.*

Note: *Accuracy is not affected by undissolved powder.*

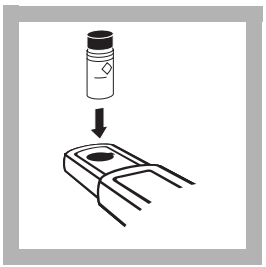


4. Fill a 10-mL sample cell to the 10-mL line with sample (the blank). Cap.



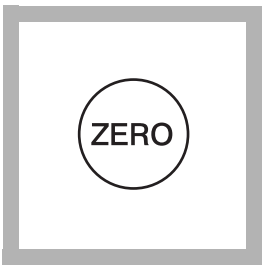
5. Remove the instrument cap.

Note: *For best results, zero the instrument and read the sample under the same lighting conditions.*



6. Place the blank in the cell holder, with the diamond mark facing you. Tightly cover the cell with the instrument cap (flat side should face the back of the instrument).

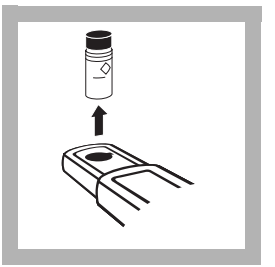
Note: *Wipe liquid off sample cells.*



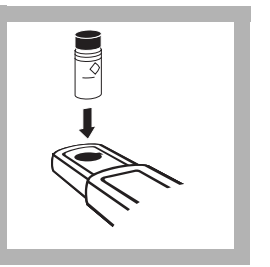
7. Press: **ZERO**

The instrument will turn on and the display will show **- - -** followed by **0.00**.

Note: *The instrument automatically shuts off after 1 minute and stores the last zero in memory. Press* **READ** *to complete the analysis.*

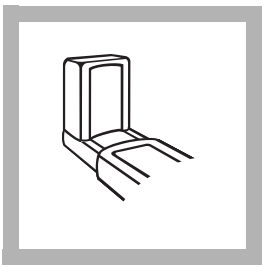


8. Remove the cell from the cell holder.

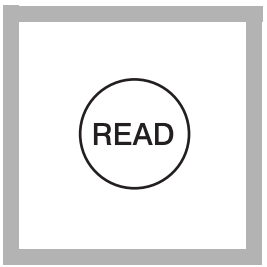


9. Within 3 minutes after the 3-minute reaction period, place the prepared sample in the cell holder.

Note: *Wipe liquid off sample cells.*



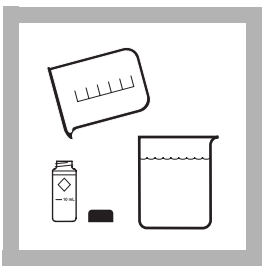
10. Cover the cell with instrument cap.



11. Press: **READ**
The instrument will show **- - -** followed by the result in mg/L total chlorine.

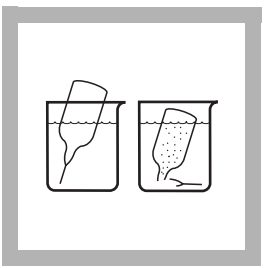
Note: *If the sample temporarily turns yellow after reagent addition or shows overrange (flashing* **2.20***), dilute a fresh sample and repeat the test. Some loss of chlorine may occur. Multiply the result by the dilution factor.*

Using AccuVac® Ampuls



1. Fill a 10-mL sample cell to the 10-mL line with sample (the blank). Cap. Collect at least 40 mL of sample in a 50-mL beaker.

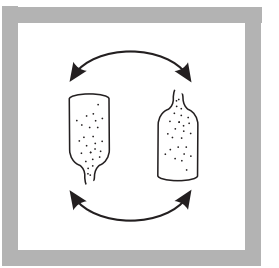
Note: *Samples must be analyzed immediately and cannot be preserved for later analysis.*



2. Fill a DPD Total Chlorine Reagent AccuVac Ampul with sample (the prepared sample).

Note: *Keep the tip immersed until the ampule fills completely.*

Note: *Be sure the instrument is in low range. See page 37.*

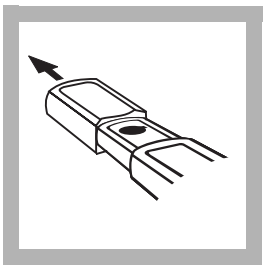


3. Quickly invert the ampule several times to mix. Wipe off any liquid or fingerprints.

Note: *A pink color will develop if chlorine is present.*

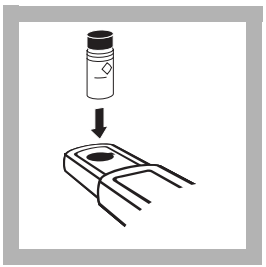
Note: *Accuracy is not affected by undissolved powder.*

4. Wait 3 minutes. During this period, proceed with *steps 5–8*.



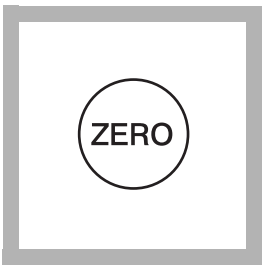
5. Remove the instrument cap.

Note: *For best results, zero and read the sample measurements under the same lighting conditions.*



6. Place the blank in the cell holder with the diamond mark facing you. Tightly cover the cell with the instrument cap (flat side should face the back of the instrument).

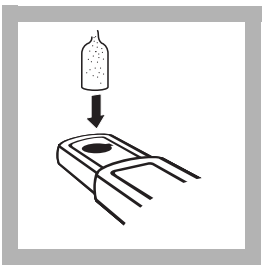
Note: *Wipe liquid off sample cells.*



7. Press: **ZERO**

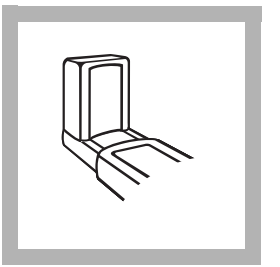
The instrument will turn on and the display will show **- - -** then **0.00**.

Note: *The instrument automatically shuts off after 1 minute and stores the last zero in memory. Press* **READ** *to complete the analysis.*

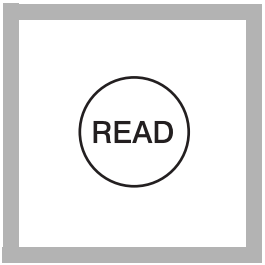


8. Within 3 minutes after the 3-minute reaction period, place the prepared sample in the cell holder.

Note: *Wipe liquid off sample cells.*



9. Cover the ampule with the instrument cap.



10. Press: **READ**

The instrument will show **- - -** followed by the result in mg/L total chlorine.

Note: *If the sample temporarily turns yellow after reagent addition or shows overrange (flashing* **2.20***), dilute a fresh sample and repeat the test. Some loss of chlorine may occur. Multiply the result by the dilution factor.*

Accuracy Check

Standard Additions Method

a. Snap the neck off a Chlorine Standard Solution Voluette® Ampule.

b. Use a TenSette® pipet to add 0.1, 0.2, and 0.3 mL of standard to three 25-mL samples. Swirl gently to mix. (For AccuVac Ampuls, use 50-mL beakers.)

c. Analyze a 10-mL aliquot of each sample as described in the procedure. Each 0.1 mL of standard will cause an incremental increase in chlorine, the exact value depends on the concentration of the Voluette ampule standard. Check the certificate enclosed with the Voluette ampules for this value.

d. If these increases do not occur, call Hach at 800-227-4224. Outside the United States, contact the Hach office or distributor serving you.

Interferences

Samples containing more than the 250 mg/L alkalinity or 150 mg/L acidity as $CaCO_3$ may inhibit full color development, or the color may fade instantly. Neutralize these samples to pH 6–7 with 1 N Sulfuric Acid or 1 N Sodium Hydroxide. Determine the

amount required on a separate 10-mL sample. Add the same amount to the sample to be tested. Correct for the additional volume.

Bromine, iodine, ozone and oxidized forms of manganese and chromium may also react and read as chlorine.

To compensate for the effects of manganese (Mn^{4+}) or chromium (Cr^{6+}), adjust the pH to 6–7 as described above. To a 25-mL sample, add 3 drops of 30 g/L Potassium Iodide Solution, mix, and wait one minute. Add 3 drops of 5 g/L Sodium Arsenite and mix. If chromium is present, allow exactly the same reaction period with DPD for both analyses. Subtract the result of this test from the original analysis to obtain the accurate chlorine concentration.

DPD Total Chlorine Reagent Powder Pillows and AccuVac Ampuls contain a buffer formulation that withstands high levels (at least 1000 mg/L) of hardness without interference.

REQUIRED REAGENTS

Description	Unit	Cat. No.
DPD Total Chlorine Reagent Powder Pillows	100/pkg	21056-69
or		
DPD Total Chlorine Reagent AccuVac® Ampuls	25/pkg	25030-25

REQUIRED APPARATUS (AccuVac® Ampuls)

Beaker, 50 mL	each	500-41

OPTIONAL REAGENTS

Chlorine Standard Solution Voluette® Ampules, 50-75 mg/L, 10 mL	16/pkg	14268-10
Chlorine Standards, secondary, Specv™, 0.0, 0.2, 0.8, and 1.5 mg/L	4/set	26353-00
DPD Total Chlorine Reagent w/dispensing cap	250 tests	21056-29
Potassium Iodide Solution, 30 g/L	100 mL MDB*	343-32
Sodium Arsenite Solution, 5 g/L	100 mL MDB	1047-32
Sodium Hydroxide Standard Solution, 1 N	100 mL MDB	1045-32
Sulfuric Acid Standard Solution, 1 N	100 mL MDB	1270-32
Water, deionized	4 L	272-56

* Marked Dropper Bottle

OPTIONAL APPARATUS

Description	Unit	Cat. No.
AccuVac® Snapper Kit	each	24052-00
Batteries, AAA, alkaline	4/pkg	46743-00
Caps for 10-mL sample cells	12/pkg	24018-12
Cylinder, graduated, 25 mL, poly	each	1081-40
Cylinder, graduated, 100 mL, PMP	each	2172-42
sens*ion*™*1* Basic Portable pH Meter, with electrode	each	51700-10
Pipet, TenSette®, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, For 19700-01 TenSette®	50/pkg	21856-96
Sample Cells, 10-mL with screw caps	6/pkg	24276-06

REPLACEMENT PARTS

Instrument Cap/light shield	each	46704-00
Instrument Manual	each	46760-88

Pro30

USER MANUAL

English

Item #606082
Rev A
Drawing # A606082
July 2011

CONTENTS

WARRANTY

The YSI Professional 30 instrument (Pro30) is warranted for three (3) years from date of purchase by the end user against defects in materials and workmanship, exclusive of batteries and any damage caused by defective batteries. Pro30 cable/probe assemblies are warranted for two (2) years from date of purchase by the end user against defects in material and workmanship. Pro30 instruments & cables are warranted for 90 days from date of purchase by the end user against defects in material and workmanship when purchased by rental agencies for rental purposes. Within the warranty period, YSI will repair or replace, at its sole discretion, free of charge, any product that YSI determines to be covered by this warranty.

To exercise this warranty, call your local YSI representative, or contact YSI Customer Service in Yellow Springs, Ohio at +1 937 767-7241, 800-897-4151 or visit www.YSI.com for a Product Return Form. Send the product and proof of purchase, transportation prepaid, to the Authorized Service Center selected by YSI. Repair or replacement will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days from date of repair or replacement.

LIMITATION OF WARRANTY

This Warranty does not apply to any YSI product damage or failure caused by:

1. Failure to install, operate or use the product in accordance with YSI's written instructions;
2. Abuse or misuse of the product;
3. Failure to maintain the product in accordance with YSI's written instructions or standard industry procedure;
4. Any improper repairs to the product;
5. Use by you of defective or improper components or parts in servicing or repairing the product;
6. Modification of the product in any way not expressly authorized by YSI.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. YSI'S LIABILITY UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT, AND THIS SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY. IN NO EVENT SHALL YSI BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY.

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INTRODUCTION

Thank you for purchasing the YSI Pro30, an instrument from the YSI *Professional Series* product family. The Pro30 measures conductivity and temperature in water. The Pro30 features an impact resistant and waterproof (IP-67) case, a rugged MS-8 (military-spec) cable connector, backlit display, user-selectable sensor options, 50 data set memory, internal barometer and a rubber over-mold case.

The Pro30 provides valuable instructions and prompts near the bottom of the display that will guide you through operation and use. However, reading the entire manual is recommended for a better understanding of the instrument's features.

> ⓘ *The Pro30 cannot communicate to a PC via a Pro Series communications saddle. Connecting the Pro30 to a communication saddle may cause erratic instrument behavior.*

GETTING STARTED

INITIAL INSPECTION

Carefully unpack the instrument and accessories and inspect for damage. Compare received parts with items on the packing list. If any parts or materials are damaged or missing, contact YSI Customer Service at 800-897-4151 (+1 937 767-7241) or the authorized YSI distributor from whom the instrument was purchased.

BATTERY INSTALLATION

The instrument requires 2 alkaline C-cell batteries. Under normal conditions, the average battery life is 425 hours at room temperature without using the back light. A battery symbol  will blink in the lower, left corner of the display to indicate low batteries when approximately 1 hour of battery life remains.

To install or replace the batteries:

1. Turn the instrument off and flip over to view the battery cover on the back.
2. Unscrew the four captive battery cover screws.
3. Remove the battery cover and remove the old batteries if necessary.
4. Install the new batteries, ensuring correct polarity alignment (figure 1).

5. Place the battery cover on the back of the instrument and tighten the four screws. Do not over-tighten.

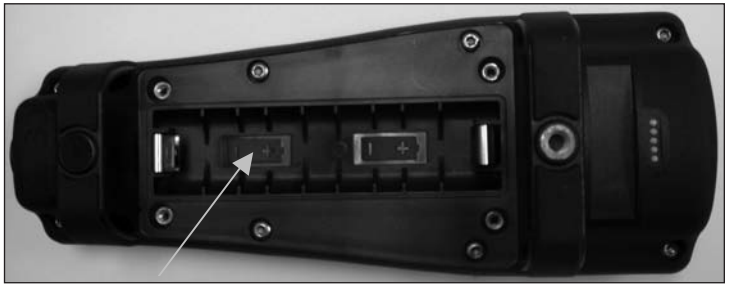


Figure 1. Pro30 with battery cover removed. Notice battery symbols indicating polarities.

> *The waterproof instrument case is sealed at the factory and is not to be opened, except by authorized service technicians. Do not attempt to separate the two halves of the instrument case as this may damage the instrument, break the waterproof seal, and will void the warranty.*

KEY PAD

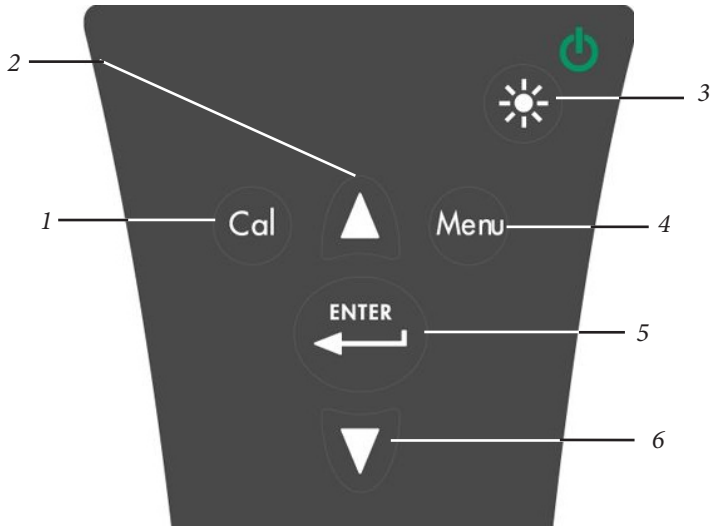


Figure 2, Keypad

Number	*Key*	*Description*
1	Cal	**Calibrate** Press and hold for 3 seconds to calibrate. Opens Calibrate menu from the Run screen.
2	▲	**Up Arrow** Use to navigate through menus, to navigate through box options along the bottom of the Run screen and to increase numerical inputs.
3	⏻ ☀	**Power and Backlight** Press once to turn instrument on. Press a second time to turn backlight on. Press a third time to turn backlight off. Press and hold for 3 seconds to turn instrument off.
4	Menu	**Menu** Use to enter the System Setup menu from the Run screen.
5	ENTER	**Enter** Press to confirm entries and selections.
6	▼	**Down Arrow** Use to navigate through menus, to navigate through box options at the bottom of the Run screen and to decrease numerical inputs.

CONNECTING THE PROBE/CABLE ASSEMBLY TO THE INSTRUMENT

The conductivity and temperature sensors are integral to the cable assembly; therefore, they cannot be removed from the cable.

To connect the cable, align the keys on the cable connector to the slots on the instrument connector. Push together firmly and then twist the outer ring until it locks into place (figure 3). This connection is water-proof.

Figure 3, Note the keyed connector.

RUN SCREEN

Press the power/backlight key to turn the instrument on. The instrument will run through a self test and briefly display a splash screen with system information before displaying the main Run screen (figure 4). The first time the Pro30 is turned on, it will prompt you to select a language; see the First Power On section of this manual for more information.

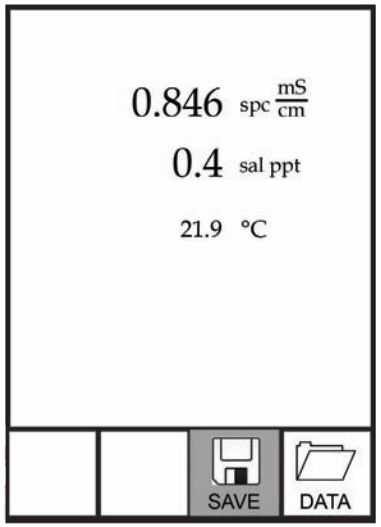


Figure 4, Run screen.

