

EXHIBIT C – SUPPLEMENT 1: DEFINITIONS, ABBREVIATIONS AND ACRONYMS

1. DEFINITIONS.

For the purpose of this Contract, the following definitions shall apply:

- 1.1 **Acquisition Management Specialist (AMS)** - The staff person from the Minnesota Department of Administration identified as the contact person who is responsible for the management of this Contract.
- 1.2 **Authorized Contract Representative (ACR)** - The personnel from a State department, agency, facility, institution, or CPV member who have authorization from the Entity to request services of the Contractor.
- 1.3 **Accredited Laboratory** - A laboratory accredited either fully or provisionally by the Minnesota Department of Health Environmental Laboratory Accreditation Program (MNELAP), EPA or another entity acceptable to the State. State of Minnesota Accredited Laboratories are listed here:
<https://eldo.web.health.state.mn.us/public/accreditedlabs/labsearch.seam>
- 1.4 **Branch Laboratory** - Laboratory under the same corporate structure, not approved under the Contract.
- 1.5 **Business Day** - A Business Day is defined as a weekday, Monday through Friday from the times of 8:00 A.M, CT to 4:30 P.M, CT, not including holidays that are recognized by the State as the following: New Year's Day, Martin Luther King Jr. Day, President's Day, Memorial Day, Juneteenth Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Day after Thanksgiving, Christmas Day
- 1.6 **Certification(s) and Accreditation(s)** - For the purpose of this RFP, Certification(s) and Accreditation(s) are interchangeable.
- 1.7 **Chain of Command** - A hierarchy of reporting relationships, from the bottom to the top of an organization who must answer to whom. It lays out an organizations line of authority and decision-making power.
- 1.8 **Chain of Custody** - An unbroken trail of accountability that ensures the physical security of samples, data, and records. Also, the name of a form used to document sample tracking.
- 1.9 **Contract Documents** - Request for Proposal, Exhibits, the Response, the executed Contract, and all addenda issued prior to receipt of the Response and all modifications issued after execution of the Contract. A modification is a written amendment or supplement to the Contract signed by both parties and a purchase order/work plan.
- 1.10 **Contract Manager** - The one designated person from a State department, agency, facility or institution who will be identified as a primary contact for the Contractor who is responsible for issuing Work Plans or identifying the personnel from that particular department, agency, facility or institution who are authorized to request the services of the Contractor.
- 1.11 **Contractor** - A laboratory (that may or may not employ samplers) that enters into a Contract with the State to furnish goods and/or services.
- 1.12 **Contractor's Office** -The Contractor's location at which equipment and staff are located and from which the Contractor leaves to initiate work for a program.
- 1.13 **Core Equipment**- Fundamental laboratory equipment necessary to complete all analytical methods submitted within the responding proposal.

- 1.14 **Electronic Data Deliverable** - Program-defined specifications for submitting environmental data electronically.
- 1.15 **Federal Requirements** - Projects that utilize Federal or State matching funds are required to adhere to the Federal Terms and Conditions, which apply to the Contractor.
- 1.16 **Field Analytes** - Analytes determined in the field while stabilizing a ground water well or collecting a surface water sample. These analytes include but are not limited to dissolved oxygen by meter, pH, specific conductance, turbidity, temperature, Secchi disc reading, and depth to water measurement (in well or stream).
- 1.17 **Holding Time** - The time elapsed between the time a sample is taken and the time it is prepared and/or analyzed.
- 1.18 **Laboratory Return Address Labels** - Mailing label with the laboratory's address. Used by Public Water Supply (PWS) to return samples to the laboratory for analysis.
- 1.19 **Large Landfill Site** - A closed landfill that has a monitoring network consisting of more than 8 ground water monitoring wells and/or a fill area more than 28 acres.
- 1.20 **Level 4 Reporting** - This level of reporting shall only be provided by the Contractor if requested by the State Project Manager. Level 4 Data Packages will include all of the information for the standard report as well as the following items:
 - 1.20.1 Raw data (chromatograms, instrument printouts, spectra, etc.) for all samples, blanks, other associated QC samples, and calibration standards;
 - 1.20.2 Sample preparation and analysis log pages; and
 - 1.20.3 Documentation on source and tracking of standards used in the analysis.
- 1.21 **Limited Holding Time Analytes** - E. coli, Fecal coliform, Nitrate, Nitrite, Orthophosphate, Hexavalent chromium, CBOD and BOD (5 day), Total Coliform.
- 1.22 **Matrix, Matrices** - Media such as, but not limited to, water, air, soil, sediment, animal tissue, plant tissue, leachate and gas condensate from solid waste facilities, influent, effluent, and sludge of wastewater treatment plants.
- 1.23 **Out of Control** - In routine operation of a quality control (QC) procedure, the control materials are analyzed before or during the analytical run, the control results are recorded and plotted on control charts, and control status is determined by inspecting the control data using the control limits selected. If the control results are in control, the run is accepted, and samples can be assayed or reported. If the control results are out of control, the run is rejected, the problem is identified and resolved, and a new run can begin or, in the case of batch analyses, a run of samples can be repeated.
- 1.24 **Overhead** - The general, continuing costs involved with running a business, such as, but limited to, rent, maintenance, utilities, taxes, insurance, and equipment costs.
- 1.25 **Overnight Status** - A Contractor is in overnight status if they are greater than 100 miles from the Contractor's Office, paying for lodging, and will continue to work the next day beyond noon on the program's tasks.

- 1.26 **Pass - through Costs** -The actual costs billed to the Contractor by the subcontractor.
- 1.27 **Profit** - the monetary surplus left to the Contractor after deducting wages, rent, cost of raw materials, and all other costs associated with fulfilling the terms of the Contract.
- 1.28 **PWS Address Label** - Mailing labels addressed to water contact at the PWS.
- 1.29 **Quality Assurance Officer** - An employee of the Contractor who coordinates and oversees data quality and corrective actions of Contractor produced data.
- 1.30 **Quality Assurance/Quality Control Coordinator (QAQCC)** - A Quality Assurance/Quality Control coordinator is the State individual who interfaces with the project team, field team, and laboratory to coordinate and verify the data quality process.
- 1.31 **Reporting Limit** - Per the Minnesota Rules 4740.2010, "Reporting Limit" means the lowest level of an analyte that can be accurately recovered from the matrix of interest. At least one of the calibration standards (or calibration verification standards) must be at or below the reporting limit for each analyte.
- 1.32 **Response** - All documents, forms, and information issued by a Contractor and submitted to the AMS in response to this Request for Proposal.
- 1.33 **Rush Service** - Rush service, when used in a sample submittal/laboratory context, refers to a sample that must be analyzed and the data reported in a time frame sooner than the laboratory's usual turn-around time. Contractors may provide an upcharge for rush service. Contractors will enter this upcharge as a percentage increase over the contracted price for the service.
- 1.34 **Sampling Project Coordinator** - The Project Coordinator is an employee of the Contractor. The Project Coordinator contacts residences, businesses, government locations, schools, etc., to set up sampling, coordinates the sampling schedule to provide cost savings to the State, and subcontracts with vendors for dedicated pump or parts purchase. The State will reimburse the Contractor for time spent on the tasks listed above, provided prior written approval has been received from the State.
- 1.35 **Sampling Technician I** - An employee of the Contractor providing sampling services to the State who has less than 2 years' experience on State projects under this Contract, the previous Contract or other State contracts with similar sampling protocols.
- 1.36 **Sampling Technician II** - An employee of the Contractor providing sampling services to the State who has two or more years' experience on State projects under this Contract, the previous Contract or other State contracts with similar sampling protocols.
- 1.37 **Satellite Laboratory** - A Contractor may have a Satellite Laboratory that is accredited by an entity acceptable to the State and has been approved by the QAQCC and the Acquisition Management Specialist to perform work under this Contract. Satellite Laboratories must be listed in the Contract or added through a Contract amendment.
- 1.38 **Soft Sediment** - A sample of unconsolidated sediment that is collected from a wetland in the top 5 cm of sediment material, i.e., the interface between the water column and the underlying consolidated sediments. These samples have the consistency of damp wet cement. Soft sediment is readily spooned into Whirl Pac bags. Stones and coarse organic debris (twigs and rootstocks) are handpicked out prior to spooning the sample into the whirl Pac. The sample is air dried within 24 hours in preparation for analysis to retain moist heat labile fractions.

- 1.39 **State** - State agencies, departments, facilities, and institutions.
- 1.40 **State Contractor** - A Contractor for the State of Minnesota. This definition includes Sampling and Analysis Contractors.
- 1.41 **State Project Manager** - The person assigned to a specific project who has overall project and fiscal responsibility. The Project Manager is the first point of contact for project related questions.
- 1.42 **Suspension**-means to be temporarily suspended by the director of the Office of State procurement form receiving solicitations, the award of a contract, or selling any products or services to State Agencies while director determines if there is probably cause for debarment.
- 1.43 **Supporting Documentation** - Sample Collection Procedure.
- 1.44 **Trip Blank** - A trip blank is prepared from organic-free reagent water and carried into the field, stored, and returned to the laboratory along with the collected samples. Since trip blanks are not exposed to sample collection equipment or ambient field conditions, they serve as a check on contamination introduced during sample shipment and storage.
- 1.45 **Twenty-four-hour sample** - A sample that must be collected, analyzed, and reported within 24 hours of being collected in order to respond to an emergency situation.