BACKLIGHT

Once the instrument is powered on, pressing the power/backlight key will turn on the display backlight. The backlight will remain on until the key is pressed again or after two minutes of not pressing any key on the keypad.

POWERING OFF

To turn the instrument off, press and hold the power/backlight key for three seconds.

NAVIGATION

The up and down arrow keys allow you to navigate through the functions of the Pro30.

NAVIGATING THE RUN SCREEN

When in the Run screen, the up and down arrow keys will move the highlighted box along the bottom options. Once a box is highlighted, press enter to access the highlighted option.

Description of Run screen box functions from left to right:

Option	*Description*
SAVE	Highlight and press enter to save displayed data to memory.
DATA	Highlight and press enter to view and/or erase saved data.

NAVIGATING THE SYSTEM SETUP MENU

When in the System Setup menu, the up and down arrow keys will move the highlighted bar up and down the system setup options. See the System Setup menu section of this manual for more information about these options.

FIRST POWER ON

The instrument will step through an initial language configuration when powered on for the first time. Use the up or down arrow keys to highlight the

appropriate language then press enter to confirm (figure 5). If an incorrect language is selected, it may be changed in the System Setup menu.

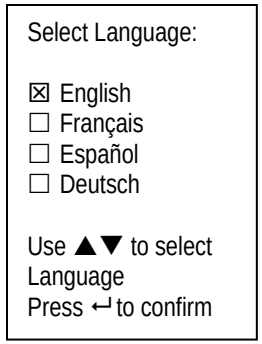


Figure 5, Select language.

After selecting a language, the Run screen will be displayed. The next time the instrument is powered up, the Run screen will display immediately after the splash screen.

SYSTEM SETUP MENU

Press the menu Menu key to access the System Setup menu. The System Setup menu contains multiple screens that are notated as 'pages'. The current page is indicated near the bottom of the display (figure 6).

Use the up and down arrow keys to scroll through menu options and menu pages.

EXITING THE SYSTEM SETUP MENU

To exit the System Setup menu, press the down arrow key until the ESC - Exit box is highlighted, then press enter to return to the Run screen.

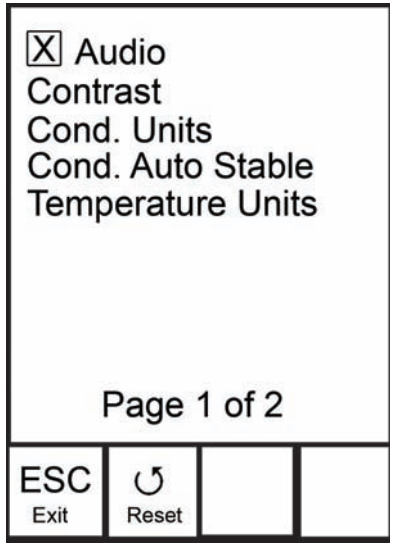


Figure 6, page 1 of System Setup menu. Audio is enabled.

AUDIO

Audio can be enabled or disabled by using the up or down arrow keys to highlight Audio and pressing enter. When enabled, there will be an 'X' in the box next to Audio.

When Audio is enabled, the Pro30 will beep twice to indicate stability when Auto Stable is enabled. The instrument will also beep when a key is pressed. When Audio is disabled, the Pro30 will not beep.

CONTRAST

To adjust the display Contrast, use the up or down arrow keys to highlight Contrast, then press enter. Next, use the up or down arrow keys to adjust the contrast. The up arrow key will darken the contrast and the down arrow key will lighten the contrast. After adjusting the contrast, press enter to save and exit the Contrast adjustment option.

EMERGENCY CONTRAST ADJUSTMENT

If necessary, there is an alternate method of adjusting the contrast. To adjust the contrast, press and hold the menu key, then press the up arrow key to darken the contrast or press the down arrow key to lighten the contrast.

CONDUCTIVITY UNITS (COND. UNITS)

Highlight Cond. Units (Conductivity Units) and press enter to open a submenu that allows you to select the conductivity units to be displayed on the Run screen. Highlight a unit and press enter to enable or disable it. An enabled conductivity unit will have an 'X' in the box next to it. Highlight the ESC-Exit box along the bottom of the display and press enter to save any changes and to close the conductivity units submenu.

There are seven options for displaying conductivity. Only four units can be enabled at the same time:

- COND-mS/cm displays conductivity in milliSiemens per centimeter.
- COND-uS/cm displays conductivity in microSiemens per centimeter.
- SPC-mS/cm displays Specific Conductance in milliSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- SPC-uS/cm displays Specific Conductance in microSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- Sal ppt displays salinity in parts per thousand. The salinity reading is calculated from the instrument's conductivity and temperature values using algorithms found in *Standard Methods for the Examination of Water and Wastewater*.
- TDS g/L displays Total Dissolved Solids in grams per liter. TDS is calculated from conductivity and temperature using a user-selectable TDS constant.
- TDS mg/L displays Total Dissolved Solids in milligrams per liter. TDS is calculated from conductivity and temperature using a user-selectable TDS constant.

Note: 1 milliSiemen = 1,000 microSiemens.

SPECIFIC CONDUCTANCE

The conductivity of a sample is highly dependent on temperature, varying as much as 3% for each change of one degree Celsius (temperature coefficient = 3%/°C). In addition, the temperature coefficient itself varies with the nature of the ionic species present in the sample. Therefore, it is useful to compensate for this temperature dependence in order to quickly compare conductivity readings taken at different temperatures.

The Pro30 can display non-temperature compensated conductivity as well as temperature compensated Specific Conductance. If Specific Conductance is selected, the Pro30 uses the temperature and conductivity values associated with

each measurement to calculate a specific conductance value compensated to a user selected reference temperature, see below. Additionally, the user can select the temperature coefficient from 0% to 4%.

Using the Pro30's default reference temperature and temperature coefficient (25 °C and 1.91%), the calculation is carried out as follows:

$$\text{Specific Conductance (25°C)} = \frac{\text{Conductivity of sample}}{1 + 0.0191 * (T - 25)}$$

T = Temperature of the sample in °C

CONDUCTIVITY AUTO STABLE (COND. AUTO STABLE)

Auto Stable utilizes preset values to indicate when a reading is stable. The preset values are adjustable in the System Setup menu. The user can input a % change in readings (0.0 to 1.9) over 'x' amount of time in seconds (3-19).

Highlight Cond. Auto Stable, then press enter to open the submenu.

Use the up or down arrow keys to highlight the % change or seconds (secs) input field, then press enter to make the highlighted field adjustable. Use the up or down arrow keys to adjust the selected value, then press enter to confirm changes. Once you have confirmed any changes, highlight the ESC-Exit box along the bottom of the display and press enter to close the Auto Stable submenu.

To disable Auto Stable, set the % Change input to 0.0.

When Auto Stable is enabled, an (AS) symbol will display next to the reading on the Run screen and blink during stabilization. When the dissolved oxygen and/or conductivity reading stabilizes based on the Auto Stable settings, the (AS) symbol will display steadily and the instrument will beep twice if Audio is turned on.

TEMPERATURE UNITS

Highlight Temperature Units and press enter to open a submenu that allows you to change the temperature units displayed on the Run screen. Highlight the desired unit (Celsius or Fahrenheit) and press enter to enable. The enabled temperature unit will have an 'X' in the box next to it. Only one unit may be enabled at a time. Highlight the ESC-Exit box and press enter to save any changes and to close the Temperature Units submenu.

SPECIFIC CONDUCTANCE REFERENCE TEMPERATURE (SPC REF. TEMP.)

SPC Ref. Temp. (Specific Conductance Reference Temperature) is the reference temperature used to calculate Specific Conductance. The reference temperature range is 15 and 25 °C. The default value is 25 °C.

To change the reference temperature, highlight SPC Ref. Temp. and press enter to open the submenu. With the reference temperature highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new reference temperature. Next, highlight the ESC-Exit box and press enter to close the submenu.

SPECIFIC CONDUCTANCE TEMPERATURE COEFFICIENT (SPC %/°C)

SPC %/°C (Specific Conductance Temperature Coefficient) is the temperature coefficient used to calculate Specific Conductance. The coefficient range is 0.00 to 4.00. The default value is 1.91% which is based on KCl standards.

To change the temperature coefficient, highlight SPC %/°C and press enter to open the submenu. With the temperature coefficient highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new coefficient. Next, highlight the ESC-Exit box and press enter to close the submenu.

TDS CONSTANT

TDS Constant is a multiplier used to calculate an estimated TDS (Total Dissolved Solids) value from conductivity. The multiplier is used to convert Specific Conductance in mS/cm to TDS in g/L. The Pro30's default value is 0.65. This multiplier is highly dependent on the nature of the ionic species present in the water sample. To be assured of moderate accuracy for the conversion, you must determine a multiplier for the water at your sampling site. Use the following procedure to determine the multiplier for a specific sample:

1. Determine the specific conductance of a water sample from the site;
2. Filter a sample of water from the site;
3. Completely evaporate the water from a carefully measured volume of the filtered sample to yield a dry solid;
4. Accurately weigh the remaining solid;
5. Divide the weight of the solid (in grams) by the volume of water used (in liters) to yield the TDS value in g/L for this site;
6. Divide the TDS value in g/L by the specific conductance of the water in mS/cm to yield the conversion multiplier. Be certain to use the correct units.

If the nature of the ionic species at the site changes between sampling studies, the TDS values will be in error. TDS cannot be calculated accurately from specific conductance unless the make-up of the chemical species in the water remains constant.

To change the TDS Constant in the Pro30, highlight TDS Constant and press enter to open the submenu. With the TDS Constant highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. The input range is 0.30 to 1.00. Press enter to save the new TDS Constant. Next, highlight the ESC-Exit box and press enter to close the submenu.

LANGUAGE

Highlight Language and press enter to open a submenu that allows you to change the language. Highlight the desired language (English, Spanish, German, or French) and press enter to enable. The enabled language will have an 'X' in the box next to it. Highlight ESC-Exit box and press enter to save any changes and to close the Language submenu.

The text in the boxes along the bottom of the Run screen will always be displayed in English regardless of the language enabled in the System Setup menu.

AUTO SHUTOFF

Auto Shutoff allows you to set the instrument to turn off automatically after a period of time. Use the up or down arrow keys to highlight Auto Shutoff, then press enter to open the submenu. Press enter while the minute field is highlighted to make it adjustable. Next, use the up or down arrow keys to adjust the shut off time from 0 to 60 minutes. Press enter to save the new shutoff time. Next, highlight the ESC-Exit box and press enter to close the submenu.

To disable Auto Shutoff, set the Time in Minutes to 0 (zero).

CELL CONSTANT

The Cell Constant displays the cell constant of the conductivity cell. The cell constant is calculated and updated each time a conductivity calibration is performed. The cell constant range is 4.0 to 6.0. Resetting the System Menu resets the cell constant to 5.0.

RESETTING THE SYSTEM SETUP MENU TO FACTORY DEFAULT

To reset the Pro30 settings to factory default, press the down arrow key while in the System Setup menu until the Reset - ↺ box is highlighted, then press enter. The instrument will ask you to confirm the reset. Highlight Yes and press enter to continue with the reset or highlight No and press enter to cancel the reset. A Factory Reset will not affect data saved in the instrument's memory.

The following will be set in the Pro30 after performing a reset:

Parameter	*Reset Defaults*
Audio	On
Contrast	Set to mid range
Conductivity Units	cond uS/cm, spc mS/cm, spc uS/cm and sal ppt
Conductivity Auto Stable	Off (0.0 % Change and 10 seconds)
SPC Reference Temperature	25°C
SPC Temperature Coefficient	1.91%/°C
TDS Constant	0.65
Temperature Units	°C
Language	English
Auto Shutoff	30 minutes
Conductivity Cell Constant	Cell constant reset to 5.0*

*It is recommended to perform a Conductivity calibration after performing a reset.

CALIBRATION

TEMPERATURE

All Pro30 cables have built-in temperature sensors. Temperature calibration is not required nor is it available.

CONDUCTIVITY CALIBRATION

Ensure the conductivity sensor is clean and dry before performing a conductivity, specific conductance or salinity calibration.

> ⓘ *It is not necessary to calibrate conductivity, specific conductance and salinity. Calibrating one of these parameters will simultaneously calibrate the others. YSI recommends calibrating specific conductance for greatest ease.*

CALIBRATING SPECIFIC (SP.) CONDUCTANCE OR CONDUCTIVITY

Note: When calibrating Specific Conductance, the Pro30 uses the factory default values for the Specific Conductance Reference Temperature and the Specific Conductance Temperature Coefficient regardless of what is configured in the System Setup Menu. The default value for the Reference Temperature is 25°C and the default value for the Temperature Coefficient is 1.91%/°C. It is important to note that the Temperature Coefficient of a calibration solution is dependent on the contents of the solution. Therefore, YSI recommends using a traceable calibration solution made of KCl (potassium chloride) when calibrating Specific Conductance since these solutions typically have a Temperature Coefficient of 1.91%/°C. Additionally, be sure to enter the value of the solution as it is listed for 25°C when calibrating Specific Conductance.

1. Fill a clean container (i.e. plastic cup or glass beaker) with fresh, traceable conductivity calibration solution and place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable (figure 7). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.

Figure 7, solution above two holes near cable.

2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight the desired calibration method, Sp. Conductance or Conductivity, and press enter.
3. Highlight the units you wish to calibrate, either uS/cm or mS/cm, and press enter. 1 mS = 1,000 uS. Next, use the up or down arrow key to adjust the value on the display to match the value of the conductivity calibration solution. If calibrating conductivity, it is necessary to look up the value of the solution at the current temperature and enter that value into the Pro30. Most conductivity solutions are labeled with a value at 25°C. If calibrating specific conductance, enter the value listed for 25°C. Depressing either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro30 will remember the entered calibration value and display it the next time a conductivity calibration is performed.
4. Press enter to complete the calibration. Or, press Cal to cancel the calibration and return to the Run screen.
5. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
6. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting guide for possible solutions.

CALIBRATING IN SALINITY

1. Fill a clean container (i.e. plastic cup or glass beaker) with fresh, traceable salinity calibration solution and place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable (figure 7). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.
2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight Salinity and press enter.
3. Use the up or down arrow key to adjust the value on the display to match the value of the salinity solution. Depressing either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro30 will remember the entered calibration value and display it the next time a salinity calibration is performed.
4. Press enter to complete the calibration. Or, press Cal to cancel the calibration and return to the Run screen.
5. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
6. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting guide for possible solutions.

TAKING MEASUREMENTS

Before taking measurements, be sure the instrument has been calibrated to ensure the most accurate readings. Place the probe in the sample to be measured and give the probe a quick shake to release any air bubbles. Be sure the conductivity sensor is completely submerged in the sample. The two holes near the cable should be covered by the sample for accurate conductivity readings (figure 7). Allow the temperature readings to stabilize.

SAVING AND VIEWING DATA

The Pro30 can store 50 data sets in non-volatile memory for later viewing. A data set includes the values currently on the display, i.e. temperature, dissolved oxygen and two conductivity parameters. Each data point is referenced with a data set number, 01 through 50.

SAVING DATA

> *The Pro30 can not communicate to a PC via a Pro Series communications saddle. Connecting the Pro30 to a communication saddle may cause erratic instrument behavior.*

From the Run screen, use the up or down arrow keys to highlight the Save box and press enter to save the current readings. The instrument will indicate the data set is saved and display the saved data set's number (figure 8).

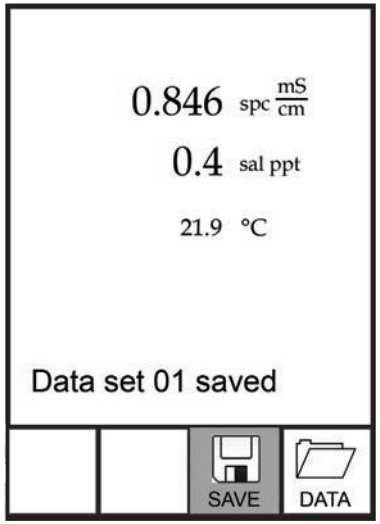


Figure 8, data set saved.

The instrument will display 'Memory Full' if all 50 data sets have been saved and you attempt to save another data set.

VIEWING AND ERASING SAVED DATA - DATA MODE

Data mode allows you to view and erase saved data. From the Run screen, use the up or down arrow keys to highlight Data and press enter to access Data mode. Note that the function boxes at the bottom of the display are different in Data mode (figure 9).

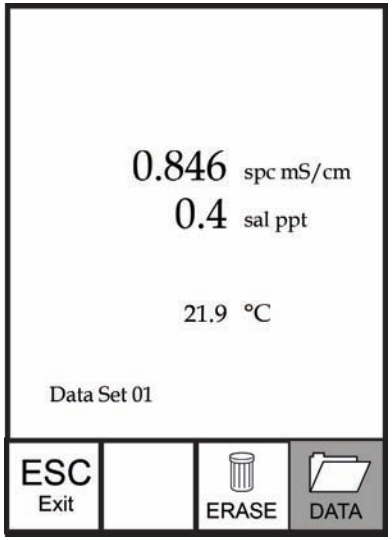


Figure 9, Data mode.

VIEWING DATA

Once in Data mode, use the up and down arrow keys to view saved data sets in sequential order or press enter to access the bottom functions. After accessing the bottom functions, highlight the Data box and press enter to regain access to viewing data. The data set displayed is indicated by the data set number, 01 through 50.

ERASING DATA

While viewing saved data, press the enter key to access the function boxes at the bottom of the display. Next, use the up or down arrow keys to highlight Erase, then press enter. The instrument will give you the option to erase one data set or all data sets (figure 10).

Figure 10, Erase data mode.

Use the up or down arrow key to select Erase Data Set, Erase All Sets or the ESC-Exit function box, then press enter to confirm.

Select ESC-Exit and press enter to exit Erase mode without erasing any data.