2. ABBREVIATIONS AND ACRONYMS

- 2.1 **ACR** - Authorized Contract Representative
- 2.2 **AMS** - Acquisition Management Specialist
- 2.3 **AWWA** - American Water Works Association
- 2.4 **BMP** - Best Management Practices
- 2.5 **BOD** - Biological Oxygen Demand
- 2.6 **CFR** - Code of Federal Regulations
- 2.7 **CERCLA** - Comprehensive Environmental Response, Compensation, and Liability Act
- 2.8 **COC** - Chain of Custody form
- 2.9 **COOP** - Continuity of Operations Plan
- 2.10 **CPV** - Cooperative Purchasing Venture
- 2.11 **CSV** - Comma separated value file
- 2.12 **CWS** - Community water systems
- 2.13 **CWP** - Clean Water Partnership
- 2.14 **DRO** - Diesel Range Organics
- 2.15 **DWP** - Drinking Water Protection
- 2.16 **EDD** - Electronic Data Deliverable
- 2.17 **EDMS** - The Environmental Database Management System
- 2.18 **GC** - Gas Chromatography
- 2.19 **GRO** - Gasoline Range Organics

- 2.20 **HRL** - Health Risk Limit
- 2.21 **HBV** - Health Based Value
- 2.22 **LAB_MN** - The MPCA/MDA EDD format.
- 2.23 **LCR** - Lead and Copper Rule
- 2.24 **MCES** - Metropolitan Council Environmental Services
- 2.25 **MCL** - Maximum Contaminant Level
- 2.26 **MDA** - Minnesota Department of Agriculture
- 2.27 **MDH** - Minnesota Department of Health
- 2.28 **MERLA** - Minnesota Environmental Response and Liability Act
- 2.29 **MNELAP** - The Environmental Laboratory Accreditation Program of the Minnesota Department of Health (MDH)
- 2.30 **MPCA** - Minnesota Pollution Control Agency
- 2.31 **MS4s** - Municipal separate storm sewers systems
- 2.32 **MS/MSD** - Matrix Spike/Matrix Spike Duplicate
- 2.33 **NTNC** - Nontransient noncommunity systems
- 2.34 **NVLAP** - National Voluntary Laboratory Accreditation Program
- 2.35 **PHL** - Public Health Laboratory
- 2.36 **PWS** - Public Water System
- 2.37 **PWSID** - Public Water System Identification
- 2.38 **ORP** - Oxidation Reduction Potential
- 2.39 **OSHA** - Occupational Safety and Health Administration
- 2.40 **QAM** - Quality Assurance Manual
- 2.41 **QAO** - Quality Assurance Officer
- 2.42 **QAQCC** - Quality Assurance/Quality Control Coordinator
- 2.43 **RCRA** - Resource Conservation and Recovery Act
- 2.44 **RFP** - Request for Proposal
- 2.45 **RPD** - Relative Percent Difference
- 2.46 **SDWA** - Safe Drinking Water Act
- 2.47 **SOP** - Standard Operating Procedure
- 2.48 **SRV** - Soil Reference Value
- 2.49 **TCLP** - Toxicity Characteristic Leaching Procedure
- 2.50 **TMDL** - Total Maximum Daily Load
- 2.51 **US EPA** - United States Environmental Protection Agency
- 2.52 **VOC** - Volatile Organic Compound
- 2.53 **WDNR** - Wisconsin Department of Natural Resources

**EXHIBIT C – SUPPLEMENT 2
REPRESENTED STATE PROGRAMS**

Minnesota Pollution Control Agency

A. CLOSED LANDFILL PROGRAM

The Closed Landfill Program operates and maintains approximately 112 closed landfills throughout Minnesota. Landfill gas, groundwater, leachate, gas condensate, and surface water are sampled to monitor groundwater quality and the presence of landfill gases. Active gas extraction systems are used at approximately 20 sites. These systems remove methane and other landfill gas components. Groundwater is pumped at approximately 7 sites to provide gradient control and prevent discharge of contaminated groundwater to both surface water and wetlands.

Sampling of all the media is used on as frequent a basis as monthly to insure compliance with discharge standards for surface water bodies and to verify that there has been no degradation of groundwater. Sampling of gas condensate/leachate, groundwater in monitoring as well as residential wells, and surface water in both natural water bodies and constructed wetlands is completed to determine compliance with standards and to assess performance of the remediation system to control plume migration. Testing of active gas extraction system flares for destruction efficiency, particulates, and volatile organic compounds may also be undertaken in this Contract.

The Closed Landfill Program intends to use the Sampling and Analysis Contract at approximately the same rate of usage as the past five years because new remediation systems are being installed and current remediation systems are being upgraded. The presence of emerging contaminants also drives sampling, analysis and remediation system upgrade in the program.

B. EMERGENCY RESPONSE PROGRAM

The MPCA responds to approximately 2500 spills and emergencies every year. These emergencies include chemical and fuel spills, abandoned wastes, sewer breaks, fish kills, contaminated drinking water, fires, vapors in buildings, meth labs, and natural disasters. MPCA response may include site or situation assessments; stabilization, cleanup, removal, and remediation; transport and disposal of wastes and debris; planning, preparing, and training for environmental emergencies and terror incidents; documentation and management of responses; oversight of responsible party clean-ups; source investigation and identification of responsible parties; and, enforcement.

Sampling needs are dictated by the incident being worked on. Media sampled include ground water, surface water, sediment, air, hard and soft surfaces, sewage, waste, and free product. Analyses are mostly used to define the extent and magnitude of contamination and to monitor remediation. Analyses are sometimes used for enforcement, including civil and criminal actions.

C. WATER QUALITY MONITORING PROGRAMS

Water quality monitoring is needed throughout the state to collect data that will be used for determining the overall quality of the lakes and streams in the state or in a basin, or for special studies conducted by the MPCA, other agencies, or a local government as part of a watershed project. These studies may be river, stream, lake, or wetland studies. Samples may need to be collected and/or analyzed from surface waters or sediment for these studies, and some sampling may be required during snowmelt, storm events, and low flow or under ice depending on the project goals. Most sampling is needed during the open water season from April through October. Lake and stream sampling sites will be specified by the MPCA and may be located anywhere in the state. Lake sampling will be from a boat. Stream sampling will be from a bridge or culvert, a stream bank or directly from the stream if it is "wadeable".

Condition monitoring programs include Major Watershed Load Monitoring, Intensive Watershed Monitoring (lakes and streams), Large River Monitoring, and the Surface Water Assessment and Watershed Pollutant Load Monitoring Grant programs. While the field collection for these programs is primarily conducted by State or local government employees, some of the laboratory work will be done through this Contract. Laboratory services in all regions of the state are needed to ensure that samples will not exceed the short holding time for bacteria and other analyses.

In addition, MPCA has three water quality programs for problem investigation that provide financial and technical assistance to local watershed groups and others to conduct water quality studies and implementation projects; the Clean Water Partnership Program, Section 319 Implementation Program, and the Impaired Waters or Total Maximum Daily Load (TMDL) Program. More information about MPCA's water quality monitoring programs can be found on our web site at <http://www.pca.state.mn.us/water/index.html>.

Watershed Approach to Condition Monitoring and Assessment

The MPCA has established a strategy and goal, recognized by the legislature and Clean Water Council, to assess the condition of Minnesota's waters via a 10-year cycle. The key organizing approach used in this strategy is that of the "major," or 8-digit hydrologic unit code (HUC), watershed. There are 81 major watersheds in Minnesota.

The idea is to intensively monitor the streams and lakes within a major watershed to determine the overall health of the water resources, identify impaired waters, and identify those waters in need of additional protection efforts to prevent impairments. Follow-up monitoring is then done in biologically impaired sub-watersheds to determine the cause(s) of the impairments (the "stressors" impacting the biological community) and to begin to identify pollutant sources. The major watershed approach provides predictability in the monitoring schedule. A schedule has been established for monitoring all of the state's major watersheds within 10 years.

Watershed Pollutant Load Monitoring Network (WPLMN)

The WPLMN consists of 200 permanent flow and chemistry monitoring sites statewide. The combination of continuous flow and an intensive water sample collection regime allows for the computation of an annual load for each site, each year. The monitoring sites are at three scales: basin/large river; major watershed; and sub-watershed. Seventy-six basin/large river and major watershed sites are sampled year-around, with a goal of 35 samples collected. One-hundred twenty-four sub-watershed sites are sampled from ice-out through the end of October, with a goal of 25 samples. Approximately one-third of all the sites in the network are sampled by MPCA staff, with sample analysis carried out by the Minnesota Department of Health. The balance of the sites are sampled by local partners, with sample analysis carried out by private laboratories. Analytes include suspended solids, suspended volatile solids, total phosphorus, total orthophosphate, total Kjeldahl nitrogen, total nitrate+nitrite nitrogen, and turbidity.

Intensive Watershed Monitoring

The intensive watershed monitoring of rivers and streams aggregates watersheds from a coarse to a fine scale. The foundation of this approach is the 81 major watersheds. Sampling occurs in each major watershed once every 10 years. In this approach, intermediate-sized (aggregated 12-digit HUC) and "minor" (14-digit HUC) watersheds are sampled along with the major watershed outlet to provide a complete assessment of water quality. Sites are selected near the outlet or "pour point" at all watershed scales. This approach provides robust assessment coverage of rivers and streams without monitoring every single stream reach.

The outlet of the major watershed is sampled for biology, water chemistry, and fish contaminants to allow for the assessment of aquatic life, aquatic consumption, and aquatic recreation use support. Each aggregated 12-digit HUC pour point is sampled for biology and water chemistry for the assessment of aquatic life and aquatic recreation use support. Watersheds at this scale generally consist of major tributary streams with drainage areas ranging from 75 to 150 square miles. Lastly, most minor watersheds (typically 10-20 square miles) are sampled for biology to assess for aquatic life use support.

Full suite of analytes (Intensive Watershed aggregated 12-digit HUC stream water quality monitoring):

Suspended solids, suspended volatile solids, total phosphorus, total ammonia nitrogen, total Kjeldahl nitrogen, total nitrate+nitrite nitrogen, hardness as CaCO₃, calcium, magnesium, chloride, E. coli, chlorophyll-a and pheophytin.

Samples for most analytes will be collected at the sites (average of 10 sites in each watershed) 10 times in May through September for the year noted in the table below. Over a two year period, at least 15 E. coli samples are collected. Due to the short holding time, it will be often be desirable to identify a lab near each of the eight watersheds being sampled each year. Most of this sampling is conducted locally, funded through the Surface Water Assessment Grant program noted below.

The second step of the intensive watershed monitoring effort consists of follow-up monitoring at all sites with an identified biological impairment. This follow-up monitoring is designed to identify the source(s) and cause(s) of impairment. This work is typically completed by MPCA.