Select Erase Data Set and press enter to erase the data set that was displayed before entering Erase mode. For example, if data set 12 was displayed before entering erase mode, and Erase Data Set is selected, Data Set 12 will be erased from memory and the data sets AFTER that number will move up to keep them sequential. For example, if there are15 records and number 12 is erased then 13 becomes 12, 14 becomes 13, and 15 becomes 14. The instrument will return to Data mode after erasing one data set.

Select Erase All Data Sets and press enter to clear the Pro30 memory and return to Data mode.

EXITING DATA MODE

While in Data mode, press enter to access the bottom functions. Next, highlight the ESC-Exit box and press enter to return to the Run screen.

CARE, MAINTENANCE AND STORAGE

This section describes the proper procedures for care, maintenance and storage of the instrument. The goal is to maximize their lifetime and minimize down-time associated with improper instrument usage.

GENERAL MAINTENANCE

GENERAL MAINTENANCE - GASKET

The instrument utilizes a gasket as a seal to prevent water from entering the battery compartment. Following the recommended procedures will help keep the instrument functioning properly.

If the gasket and sealing surfaces are not maintained properly, it is possible that water can enter the battery compartment. If water enters this area, it can severely damage the battery terminals causing loss of battery power and corrosion to the battery terminals. Therefore, when the battery compartment lid is removed, the gasket that provides the seal should be carefully inspected for contamination (i.e. debris, grit, etc.) and cleaned with water and mild detergent if necessary.

SENSOR MAINTENANCE

SENSOR MAINTENANCE - TEMPERATURE

You must keep the temperature sensor free of build up. Other than that, no additional maintenance is required. A toothbrush can be used to scrub the temperature sensor if needed.

SENSOR MAINTENANCE - CONDUCTIVITY

The openings that allow sample access to the conductivity electrodes should be cleaned regularly. The small cleaning brush included in the Maintenance Kit is intended for this purpose. Dip the brush in clean water and insert it into each hole 10 to 12 times. In the event that deposits have formed on the electrodes, it may be necessary to use a mild detergent (laboratory grade soap or bathroom foaming tile cleaner) with the brush. Rinse thoroughly with clean water, then check the response and accuracy of the conductivity cell with a calibration solution.

SENSOR STORAGE

SHORT AND LONG TERM STORAGE

For both short and long term storage, the conductivity sensor should be stored clean and dry.

Remove the batteries from the instrument when storing it for long periods of time (>30 days).

Long Term Storage Temperature: -5 to 70°C (23 to 158°F)

TROUBLESHOOTING

Symptom	*Possible Solution*
Instrument will not turn on, a battery symbol appears, or "Critical Shutdown" displays on the screen.	1. Low battery voltage, replace batteries. 2. Batteries installed incorrectly, check battery polarity. 3. Return system for service.
Temperature values display Over or Undr on Run screen.	1. Sample temperature is less than -5° C or more than +55°C. Increase or decrease the sample temperature to bring within the allowable range. 2. Contact YSI Tech Support.
Instrument will not calibrate the Conductivity sensor; instrument displays "Calibration Over", "Calibration Under", or "Unstable Reading" during calibration.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the calibration solution is above the two holes near the cable, see figure 8. 3. Verify the calibration solution is not expired or contaminated. Try a new bottle of solution. 4. Ensure you are entering in the correct value for the solution according to the measurement units. 1 mS = 1,000 uS. 5. Allow sufficient stabilization time for conductivity and temperature AND wait at least 3 seconds before confirming a calibration. 6. Contact YSI Tech Support.

Symptom	*Possible Solution*
Conductivity readings are inaccurate.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the sample is above the two holes near the cable, see figure 8. 3. Verify calibration. 4. Verify temperature readings are accurate. 5. Verify the correct units are setup in the System Setup menu, i.e. uS vs mS and Conductivity vs. Specific Conductance. 6. Contact YSI Tech Support.
Conductivity values display Over or Undr on Run screen.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the sample is above the two holes near the cable, see figure 8 3. Verify calibration. 4. Verify temperature readings are accurate. 5. Sample conductivity is outside the measurement range of the instrument, i.e. 0-200 mS. 6. Contact YSI Tech Support.

SPECIFICATIONS

These specifications represent typical performance and are subject to change without notice. For the latest product specification information, please visit YSI's website at www.ysi.com or contact YSI Tech Support.

Parameter	*Range*	*Resolution*	*Accuracy*
Temperature	-5 to 55°C	0.1°C	± 0.2°C
Conductivity	0-500 uS/cm 0-5 mS/cm 0-50 mS/cm 0-200 mS/cm (auto ranging)	0.0001 to 0.1 mS/cm; 0.1 to 0 uS/cm (range dependent)	Instrument only: ± 0.5% of the reading or 1 uS/cm, whichever is greater. Instrument with 1 or 4 meter cables: ± 1.0% of the reading or 1 uS/cm, whichever is greater. Instrument with 10, 20, or 30 meter cables: ± 2.0% of the reading or 1 uS/cm, whichever is greater.
Salinity	0 to 70 ppt	0.1 ppt	± 1.0% of the reading or ± 0.1 ppt, whichever is greater.
Total Dissolved Solids (TDS)	0 to 100 g/L. TDS Constant range: 0.3 to 1.00 (0.65 default)	0.0001 to 0.1 g/L (range dependent)	Dependent on accuracy of temperature, conductivity and TDS Constant.

ACCESSORIES / PART NUMBERS

Part Number	*Description*
6050030	Pro30 Instrument
60530-1, -4, -10, -20, or -30	1, 4, 10, 20, 30-meter cable assembly*
603077	Flow cell
603056	Flow cell mounting spike
603075	Carrying case, soft-sided
603074	Carrying case, hard-sided
603069	Belt clip
063517	Ultra clamp for instrument
063507	Tripod for instrument
603062	Cable management kit, included with all cables longer then 1 meter.
605978	Cable weight, 4.9 oz, stackable
603070	Shoulder strap
060907	Conductivity Calibration Solution, 1,000 µS/cm. 1 box of 8 pints.
060911	Conductivity Calibration Solution, 10,000 µS/cm. 1 box of 8 pints.
060660	Conductivity Calibration Solution, 50,000 µS/cm. 1 box of 8 pints.
065274	Conductivity Calibration Solution, 100,000 µS/cm. 1 box of 8 pints.

*All cables include a temperature and conductivity sensor.

DECLARATION OF CONFORMITY

The undersigned hereby declares on behalf of the named manufacturer under our sole responsibility that the listed product conforms to the requirements for the listed European Council Directive(s) and carries the CE mark accordingly.

Manufacturer:	YSI Incorporated 1725 Brannum Lane Yellow Springs, OH 45387 USA
Product Name:	Pro30 Water Quality Instrument
Model Numbers	
Instrument/Accessory:	Pro30 (6050030)
Probe/Cable Assemblies:	60530-1, -4, -10, -20, and -30
Conforms to the following:	
Directives:	IEC 61326-1:2005 RoHS 2002/95/EC WEEE 2002/96/EC IP-67 Protection per ANSI/IEC 60529-2004
Harmonized Standards:	• EN61326-1:2006 (IEC 61326-1:2005) Basic Immunity
Supplementary Information:	All performance met the operation criteria as follows: 1. ESD, IEC 61000-4-2:2001, Performance Criterion B 2. Radiated Immunity, IEC 61000-4-3, Performance Criterion A 3. Electrical Fast Transient (EFT), IEC 61000-4-4:2004, +Corr. 1:2006 + Corr. 2:2007, Performance Criterion B 4. Radio Frequency, Continuous Conducted Immunity, IEC61000-4-6, Performance Criterion A 5. Radiated Emissions, EN 61326-1:2006 (IEC61326-1:2005) Class B
Authorized EU Representative	YSI Hydrodata Ltd Unit 2 Focal Point, Lacerta Court, Works Road Letchworth, Hertfordshire, SG6 1FJ UK

Signed: Lisa M. Abel Date: 27 June 2011
Title: Director of Quality

RECYCLING

YSI is committed to reducing the environmental footprint in the course of doing business. Even though materials reduction is the ultimate goal, we know there must be a concerted effort to responsibly deal with materials after they've served a long, productive life-cycle. YSI's recycling program ensures that old equipment is processed in an environmentally friendly way, reducing the amount of materials going to landfills.

- Printed Circuit Boards are sent to facilities that process and reclaim as much material for recycling as possible.
- Plastics enter a material recycling process and are not incinerated or sent to landfills.
- Batteries are removed and sent to battery recyclers for dedicated metals.

When the time comes for you to recycle, follow the easy steps outlined at www.ysi.com.

BATTERY DISPOSAL

The Pro30 is powered by alkaline batteries which the user must remove and dispose of when the batteries no longer power the instrument. Disposal requirements vary by country and region, and users are expected to understand and follow the battery disposal requirements for their specific locale.

CONTACT INFORMATION

ORDERING AND TECHNICAL SUPPORT

Telephone: 800 897 4151 (USA)
+1 937 767 7241 (Globally)
Monday through Friday, 8:00 AM to 5:00 ET

Fax: +1 937 767 9353 (orders)
+1 937 767 1058 (technical support)

Email: environmental@ysi.com
Mail: YSI Incorporated
1725 Brannum Lane
Yellow Springs, OH 45387 USA

Internet: www.ysi.com

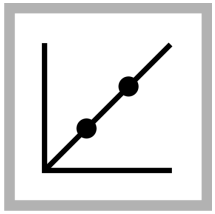
When placing an order please have the following available:
1.) YSI account number (if available)
2.) Name and phone number
3.) Purchase Order or Credit Card number
4.) Model Number or brief description
5.) Billing and shipping addresses
6.) Quantity

SERVICE INFORMATION

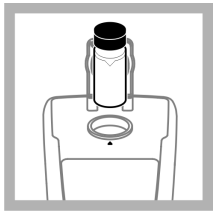
YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit www.ysi.com and click 'Support' or contact YSI Technical Support directly at 800-897-4151 (+1 937-767-7241).

When returning a product for service, include the Product Return form with cleaning certification. The form must be completely filled out for a YSI Service Center to accept the instrument for service. The form may be downloaded from www.ysi.com by clicking on the 'Support".

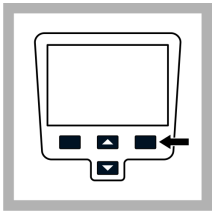
Item # 606082
Rev A
Drawing # A606082
July 2011



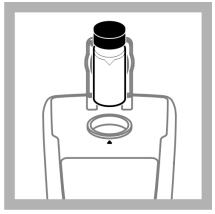
1. Push the **CALIBRATION** key to enter the Calibration mode. Follow the instructions on the display.
Note: *Gently invert each standard before inserting the standard.*



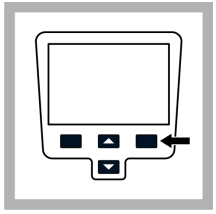
2. Insert the 20 NTU StablCal Standard and close the lid.
Note: *The standard to be inserted is bordered.*



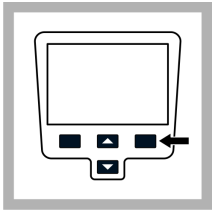
3. Push **Read**. The display shows Stabilizing and then shows the result.



4. Repeat Step 2 and 3 with the 100 NTU and 800 NTU StablCal Standard.
Note: *Push **Done** to complete a 2 point calibration.*



5. Push **Done** to review the calibration details.



6. Push **Store** to save the results.
After a calibration is complete, the meter automatically goes into the Verify Cal mode. Refer to Calibration verification (Verify Cal) on page 16.

Turbidity measurement

⚠ WARNING

Potential explosion and fire hazard. This turbidimeter is designed for water based samples. Do not measure solvent or combustible based samples.

Readings can be taken with the Normal reading mode, Signal Average mode or in the Rapidly Settling Turbidity mode. Refer to Reading modes on page 16 for more information. For accurate turbidity readings use clean sample cells and remove air bubbles (degassing).

Measurement notes

Proper measurement techniques are important in minimizing the effects of instrument variation, stray light and air bubbles. Use the following measurement notes for proper measurements.

Instrument

- Make sure that the meter is placed on a level, stationary surface during the measurement.
  Note: *Do not hold the meter in the hand during measurement.*
- Always close the sample compartment lid during measurement, calibration and storage.
- Remove sample cell and batteries from the instrument if the instrument is stored for an extended time period (more than a month).
- Keep the sample compartment lid closed to prevent the entry of dust and dirt.

Sample cells

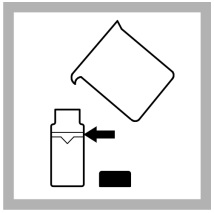
- Always cap the sample cell to prevent spillage of the sample into the instrument.
- Always use clean sample cells in good condition. Dirty, scratched or damaged cells can cause inaccurate readings.
- Make sure that cold samples do not “fog” the sample cell.
- Store sample cells filled with distilled or deionized water and cap tightly.

Measurement

- Measure samples immediately to prevent temperature changes and settling. Before a measurement is taken, always make sure that the sample is homogeneous throughout.
- Avoid sample dilution when possible.
- Avoid operation in direct sunlight.

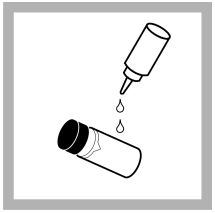
Turbidity measurement procedure

Note: *Before a measurement is taken, always make sure that the sample is homogeneous throughout.*



1. Collect a representative sample in a clean container. Fill a sample cell to the line (about 15 mL). Take care to handle the sample cell by the top. Cap the cell.

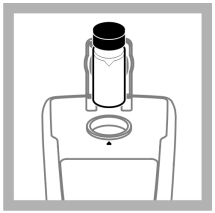
2. Wipe the cell with a soft, lint-free cloth to remove water spots and fingerprints.



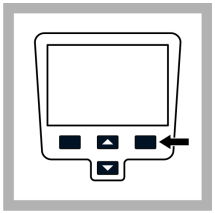
3. Apply a thin film of silicone oil. Wipe with a soft cloth to obtain an even film over the entire surface (Apply silicone oil to a sample cell on page 17).

4. Push the **Power** key to turn the meter on. Place the instrument on a flat, sturdy surface.

Note: *Do not hold the instrument while making measurements.*



5. Gently invert and then insert the sample cell in the instrument cell compartment so the diamond or orientation mark aligns with the raised orientation mark in front of the cell compartment. Close the lid.



6. Push **Read**. The display shows Stabilizing then the turbidity in NTU (FNU). The result is shown and stored automatically (Refer to Data management on page 11)

Data management

About stored data

The following types of data are stored in the data log:

- Reading Log: stores automatically each time a sample reading is taken (500 records).
- Calibration Log: stores only when **Store** is selected at the end of a calibration (25 records).
- Verify Cal Log: stores only after **Done** is selected at the end of a verification calibration (250 records).

When the data log becomes full, the oldest data point is deleted when more data is added to the log.

View data log

The data log contains Reading Log, Calibration Log and Verify Cal log. All logs can be sorted by date.

APPENDIX H

System Vulnerability Factor (SVF) Analysis (2023)

System Vulnerability Factor (SVF) Analysis (2023)

	Required SVFs								Optional SVFs					
SVF #	1	2	3	4	5	6	7	8	9	10	11	12	13	
Outfall ID	History of SSOs	Common or Twin Invert Manholes	Common Trench Construction	Storm / Sanitary Crossings (Sanitary Above)	Sanitary Lines with Underdrains	Inadequate Sanitary Level of Service	Areas Formerly Served by Combined Sewers	Sanitary Infrastructure Defects	SSO Potential in Event of System Failures	Infrastructure > 40 Years Old	Septic with Poor Soils or Water Table Separation	History of BoH Actions Addressing Septic Failures	Priority	At Least 1 Required
270001	Y	N	N	Y	N	Y	N	N	Y	Y	N	N	Low	Y
270002	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270002.1	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270003	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270004	N	N	Y	Y	N	N	N	N	N	Y	N	N	Low	Y
270004.1	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270004.2	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270005	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270006	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270011	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270012	N	N	N	N	N	N	N	Y	N	Y	N	N	High	Y
270013	N	N	N	Y	N	N	N	N	N	Y	N	N	Low	Y
270014	N	N	N	Y	N	N	N	N	N	Y	N	N	Low	Y
270015	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270016	N	N	Y	N	N	N	N	N	N	Y	N	N	Low	Y
270020	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270021	N	N	N	Y	N	N	N	N	N	Y	N	N	Low	Y
270022	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270024	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270024.1	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270026	N	Y	Y	Y	N	N	N	N	N	Y	N	N	Low	Y
270027	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270028	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270029	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270031	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270032	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270033	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270034.1	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270035	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270036	N	N	N	Y	N	N	N	N	N	Y	N	N	Low	Y
270038	N	N	N	Y	N	N	N	N	N	Y	N	N	Low	Y
270039	N	N	Y	Y	N	N	N	N	Y	Y	N	N	Low	Y
270040	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270041	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270042	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	High	Y
270044	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270045	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270046	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270047	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270048	N	N	N	N	Y	N	N	N	Y	Y	N	N	High	Y
270049	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270050	N	N	N	N	Y	N	N	N	N	Y	N	N	High	Y
270051	Y	Y	N	Y	Y	Y	N	Y	Y	Y	N	N	High	Y
270052	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270053	Y	Y	Y	Y	Y	Y	N	N	N	Y	N	N	High	Y
270054	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270055	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270056	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270057	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270057.1	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270058	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270059	N	N	N	Y	Y	N	N	N	Y	Y	N	N	High	Y
270060	N	N	N	N	N	N	N	Y	N	Y	N	N	High	Y
270061	N	N	N	N	N	N	N	N	N	Y	N	N	High	N
270062	Y	N	Y	Y	N	Y	N	N	Y	Y	N	N	Low	Y
270063	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270064	Y	Y	Y	Y	N	Y	N	N	N	Y	N	N	High	Y
270065	N	N	Y	N	N	N	N	N	N	Y	N	N	Low	Y
270066	N	N	N	N	N	N	N	Y	N	Y	N	N	High	Y
270067	N	N	N	N	N	N	N	N	N	Y	N	N	Low	N
270068	N	N	N	Y	Y	N	N	N	N	Y	N	N	Low	Y