The intensive watershed monitoring of lakes focuses first on lakes greater than 500 acres, then on lakes greater than 100 acres. Lakes are sampled at the deepest point of the lake. Samples are collected over two consecutive summers, from May to September to meet the minimum requirements for water quality assessments.

MPCA staff sample approximately 100 lakes per year for the purposes of assessments. Many more lakes are offered up through the Surface Water Assessment Grant program noted below. Primary analytes include total phosphorus, and chlorophyll-a, corrected for pheophytin.

In addition to the MPCA's intensive watershed monitoring effort described above, the Minnesota Department of Agriculture (MDA) monitors pesticides in Minnesota water resources to identify surface water pesticides of concern, trends over time, provide information on the effectiveness of pesticide management plans and best management practices, and provide data needed by the MPCA to assess water quality. This information can also be factored into the watershed framework, further enhancing our understanding of water quality within each watershed.

Surface Water Assessment Grants

Water quality monitoring will be conducted throughout the state to collect data that will be used to determine the overall quality of lakes and streams. The primary focus of this sampling is to meet minimum requirements for water quality assessments. Samples will be collected from surface water on a set schedule. Lake and stream sampling will occur between May and September annually. Number of lakes and streams sampled is determined by available funds and project proposals. Sites will be determined MPCA. Lake sampling will be conducted at a deep, centrally located site via a boat; stream sampling will be conducted from a bridge or culvert, stream bank, or in stream (if wadeable).

Watershed Pollutant Load Monitoring Network Grants

Approximately two-thirds of the 200 Watershed Pollutant Load Monitoring Network sites (discussed earlier in this exhibit) are sampled by local partners through a grant program.

Clean Water Partnership and Section 319 Programs

The MPCA provides financial and technical assistance to local governments and other water resource managers to address nonpoint source water pollution through the Clean Water Partnership (CWP) and Section 319 Programs. Nonpoint pollution comes from many different sources such as urban and agricultural runoff, storm sewers, construction sites, animal waste from feedlots, paved surfaces, failing septic systems, and over fertilized lawns. When taken together these sources contribute huge quantities of phosphorus, bacteria, sediments, nitrates, and other pollutants to the environment. The programs provide financial and technical assistance for the study of water bodies experiencing pollution problems, development of action plans to address the problems, and implementation of the plans to fix the problems. Projects funded by both programs are led by local coalitions of those concerned about water quality in the area. Water quality sampling and/or lab analyses may be needed by projects funded under these programs.

Watershed Restoration and Protection Strategies (WRAPS)

The State of Minnesota has adopted a “watershed approach” to address the state’s 81 “major” watersheds (denoted by 8-digit hydrologic unit code or HUC). This watershed approach incorporates water quality assessment, watershed analysis, civic engagement, planning, implementation, and measurement of results into a 10-year cycle that addresses both restoration and protection.

As part of the watershed approach, waters not meeting state standards are still listed as impaired and Total Maximum Daily Load (TMDL) studies are performed, as they have been in the past, but in addition the watershed approach process facilitates a more cost-effective and comprehensive characterization of multiple water bodies and overall watershed health. A key aspect of this effort is to develop and utilize watershed-scale models and other tools to help state agencies, local governments and other watershed stakeholders determine how to best proceed with restoring and protecting lakes and streams. This report summarizes past assessment and diagnostic work and outlines ways to prioritize actions and strategies for continued implementation. More information about the [watershed approach](#) is on our web site.

Total Maximum Daily Load (TMDL)

Total Maximum Daily Loads are water quality studies required by the federal Clean Water Act. If a water body in the state is found to be impaired based on a comparison of monitoring data to the State’s water quality standards, the State is required to list the water body and its pollutants and to develop a TMDL. This list is Minnesota’s impaired waters list, also known as the 303(d) or TMDL list.

The MPCA’s strategy for responding to known impairments is to work with local governments, watershed groups and contractors to develop the TMDL study. A TMDL study identifies both point and nonpoint sources of each pollutant that fails to meet water quality standards. Water quality sampling and computer modeling determine how much each pollutant source must reduce its contribution to assure the water quality standard is met. Rivers, streams and lakes may have several TMDLs, each one determining the limit for a different pollutant. Samples will be collected and analyzed for the TMDL projects and some of the monitoring will require frequent sampling and have short holding times, such as bacteria sampling.

Additional water quality and land use data collection is usually needed for the study to develop load allocations and make a reduction plan. Once the study is conducted, a plan with various implementation steps is developed to restore the water resource back to its designated use. This strategy is designed to involve local stakeholders in the planning who will also be integral to the implementation of the TMDL plan. More information about assessing water quality in Minnesota and the impaired waters program can be found on our web site at <http://www.pca.state.mn.us/water/tmdl/index.html>.

Storm Water Program

The MPCA’s Storm Water Program was developed to reduce the pollution and damage caused by runoff from construction sites, industrial facilities and municipal separate storm sewer systems (MS4s). A 1987 amendment to the federal Clean Water Act required implementation of a two-phase comprehensive national program to address storm water runoff. Phase I focused on large construction sites, 11 categories of industrial facilities, and major metropolitan MS4s.

Phase II was the next step in an effort to preserve, protect and improve water resources impacted by storm water runoff. Under Phase II, the program broadened to include smaller construction sites and smaller municipalities. Phase II is designed to further reduce adverse impacts to water quality and puts controls on runoff that have the greatest likelihood of causing continued environmental degradation.

The storm water regulations are part of the National Pollutant Discharge Elimination System (NPDES) permit program. The U.S. Environmental Protection Agency (EPA) delegated permitting authority for Minnesota’s NPDES program to the MPCA. The three permit types - construction, industrial, MS4 - each have distinct requirements.

Monitoring objectives for storm water include defining water quality, assessing Best Management Practice (BMP) performance/reliability and evaluating compliance with permit conditions. Samples may need to be collected and/or analyzed from surface waters and sediments. Sampling may be required during all of the seasons, during storm events, and from a diversity of drainage area sizes depending on the project needs. Accurate estimation of flows and flow-based sampling over short (e.g. hourly) time periods will be necessary in order to estimate pollutant loading for specific project needs, such as BMP effectiveness monitoring.

MPCA staff will determine flow velocity and volume and the sampling Contractor will follow the protocol in collecting representative samples.

Storm water monitoring of flows and water quality sampling will occur in a variety of urban, industrial and construction site environs. Confined spaces associated with storm sewers may be encountered. Typical analytes of concern may include biochemical oxygen demand (BOD), nutrients, sediments, dissolved oxygen, organics, heavy metals, temperature and pH.

Wetland Quality Monitoring

This statewide monitoring program collects biological and chemical data that are used to assess the quality and condition of wetlands. Relationships between biological condition indicators and water and sediment analytes are used to further characterize wetland stressors and model stressor gradients.

Samples are loose, usually watery unconsolidated soft sediments collected from the first few centimeters of the water sediment interface. Samples are typically collected in mid to late summer, July or August. The MPCA wetland assessment program has required analysis of soft sediment samples in the past. Recent shifts in MPCA wetland assessment program priorities have not required soft sediment sample analysis. The MPCA currently assesses about 80 wetlands per year and it is likely if needed again in the future, the MPCA wetland condition assessment program soft sediment sample analysis needs would not exceed this number of samples per year.

Future MPCA work to characterize wetland specific roles in biogeochemical cycling processes and development of total maximum daily load (TMDL) plans or other special studies may require wetland soft sediment sample processing and analysis. A small number of watershed districts and county conservation offices are also collecting wetland soft sediment samples which require analytical processing and analysis.

D. PETROLEUM REMEDIATION (PRP) AND PETROLEUM BROWNFIELD (PBP) PROGRAMS.

The PRP assumes management of petroleum tank release sites when the responsible party cannot or will not do so. Typically, the PRP multi-site contractors' contract with the State Contracted laboratories for analytical services.

Per- and polyfluoroalkyl substances (PFAS) are emerging contaminants composed of thousands of human-made, fluorinated organic chemicals. The actual number of compounds is continually changing with some compounds no longer being produced and new alternatives being created. MPCA shall be initiating PFAS monitoring programs in surface waters, groundwater, soil sediment, waste streams, air, and biota to determine the presence and impact of these environmentally persistent compounds. Information and guidance can be found online at

[Guidance for Per- and Polyfluorinated Alkyl Substance: Analytical \(state.mn.us\)](http://www.pca.state.mn.us/guidance/per-and-polyfluorinated-alkyl-substances-analytical)

The laboratory services required at PRP sites include, but are not limited to, collection and analysis of soil, air, surface and ground water samples and fluid level measurements. Laboratory activities at PRP and PBP sites are conducted according to PRP guidance documents which can be found on the MPCA web page at http://www.pca.state.mn.us/programs/lust_p.html

E. SUPERFUND, VOLUNTARY INVESTIGATION AND CLEAN-UP (VIC) AND RESOURCE CONSERVATION RECOVERY ACT (RCRA) PROGRAMS

Superfund, Voluntary Investigation and Clean-up (VIC) and Resource Conservation Recovery Act (RCRA) are clean up programs that deal with all media, soil, sediment, water, solids and air on either Responsible Parties or Fund Financed sites in Minnesota. The schedules for most sampling events are quarterly, semi annual and annual. All sampling events are compliance driven. The methods of sampling meet Standard Operating Procedures (SOP's). Some of the analytical methods are: VOCs, SVOCs, Metals, TCLP, General Chemistry, GRO, DRO, G-DPH, Gross Alpha and Beta.

Minnesota Department of Agriculture

A. INCIDENT RESPONSE UNIT (IRU)

An investigation and cleanup unit whose primary duties involve the investigation, monitoring and clean-up of agricultural chemical spills in all media, including soil, water, solids and vapor. Relevant programs include the Agricultural Voluntary Investigation and Clean-up (AgVIC) program, the Comprehensive program, and the Superfund program. Some of the analytical methods are: General Chemistry, MDA List 1, MDA List 2, Metals, VOCs and SVOCs.