Methodology:

1. SSOs from EPA compliance reporting

2. GIS - checked for overlapping MH nodes

3. GIS - searched within 1' + diameter on either side of drain and sewer for overlap

4. GIS - developed elevation surfaces from sewer and drain inverts, found all sewer/drain intersections, differenced surface elevations, took all where sewer was higher than drain OR no elevation data was available

5. GIS underdrain layer

6. No info available - checking with Gino, and included all SSOs

7. Assumed no for all

8. Checked former I-I reports and planned sewer rehab projects

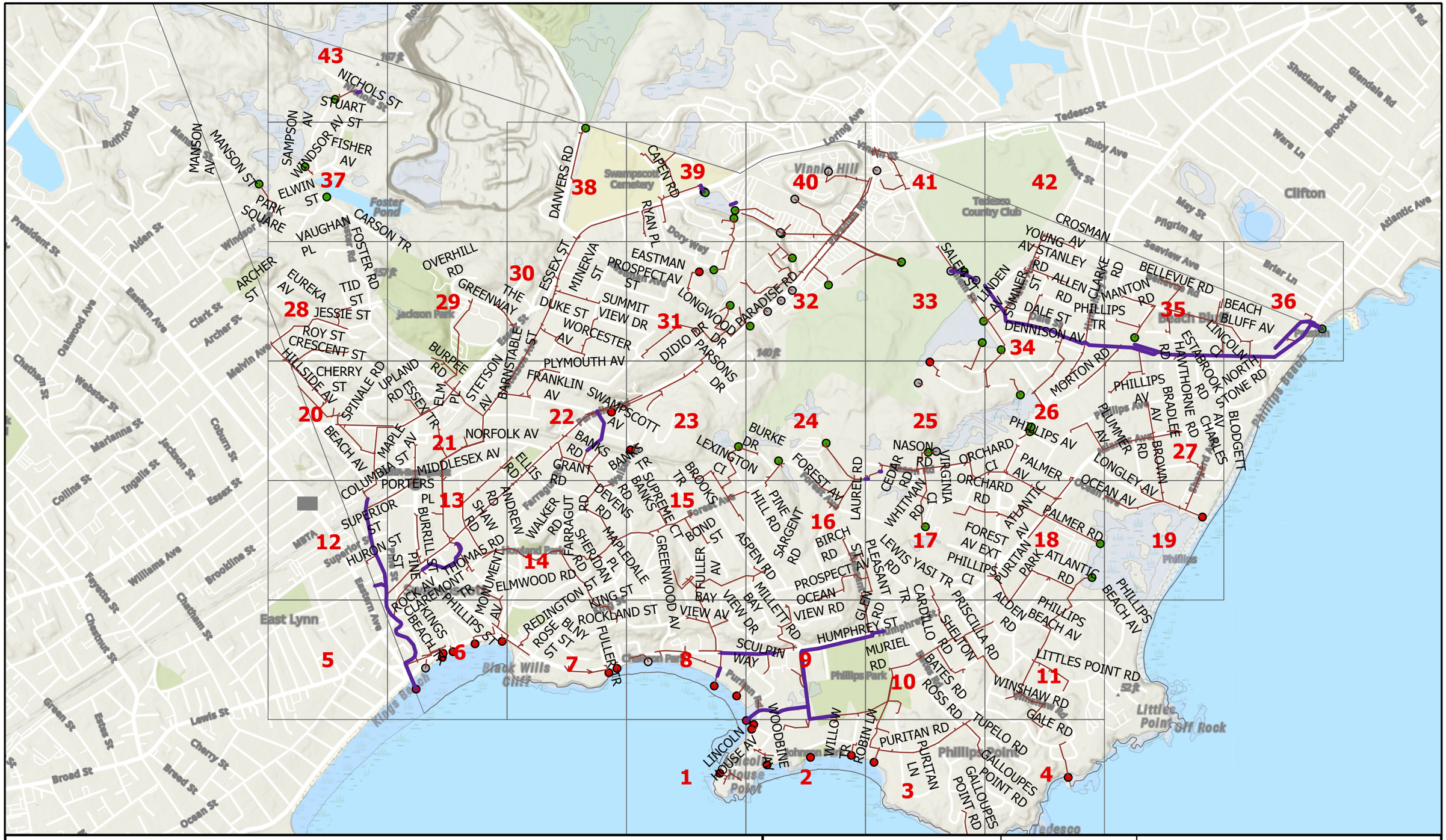
9. Pressurized sewer pipe layer

10. Assumed yes for all

11 / 12. Assumed no for all, as sewer covers the entire town (both septic related)

APPENDIX I

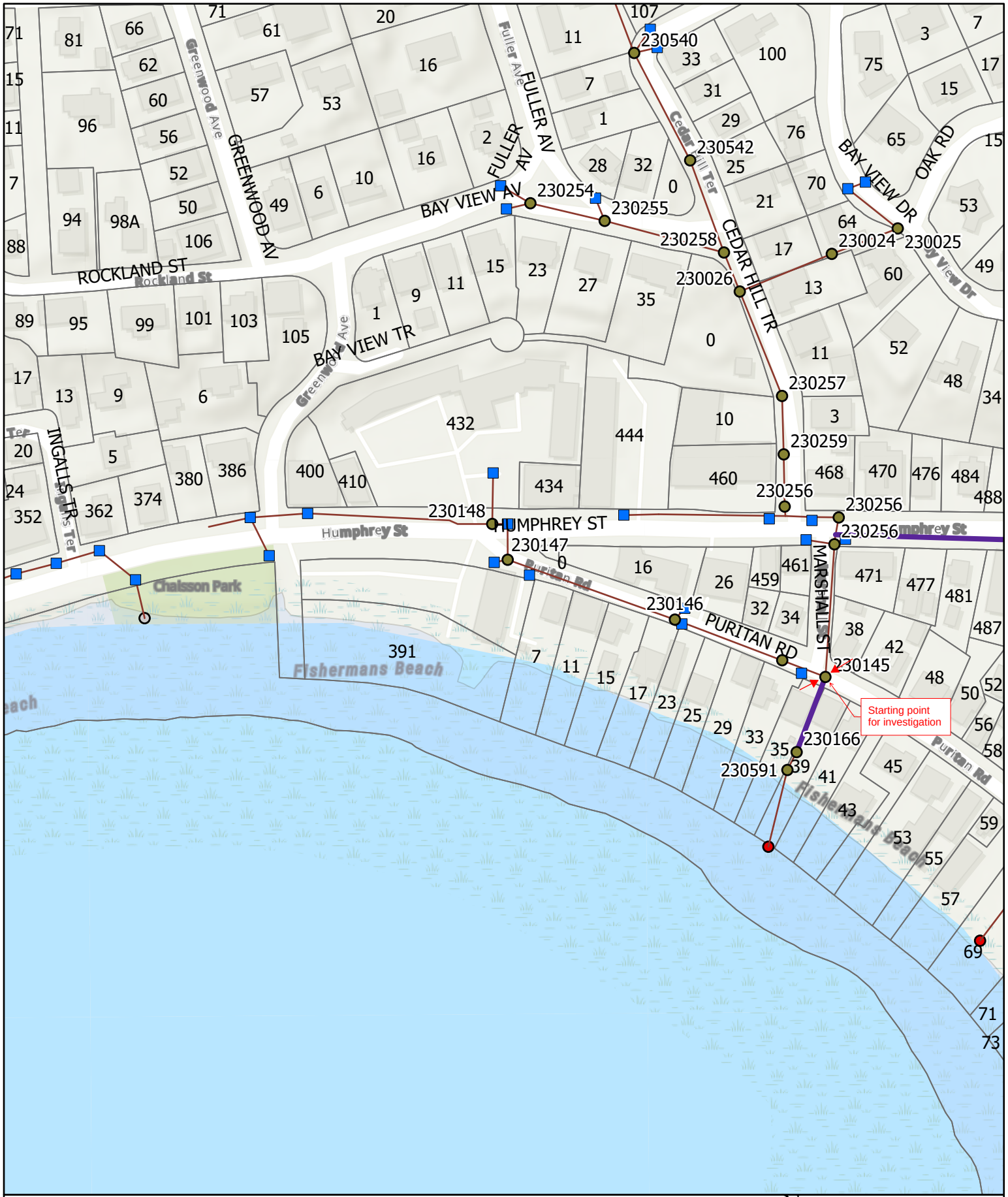
IDDE Field Work Results and Map (May 2023)



KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

PROJECT NO.	24000511.001A
CREATED:	5/16/2023
CREATED BY:	STKhan

Storm System Map



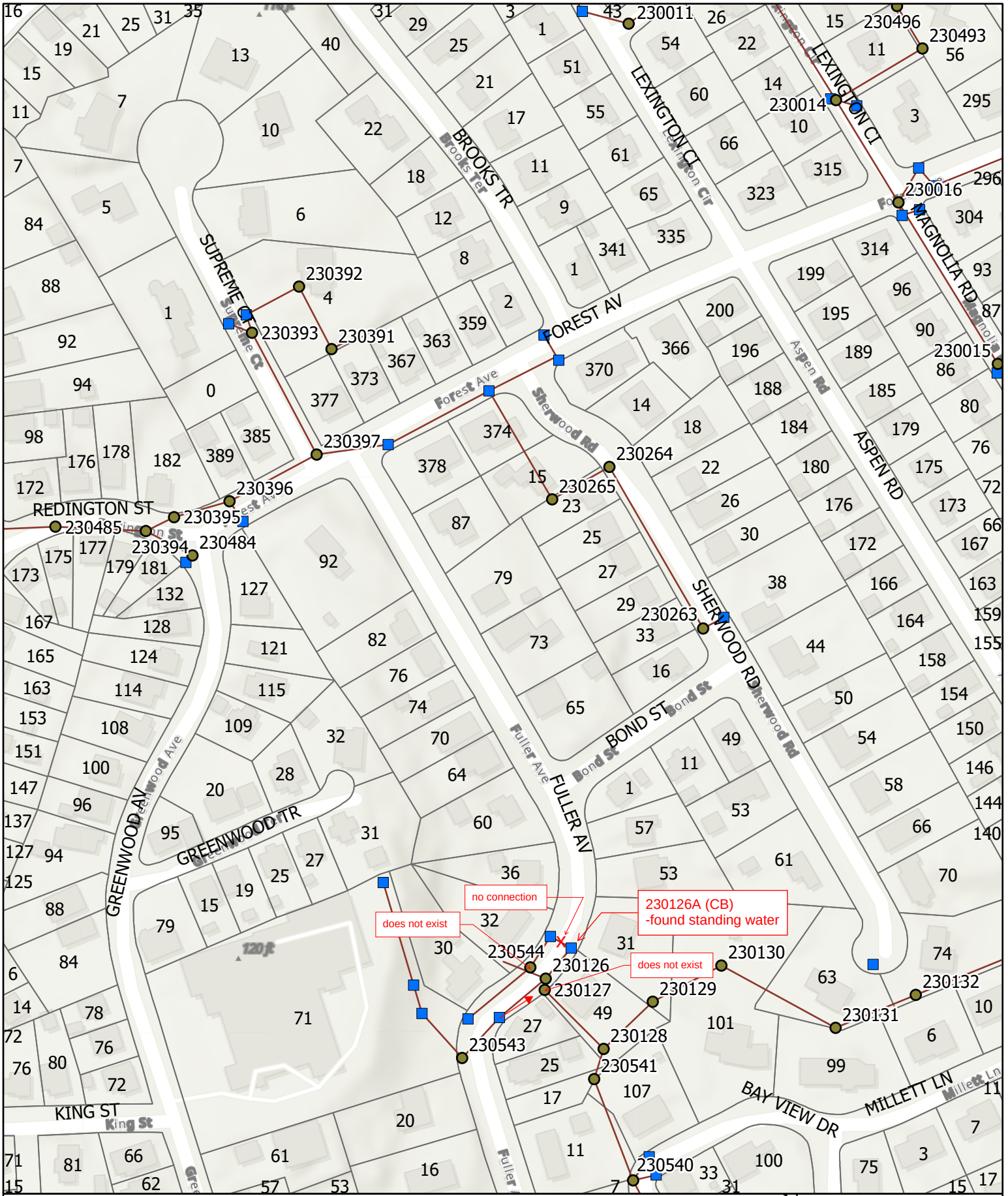
Legend

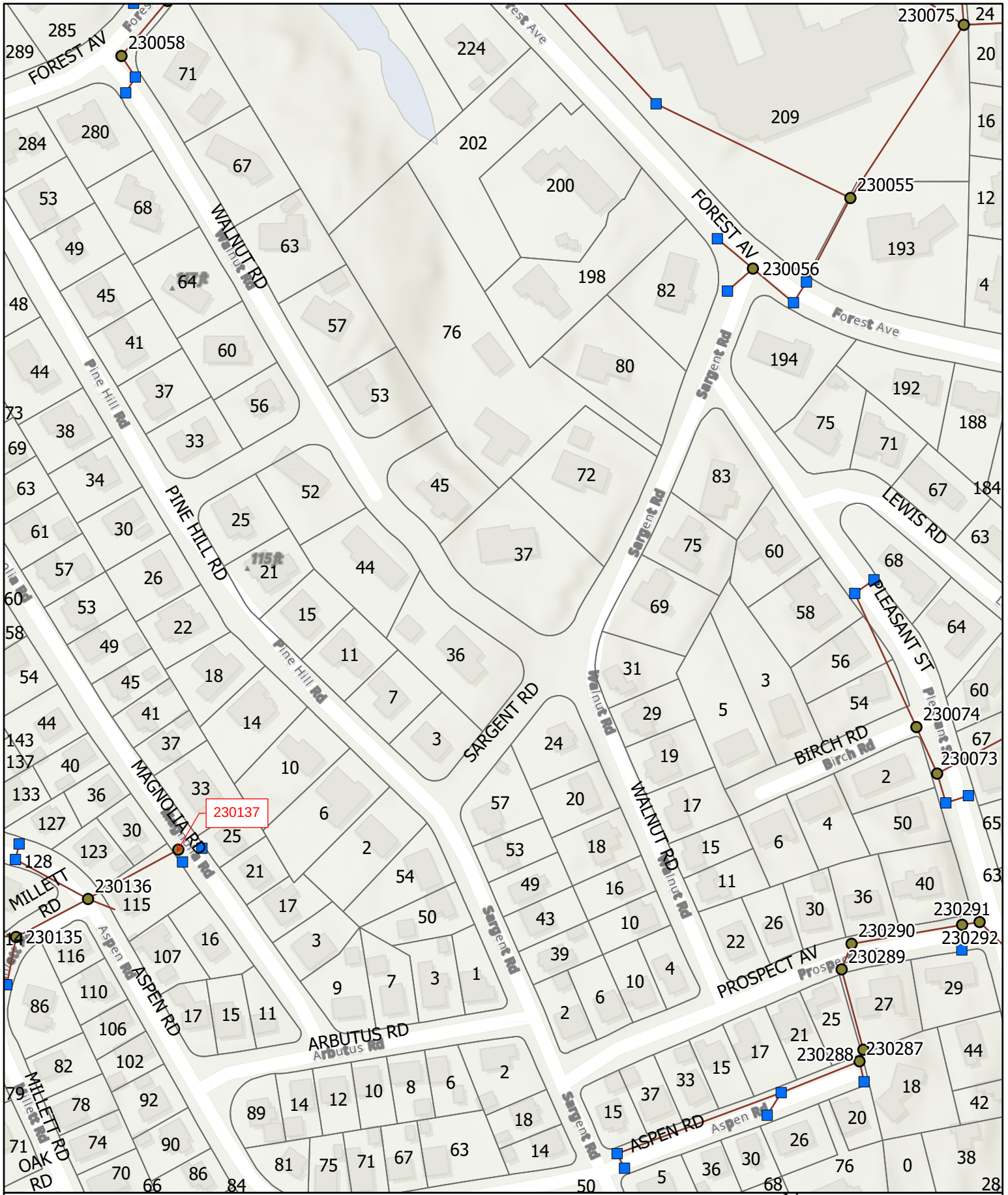
- Manhole
- CatchBasin
- GravityMain
- Outfall
- Priority_Rank
  - High
  - Low
- <Null>
- N.A.
- dCulvert
- parcels_ma_poly

KLEINFELDER
Bright People. Right Solutions.