B. EMERGENCY RESPONSE UNIT

Accidents, severe weather, and mechanical problems can all lead to a spill of pesticides, fertilizers, anhydrous ammonia, or swimming pool chemicals. The MDA Emergency Response Unit helps Minnesotans to prevent, manage, and clean up the environmental damage caused by spills. The On-Call Team assists farmers, ag coops, manufacturers, truckers, residents, and other state agencies to respond to and cleanup spilled agricultural chemicals, and is responsible for responding to all agricultural chemical spills that are reported. There are four people who staff the team and all are highly trained and have years of experience to provide the best customer service to those who report their spills.

C. MONITORING AND ASSESSMENT PROGRAM

Samples groundwater and surface water throughout the state for pesticides and nutrients. Sampling occurs throughout the year but primarily during the growing season. While the field collection for these programs is primarily conducted by State or local partners, some of the laboratory work may be done through this Contract.

D. CLEAN WATER TECHNICAL UNIT (CWTU)

Conducts watershed and on-farm research and demonstrations that includes testing of soil, water, and plant (corn stalk) sampling for nitrate and other agricultural chemicals. These samples are taken during the crop growing season to evaluate the effect of agricultural land use and best management practices on soil and water. Corn basal stalk nitrate test is an end of season test that determines the amount of nitrate in the corn stalk. The lab results are used to evaluate nitrogen management and other best management practices impact on soil and water quality.

E. AGRICULTURAL LIME SAMPLING

The MDA requires that each sample of agricultural lime product be analyzed before the product can be sold or used in Minnesota. Licensed agricultural lime producers must sample/analyze each agricultural lime product each year. The analysis provides the agricultural lime quality rating expressed in the minimum pounds of ENP per Ton (Min. lbs ENP/Ton). The Min. lbs ENP/Ton is required to list on the agricultural lime product distribution label. A copy of the distribution label must be supplied to the consumer with each delivery of agricultural lime material.

Minnesota Department of Health

A. FEDERAL SAFE DRINKING WATER ACT AND IT'S IMPLEMENTING REGULATIONS

Drinking Water Protection (DWP) is responsible for the implementation of the federal Safe Drinking Water Act (SDWA) and safeguarding the quality of drinking water in Minnesota. The SDWA requires Public Water Systems (PWS) serving 25 or more people on a regular basis to monitor for over 80 different contaminants, including total coliform bacteria/E.coli and lead & copper. The SDWA applies to over 6800 Public Water System (System) in the state. The DWP seeks MN ELAP accredited laboratories for statewide Lead & Copper and Total Coliform Bacteria/E. coli analytical services.

B. PUBLIC HEALTH LABORATORY

The Public Health Laboratory (PHL) would like to identify laboratories capable of providing continuity of operations (COOP) and/or subcontracting analytical services for SDWA samples on behalf of MDH PHL. There is no guarantee for need of these services and will be utilized on an as needed basis. The intended use would include, but not be limited to, surge capacity and back up services in the event of instrumentation failures or staffing shortages.

EXHIBIT C - SUPPLEMENT 3

Revised January 27, 2022 by LCM

Closed Landfill Program

Sampling Protocol for Monitoring Wells

January 2022

Minnesota Pollution Control Agency
520 Lafayette Road North
Saint Paul, MN 55155-4194 <http://www.pca.state.mn.us>
651-296-6300 or 800-657-3864 toll free
Available in alternative formats

*The MPCA is reducing printing and mailing costs by using the Internet to distribute reports and information to a wider audience. For additional information, see the Web site:
<http://www.pca.state.mn.us/cleanup/closedlandfills.html>*

TABLE OF CONTENTS

1.0 INTRODUCTION.....	A-4
2.0 ADVANCE PREPARATION FOR SAMPLING.....	A 4
2.1 Selection Of Analytical Parameters	A 4
2.2 Detection Limits.....	A 4
2.3 Quality Assurance For Field Procedures.....	A 4
2.4 Sampling Containers And Preservatives.....	A 5
2.5 Purging And Sampling Equipment	A 5
2.6 Decontamination, Storage And Transport Of Equipment.....	A 5
2.7 Selection Of Sample Collection Techniques.....	A 6
2.8 Order Of Sampling.....	A 7
3.0 PRELIMINARY FIELD WORK	A 7
3.1 Field Inspections And Field Decisions	A 7
3.2 Detection Of Immiscible Layers	A 7
3.3 Water-Level Measurements	A 8
3.4 Field Water-Quality Measurements	A 9
Specific Conductance	A -----9
Temperature.....	A ----- 10
pH	A ----- 10
Dissolved Oxygen.....	A----- 11
Turbidity.....A-11
Eh.....A-11
3.5 Well Purging And Stabilization.....	A-12
Water Table Wells.....	A-12
Wells Screened Below the Water Table.....	A-12
Permanently Installed Pumps.....	A-12
4.0 SAMPLE COLLECTION	A-13
4.1 Pump Setting.....	A-13
4.2 Sample Filtration.....	A-13
4.3 Filling Sample Containers.....	A-14
Dissolved Gasses.....	A-15
Volatile Organics.....	A-15
Metals	A-15
Nitrogen Series.....	A-15
Cyanide.....	A-15
General Parameters.....	A-16
Semi-Volatile Organics	A-16
Perfluorochemicals.....	A-16
4.4 Field Blanks and Replicates.....	A-16
Field Blank Samples.....	A-17
Field Replicate Samples.....	A-17
5.0 DOCUMENTATION OF SAMPLING EVENT	A-17
5.1 Sample Identification	A-17
5.2 Chain Of Custody.....	A-18
Field Chain of Custody Documentation.....	A-18

Chain of Custody During Shipping and Transfer of Samples.....	A-18
5.3 Field Sampling Log.....	A-18
5.4 Exceptions To Sampling Protocol.....	A-19
5.5 Field Conditions.....	A-19

6.0 SAMPLE PRESERVATION, HANDLING AND TRANSPORT.....	A-19
6.1 Sample Preservation.....	A-19
6.2 Sample Handling And Transport.....	A-19

LIST OF TABLES

Table A - 1: Sample Containers, Filling Method, Preservation and Holding Times	A-21
Table A - 2: Order of Purging and Sampling of Wells.....	A-25

LIST OF FIGURES

Figure A - 1: Location of Sampling Points.....	A-26
--	------

LIST OF APPENDICES

APPENDIX A1: SELECTED ANALYTICAL PARAMETERS, METHOD NUMBERS AND REPORTING LIMITS	A- 27
APPENDIX A2: EQUIPMENT DESCRIPTIONS AND SPECIFICATIONS	A- 27
APPENDIX A3: PURGING AND SAMPLING EQUIPMENT INSPECTION AND MAINTENANCE SCHEDULE.....	A- 27
APPENDIX A4: EXAMPLE FORMS	A- 27
APPENDIX A5: SUPPLEMENT TO FIELD WATER QUALITY MEASUREMENT PROCEDURES	A- 27
APPENDIX A6: SEQUENCE OF SAMPLING OUTLINE.....	A- 27

SAMPLING PROTOCOL
FOR GROUNDWATER MONITORING WELLS
AT CLOSED SOLID WASTE FACILITIES

1.0 INTRODUCTION

This document defines procedures to be used for groundwater quality measurements and for collecting and handling groundwater samples obtained from monitoring wells at all closed landfills. Deviations from these procedures may be required by unforeseen circumstances that develop during the program. Such deviations will be approved by the hydrogeologist or the field crew leader as described below. When approvals cannot be obtained in advance, deviations from the established procedures will be evaluated as soon as possible after sampling and needs for re-sampling will be evaluated. Deviations from the specified procedures will be clearly noted on the Sampling Form (Sampling Information Form SIF or approved equivalent) used for the sampling of each well and will be included in the Sampling and Analysis Report as described below. An outline of the sequence of field sampling activities is provided in Appendix A6 solely as an organizational tool. Actual sampling will follow the detailed text below.

2.0 ADVANCE PREPARATION FOR SAMPLING

Selection of analytical parameters, laboratory arrangements, the order of sampling wells, field measurement and sampling techniques, equipment selection and other quality assurance measures are based on the sampling objectives presented in the main body of the Sampling Plan.

2.1 Selection of Analytical Parameters

Analytical parameters were selected based on regulatory requirements and a review of site history. Samples will be collected for analysis of the parameters shown in Appendix A1 to fulfill requirements of the closed landfill program. Analytical techniques for trace metals and organic compounds were selected primarily on the basis of ability to detect potential contaminants at low levels.

2.2 Detection Limits

Practical quantitation limits are shown in Appendix A1. In all cases, except where noted, these detection limits are at or below applicable Health Risk Limits (or Health Based Values or Maximum Contaminant Levels).

2.3 Quality Assurance for Field Procedures

Particular care will be exercised to avoid the following common ways in which cross contamination or background contamination may compromise groundwater samples:

- Improper storage or transportation of equipment
- Contaminating the equipment or sample bottles on site by setting them on or near potential contamination sources such as uncovered ground, a contaminated vehicle, or vehicle exhaust
- Handling bottles or equipment with dirty hands or gloves
- Inadequate cleaning of well purging or sampling devices

Special care will be exercised to prevent cross-contamination of sampling equipment, sampling bottles, or anything else that could potentially compromise the integrity of samples. Field method quality assurance verification procedures are described

below in Section 4.4, “Field Blanks and Replicates”. Field personnel will work under the assumption that contamination exists in land surface soil and vegetation, near sampling points, in wash water, etc. Therefore, exposure to these media will be minimized by taking at least the following precautions:

- Minimizing the amount of rinse water left on washed materials
- Minimizing the time sampling containers are exposed to airborne dust or volatile contaminants in ambient air
- Placing equipment on clean, ground-covering materials instead of on the land surface

Clean gloves made of appropriately inert material, for example powderless nitrile gloves, will be worn by all field crew. Gloves will be kept clean while handling sampling-related materials. The gloves will be replaced by a new pair when soiled and between each sampling point.

2.4 Sampling Containers and Preservatives

Laboratory-supplied sampling containers and preservatives that are to be used for samples from all wells are shown in Table A-1. The Laboratory Quality Assurance Project Plan includes specific procedures for the following: sample container cleaning, testing, labeling and storage, preparation and addition of preservatives. Sampling contractors must coordinate directly with the laboratories as to whether preservatives are added to bottles in the field or in the laboratory.