N

0 65 130 260 Feet

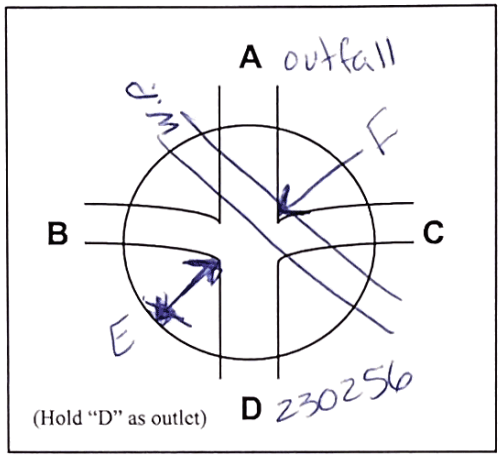

no connection
does not exist
230126A (CB)
-found standing water
does not exist
230011
230496
230493
230014
230016
230015
230392
230393
230391
230397
230396
230395
230485
230394
230484
230264
230265
230263
230544
230126
230127
230543
230130
230129
230128
230541
230131
230132
230540
LEXINGTON CI
BROOKS TR
FOREST AV
SUPREME CT
MAGNOLIA RD
ASPEN RD
SHERWOOD RD
REDINGTON ST
GREENWOOD AV
GREENWOOD TR
FULLER AV
BOND ST
KING ST
BAY VIEW DR
MILLETT LN
Legend
Manhole
CatchBasin
GravityMain
Outfall
Priority_Rank
High
Low
<Null>
N.A.
dCulvert
parcels_ma_poly
KLEINFELDER
Bright People. Right Solutions.
N
0
65
130
260 Feet
Page
15


FOREST AV
WALNUT RD
PINE HILL RD
SARGENT RD
MAGNOLIA RD
MILLETT RD
ASPEN RD
ARBUTUS RD
OAK RD
BIRCH RD
PLEASANT ST
LEWIS RD
PROSPECT AV
Forest Ave
Sargent Rd
Walnut Rd
Pine Hill Rd
Birch Rd
Aspen Rd
Millett Rd
Arbutus Rd
230058
230075
230055
230056
230074
230073
230137
230136
230135
230291
230290
230292
230289
230288
230287
Legend
Manhole
CatchBasin
GravityMain
Outfall
Priority_Rank
High
Low
<Null>
N.A.
dCulvert
parcels_ma_poly
KLEINFELDER
Bright People. Right Solutions.
N
0
65
130
260 Feet

Manhole Inspection Report

MH# 230145

Catchment Area: 230591 ?
Inspector: Aleena A.
Date/Time: 9:53 AM May 17th, 2023
Weather: Dry High Tide
Street/Location: Puritan & Marshall
General Comments: _____



Structural Information:

Cover Size:	(24")	30"	Other: _____
MH Size:	4'	5'	Other: _____
MH Sump:	Y / N		Sump Depth: _____
MH Channel:	Y / N		
Weir:	Y / N		Rim to Top of Weir: _____
Internal Drop:	Y / N		
Depth to Wet Ring from Rim: _____			

General Information:

Manhole Type:	Sanitary ☐	Storm ☒	Combined ☐	Common ☐							
Location of MH:	Roadway ☒	Sidewalk ☐	Roadside ☐	Alley ☐	Easement ☐	Other ☐					
Manhole Material:	Brick ☒	Clay Block ☐	Poured Concrete ☐		Manhole Block ☐	Precast Concrete ☐	Other ☐				
Paved Area Around MH:	Satisfactory ☒		Cracked ☐	☐	Missing Pavement ☐	Vegetation Growth					
Unpaved Area Around MH:	Satisfactory ☐		Eroded ☐								
Odors:	Ocean water smell										
Recommendations:	No Action ☒	Rebuild ☐	Line Manhole Wall ☐		Reset Frame ☐	Clean / Remove debris from Invert ☐					

Field Test Kit Results:

Pipe (A-F):						
Ammonia, mg/L (Compliant ≤ 0.5 mg/L)						
Surfactants, mg/L (Compliant ≤ 0.25 mg/L)						
Chlorine, mg/L (Compliant < 0.02 mg/L)						

Pipe Information:

	Pipe Size	Material	From / To MH#	Invert Depth (from Rim)	Flow Depth (from Invert)	Debris Depth (from Invert)	Condition	Flow	Clarity of Flow
A.									
B.									
C.									
D.									
E.									
F.				6' 10"					

Manhole Inspection Report

MH# 230256

Catchment Area: _____

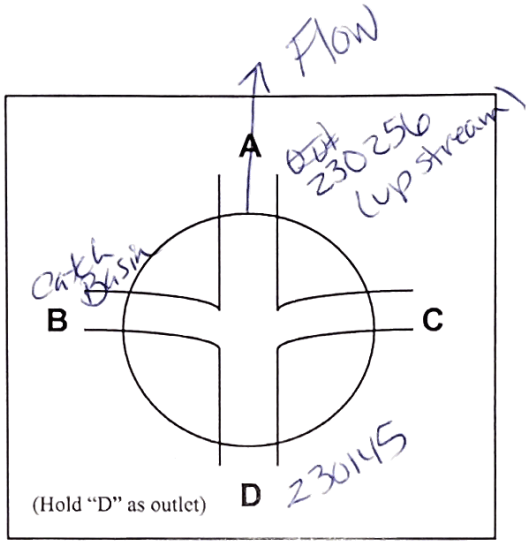
Inspector: _____

Date/Time: _____

Weather: _____

Street/Location: Corner Humphrey St / Marshall

General Comments: _____



Structural Information: (1)

Cover Size:	24"	30"	Other: _____
MH Size:	4'	5'	Other: _____
MH Sump:	Y / N		Sump Depth: _____
MH Channel:	Y / N		
Weir:	Y / N		Rim to Top of Weir: _____
Internal Drop:	Y / N		
Depth to Wet Ring from Rim: _____			

General Information:

Manhole Type:	Sanitary ☐	Storm ☒	Combined ☐	Common ☐							
Location of MH:	Roadway ☐	Sidewalk ☒	Roadside ☐	Alley ☐	Easement ☐	Other ☐					
Manhole Material:	Brick ☒	Clay Block ☐	Poured Concrete ☐		Manhole Block ☐	Precast Concrete ☐	Other ☒ Concrete Block				
Paved Area Around MH:	Satisfactory ☒		Cracked ☐	☐	Missing Pavement ☐	Vegetation Growth					
Unpaved Area Around MH:	Satisfactory ☐		Eroded ☐								
Odors:											
Recommendations:	No Action ☐	Rebuild ☐	Line Manhole Wall ☒		Reset Frame ☐	Clean / Remove debris from Invert ☐					

Infiltration possible through walls

Field Test Kit Results:

Pipe (A-F):						
Ammonia, mg/L (Compliant ≤ 0.5 mg/L)						
Surfactants, mg/L (Compliant ≤ 0.25 mg/L)						
Chlorine, mg/L (Compliant < 0.02 mg/L)						

Pipe Information:

	Pipe Size	Material	From / To MH#	Invert Depth (from Rim)	Flow Depth (from Invert)	Debris Depth (from Invert)	Condition	Flow	Clarity of Flow
A.									
B.									
C.									
D.									
E.									
F.									

Manhole Inspection Report

MH# 230259

Catchment Area: _____

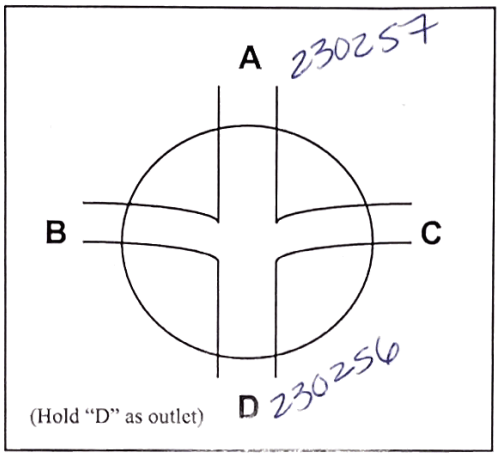
Inspector: _____

Date/Time: 10

Weather: _____

Street/Location: Cedar Hill Terr.

General Comments: Fast Moderate Flow



Structural Information:

Cover Size: (24") 30" Other: _____

MH Size: (4') 5' Other: _____

MH Sump: Y / N Sump Depth: _____

MH Channel: Y / N

Weir: Y / N Rim to Top of Weir: _____

Internal Drop: Y / N

Depth to Wet Ring from Rim: _____

General Information:

Manhole Type:	Sanitary ☒	Storm ☐	Combined ☐	Common ☐						
Location of MH:	Roadway ☒	Sidewalk ☐	Roadside ☐	Alley ☐	Easement ☐	Other ☐				
Manhole Material:	Brick ☒	Clay Block ☐	Poured Concrete ☐		Manhole Block ☐	Precast Concrete ☐	Other ☐			
Paved Area Around MH:	Satisfactory ☒		Cracked ☐	☐	Missing Pavement ☐	Vegetation Growth				
Unpaved Area Around MH:	Satisfactory ☐		Eroded ☐							
Odors:										
Recommendations:	No Action ☒	Rebuild ☐	Line Manhole Wall ☐		Reset Frame ☐	Clean / Remove debris from Invert ☐				

Field Test Kit Results:

Pipe (A-F):						
Ammonia, mg/L (Compliant ≤ 0.5 mg/L)						
Surfactants, mg/L (Compliant ≤ 0.25 mg/L)						
Chlorine, mg/L (Compliant < 0.02 mg/L)						

Pipe Information:

	Pipe Size	Material	From / To MH#	Invert Depth (from Rim)	Flow Depth (from Invert)	Debris Depth (from Invert)	Condition	Flow	Clarity of Flow
A.									
B.									
C.									
D.									
E.									
F.									

Manhole Inspection Report

MH# 230258

Catchment Area: _____

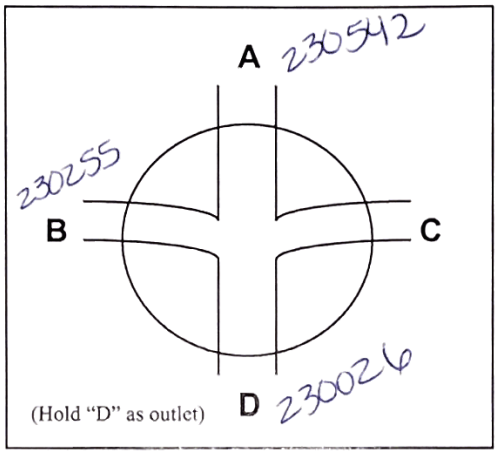
Inspector: _____

Date/Time: _____

Weather: _____

Street/Location: _____

General Comments: Flow From cedar and not from Bayview Ave



Structural Information:

Cover Size: (24") 30" Other: _____

MH Size: (4') 5' Other: _____

MH Sump: Y / N Sump Depth: _____

MH Channel: Y / N

Weir: Y / N Rim to Top of Weir: _____

Internal Drop: Y / N

Depth to Wet Ring from Rim: _____

General Information:

Manhole Type:	Sanitary ☐	Storm ☒	Combined ☐	Common ☐							
Location of MH:	Roadway ☒	Sidewalk ☐	Roadside ☐	Alley ☐	Easement ☐	Other ☐					
Manhole Material:	Brick ☒	Clay Block ☐	Poured Concrete ☐		Manhole Block ☐	Precast Concrete ☐	Other ☐				
Paved Area Around MH:	Satisfactory ☒		Cracked ☐	☐	Missing Pavement ☐	Vegetation Growth					
Unpaved Area Around MH:	Satisfactory ☐		Eroded ☐								
Odors:											
Recommendations:	No Action ☒	Rebuild ☐	Line Manhole Wall ☐		Reset Frame ☐	Clean / Remove debris from Invert ☐					

Manhole cover has the wrong Cable cover

Field Test Kit Results:

Pipe (A-F):						
Ammonia, mg/L (Compliant ≤ 0.5 mg/L)						
Surfactants, mg/L (Compliant ≤ 0.25 mg/L)						
Chlorine, mg/L (Compliant < 0.02 mg/L)						

Pipe Information:

	Pipe Size	Material	From / To MH#	Invert Depth (from Rim)	Flow Depth (from Invert)	Debris Depth (from Invert)	Condition	Flow	Clarity of Flow
A.									
B.									
C.									
D.									
E.									
F.									

Manhole Inspection Report

MH# 230128

Catchment Area: _____

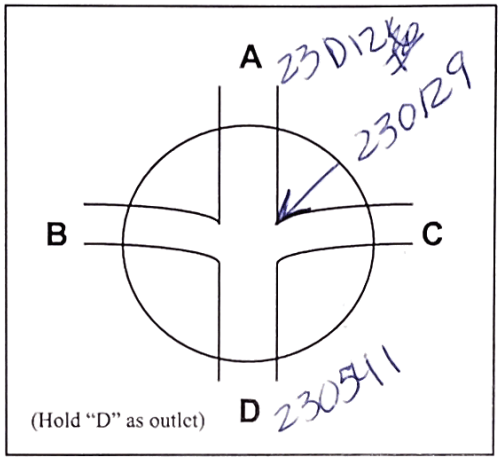
Inspector: _____

Date/Time: _____

Weather: _____

Street/Location: 4/9 Fuller

General Comments: Moderate flow From 230129, but unclear if flow is coming Form 230127



Structural Information:

Cover Size:	(24")	30"	Other: _____
MH Size:	(4')	5'	Other: _____
MH Sump:	Y / N		Sump Depth: _____
MH Channel:	Y / N		
Weir:	Y / N		Rim to Top of Weir: _____
Internal Drop:	Y / N		
Depth to Wet Ring from Rim: _____			

General Information:

Manhole Type:	Sanitary ☐	Storm ☒	Combined ☐	Common ☐								
Location of MH:	Roadway ☐	Sidewalk ☐	Roadside ☐	Alley ☐	Easement ☒	Other ☒	Back Yard					
Manhole Material:	Brick ☒	Clay Block ☐	Poured Concrete ☐		Manhole Block ☐	Precast Concrete ☐	Other ☐					
Paved Area Around MH:	Satisfactory ☒		Cracked ☐	☐	Missing Pavement ☐	Vegetation Growth						
Unpaved Area Around MH:	Satisfactory ☐		Eroded ☐									
Odors:												
Recommendations:	No Action ☒	Rebuild ☐	Line Manhole Wall ☐		Reset Frame ☐	Clean / Remove debris from Invert ☐						

Field Test Kit Results:

Pipe (A-F):						
Ammonia, mg/L (Compliant ≤ 0.5 mg/L)						
Surfactants, mg/L (Compliant ≤ 0.25 mg/L)						
Chlorine, mg/L (Compliant < 0.02 mg/L)						

Pipe Information:

	Pipe Size	Material	From / To MH#	Invert Depth (from Rim)	Flow Depth (from Invert)	Debris Depth (from Invert)	Condition	Flow	Clarity of Flow
A.									
B.									
C.									
D.									
E.									
F.									

Manhole Inspection Report

MH# 230127

Catchment Area: _____

Inspector: _____

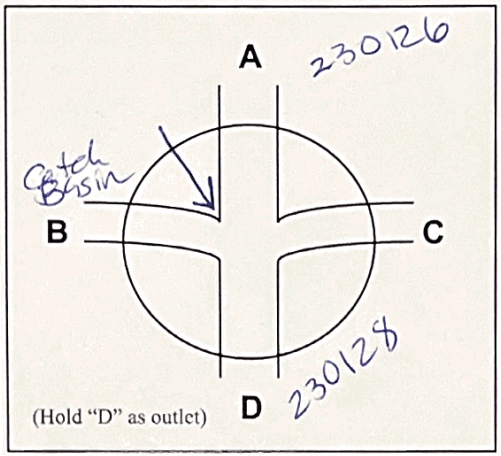
Date/Time: _____

Weather: _____

Street/Location: 4/9 Fuller

General Comments: _____

_____



Structural Information:

Cover Size: (24") 30" Other: _____

MH Size: (4') 5' Other: _____

MH Sump: (Y) / N Sump Depth: 4"-6"

MH Channel: Y / N

Weir: Y / N Rim to Top of Weir: _____

Internal Drop: Y / N

Depth to Wet Ring from Rim: _____

General Information:

Manhole Type:	Sanitary ☐	Storm ☒	Combined ☐	Common ☐						
Location of MH:	Roadway ☐	Sidewalk ☐	Roadside ☒	Alley ☐	Easement ☐	Other ☐				
Manhole Material:	Brick ☒	Clay Block ☐	Poured Concrete ☐		Manhole Block ☐	Precast Concrete ☐	Other ☐			
Paved Area Around MH:	Satisfactory ☒		Cracked ☐	☐	Missing Pavement ☐	Vegetation Growth				
Unpaved Area Around MH:	Satisfactory ☐		Eroded ☐							
Odors:										
Recommendations:	No Action ☒	Rebuild ☐	Line Manhole Wall ☐		Reset Frame ☐	Clean / Remove debris from Invert ☐				

manhole cover lable is wrong

Field Test Kit Results:

Pipe (A-F):						
Ammonia, mg/L (Compliant ≤ 0.5 mg/L)						
Surfactants, mg/L (Compliant ≤ 0.25 mg/L)						
Chlorine, mg/L (Compliant < 0.02 mg/L)						

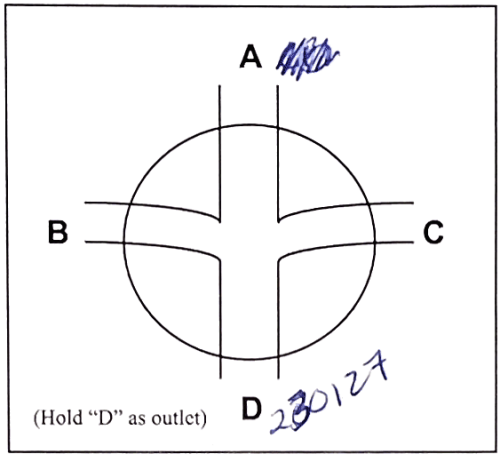
Pipe Information:

	Pipe Size	Material	From / To MH#	Invert Depth (from Rim)	Flow Depth (from Invert)	Debris Depth (from Invert)	Condition	Flow	Clarity of Flow
A.									
B.									
C.									
D.									
E.									
F.									

Manhole Inspection Report

Catch Basin
MH# 230126A

Catchment Area: 230591
Inspector: _____
Date/Time: _____
Weather: _____
Street/Location: _____
General Comments: _____



Structural Information:

Cover Size: 24" 30" Other: _____
MH Size: 4' 5' Other: _____
MH Sump: Y / N Sump Depth: _____
MH Channel: Y / N
Weir: Y / N Rim to Top of Weir: _____
Internal Drop: Y / N
Depth to Wet Ring from Rim: _____

General Information:

Manhole Type:	Sanitary ☐	Storm ☒	Combined ☐	Common ☐							
Location of MH:	Roadway ☐	Sidewalk ☐	Roadside ☒	Alley ☐	Easement ☐	Other ☐					
Manhole Material:	Brick ☒	Clay Block ☐	Poured Concrete ☐		Manhole Block ☐	Precast Concrete ☐	Other ☐				
Paved Area Around MH:	Satisfactory ☐		Cracked ☐	☐	Missing Pavement ☐	Vegetation Growth					
Unpaved Area Around MH:	Satisfactory ☐		Eroded ☐								
Odors:											
Recommendations:	No Action ☒	Rebuild ☐	Line Manhole Wall ☐		Reset Frame ☐	Clean / Remove debris from Invert ☐					

Field Test Kit Results:

Pipe (A-F):						
Ammonia, mg/L (Compliant ≤ 0.5 mg/L)	0.25					
Surfactants, mg/L (Compliant ≤ 0.25 mg/L)	0					
Chlorine, mg/L (Compliant < 0.02 mg/L)	0					

Pipe Information:

	Pipe Size	Material	From / To MH#	Invert Depth (from Rim)	Flow Depth (from Invert)	Debris Depth (from Invert)	Condition	Flow	Clarity of Flow
A.									
B.									
C.									
D.									
E.									
F.									

Manhole Inspection Report

MH# 230136

Catchment Area: _____

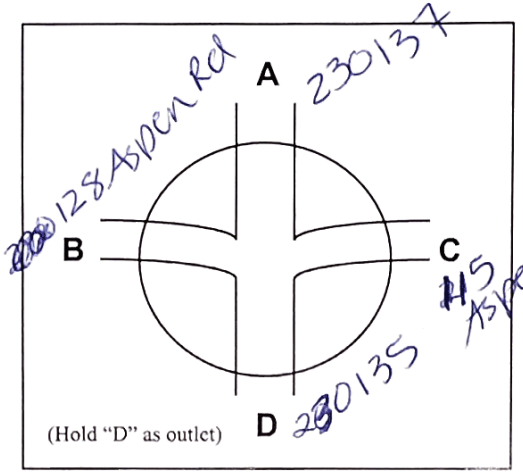
Inspector: _____

Date/Time: _____

Weather: _____

Street/Location: _____

General Comments: Dry



Structural Information:

Cover Size:	(24")	30"	Other: _____
MH Size:	(4')	(5')	Other: _____
MH Sump:	Y / N		Sump Depth: _____
MH Channel:	Y / N		
Weir:	Y / N		Rim to Top of Weir: _____
Internal Drop:	Y / N		
Depth to Wet Ring from Rim: _____			

General Information:

Manhole Type:	Sanitary ☐	Storm ☒	Combined ☐	Common ☐							
Location of MH:	Roadway ☒	Sidewalk ☐	Roadside ☐	Alley ☐	Easement ☐	Other ☐					
Manhole Material:	Brick ☒	Clay Block ☐	Poured Concrete ☐	Manhole Block ☐	Precast Concrete ☐	Other ☐					
Paved Area Around MH:	Satisfactory ☒	Cracked ☐	☐	Missing Pavement ☐	Vegetation Growth						
Unpaved Area Around MH:	Satisfactory ☐	Eroded ☐									
Odors:											
Recommendations:	No Action ☒	Rebuild ☐	Line Manhole Wall ☐	Reset Frame ☐	Clean / Remove debris from Invert ☐						

Manhole cover wrong Lable

Field Test Kit Results:

Pipe (A-F):						
Ammonia, mg/L (Compliant ≤ 0.5 mg/L)						
Surfactants, mg/L (Compliant ≤ 0.25 mg/L)						
Chlorine, mg/L (Compliant < 0.02 mg/L)						

Pipe Information:

	Pipe Size	Material	From / To MH#	Invert Depth (from Rim)	Flow Depth (from Invert)	Debris Depth (from Invert)	Condition	Flow	Clarity of Flow
A.									
B.									
C.									
D.									
E.									
F.									

Manhole Inspection Report

MH# 230135

Catchment Area: _____

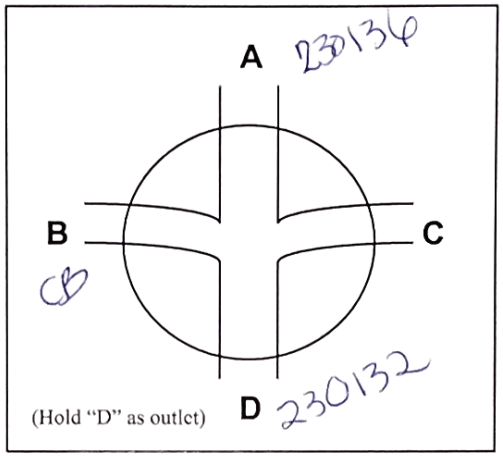
Inspector: _____

Date/Time: _____

Weather: Dry

Street/Location: Millet Road

General Comments: Cleaned & Will be sampled again for Ammonia



Structural Information:

Cover Size: (24") 30" Other: _____

MH Size: 4' (5') Other: _____

MH Sump: Y (N) Sump Depth: _____

MH Channel: Y / N

Weir: Y / N Rim to Top of Weir: _____

Internal Drop: Y / N

Depth to Wet Ring from Rim: _____

General Information:

Manhole Type:	Sanitary ☐	Storm ☒	Combined ☐	Common ☐						
Location of MH:	Roadway ☒	Sidewalk ☐	Roadside ☐	Alley ☐	Easement ☐	Other ☐				
Manhole Material:	Brick ☐	Clay Block ☐	Poured Concrete ☐		Manhole Block ☒	Precast Concrete ☐	Other ☐			
Paved Area Around MH:	Satisfactory ☒		Cracked ☐	☐	Missing Pavement ☐	Vegetation Growth				
Unpaved Area Around MH:	Satisfactory ☐		Eroded ☐							
Odors:										
Recommendations:	No Action ☒	Rebuild ☐	Line Manhole Wall ☐		Reset Frame ☐	Clean / Remove debris from Invert ☐				

Manhole Cover has wrong Label

Field Test Kit Results:

Pipe (A-F):						
Ammonia, mg/L (Compliant ≤ 0.5 mg/L)	6.0+					
Surfactants, mg/L (Compliant ≤ 0.25 mg/L)						
Chlorine, mg/L (Compliant < 0.02 mg/L)						

Pipe Information:

	Pipe Size	Material	From / To MH#	Invert Depth (from Rim)	Flow Depth (from Invert)	Debris Depth (from Invert)	Condition	Flow	Clarity of Flow
A.									
B.									
C.									
D.									
E.									
F.									

APPENDIX J

IDDE Training Sign-In Sheet

TRAINING ATTENDANCE

IDDE PLAN ANNUAL TRAINING

TOWN OF SWAMPSCOTT, MA

NAME (PRINT)	DEPARTMENT	DATE
Ala Alsarahj	Engineering Dept.	May 17th, 2023
BRIAN MARTIN	WATER DEPT	MAY 17th 2023
David Lawless	Water Dept	May 17th 23
EVAN SEGAL	DPW	MAY 17TH 2023
CARL ECKMAN	WATER DEPT.	MAY 17 2023

APPENDIX B
Eligibility: Endangered Species and Historic Properties

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial St, Suite 300
Concord, NH 03301-5087
http://www.fws.gov/newengland

September 24, 2018

To whom it may concern:

The U.S. Fish and Wildlife Service (USFWS) reviewed the stormwater discharge activities associated with the 2016 National Pollutant Discharge and Elimination System (NPDES) Massachusetts (MA) Small Municipal Separate Storm Sewer System (MS4) general permit (MA MS4 General Permit) issued by the Environmental Protection Agency (EPA). We determined those activities may affect, but are not likely to adversely affect, certain species listed under the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) when specific conditions are met. When these conditions are met, we do not need to review individual projects. These comments are provided in accordance with section 7 of the ESA and complement existing 2016 MA MS4 General Permit Appendix C Guidance. We understand the applicant is acting as a non-Federal representative of the EPA for the purpose of consultation under section 7. **This letter provides additional guidance for meeting Criterion B and should be submitted as part of your application package to the EPA.**

If the USFWS Information for Planning and Consultation website (https://ecos.fws.gov/ipac/) indicates your MA MS4 General Permit project action area may contain one or more of the following federally listed endangered species: roseate tern (*Sterna dougallii*), northern red-bellied cooter (*Pseudemys rubriventris*), dwarf wedgemussel (*Alasmidonta heterodon*), rusty patched bumble bee (*Bombus affinis*), northeastern bulrush (*Scirpus ancistrochaetus*), or American chaffseed (*Schwalbea americana*); threatened species: piping plover (*Charadrius melodus*), bog turtle (*Glyptemys muhlenbergii*), Puritan tiger beetle (*Cicindela puritana*), northeastern beach tiger beetle (*Cicindela dorsalis*), or red knot (*Calidris canutus rufa*); or their federally designated critical habitat; and the specific conditions listed below are met, you may submit this letter to complete the **MA MS4 General Permit Appendix C: Step 4** in place of a concurrence letter for informal consultation as documentation of ESA eligibility for **USFWS Criterion B**.

In addition, this letter also satisfies the requirement in the **MA MS4 General Permit Appendix C: Step 2 (3)** to contact the USFWS and obtain a concurrence letter, if you have not yet done so. If your project action area includes one or more of the above-listed species *and* one or more of the

species listed under **Criterion C,**[1] you may still use this letter to certify under **Criterion B**. All existing guidance regarding requirements for certifying eligibility according to the USFWS Criterion A, B, or C for coverage by the 2016 MS4 Permit (see MA MS4 General Permit Appendix C – Endangered Species Guidance) remains unchanged.

We have determined that proposed stormwater discharge activities covered under the 2016 MS4 Permit *may affect, but are not likely to adversely affect*, the above-listed species and the species' critical habitat when the following are true:

1. all stormwater discharges are pre-existing or previously permitted by EPA;
2. any planned operations and maintenance work covered by this permit will only affect previously disturbed areas where stormwater controls are already installed. In these situations the chance of encountering any of the subject species is discountable;
3. the project implements EPA MS4 Best Management Practices (BMPs) and meets Clean Water Act and Massachusetts Water Quality Standards. Although permitted discharges may reach the environment used by these species, BMPs reduce pollutants to the extent that discharges are not known to have measurable impacts on these species or their habitat;
4. no new construction or structural BMPs are proposed under this permit at this time; and
5. you agree that if, during the course of the permit term, you plan to install a structural BMP not identified in the Notice of Intent (NOI), you will re-initiate consultation with the USFWS as necessary (see **MA MS4 General Permit Appendix C: Step 2 (5)**).

If the above criteria are met, further consultation with the USFWS under section 7 of the ESA is not required at this time; however, if the proposed action changes in any way such that it may affect a listed species in a manner not previously analyzed or if new information reveals the presence of additional listed species that may be affected by the project, the applicant or the EPA should contact us immediately and suspend activities that may affect those species until the appropriate level of consultation is completed with our office. Thank you for your cooperation, and please contact David Simmons of this office at (603) 227-6425 if you have questions or need further assistance.

Sincerely yours,

Thomas R Chapman
Supervisor
New England Field Office

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[1] Criterion C includes guidance for project action areas that may contain species for which EPA has already made a determination. These species include the northern long-eared bat (*Myotis septentrionalis*), sandplain gerardia (*Agalinis acuta*), small whorled pogonia (*Isotria medeoloides*), and/or American burying beetle (*Nicrophorus americanus*) (MA MS4 General Permit Appendix C: Step 3 – Determine if You Can Meet Eligibility USFWS Criterion C).

October 31, 2018

Endangered Species:

See attached letter from USFWS dated September 24, 2018.

Swampscott Endangered Species

No description provided.

LOCATION Essex County, Massachusetts

CREATED October 31, 2018

1 MEMBER 1 DOCUMENT

Resources

This project potentially impacts 52 resources managed or regulated by the U.S. Fish and Wildlife Service.

- 3 endangered species
- 48 migratory birds
- Known wetlands

SEE RESOURCES

October 31, 2018

IPaC Information for Planning and Consultation

MY PROJECTS

U.S. Fish & Wildlife Service

STEPHANIE ALIMENA

PROJECT HOME | REGULATORY REVIEW | LOCAL OFFICE NEW ENGLAND ESFO

Resources

- ENDANGERED SPECIES 3
- MIGRATORY BIRDS 48
- FACILITIES
- WETLANDS ✔

PRINT RESOURCE LIST

Endangered species

Listed species and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

Additional information on endangered species data is provided below.

The following species are potentially affected by activities in this location:

THUMBNAILS | LIST

Mammals

Northern Long-eared Bat
Myotis septentrionalis

Birds

Red Knot
Calidris canutus rufa

Roseate Tern
Sterna dougallii dougallii

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

- What does IPaC use to generate the list of endangered species potentially occurring in my specified location?
- Do these lists represent all species to be considered at this location?
- If this resource list is empty, do I still need to coordinate with the USFWS?
- What is an 'official species list' and why would I need one?

October 31, 2018

Town of Swampscott, MA
NOI Screenings

National Historic Properties:

The Town's MS4 is an existing system covered under the 2003 permit; therefore, the Town meets criteria A of Appendix D to the Small MS4 General Permit.

The following nationally listed historic properties were identified through this screening:

- Swampscott Cemetery (13000051)
- Olmsted Subdivision Historic District (02000696)
- Swampscott Railroad Depot (98001106)
- Sir John Humphreys House (90000258)
- Swampscott Fish House (85001120)
- Elihu Thomson House (76002002)

APPENDIX C
Infrastructure O&M Procedures

BMP 1 - ROAD SAND/SALT APPLICATION AND STORAGE

BMP 1: ROAD SAND/SALT APPLICATION AND STORAGE

DESCRIPTION

The Town clears ice and snow for all 50 miles of roadway in Swampscott. The current policy is to use salt, sand, or magnesium chloride (or a combination of these materials) on streets and facility parking lots. Liquid magnesium chloride is used in the pre-treatment of select roadways. Proper storage is necessary to prevent contamination to surface and ground water supplies. Salts are very soluble—once in contact with water there is no way to remove salt. Swampscott constructed a new salt shed in August 2018 to replace their old and undersized shed. The new shed, located at the DPW Garage at 200 Paradise Road, is located on an impervious surface and is covered. The major reasons for keeping salt covered and controlling use are that salt:

- Kills vegetation
- Corrodes infrastructure
- Blocks storm drains and swales
- Increases sedimentation to streams and rivers
- Small quantities (5% road salt) contain phosphorus, nitrogen, copper, and cyanide

POLLUTION PREVENTION APPROACH

Implement applicable suggested Best Management Practices to reduce the influx of pollutants to the stormwater system to the maximum extent practicable.

SUGGESTED BEST MANAGEMENT PRACTICES

Proper Storage

Storage facilities for salt and sand/salt mixtures should have the following key elements:

- Covered structure on impervious surface.
- Drainage should be diverted away from storage facility.
- Sand/salt handling should be done within storage facility.
- Should not be located in a water supply watershed or within 100-year floodplain.
- Do not order excessive quantities of materials

Proper Disposal

Disposal of sand/salt mixtures should not be done in the following areas:

- Wetlands
- Any surface waters
- Well locations and public drinking supplies

Proper Removal

- Street cleaning of all Town roadways at least once per year.
- Catch basin cleaning completed as necessary.

TARGETED FACILITIES AND OPERATIONS

- All Town-Owned Facilities
- Street Rights-of-Way
- DPW

TARGETED CONSTITUENTS

- Sediment
- Salt
- Nutrients
- Trash
- Metals
- Oil & Grease
- Organics
- Low Dissolved Oxygen

NOTES / SPECIFIC PROCEDURES:
(List identified problem or priority areas, document changes in protocol, or unique conditions along with date(s) of implementation and personnel initials)

BMP 1 - ROAD SAND/SALT APPLICATION AND STORAGE

Proper Use • Establish a low salt area near any water bodies or residential areas. • Regulate the amount of road salt applied to prevent over-salting of motorways and increasing runoff concentrations. • Vary the amount of salt applied to reflect site-specific characteristics, such as road width and design, traffic concentration, and proximity to surface waters. • Provide calibration devices for spreaders in trucks to aid maintenance workers in the proper application of road salts. • Establish air temperature and snow depth conditions favorable for successful use of salt. • Use alternative materials, such as sand or gravel, in especially sensitive areas. • Use environmentally friendly products alternative to traditional deicing salt. **INSPECTION PROCEDURES** • Inspect salt storage facilities for leaks on a regular basis including Fall and Spring. • Inspect salt application equipment including calibration equipment and spreaders. • Inspect salt regularly for lumping or water contamination. • Inspect surface areas for evidence of runoff – salt stains in ground near and around the salt storage facility, loading area, or downslope. • Inspect for excessive amounts of salt on roads. **MAINTENANCE PROCEDURES** • Service trucks and calibrated spreaders regularly to ensure accurate, efficient distribution of salt. • Educate and train operators on hazards of over-salting to roads and environment at the beginning of the snow season as part of meetings with supervisors and drivers. • Repair any facility leaks.	

BMP 1 - ROAD SAND/SALT APPLICATION AND STORAGE

MAINTENANCE LOG BMP 1 - Road Sand/Salt Application & Storage

Control Measure Maintenance Records (copy information below for each control measure)

Control Measure or Equipment:

Regular Maintenance Activities:

Regular Maintenance Schedule:

Date of Action:

Reason for Action: ☐ **Regular Maintenance** ☐ **Discovery of Problem**

If Problem,

- **Description of Action Required:**
- **Date Control Measure Returned to Full Function:**
- **Justification for Extended Schedule, if applicable:**

Notes:

Control Measure Maintenance Records (copy information below for each control measure)

Control Measure or Equipment:

Regular Maintenance Activities:

Regular Maintenance Schedule:

Date of Action:

Reason for Action: ☐ **Regular Maintenance** ☐ **Discovery of Problem**

If Problem,

- **Description of Action Required:**
- **Date Control Measure Returned to Full Function:**
- **Justification for Extended Schedule, if applicable:**

Notes:

BMP 2 - STREET AND PARKING LOT SWEEPING

BMP 2: STREET AND PARKING LOT SWEEPING

DESCRIPTION

Street and parking lot sweeping includes self-propelled equipment to remove sediment from paved surfaces that can enter storm drains or receiving waters. Sweeping is most effective for removing coarse particles, leaves, and trash. Regularly sweeping reduces catch basin cleaning. The Town's Policy is to sweep 100% of all streets and 50% of all municipal parking lots twice per year.