2.5 Purging and Sampling Equipment

Well purging and sampling equipment includes the following:

- Two-inch nominal diameter stainless-steel positive-displacement submersible bladder pumps or low flow variable-speed electric submersible pumps with Teflon® bladder: provide manufacturer name, model name/number and optional equipment used (at many Closed Landfill sites, dedicated systems are installed)
- Pump discharge lines: new or dedicated Teflon® tubing or polyethylene (LDPE and HDPE) for sampling of PFAS
- Regulators and compressed nitrogen or air tanks
- Bailers (only if MPCA hydrogeologist approved), rope, other pumps, generators, air compressors with air filter, etc.

Equipment description and specification details, equipment inspection and maintenance schedules must be provided by the contractor annually.

2.6 Decontamination, Storage, and Transport of Equipment

Pump tubing may be new for each well, dedicated to a single well for subsequent sampling events, or decontaminated between sampling events in a laboratory setting and stored in a sealed, chemically inert plastic bag for reuse. The bag will be labeled and stored in a secure, clean location. Pump bladders will be decontaminated by circulating decontamination fluids through the pump after working at each sampling point.

All sampling-related equipment including filtration devices, personal protection gear and materials coming into contact with actual sampling equipment or with sampling personnel will be decontaminated. Sampling pumps and tubing that are permanently installed or dedicated to individual wells are exempt from field decontamination. All equipment will be handled in a manner that will minimize cross-contamination between wells and avoid introducing surface or ambient air contamination into a well. Equipment used during purging or sampling will be thoroughly cleaned prior to use in each individual well even when the wells are located close to each other. After cleaning, the equipment will be inspected visually to detect sticky residues or other substances that may survive normal cleaning. If inspection reveals that decontamination was insufficient, additional measures will be implemented as needed and documented.

Before mobilizing for fieldwork or performing any decontamination, a source of control water of known chemistry and organic-free reagent grade deionized water for decontamination will be selected and evaluated. The inorganic

desorbing agent will be either 10% nitric or hydrochloric acid solution made from reagent grade acid and deionized water. The organic desorbing agent described below will be pesticide grade isopropanol. Equipment will be decontaminated in the following manner:

- I. Equipment that doesn't contact sample water or the inside of the well
 - A. clean the inside and the outside where possible with a pressure-washer filled with clean water or an Alconox/clean-water solution - applied with a scrub brush where practical
 - B. rinse with clean control water
 - C. inspect for remaining particles or surface film and repeat cleaning and rinse procedures if necessary

- II. Equipment that contacts sample water or the inside of the well
 - A. clean inside and the outside where possible with an Alconox/clean-water solution - applied with a scrub brush made of inert materials
 - B. rinse with clean control water
 - C. inspect for remaining particles or surface film and repeat cleaning and rinse procedures if necessary
 - D. rinse with an inorganic desorbing agent in the laboratory
 - E. rinse with clean control water
 - F. rinse with an organic desorbing agent
 - G. rinse thoroughly with laboratory controlled deionized water
 - H. shake off remaining water and allow to air dry

The internal surfaces of pumps and tubing that cannot be adequately cleaned by the above methods alone will also be cleaned by circulating decontamination fluids through them. The fluids will be circulated through this equipment in the order shown above under "II". Exercise special care to ensure that the rinse fluids are circulated in sufficient quantities to completely flush out contaminants, detergents and desorbing agents.

When transporting or storing equipment after cleaning, protect the equipment in a manner that minimizes the potential for contamination. Completely enclose sampling pumps in a clean case capped at both ends. If the case is used to transport used pumps, the case will undergo the same decontamination process as the pump before being used again. Place the tubing in a clean, inert plastic bag; wrap bailers, if allowed, in inert plastic or aluminum foil.

2.7 Selection of Sample Collection Techniques

Sample collection techniques as detailed in this document have been tailored to the goals of this sampling event and the individual characteristics of this site. A summary of the sampling goals and the pertinent site, well, or contaminant characteristics is given in the Sampling Plan. The techniques described herein are scientifically sound and widely used in this industry. If bailers are used in place of pumps for purging or sampling, prior approval must be obtained from the MPCA hydrogeologist.

Use bailers as follows:

- Use a new disposable bailer and retrieval line at each sampling point. Do not decontaminate a disposable bailer or line in the field for reuse at any site.
- Do not allow the bailer or the retrieval line to touch dirty hands, the ground, a dirty ground cloth or any other potentially contaminated surface during the purging or sampling process.
- Monitor the top of the water column to ensure the bailer enters the water column gently.
- Withdraw the bailer gently from the water column.
- Keep check valves clear of sediment and operating effectively to minimize the amount of water dripping back into the well.
- Use the same bailer for both purging and sampling.
- When collecting a sample, raise the sample to the surface immediately after exiting the water column.
- Quickly transfer the sample from the bailer to the sample vessel while minimizing turbulence and exposure to the atmosphere.
- Use a bottom-emptying device that delivers water from the bottom of the bailer at a low rate that results in controlled, non-turbulent flow.

- If filtration is necessary, use an in-line filter operated by positive pressure. For example, using the force of gravity to drive the sample through a filter fitted to the bottom of the bailer is an acceptable method if filtration can be completed quickly.

2.8 Order of Sampling

Where water quality data are available, purging and sampling of wells will begin with the least contaminated wells and proceed to increasingly contaminated wells as specified by the MPCA hydrogeologist. Where the distribution of contaminants is not known, purging and sampling activities will begin with wells considered upgradient from sources of contamination and finish with downgradient wells closest to suspected contamination. Where application of the term “upgradient” may not be applicable and previous water quality data are not available, purge and sample wells considered background wells first.

For each set of equipment, both the purging and the sampling will be completed without removing the pump or tubing before beginning purging at subsequent wells.

Sampling order may be flexible at Closed Landfill sites where dedicated sampling equipment is installed in all the monitoring wells.

3.0 PRELIMINARY FIELD WORK

The following procedures are implemented to ensure representativeness of samples collected by methods in Section 4, “Sample Collection”.

3.1 Field Inspections and Field Decisions

The sequence of sampling is outlined in Table A-2.

Upon arrival at each monitoring well, inspect the well to verify that the annular seal is intact at the surface. Note missing parts, missing labeling, missing locks, well damage, or tampering. Record field conditions according to Section 5.5 of this protocol. Field conditions such as wind direction may affect sampling station setup. Locate any running vehicle or field generator downwind of sampling station. Unlock the well. Put on protective gloves before removing the inner riser cap. Set the cap in a clean storage spot.

Measure the well depth with the same instrument used to measure the water level. A weight may be attached to the measurement device for sounding the well bottom. Decontaminate this sounding device in the same manner as specified for making water-level measurements (Section 3.3). Record the well depth to the nearest 0.1 feet. In addition, inspect the condition of any relevant facts regarding the physical condition of the well, the surrounding soil and vegetation or other objects in the immediate vicinity of the well. Record any unusual conditions or odors on the Sampling Form or approved equivalent. Note details in the field sampling log and in the Sampling and Analysis Report. If any condition that may interfere with obtaining representative analytical results is discovered, note the condition and rectify, if possible, before sampling the dissolved phase of well water.

Field decisions to make minor changes to this protocol can be made by the field crew leader. The decision will be reviewed with the MPCA hydrogeologist at the end of the day to decide whether or not any wells need to be re-sampled. For significant changes to this protocol, obtain approval in advance from the MPCA hydrogeologist. The MPCA Hydrogeologist will: review any changes to the protocol that may adversely affect results; record the decision and exact change of procedure on the Sampling Form and in the Sampling and Analysis Report.

3.2 Detection of Immiscible Layers

Previous sampling indicates that this section is not applicable for most facilities

If immiscible layers of contaminants (free product “floaters” or “sinkers”) are suspected or seen or if odors or an oil sheen are observed, follow special procedures to characterize the distribution of contaminants in the water-yielding zone adjacent to the well screen. Because free product can accumulate anywhere from the top to the bottom of the water column, precede the

normal sequence of purging and sampling with a free-product evaluation step to allow for the best characterization of nearby contamination.

Based on site and well-specific information, make a decision regarding the number and depth of discrete, depth-specific, samples needed. If free product is suspected but the source not clearly defined, collect separate samples from at least the top and the bottom of the water column before purging. Collect the discrete interval samples in a manner that disturbs the water column as little as possible; begin sampling with the interval closest to the top of the water column and proceed downward.

More specifically, use a bailer to collect any pre-purging samples from the water table surface and use a thief sampler to collect any pre-purging discrete-interval samples from below the top of the water column. Keep the thief sampler closed while being lowered through the water column, open it at the bottom of the well and then completely close it again while raising it back up through the water column. In addition to any discrete-interval samples collected, collect an additional sample from near the middle of the water column after normal purging. Analytical needs for these three samples will be reviewed with the appropriate regulatory agency representative to determine which analyses are required for each sample. Visual screening or sequential analysis of samples may eliminate the need to analyze all samples collected in some circumstances.

Note the presence and characteristics of any detected immiscible layers on the Sampling Form. Attempt to measure the thickness of any free product using an interface probe. General procedures for detection and sample collection of immiscible layers will be in accordance with guidance provided in the Technical Enforcement Guidance Document (TEGD EPA 1986, pages 100-102). Record and include specific detailed procedures actually used in response to site/well conditions on the Sampling Form and in the Sampling and Analysis Report.

3.3 Water-Level Measurements

Record and measure initial static water levels at each well prior to any well evacuation or sampling. This is done to facilitate selection of the proper pump intake depths for purging and sampling and calculation of the groundwater flow direction. Start calibrations of field water quality instruments at this point (see section 3.4).

During initial static water level measurement, a minimum of two water level measurements will be made at each well. If there is poor agreement between the first and second static water level measurements (i.e., a difference of more than 0.01 feet), data will be re-evaluated for measurement errors, unsuspected pumping that may be causing transient changes in gradient, etc. If the disagreement cannot be rectified, a third static water level measurement will be made at each questionable sampling point to assess the true water level, verify non-steady state conditions, etc.