POLLUTION PREVENTION APPROACH

Implement applicable suggested Best Management Practices to reduce the influx of pollutants to the stormwater drainage system to the maximum extent practicable.

SUGGESTED BEST MANAGEMENT PRACTICES

- Adhere to the Town's cleaning schedule – every roadway swept once per year. Increase frequency in areas where full catch basins are identified.
- Town parking lots should be checked regularly by Facility personnel and swept when needed.
- Any visible sediment should be swept up (including sand/salt mixtures and granular material).
- Control the number of points where vehicles leave the Facilities to allow sweeping to be focused on certain areas in parking lots.
- Sweep up the smallest particles feasible.
- Sweep in pattern to keep spilled material from being pushed into catch basins.
- Before sweeping, manually rake sand from any turf areas on surfaces to be swept.
- Use hand-held tools to assist with mechanical equipment.
- If possible, recycle Fall leaf sweepings by composting.
- The DPW should maintain a log or schedule of sweeping activities they conduct. Information should include mileage, amount of sweepings removed, and heavily sedimented areas for street rights-of-way.
- Facilities should maintain a log or schedule for their facility parking lots. Information should include amount of sweepings removed, heavily sedimented catch basins, and date of sweeping activities. By recording heavily sedimented areas, prioritizations can be made to sweep these areas or clean catch basins more frequently.

INSPECTION PROCEDURES

- Regularly inspect streets and Town-owned parking lots for debris.

TARGETED FACILITIES AND OPERATIONS

- All Town-Owned Facilities
- Street Rights-of-Way
- Highway Division

TARGETED CONSTITUENTS

- Sediment
- Nutrients
- Salt
- Trash
- Metals
- Oil & Grease
- Organics

NOTES / SPECIFIC PROCEDURES:
(List identified problem or priority areas, document changes in protocol, or unique conditions along with date(s) of implementation and personnel initials)

BMP 2 - STREET AND PARKING LOT SWEEPING

MAINTENANCE PROCEDURES • Adjust broom frequently to maximize efficiency of sweeping operations. • After sweeping is finished, properly dispose of sweeper wastes. • Do not use kick brooms or sweeper attachments that tend to spread dirt. • When unloading sweeper, make sure there is no dust or sediment release. Inspect sweepers to check that they are properly maintained and repaired.	

BMP 2 - STREET AND PARKING LOT SWEEPING

Street Sweeping & Parking Lot Maintenance Activity Log

Date	Street Name (Segment) or Facility Name	Distance/Length (miles)	Equipment Employed	Est. Volume of Material Removed

BMP 2 - STREET AND PARKING LOT SWEEPING

MAINTENANCE LOG BMP 2- Street & Parking Lot Sweeping

Control Measure Maintenance Records (copy information below for each control measure)

Control Measure or Equipment:

Regular Maintenance Activities:

Regular Maintenance Schedule:

Date of Action:

Reason for Action: ☐ **Regular Maintenance** ☐ **Discovery of Problem**

If Problem,

- **Description of Action Required:**
- **Date Control Measure Returned to Full Function:**
- **Justification for Extended Schedule, if applicable:**

Notes:

Control Measure Maintenance Records (copy information below for each control measure)

Control Measure or Equipment:

Regular Maintenance Activities:

Regular Maintenance Schedule:

Date of Action:

Reason for Action: ☐ **Regular Maintenance** ☐ **Discovery of Problem**

If Problem,

- **Description of Action Required:**
- **Date Control Measure Returned to Full Function:**
- **Justification for Extended Schedule, if applicable:**

Notes:

CATCH BASIN INSPECTION FIELD SHEET

BMP 3: CATCH BASIN CLEANING

DESCRIPTION

It is important to remove sediments from catch basins that can have a high concentration of pollutants including metals and hydrocarbons. These sediments can clog downstream drainage systems and transport pollutants to nearby water bodies.

POLLUTION PREVENTION APPROACH

Implement applicable suggested Best Management Practices to reduce the influx of pollutants to the stormwater drainage system to the maximum extent practicable.

SUGGESTED BEST MANAGEMENT PRACTICES

- Prioritize inspection and maintenance for catch basins located near construction activities
- Ensure that no catch basin at any time will be more than 50 percent full
- Documents catch basins with sumps more than 50 percent full during two consecutive inspections/cleanings
- EPA recommends cleaning basins when solids reach one-third the depth from the basin bottom to the invert of the lowest pipe into or out of the basin.
- Target cleaning for early Spring or late Fall.
- Clean manually or with equipment (i.e., bucket loaders).
- Properly dispose of catch basin material or store until contractor picks up cleanings (Massachusetts DEP and EPA requires chemical analysis to determine if substance is hazardous waste).
- Repair damaged catch basins including outlet traps.
- Install hoods if catch basins do not have them.
- Inform employees that catch basins are part of the stormwater drainage system and not the sanitary sewer system.
- The DPW should maintain a log of cleaning activities. Information should include amount of material removed and areas with heavily filled basins.
- Facilities should maintain a log of cleaning activities on their parking lots. Information should include amount of material removed, heavily filled catch basins, and dates cleaned by DPW.

INSPECTION PROCEDURES

- Inspect catch basins, grates, and ditches at least once per year (best times are before the start and before the end of the rainy season).
- Inspections should be incorporated during routine cleaning, as part of reconstruction contracts, and through requests made by residents or other Town departments.

TARGETED FACILITIES AND OPERATIONS

- All Town-Owned Facilities
- Street Rights-of-Way

TARGETED CONSTITUENTS

- Sediment
- Nutrients
- Trash
- Metals
- Oil & Grease
- Organics

NOTES / SPECIFIC PROCEDURES:

(List identified problem or priority areas, document changes in protocol, or unique conditions along with date(s) of implementation and personnel initials)

BMP 3 - CATCH BASIN CLEANING

MAINTENANCE PROCEDURES • Clean catch basins based on the cleaning schedule or as needed. Catch basins should be checked for sediment levels in sump. Those in areas that accumulate a significant amount of sediment should be cleaned more frequently. • During catch basin repairs, any hoods missing should be replaced.	

BMP 3 - CATCH BASIN CLEANING

Catch Basin Maintenance Log

Date	Catch Basin Asset ID	Nearest Street Address	Percent Full Sump at Initiation (Estimated)	Volume of Material Removed (Estimated)	Disposal Method

BMP 3 - CATCH BASIN CLEANING

CATCH BASIN INSPECTION SHEETS

Note: Highlighted Fields are minimum tracking requirements according to the 2016 Permit

CATCH BASIN INSPECTION FIELD SHEET

Section 1: Background Data

City:	Street:	Tax Map #:	Catch Basin ID: CB-
Owner: ☐ City ☐ State ☐ Private ☐ Other: _____		Nearest House/Utility Pole #:	
Today's date:		Time (Military):	
Investigators:		Form completed by:	
Temperature (°F):	Rainfall (in.): Last 24 hours:	Last 48 hours:	
Northing:	Easting:	GPS Unit:	GPS LMK #:
Rim Elevation (ft): _____)	(Datum	A: Depth Rim to Lowest Outlet Invert (in):	
B: Depth Rim to Top of Sediment (Before Cleaning) (in.):		C: Depth Rim to Bottom of Sump after Cleaning (in.):	
D: Depth of Sump = A – C (in):	Catch Basin Sump % Full = (C-B) / D:		

Land Use in Drainage Area (Check all that apply):

☐ Industrial
☐ Urban Residential
☐ Suburban Residential
☐ Commercial
☐ Ongoing Construction Site
☐ Open Space/Wooded
☐ Institutional
Other: _____
Known Industries: _____

Notes:

Section 2: Catch Basin Description

TYPE*	MATERIAL	SHAPE	HOOD PRESENT	DIMENSIONS (IN.)	SUBMERGED
☐ BB ☐ LB ☐ DB ☐ Other: _____	☐ Brick ☐ Block ☐ Poured Concrete ☐ Precast Concrete ☐ Other: _____	☐ Circular ☐ Elliptical ☐ Box ☐ Other: _____	☐ Yes ☐ No	Sump Diameter/Dimensions: ☐ 4-foot ☐ 5-foot ☐ Other: _____	In Water: ☐ No ☐ Partially ☐ Fully With Sediment: ☐ No ☐ Partially ☐ Fully

GRATE TYPE	CURB INLET PRESENT	AREA AROUND CB (PAVED)	AREA AROUND CB (UNPAVED)
☐ Vane ☐ Slotted ☐ Other: _____	☐ Yes ☐ No	☐ Satisfactory ☐ Vegetative Growth ☐ Missing Pavement ☐ Cracked	☐ Satisfactory ☐ Eroded *BB = Block Basin; HB = Hi-way CB; LB = Leaching CB; DB = Double Leaching CB

Section 3: Sketch

Note: Highlighted Fields are those minimally required for information tracking required by the NPDES MS4 Permit

CATCH BASIN INSPECTION FIELD SHEET

Section 4: Visual/Sensory Observations of Potential Illicit Discharge?

Are Any Visual/Sensory Observations Present? ☐ Yes ☐ No *(If No, Skip to Section 5)*

Section 5: Structural Condition

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Flow	☐	Flow Source:	☐ 1 – Trickle	☐ 2 – Moderate	☐ 3 – Substantial
Odor	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:	☐ 1 – Faint	☐ 2 – Easily detected	☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:	☐ 1 – Faint color	☐ 2 – Moderately visible	☐ 3 – Clearly visible
Turbidity	☐	See severity	☐ 1 – Slight cloudiness	☐ 2 – Cloudy	☐ 3 – Opaque
Floatables -Does Not Include Trash!!	☐	☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:	☐ 1 – Few/slight; origin not obvious	☐ 2 – Some; indications of origin (e.g., possible suds or oil sheen)	☐ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

Are there any Structural Condition issues of concern? ☐ Yes ☐ No, Catch Basin is in acceptable condition *(If No, Skip to Section 6)*

Depth (ft)	Component	Code		Continuous Defect	Joint	Circumferential Location		Image Reference	COMMENTS
		Descript.	Modifier			At/From	To		

Section 6: Recommended Action

☐ A – No Action Required ☐ B – Clean Catch Basin ☐ C – Reset Frame and Cover

☐ D – Rebuild Catch Basin ☐ E – Repair Pavement ☐ F – Repair Channel

CONSTRUCTED BEST MANAGEMENT PRACTICES (BMPS)

Town of Swampscott
STANDARD OPERATING PROCEDURES (SOP) FOR INSPECTING CONSTRUCTED BEST MANAGEMENT PRACTICES (BMPS)
Adapted from the Central Massachusetts Regional Stormwater Coalition SOP 9

Best Management Practices (BMPs) are policies, procedures and structures designed to reduce stormwater pollution, prevent contaminant discharges to natural water bodies, and reduce stormwater facility maintenance costs. Constructed BMPs are permanent site features designed to treat stormwater before infiltrating it to the subsurface or discharging it to a surface water body. Currently, there are no Constructed BMPs for the Town to maintain. If necessary in the future, the Town will utilize these guidelines as a starting point for site inspection procedures.

This Standard Operating Procedure provides a general summary of inspection procedures for eight common constructed BMPs, including:

1. Bioretention Areas and Rain Gardens
2. Constructed Stormwater Wetlands
3. Extended Dry Detention Basins
4. Proprietary Media Filters
5. Sand and Organic Filters
6. Wet Basins
7. Dry Wells
8. Infiltration Basins

This SOP is based on the Massachusetts Stormwater Handbook and is not intended to replace that document. This SOP is also not intended to replace the Stormwater BMP Operation and Maintenance (O&M) Plan required by the Massachusetts Wetlands Protection Act, Order of Conditions.

BMP 4 - BIORETENTION AREAS AND RAIN GARDENS

BMP 4: BIORETENTION AREAS AND RAIN GARDENS

DESCRIPTION

Bioretention areas and rain gardens are shallow depressions filled with sandy soil, topped with a thick layer of mulch and planted with dense native vegetation. There are two types of bioretention cells:

1. Filtering bioretention area: Areas that are designed solely as an organic filter; and
2. Exfiltration bioretention area: Areas that are configured to recharge groundwater in addition to acting as a filter.

POLLUTION PREVENTION APPROACH

Regular inspection and maintenance are important to prevent against premature failure of bioretention areas or rain gardens. Regular inspection and maintenance of pretreatment devices and bioretention cells for sediment buildup, structural damage and standing water can extend the life of the soil media.

SUGGESTED BEST MANAGEMENT PRACTICES

- When failure is discovered, excavate the bioretention area, scarify the bottom and sides, replace the filter fabric and soil, replant vegetation and mulch the surface.

INSPECTION AND MAINTENANCE PROCEDURES

- Inspect for soil erosion and repair on a monthly schedule.
- Inspect for invasive species and remove if present on a monthly schedule.
- Remove trash on a monthly schedule.
- Mulch void areas annually in the spring.
- Remove dead vegetation bi-annually, once in the fall and once in the spring.
- Replace dead vegetation annually in the spring.
- Prune annually, either in the spring or fall.
- Replace all media and vegetation as needed in late spring/early summer.
- Never store snow within a bioretention area or rain garden. This would prevent required water quality treatment and the recharge of groundwater.

TARGETED FACILITIES AND OPERATIONS

- All Town-Owned Facilities
- Street Rights-of-Way

TARGETED CONSTITUENTS

- Sediment
- Nutrients
- Trash
- Metals
- Oil & Grease
- Organics

NOTES / SPECIFIC PROCEDURES:
(List identified problem or priority areas, document changes in protocol, or unique conditions along with date(s) of implementation and personnel initials)

BMP 4 - BIORETENTION AREAS AND RAIN GARDENS

INSPECTION OF BIORETENTION AREAS / RAIN GARDENS

General Information

BMP Description	**Bioretention Area / Rain Garden**		
BMP Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular ☐ Pre-Storm Event ☐ During Storm Event ☐ Post-Storm Event ☐			
Weather conditions at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
Inspect for soil erosion and repair	Monthly	Yes ☐ No ☐	
Inspect for invasive species and remove if present	Monthly	Yes ☐ No ☐	
Remove trash	Monthly	Yes ☐ No ☐	
Mulch void areas	Annually	Yes ☐ No ☐	
Remove dead vegetation	Bi-Annually	Yes ☐ No ☐	
Replace dead vegetation	Annually	Yes ☐ No ☐	
Prune	Annually	Yes ☐ No ☐	
Replace all media and vegetation	As Needed	Yes ☐ No ☐	

BMP 5 - CONSTRUCTED STORMWATER WETLANDS

BMP 5: CONSTRUCTED STORMWATER WETLANDS

DESCRIPTION

Constructed stormwater wetlands maximize the pollutant removal from stormwater through the use of wetland vegetation uptake, retention and settling. Constructed storm water wetlands must be used in conjunction with other BMPs, such as sediment forebays.

POLLUTION PREVENTION APPROACH

Regular inspection and maintenance are important to prevent against premature failure of bioretention areas or rain gardens. Regular inspection and maintenance of pretreatment devices and bioretention cells for sediment buildup, structural damage and standing water can extend the life of the soil media.

SUGGESTED BEST MANAGEMENT PRACTICES

- When failure is discovered, excavate the bioretention area, scarify the bottom and sides, replace the filter fabric and soil, replant vegetation and mulch the surface.
- Never store snow within a constructed stormwater wetland. This would prevent required water quality treatment and the recharge of groundwater.

INSPECTION AND MAINTENANCE PROCEDURES

Years 0-3:

- Inspect for invasive species and remove, if present, on a monthly schedule.
- Record and map types and distribution of dominant wetland plants bi-annually.
- Record and map presence and distribution of planted wetland species annually in the spring.
- Record and map presence and distribution of invasive species in the fall and the spring annually.
- Record and map indications that other species are replacing planted wetland species in the spring annually.
- Record and map percent of standing water that is not vegetated annually either in the spring or fall.
- Replace all media and vegetation as needed.
- Record and map stability of original depth zones and micro-topographic features at each inspection.
- Record and map accumulation of sediment in the forebay and micropool and survival rate of plants.

TARGETED FACILITIES AND OPERATIONS

- All Town-Owned Facilities
- Street Rights-of-Way
- Disposal of Removed Solids

TARGETED CONSTITUENTS

- Sediment
- Nutrients
- Trash
- Metals
- Oil & Grease
- Organics

NOTES / SPECIFIC PROCEDURES:

(List identified problem or priority areas, document changes in protocol, or unique conditions along with date(s) of implementation and personnel initials)

BMP 5 - CONSTRUCTED STORMWATER WETLANDS

Year 4+: • Inspect for invasive species and remove if present monthly. • Clean forebays annually. • Clean sediment in basin/wetland system once every 10 years. • Mulch void areas annually in the spring. • Remove dead vegetation bi-annually, once in the fall and once in the spring. • Replace dead vegetation annually in the spring. • Prune annually, either in the spring or fall. • Replace all media and vegetation as needed in late spring/early summer.	

BMP 5 - CONSTRUCTED STORMWATER WETLANDS

INSPECTION OF CONSTRUCTED STORMWATER WETLANDS

Years 0-3 of Operation

General Information

BMP Description	**Constructed Stormwater Wetland**		
BMP Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular ☐ Pre-Storm Event ☐ During Storm Event ☐ Post-Storm Event ☐			
Weather conditions at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
Inspect for invasive species and remove if present	Monthly	Yes ☐ No ☐	
Replace all media and vegetation	As Needed	Yes ☐ No ☐	

In addition, the following information should be recorded and mapped at least once per year:

- Types and distribution of dominant wetland plants
- Presence and distribution of planted wetland species
- Presence and distribution of invasive species
- Indications other species are replacing planted wetland species
- Percent of standing water that is not vegetated
- Replace all media and vegetation
- Stability of original depth zones and micro-topographic features
- Accumulation of sediment in the forebay and micropool and survival rate of plants

BMP 6 - EXTENDED DRY DETENTION BASINS

BMP 6: EXTENDED DRY DETENTION BASINS

DESCRIPTION

Extended dry detention basins are designed to control both stormwater quantity and quality. These BMPs are designed to hold stormwater for at least 24 hours, allowing solids to settle and to reduce local and downstream flooding. Pretreatment is required to reduce the potential for overflow clogging. The outflow may be designed as either fixed or adjustable. Additional nutrient removal may be achieved by a micropool or shallow marsh.