The sampling crew will make water-level measurements at all applicable site monitoring wells and piezometers within a twelve hour time interval to provide comparable numbers by which to calculate the groundwater gradient. An additional water level measurement may be taken immediately before purging at each well and a final will be taken immediately after sampling is completed. Enter these water levels on the Sampling Form.

Decontaminate water level probes with Alconox, double rinse with distilled or deionized water, and dry with a clean tissue before use in each well. Measure water levels with an electric water-level sensor probe that has been calibrated within the last month and recorded to the nearest 0.01 feet. Lower the electric water-level sensor probe down the well until the light illuminates or a tone sounds, indicating contact of the probe with the water surface.

Reference the depth-to-water from the measuring point marked at the top of the innermost well casing. If a measuring point has not been marked, assume the measuring point to be at the top of the innermost casing on the north side. When reporting absolute water level elevation, convert this measurement to water level elevation from the surveyed elevation of the top of the innermost well casing. Complete the water-level data form shown in Appendix A4 or approved equivalent for all wells where water level measurements are made. Calculate the water column volume based on the static water level and the nominal diameter of the inner well casing or open hole and note it on the Sampling Form.

3.4 Field Water-Quality Measurements

Specific conductance, pH, temperature, turbidity, and dissolved oxygen will be measured in the field during stabilization and immediately before sample collection. At specific sites requiring natural attenuation sampling, field analysis will be completed for redox potential (eH), ferrous iron (Fe (II)), dissolved oxygen (Winkler or titration method), hydrogen sulfide (H₂S), alkalinity, manganese (II). The methods used to determine the natural attenuation field parameters will be manufacturer and kit specific. Calibration information and all measurements will be recorded on the Well Purging - Field Water-Quality Measurements Form or approved equivalent. Measurement conditions and the steady-state value for each field water-quality parameter will also be noted on the Sampling Form.

All measurements will be taken within a closed flow cell designed to allow measurement of these parameters while minimizing changes in temperature, pressure, and dissolved gases from the in-situ aquifer environment. Flow cells have evolved since the last update of this document. Water Quality sondes are utilized in flow through cells and provide continuous readings of the field parameters. These sondes are also capable of transmitting the data electronically through a data logger. Examples of these sondes and data loggers include Hach Hydrolab Water Quality Sondes, YSI, Global Water, and Troll (This is not a complete list and does not imply a preference by the MPCA. Any sonde and datalogger fulfilling the specifications of this section are acceptable for use).

The flow cell has the following characteristics:

- Air tight fittings for installation of all probes.
- Intake is connected directly to the pump discharge line.
- Resides in a water bath kept at a temperature close to the in-situ groundwater temperature.
- A discharge line approximately three feet long that is connected to the flow cell with an air tight connection.
- A maximum volume of no greater than five times the per minute volumetric rate of inflow to the cell to maintain measurement sensitivity to temporal changes in water quality.
- A minimum volume of 250 ml to provide enough thermal mass to minimize external temperature effects. The flow cell and lines will be shielded from strong winds and from direct sunlight.

□

The operation of the probes will be as follows:

1. The flow of sample water through the flow cell will be maintained as continuous and steady as practical throughout the measurement period.
2. Discharge velocities through the flow cell are kept low to prevent problems of streaming potential with probes.
3. All probes will be fully immersed without touching the sides of the air tight, non-metallic flow cell.
4. All probes will be allowed to equilibrate with fresh well water for five minutes before beginning to record measurements.

Specific procedural details for measurement of individual field water quality parameters are specified below. General care, maintenance, calibration procedures, and operation of each measurement device will also follow manufacturers' specifications as detailed in the instruction/owner's manual for each device. Where there are differences in procedures as defined in this document compared to manuals accompanying measurement devices, the samplers shall provide documentation of procedures used.

Specific Conductance

The conductivity cell will be stored according to manufacturer specifications. The conductivity meter will be calibrated each day before taking measurements at the first site. The conductivity cell will be inspected to be sure it is in good condition with no chips in the coating. While the meter is still off, the needle will be checked to see that it points to zero. If not, the needle will be adjusted to point to zero. Next, the selector will be set to "red line" and the needle will be adjusted to the red line, if necessary.

The following applies to meters that are subject to calibration:

To find the correction factor (k), immerse the probe in ASTM D1125 standard potassium chloride reference solution. A standard solution with a conductance value relatively close to that expected in the groundwater to be tested will be used, usually 1000 micro-Mhos per cm². The conductivity standard calibration solution will be labeled to show the date of preparation, check-marked to show the number of times used and replaced at regular intervals of no

more than three months or 10 uses whichever ever comes first. The probe will be fully immersed but will not be allowed to touch the non-metallic container. After selecting the appropriate magnitude scale, the reading taken in the calibration standard will be recorded. This reading will be compared with the chart value for the standard reference solution at the temperature of the solution. The correction factor is calculated as follows:

$k = \text{value from the chart divided by the meter reading.}$

While making field measurements, the true electrical conductivity, (EC) = meter reading x k will be recorded. Before taking conductivity measurements in the field the mechanical zero and red line settings will be checked at each sampling point as explained above. The meter will be left in the “on” position and the probe will be fitted into the flow cell for measurement of fresh groundwater. The probe will be fully immersed without touching the sides of the non-metallic flow cell. Each measurement will be calculated in the following manner:

$\text{meter reading} \times \text{scale magnitude} \times \text{correction factor} = \text{EC (micro-Mhos/cm).}$

If the instrument does not automatically correct EC to 25 degrees Celsius, then both the EC and specific conductance (SC) measurements will be recorded on the appropriate field forms. The specific conductance (EC corrected to 25 degrees Celsius) will be calculated from the EC and the water temperature. The SC value will be taken from the conversion table provided in the EC meter instruction manual and recorded in micro-Mhos/cm to three significant digits. The SC will be used to determine when stabilization is reached.

Temperature

At the beginning of each day of field operations, the temperature probe will be inspected and compared in a water bath to a thermometer capable of being read to the nearest 0.1 degrees Celsius to assure it is in good operating condition. The measured groundwater temperature will be recorded to the nearest 0.1 degrees Celsius.

pH

Personnel using pH measuring equipment will read the manufacturer’s instruction manual carefully before recording any measurements. Special care will be taken to protect the fragile glass bulb on the end of the pH electrode. Careful handling includes all steps from the manner in which the cap is taken off the electrode and includes keeping the electrode tip moist between sampling points. The electrode will not be touched or allowed to freeze.

Before sampling is begun for the day, the pH meter will be calibrated by a two-point calibration method or according to the manufacturer’s specifications (if using manufacturer’s specifications disregard the following instructions). If the meter is shown to hold its slope well over time, routine calibration later in the day can be accomplished by calibrating the meter with only one buffer. The single buffer calibration will normally be accomplished using a pH = 7 buffer for natural waters. At a minimum, the pH meter will be calibrated by a single-point calibration method before taking measurements at each new sampling point or every two hours, whichever comes first. Before calibration and before the first measurement at each sampling point, the electrode will be held by the cap and given a few downward shakes to clear any bubbles. Then the bulb will be checked visually to verify that the bulb has not dried out and that there are no air bubbles.

For the two-point calibration method, two buffers with pH values representative of the range of values expected in the field will be used to check the slope of the meter. Typically, a pair of buffers with pH = 4 and 7 or, alternately, of pH = 7 and 10 will be used for the two-point calibration.

Because the pH of buffer solutions varies with temperature, the actual pH (e.g., pH = 4.07 vs. 4.00) of the buffer solution at its current temperature will be used for calibration. The actual pH of the buffer at its temperature of measurement will be determined from manufacturer documentation accompanying the buffer. The exact pH of the buffer solutions at 2- to 5-degree intervals for the range of buffer temperatures expected will be recorded in indelible ink on the buffer solution bottles. Under extreme or variable temperature conditions, the buffers will be placed in a water bath from the well discharge to minimize temperature-correction errors. Only fresh buffer solutions will be used. Care will be taken not to dilute or contaminate the buffer solutions. Buffer solutions will be discarded after the tenth calibration or four weeks after the first use of the solution, whichever occurs first. pH meter calibration will be performed as follows:

1. The pH meter temperature compensation control will be set to the current temperature of the buffer solution.
2. The pH meter electrode will be rinsed with distilled water and the excess water will be shaken off.
3. The electrode will then be stirred and left immersed in the buffer container until it stabilizes.

4. While immersed in the first buffer solution, the calibration control will be adjusted until the display matches the known pH of the buffer.
5. Steps 2, 3, and 4 will then be repeated to prepare for the second buffer.
6. If measurement of the second buffer does not give a satisfactory reading the slope control will be adjusted.
7. Steps 2-6 will be repeated until both buffer solutions yield satisfactory readings within approximately 0.02 pH units of the actual value on both ends of the measured scale.
8. After calibration is complete, step 2 will be repeated before measuring the pH of well water.

After allowing the pH probe to equilibrate with a continuously replenished supply of fresh aquifer water for a minimum of five minutes, the first pH measurement will be recorded.

Dissolved Oxygen

Personnel using dissolved oxygen measuring equipment will read the manufacturer's instruction manual carefully before making dissolved oxygen measurements. Special care will be taken to store the probe in a humid environment and to otherwise protect the delicate membrane on the end of the probe. The membrane will be replaced every four weeks.

The dissolved oxygen meter will be calibrated daily according to manufacturer's specifications. When dissolved oxygen readings less than approximately 1.0 mg/L are expected, the meter will be calibrated in a mode, if available that enhances accuracy at low concentrations. The calibration method will be recorded on the Well Purging - Field Water Quality Measurements Form, or approved equivalent. Measurements will be taken as follows:

1. The membrane at the tip of the probe will be checked visually to verify that it is in good condition.
2. After allowing the dissolved oxygen probe to equilibrate with a continuously replenished supply of fresh aquifer water for a minimum of five minutes, the first measurement will be recorded.

Readings should appear stable on the display to be considered valid. If fluctuating readings are observed, they will be footnoted when recorded and the fluctuating measurement conditions will also be clearly stated in the final Sampling and Analysis Report. Readings will be reported to the nearest 0.1 mg/L dissolved oxygen.

Turbidity

Turbidity meter calibration and measurement techniques will follow manufacturer recommendations. Measurements will be made inside a glass or transparent plastic bottle filled directly from well discharge in the same manner as samples are collected or directly in the flow cell. Measurements will be taken immediately after filling the container to minimize bias due to particulate settling.

Eh

The reduction/oxidation (redox) potential will be taken using a pH meter with redox probes. The performance of Eh probes is measured by placing the indicator and reference electrodes in Light's or Zobell's solution. Light's solution is 48.22 grams of ferrous ammonium sulfate dissolved in 56.2 ml of sulfuric acid, diluted to 1 liter. At 25 degrees C with a silver/silver chloride reference electrode, Light's solution has a potential of +438 mV.

Zobell's solution is 3×10^{-3} M potassium ferrocyanide and 2×10^{-2} M potassium ferricyanide in 0.1 M KCl. At 25 degrees C Zobell's solution has a potential of 428 mV. A KCl-saturated calomel electrode will be used as a reference electrode, 242 mV at 25 degrees C will be added to convert to true Eh. When calibrating, the solution will be gently stirred. The exact field calibration method will be recorded.

Platinum electrodes will be carefully pre-treated according to the manufacturer's instructions, and stored in an oxygen-scavenging solution of 0.2 M sodium sulfide, because the probes are sensitive to the presence of oxygen. Routine replacement of the redox probes will be done after each sampling day after exposure to water containing oxygen, as variations of several hundred mV have been observed between used and fresh electrodes.

3.5 Well Purging And Stabilization

Before a well is sampled for laboratory parameters, it will be evacuated to ensure that samples contain fresh formation water. If Micro-purge method is selected, then partial evacuation normally will occur before sampling. The time purging begins will be recorded on the Sampling Form. Any final rinse water remaining in any portion of the sampling pump or discharge lines will be completely purged with well water before measurement of field water quality parameters.

While the well is being purged, water quality parameters described above in Section 3.4, "Field Water-Quality Measurements", and the quantity of water evacuated will be recorded on the Well Purging - Field Water Quality Measurements Form or approved equivalent.

If the turbidity is greater than 10 Nephelometric turbidity units (NTU) after removal of 5 water column volumes, the water sample will be taken regardless. The purging rate (from Table A-2) that will minimize drawdown while still allowing the well to be purged in a reasonable length of time will be specified by the MPCA hydrogeologist and recorded on the Sampling Form. Care will be taken to avoid any significant amount of cascading or turbulence in the well.

3.5.1 Methods of Purging and Stabilization

One of the following purging methods will be specified in Table A-2, as provided quarterly.

A. MEDIUM TO HIGH-YIELD WELLS (>100-200 ml/min.)

Wells that have adequate recharge rates will be purged and sampled as described below. Purging will be conducted in a manner that, to the extent practical, removes all "old" water in the well so it is replaced by fresh formation water.

- The well will be purged by withdrawing water from, generally, two feet from the bottom of the well. Vertical adjustment of the purging equipment intake should not be necessary because the pumping rate should approximate the aquifer yield.
- A minimum of three water column volumes must be purged before sampling. Field water quality parameters will be measured after each water column volume.
- Sampling will immediately follow purging.
- Well evacuation will be continuous between purging and sampling.

A. LOW-YIELD WELLS WITH RECOVERY (Wells that cannot be stabilized at purge rates of 100-200 ml/min.)

Normal purging may be impractical for a well installed in tight formation materials with an extremely slow recharge rate. In such a case, the well will be purged to near dryness and allowed to partially recover one time before sampling. The well will be allowed to partially recover for at least 0.3-14 hours. A minimum of one water column will be removed. Field water quality measurements will be taken after evacuation.

The well will be sampled as soon as possible after the evacuation. The recommended limit between final purging and sampling is two hours. However, in some cases overnight recovery is warranted. The data and procedures will be clearly noted on the Sampling Form and in the Sampling and Analysis Report.

B. MICRO-PURGE

The following special conditions apply to micro-purged wells:

- A dedicated pump will be permanently installed in the well. The pump will fit securely in the well screen.
- The well will be pumped by withdrawing water from within the targeted zone, at a rate equal to the aquifer yield, without drawdown.
- Field water quality measurements will be taken after one pump-tubing volume is purged, and after each 1/2 water column volume is stabilized. A minimum of one water column plus one pump-tubing volume must be purged before sampling.

D. PURGING WITH A PACKER TO MINIMIZE THE WATER COLUMN VOLUME

The following special conditions apply when a packer is to be used:

- The installation procedure and placement of the packer will be described on the Sampling Form.
- The water-column volume will be calculated based on the water volume below the packer.
- A minimum of three water-column volumes as defined above will be removed.

3.5.2 Criteria for Stabilization

Field water quality parameters will be measured for stabilization after each water-column volume or each partial water-column volume as applicable, is purged. One water-column volume is defined here as equal to the volume of a cylinder with a height (h) equal to that of the Static Water Column (or water column below a packer) inside the well and a diameter (d) equal to the diameter of the well casing ($\text{Volume} = \pi(d/2)^2h$). The following target criteria for three consecutive measurements will be used to demonstrate stabilization:

- pH +/- 0.1 units
- specific conductance +/- 5%
- dissolved oxygen +/- 0.5 mg/L

Unless alternative methods are specified from Section 3.5.1, samples for laboratory analysis will be collected only after a minimum of three water-column volumes has been purged and stabilization of field water-quality parameters has been demonstrated by meeting the target criteria defined in the preceding paragraph. If field parameters do not stabilize after approximately five water-column volumes, then field staff will check operator procedures, equipment functioning and well construction information for potential problems.

Samples will be collected after five water-column volumes have been purged even if field measurements have not stabilized. It will be clearly documented that stabilization was not achieved on the Sampling Form and in the Sampling and Analysis Report.

4.0 SAMPLE COLLECTION

This section describes procedures for setting the sampling pump and collecting groundwater samples. Field data for these items will be recorded on the Sampling Form for each sampling point.

4.1 Sampling Rate

A two-inch submersible bladder or low flow variable-speed electric submersible pump (e.g. Timco bladder or Grundfos Rediflo) will be used as the default device for sample collection. If well recovery is so slow that a satisfactory water column height for normal pump operation is not maintained, then a zero submergence bladder pump, Waterra® pump or Teflon bailer will be used for sample collection. The use of any other device must have pre-approval by the MPCA hydrogeologist. The Sampling Form will show what type of pump or bailer was used to sample each well. The approximate depth of the pump intake setting must also be reported.

The same pump will be used for sampling as was used for purging. Pumping will be continuous and sampling will immediately follow purging. The pump must be pulled immediately after sampling and the water level measured immediately after removal of the pump. If pumping is not continuous it will be noted on the Sampling Form. The sample collection pumping rate will be less than or equal to the purging rate. However, in wells with a high velocity of flow (3-4 gpm), the sample rate can be lowered to aid in the collection of dissolved gases or volatile organic compounds. The sampling time will be recorded on the Sampling Form.

4.2 Sample Filtration

See Section 4.3, Metals for criteria to determine the need for field filtration.

Table A-1 identifies which sample containers will be filled with sample water that has been filtered in the field. Sample filtration will be completed as follows:

1. The new filters will be flushed with fresh sample water before collecting samples.
2. The filter may be connected directly to the well sampling pump discharge line using positive pressure to force the sample through the filter.
3. From the filter, the flow will be routed directly into the sample collection container.
4. A 0.45 micron pore size filter will be used unless otherwise specified.
5. The flow rate will not exceed 500 ml per minute.
6. Agitation and aeration of the sample will be minimized.
7. Teflon[®] or another inert tubing will be used for the pump and filter discharge lines when collecting samples for organic compounds.

4.3 Filling Sample Containers

Table A-1 summarizes the sample container type, filling method, preservation method and holding time for each analytical parameter set. To clarify and supplement the summary in Table A-1, the manner in which containers will be filled is described below in subsections of 4.3.

Individually prepared bottles will not be opened until they are to be filled with water samples. Follow the procedures below:

1. The area surrounding the wellhead will be kept as clean as practical to minimize the potential for contamination of samples.
2. Care will be exercised to minimize the potential for airborne contamination of sample water during collection. If vehicles or generators are left running during sample collection, containers will be filled upwind from engine exhaust sources. If conditions are dusty, an effort will be made to shield the sample collection area from windborne contamination.
3. A clean and dry sheet of relatively inert plastic shall be placed on the ground surface in the wellhead area. If materials used in the sampling process must be put down, they will be placed on a clean portion of the plastic sheet instead of the ground surface.
4. A clean pair of nitrile gloves will be put on at the onset of sampling activities at each new sampling point.
5. Sampling personnel will keep their hands as clean as practical and replace gloves if they become soiled while performing sampling activities.
6. Sampling personnel will not touch the inside of sampling containers, bottle caps, or rim of sample containers. If contact occurs, sample containers will be replaced.

At the well, bottles will be labeled and chain-of-custody sections will be filled out by the field personnel according to procedures described below in Section 5: “Documentation of Sampling Event”. Chain of custody information will be completed before leaving the sampling point. Laboratory prepared bottles will be used to assure quality control.

The order of filling bottles with water to be analyzed will be as follows:

1. dissolved gases: ethene, ethane, methane (where applicable)
2. volatile organics
3. metals
4. nitrogen series
5. cyanide
6. general parameters
7. semi-volatile organics
8. per- and polyfluoroalkyl substances (or collected during another event as the single parameter)

Replicate samples will be collected sequentially as described in Section 4.4: “Field Blanks, Replicates and Split Samples”. Methods for filling sample containers for individual analyses are described below.

The sample water discharge point at the end of the tube will be held as close as possible to the sample container without allowing the sample tubing to contact the container. The exception to this rule is for dissolved oxygen and chemical oxygen demand samples where the container is filled from the bottom up by inserting the tube into the bottom of the container. At a

minimum, sampling personnel will use their body to shield the sampling container from wind and airborne dust while filling. When strong winds, heavy rain, or dusty conditions are present, additional measures will be implemented to guard against background interference, such as use of a portable shelter at the well head. A final water level measurement will be made immediately after sample collection is finished.