POLLUTION PREVENTION APPROACH

Annual inspection of extended dry detention basins is required to ensure that the basins are operating properly. Potential problems include: erosion within the basin and banks, tree growth on the embankment, damage to the emergency spillway and sediment accumulation around the outlet. Should any of these problems be encountered, necessary repairs should be made immediately

INSPECTION AND MAINTENANCE PROCEDURES

- Inspect basins bi-annually in the spring and fall, and during and after major storms.
- Examine outlet structure for clogging or high outflow release velocities.
- Mow upper stage, side slopes, embankment and emergency spillway bi-annually from the spring through the fall.
- Remove trash and debris bi-annually in the spring.
- Remove sediment from basin at least once every 5 years.

TARGETED FACILITIES AND OPERATIONS

- All Town-Owned Facilities
- Street Rights-of-Way
- Disposal of Removed Solids

TARGETED CONSTITUENTS

- Sediment
- Nutrients
- Trash
- Metals
- Oil & Grease
- Organics

NOTES / SPECIFIC PROCEDURES:
(List identified problem or priority areas, document changes in protocol, or unique conditions along with date(s) of implementation and personnel initials)

BMP 6 - EXTENDED DRY DETENTION BASINS

INSPECTION OF EXTENDED DRY DETENTION BASINS
Inspections should be conducted bi-annually, and during and after major storm events.

General Information

BMP Description	**Extended Dry Detention Basin**		
BMP Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular ☐ Pre-Storm Event ☐ During Storm Event ☐ Post-Storm Event ☐			
Weather conditions at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
Examine outlet structure for clogging or high outflow release velocities	Bi-Annually	Yes ☐ No ☐	
Mow upper stage, side slopes, embankment and emergency spillway	Bi-Annually	Yes ☐ No ☐	
Remove trash and debris	Bi-Annually	Yes ☐ No ☐	
Remove sediment from basin	At least once every 5 years	Yes ☐ No ☐	

BMP 8 - SAND AND ORGANIC FILTERS

BMP 7: **PROPRIETARY MEDIA FILTERS**

DESCRIPTION

Media Filters are designed to reduce total suspended solids and other target pollutants, such as organics, heavy metals or nutrients, which are sorbed onto the filter media, which is contained in a concrete structure. The substrate used as filter media depends on the target pollutants, and may consist of leaf compost, pleated fabric, activated charcoal, perlite, amended sand in combination with perlite, and zeolite. Two types of Media Filters are manufactured: Dry Media Filters, which are designed to dewater within 72 hours; and Wet Media Filters, which maintain a permanent pool of water as part of the treatment system.

POLLUTION PREVENTION APPROACH

Maintenance in accordance with the manufacturer's requirements is necessary to ensure stormwater treatment. Inspection or maintenance of the concrete structure may require OSHA confined space training. Dry Media Filters are required to dewater in 72 hours, thus preventing mosquito and other insect breeding. Proper maintenance is essential to prevent clogging. Wet Media Filters require tight fitting seals to keep mosquitoes and other insects from entering and breeding in the permanent pools. Required maintenance includes routine inspection and treatment.

INSPECTION AND MAINTENANCE PROCEDURES

- Inspect for standing water, trash, sediment and clogging per manufacturer's schedule, bi-annually at a minimum.
- Remove trash and debris during each inspection.
- Examine to determine if system drains in 72 hours once a year in the spring, or after a large storm.
- Inspect filtering media for clogging per manufacturer's schedule.

TARGETED FACILITIES AND OPERATIONS

- All Town-Owned Facilities
- Street Rights-of-Way
- Disposal of Removed Solids

TARGETED CONSTITUENTS

- Sediment
- Nutrients
- Trash
- Metals
- Oil & Grease
- Organics

NOTES / SPECIFIC PROCEDURES:

(List identified problem or priority areas, document changes in protocol, or unique conditions along with date(s) of implementation and personnel initials)

BMP 8 - SAND AND ORGANIC FILTERS

INSPECTION OF PROPRIETARY MEDIA FILTERS

General Information

BMP Description	**Media Filter**		
BMP Location			
Media Type			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular ☐ Pre-Storm Event ☐ During Storm Event ☐ Post-Storm Event ☐			
Weather conditions at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
Inspect for standing water, trash, sediment and clogging	Bi-Annually (minimum)	Yes ☐ No ☐	
Remove trash and debris	Each Inspection	Yes ☐ No ☐	
Examine to determine if system drains in 72 hours	Annually	Yes ☐ No ☐	
Inspect filtering media for clogging	Per manufacturer's schedule	Yes ☐ No ☐	

BMP 8 - SAND AND ORGANIC FILTERS

BMP 8: SAND AND ORGANIC FILTERS

DESCRIPTION

Sand and organic filters, also known as filtration basins, are intended for quality control rather than quantity control. These filters improve water quality by removing pollutants through a filtering media and settling pollutants on top of the sand bed and/or in a pretreatment basin. Pretreatment is required to prevent filter media from clogging. Runoff from the filters is typically discharged to another BMP for additional treatment.

POLLUTION PREVENTION APPROACH

If properly maintained, sand and organic filters have a long design life. Maintenance requirements include raking the sand and removing sediment, trash and debris from the surface of the BMP. Over time, fine sediments will penetrate deep into the sand requiring replacement of several inches or the entire sand layer. Discolored sand is an indicator of the presence of fine sediments, suggesting that replacement of the sand should be completed.

INSPECTION AND MAINTENANCE PROCEDURES

- Inspect filters and remove debris after every major storm for the first 3 months after construction completion and every 6 months thereafter.

TARGETED FACILITIES AND OPERATIONS

- All Town-Owned Facilities
- Street Rights-of-Way
- Disposal of Removed Solids

TARGETED CONSTITUENTS

- Sediment
- Nutrients
- Trash
- Metals
- Oil & Grease
- Organics

NOTES / SPECIFIC PROCEDURES:
(List identified problem or priority areas, document changes in protocol, or unique conditions along with date(s) of implementation and personnel initials)

BMP 8 - SAND AND ORGANIC FILTERS

INSPECTION OF SAND AND ORGANIC FILTERS
Inspections should be conducted after every major storm event for the first 3 months following completion, then every 6 months thereafter.

General Information

BMP Description	**Sand/Organic Filter**		
BMP Location			
Media Type			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular ☐ Pre-Storm Event ☐ During Storm Event ☐ Post-Storm Event ☐			
Weather conditions at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
Remove sediment, trash, and debris	Every 6 months	Yes ☐ No ☐	
Rake sand	Every 6 months	Yes ☐ No ☐	

BMP 9 - WET BASINS

BMP 9: WET BASINS

DESCRIPTION

Wet basins are intended to treat stormwater quality through the removal of sediments and soluble pollutants. A permanent pool of water allows sediments to settle and removes the soluble pollutants, including some metals and nutrients. Additional dry storage is required to control peak discharges during large storm events, and if properly designed and maintained wet basins can add fire protection, wildlife habitat and aesthetic values to a property.

POLLUTION PREVENTION APPROACH

To ensure proper operation, wet basin outfalls should be inspected for evidence of clogging or excessive outfall releases. Potential problems to investigate include erosion within the basin and banks, damage to the emergency spillway, tree growth on the embankment, sediment accumulation around the outlet and the emergence of invasive species. Should any of these problems be encountered, perform repairs immediately. An on-site sediment disposal area will reduce sediment removal costs

INSPECTION AND MAINTENANCE PROCEDURES

- Inspect wet basins at least once per year in either the spring or fall.
- Mow upper stage, side slopes, embankment and emergency spillway at least bi-annually from the spring to the fall.
- Remove sediment, trash and debris at least bi-annually from the spring through the fall.
- Remove sediment from basin as required, but at least once every 10 years.

TARGETED FACILITIES AND OPERATIONS

- All Town-Owned Facilities
- Street Rights-of-Way
- Disposal of Removed Solids

TARGETED CONSTITUENTS

- Sediment
- Nutrients
- Trash
- Metals
- Oil & Grease
- Organics

NOTES / SPECIFIC PROCEDURES:

(List identified problem or priority areas, document changes in protocol, or unique conditions along with date(s) of implementation and personnel initials)

BMP 9 - WET BASINS

INSPECTION OF WET BASINS
Inspections should be conducted after every major storm event for the first 3 months following completion, then biannually thereafter.

General Information

BMP Description	**Wet Basin**		
BMP Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular ☐ Pre-Storm Event ☐ During Storm Event ☐ Post-Storm Event ☐			
Weather conditions at time of inspection			
Describe condition of wet basin at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
Preventative maintenance	Bi-Annually	Yes ☐ No ☐	
Mow/rake buffer area, side slopes and basin bottom	Bi-Annually	Yes ☐ No ☐	
Remove trash, debris and organic matter	Bi-Annually	Yes ☐ No ☐	
Inspect and clean pretreatment devices	Every other month and after every major storm event	Yes ☐ No ☐	

BMP 10 - DRY WELLS

BMP 10: DRY WELLS

DESCRIPTION

Dry wells are used to infiltrate uncontaminated runoff. These BMPs should never be used to infiltrate stormwater or runoff that has the potential to be contaminated with sediment and other pollutants. Dry wells provide groundwater recharge and can reduce the size and cost required of downstream BMPs or storm drains. However, they are only applicable in drainage areas of less than one acre and may experience high failure rates due to clogging.

POLLUTION PREVENTION APPROACH

Proper dry well function depends on regular inspection. Clogging has the potential to cause high failure rates. The water depth in the observation well should be measured at 24-hour and 48-hour intervals after a storm and the clearance rate calculated. The clearance rate is calculated by dividing the drop in water level (inches) by the time elapsed (hours).

INSPECTION AND MAINTENANCE PROCEDURES

- Inspect dry wells after every major storm for the first 3 months after construction completion and then annually thereafter.

TARGETED FACILITIES AND OPERATIONS

- All Town-Owned Facilities
- Street Rights-of-Way
- Disposal of Removed Solids

TARGETED CONSTITUENTS

- Sediment
- Nutrients
- Trash
- Metals
- Oil & Grease
- Organics

NOTES / SPECIFIC PROCEDURES:
(List identified problem or priority areas, document changes in protocol, or unique conditions along with date(s) of implementation and personnel initials)

BMP 10 - DRY WELLS

INSPECTION OF DRY WELLS
Regular inspections should be conducted after every major storm event for the first 3 months following completion, then annually thereafter.

General Information

BMP Description	**Dry Well**		
BMP Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular ☐ Pre-Storm Event ☐ During Storm Event ☐ Post-Storm Event ☐			
Weather conditions at time of inspection			
Describe condition of dry well at time of inspection			

After a major storm event, the water depth in the observation well should be measured at 24- and 48-hour intervals and the clearance rate calculated.

BMP 11 - INFILTRATION BASINS

BMP 11: INFILTRATION BASINS

DESCRIPTION

Infiltration basins are designed to contain stormwater quantity and provide groundwater recharge. Pollution prevention and pretreatment are required to ensure that contaminated stormwater is not infiltrated. Infiltration basins reduce local flooding and preserve the natural water balance of the site, however high failure rates often occur due to improper siting, inadequate pretreatment, poor design and lack of maintenance.

POLLUTION PREVENTION APPROACH

Regular maintenance is required to prevent clogging, which results in infiltration basin failure. Clogging may be due to upland sediment erosion, excessive soil compaction or low spots. Inspections should include signs of differential settlement, cracking, erosion, leakage in the embankments, tree growth on the embankments, riprap condition, sediment accumulation and turf health.

INSPECTION AND MAINTENANCE PROCEDURES

- Preventative maintenance bi-annually in the spring and the fall.
- Inspection after every major storm for the first 3 months after construction completion. Then, bi-annually thereafter and discharges through the high outlet orifice.
- Mow/rake buffer area, side slopes and basin bottom bi-annually in the Spring and the Fall.
- Remove trash, debris and organic matter bi-annually in the spring and the fall.

TARGETED FACILITIES AND OPERATIONS

- All Town-Owned Facilities
- Street Rights-of-Way
- Disposal of Removed Solids

TARGETED CONSTITUENTS

- Sediment
- Nutrients
- Trash
- Metals
- Oil & Grease
- Organics

NOTES / SPECIFIC PROCEDURES:
(List identified problem or priority areas, document changes in protocol, or unique conditions along with date(s) of implementation and personnel initials)

BMP 11 - INFILTRATION BASINS

INSPECTION OF INFILTRATION BASINS
Regular inspections should be conducted after every major storm event for the first 3 months following completion, then bi-annually thereafter

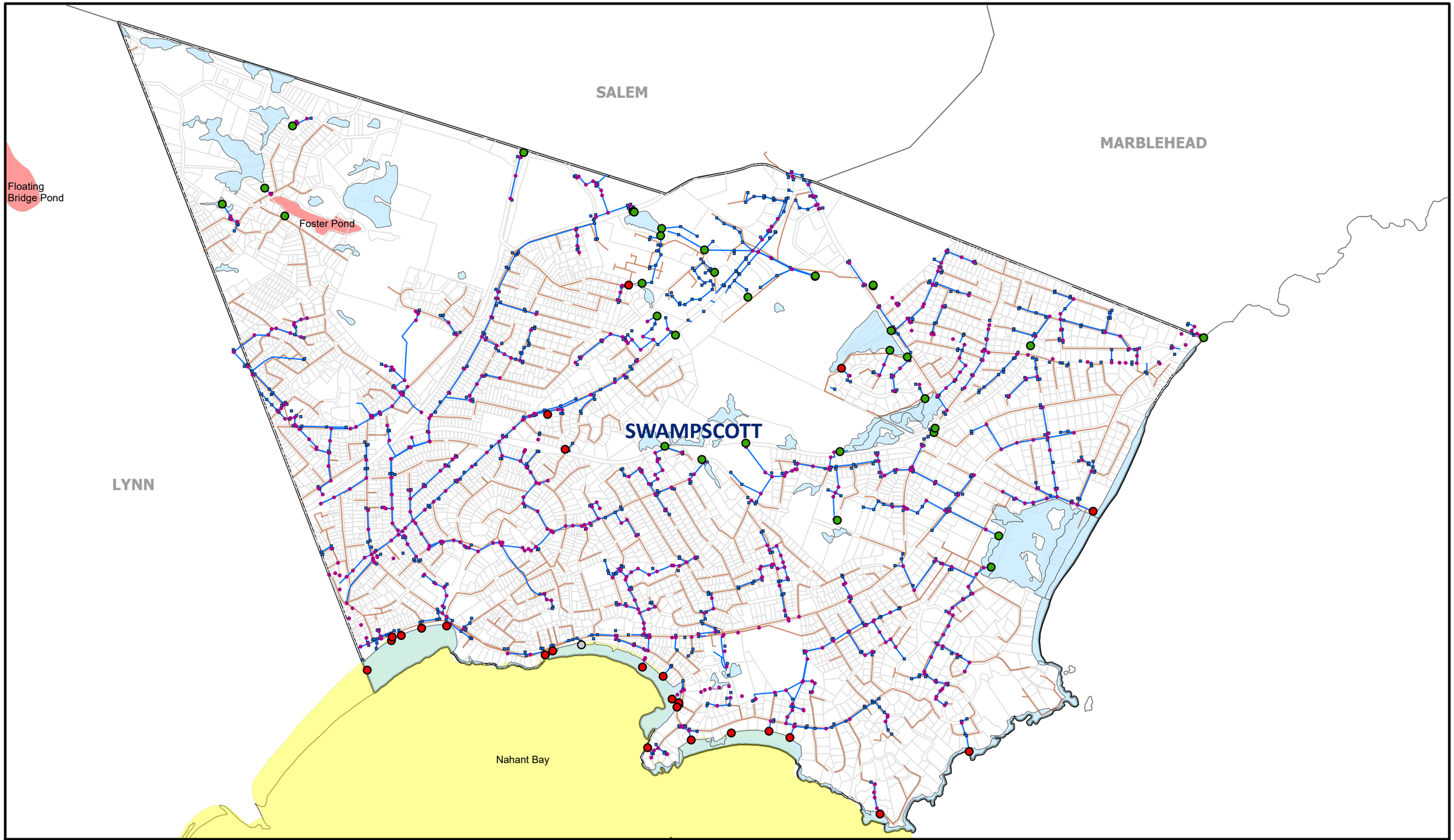
General Information

BMP Description	**Infiltration Basins**		
BMP Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular ☐ Pre-Storm Event ☐ During Storm Event ☐ Post-Storm Event ☐			
Weather conditions at time of inspection			

Specific Information

Maintenance Activity	Maintenance Frequency	Is Status of BMP Satisfactory?	Corrective Action Needed
		Yes ☐ No ☐	
		Yes ☐ No ☐	
		Yes ☐ No ☐	
		Yes ☐ No ☐	
		Yes ☐ No ☐	
		Yes ☐ No ☐	
		Yes ☐ No ☐	

APPENDIX D
Storm System Map



Legend

Outfalls

Priority Rank
- High
- Low
- Unknown

- Manhole
- CatchBasin
- Storm Drains
- Sewer Gravity Mains

Impaired Waterbody Category
- 4A
- 5
- Town of Swampscott
- Wetlands

N

0 1,000 2,000 Feet

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CREATED BY:	STKhan

Storm System Map

Town of Swampscott, MA