Dissolved Gases

The 60-ml serum vial will be filled in a manner that minimizes turbulence, entrapment of air and overfilling. They will not be rinsed in the field but will be completely filled in a manner that leaves a positive meniscus at the top of the vial. Sulfuric acid prepared specifically for dissolved gases analysis by the laboratory will be used to preserve samples. The acid may be added to vials at the laboratory in advance of sampling, with extra caution exercised to minimize overfilling in the field. Alternatively, the acid may be added immediately after filling the vials in the field. After addition of the acid, a crimping tool will be used to apply a crimp cap to the vial for minimal escape of dissolved gases.

Volatile Organics

The 40-ml purge and trap vials will be filled in a manner that minimizes turbulence, entrapment of air and overfilling. They will not be rinsed in the field but will be completely filled in a manner that leaves a positive meniscus at the top of the vial. Hydrochloric acid prepared specifically for volatile organics analysis by the laboratory will be used to preserve samples. The acid may be added to vials at the laboratory in advance of sampling, with extra caution exercised to minimize overfilling in the field. Alternatively, the acid may be added immediately after filling the vials in the field. Field personnel will add the number of drops specified by the laboratory to bring the pH to less than or equal to $\text{pH} = 2$, and immediately cap the vials.

Metals

Sample containers for general ions and metals analysis will be prepared in advance by the laboratories with HNO_3 as a preservative. This will insure that samples will be acidified as soon as they are collected. Containers will be filled approximately 95% full (up to the neck). Containers will not be rinsed or overfilled at any time in the field.

The sample bottles for metals analysis will be clearly labeled as “filtered” or “unfiltered.”

1. Unfiltered samples will be collected after the third consecutive sampling round of turbidity results of 5 NTUs or less.
2. Filtered samples will be taken at wells where turbidity exceeds 5 NTUs after purging and well stabilization. Sample water will be filtered through a 0.45 micron pore size filter unit before filling the laboratory prepared bottle. New filters will be used for each sample.

Whether filtered or not, samples for metals analysis will be collected in a manner that minimizes turbulence and aeration and then acidified immediately as described above. Plastic containers will be used for sample collection. The acid will be produced/controlled within the applicable QA/QC program to ensure that it is pure enough with regard to metals to avoid a false positive analytical result.

Nitrogen Series

Sample containers for nitrate/nitrite and ammonia analysis will be prepared in advance by the laboratories with H_2SO_4 as a preservative. The containers will be filled approximately 95% full with unfiltered water. Containers will not be rinsed or overfilled anytime in the field. Samples will be checked with pH paper in the field to verify that the pH has been lowered to less than or equal to $\text{pH} = 2$.

Cyanide

Sample containers for cyanide analysis will be prepared in advance by the laboratories with NaOH as a preservative. The containers will be filled approximately 95% full with unfiltered water. Containers will not be rinsed or overfilled at any time in the field. Samples will be checked with clean pH paper in the field to verify that the pH has been raised to greater than or equal to $\text{pH} = 12$.

General Parameters

The sample containers for laboratory analysis of general parameters: anions, total dissolved solids, total suspended solids, specific conductance, pH, alkalinity and turbidity, will not be rinsed in the field or allowed to overflow excessively during sample collection. The containers will be filled completely and capped promptly.

Semi-Volatile Organics

As defined here, semi-volatile organics include the following sets of parameters: base-neutral/acid extractable organics, phthalate esters, polychlorinated biphenyls (PCBs), phenols, polynuclear aromatic hydrocarbons, chlorinated herbicides, organochlorinated pesticides & PCBs, and organophosphorus pesticides. Sample containers used for non-volatile organics analysis will not be rinsed in the field or allowed to overflow excessively during sample collection. Containers will be filled completely.

Per- and Polyfluoroalkyl Substances (PFAS)

PFAS are a suite of human-made emerging contaminants composed of fluorinated organic chemicals that have been widely used for decades. PFAS are extremely stable and do not breakdown in the environment. Common uses include nonstick cookware, stain-resistant carpets and fabrics, components of firefighting foam, industrial applications, coatings for packaging such as milk cartons, cosmetic additives and personal products. PFAS samples can easily be contaminated from sources such as consumer products or other PFAS-contaminated media. Potential cross-contamination in a typical sampling event may include:

- Sampling equipment
- Field clothing
- Personal Protective Equipment (PPE)
- Sun and biological protection products
- Personal hygiene and personal care products
- Food packaging
- Other environmental media (soil, dust...)

Sample collectors should request lab verified PFAS-free sample bottles from the laboratory. Prior to sampling, samplers may come into contact with PFAS in carpets and car interiors. Samplers need to be aware of materials and other treated surfaces (water or stain resistant coatings) that have a potential to cross-contaminate PFAS samples. Sampling equipment should not be stored on or come into contact with materials suspected to contain PFAS.

- Wash hands well before sampling when possible.
- Put on clean powderless nitrile gloves prior to sample collection or handling sample equipment.
- Keep sample container(s) sealed at all times and only open during sample collection.
- Never place the sample container cap(s) or lid(s) on any surface unless it is PFAS-free. The cap or lid must never be placed directly on the ground or facing downward.
- Follow method specific sample preservation, thermal storage and holding times to limit microbial growth.

For the most up-to-date and detailed sampling guidance please refer to Guidance for per- and polyfluoroalkyl substances (PFAS): Sampling (p-eao2-27) document on the MPCA website.

4.4 Field Blanks and Replicates

Sample blanks will be collected to detect background or method contamination. Replicate samples will be collected to evaluate variability in analytical methods. Other QA/QC samples will be collected at sampling points suspected to have relatively higher levels of contamination to provide meaningful information for blank or duplicate sample evaluation. All QA/QC samples will be collected in the same type of container as the corresponding primary samples. All QA/QC samples will be assigned identification aliases on the sample bottle label and on the chain of custody sheet to avoid alerting laboratories that the sample is a blank or replicate sample. The true identity of the QA/QC samples will be recorded in the field sampling log.

The collection schedule for QA/QC samples will be as follows:

1. one trip blank for each cooler of VOC samples
2. one field methods (equipment) blank each day by each field sampling crew, and replicate as specified by MPCA hydrogeologist. At sites where dedicated equipment is installed in all monitoring wells this sample can be eliminated.

For each type of QA/QC sample, containers will be prepared and submitted for the following analyses:

1. trip blank
2. field methods (equipment) blank: VOCs; and trace metals as specified by MPCA hydrogeologist
3. field ambient air blank: only if specified
4. replicates: all analytical parameters specified

Field Blank Samples

Methods that will be used for preparing field blank samples are described below.

Trip blanks for VOCs will be filled and sealed by the analytical laboratory with laboratory-controlled, organic-free water. The 40 ml, purge and trap, blank sample vials will travel with the actual sample vials to and from the field in the cooler, to the well head, etc., so that the blanks are exposed to precisely the same conditions as the actual samples. The bottle blanks will not be opened until they are analyzed in the laboratory along with the actual VOC samples they have accompanied.

Ambient air field blanks will be filled in the field. VOC vials will be filled with laboratory-controlled, organic-free water. Containers will be opened and placed or held as closely as practical to the point at which actual sample containers are opened and filled. The sample blank containers will be filled with the laboratory-supplied water by the same personnel and at approximately the same time as the primary samples are being collected. The sample blank water in each container will be exposed to the air on site for an amount of time equivalent to that for filling and closing a primary sample container.

Field equipment/methods blanks will be collected in the field for VOCs, and trace metals as specified by the MPCA hydrogeologist. Containers used for each blank will be the same type as for the actual sample. All containers shall be precleaned within the laboratory's QA/QC program in the same manner as primary sample bottles. The blank containers will be filled in the field. Laboratory-controlled, organic-free water will be used to fill all organic blank samples. Trace metals blanks will be filled with laboratory-prepared, triple deionized water. The same preservatives will be added to both the methods blank and the primary samples. The field blank water shall contact all the equipment surfaces that the sample water will contact.

Field Replicate Samples (Duplicates)

Field replicate samples will be collected as specified by the MPCA hydrogeologist. All containers will be filled as close together in time as practical with a sampling stream that is steady and continuous.

5.0 DOCUMENTATION OF SAMPLING EVENT

This sampling protocol includes the use of forms shown in Appendix A4 or approved equivalent. They are designed for documentation of field activities and collection of field data. The forms must be completed before leaving the sampling point. The following forms or the approved equivalents must be used:

- Purging and Sampling Rate Test Form
- Water-level Data Form
- Well Purging/Field Water Quality Measurements Form
- Groundwater Sampling Information Form
- Sample Identification - Field Chain of Custody Record

5.1 Sample Identification

The Sample Identification - Field Chain of Custody Record (SI-FCCR) in Appendix A4 or an approved equivalent will be completed. All primary and QA/QC samples collected at a given sampling point over a discrete interval of time will be assigned the same sample event ID. This ID is used to link that set of containers together and associate them with all of the information contained on the Sampling Form or approved equivalent.

If the SI-FCCR is used, it will contain a unique record number printed in the upper margin on the right side of the form. If it is not used, the remainder of the paragraph may be disregarded. The container's row # appended to the record # on the form uniquely identifies each sample. In the case of a multi-container set, such as a set of three associated VOC vials, the set is uniquely identified.

Each sample container will be labeled with the following information using a waterproof marker on firmly affixed, water-resistant labels:

- site name
- unique container ID
- sample collection Date
- sample collection Time
- initials of person
- collecting sample
- parameters names/groups to be analyzed
- preservation method

Containers will be labeled at the sampling point at the time of sample collection with the following exceptions. For containers receiving preservatives in advance, "parameter names" and "preservation method" will be entered onto labels by laboratory staff. For containers receiving preservatives in the field, "preservation method" will be entered at the time individual containers are filled.

5.2 Chain Of Custody

A chain-of-custody (COC) record (SI-FCCR or approved equivalent) will be initiated in the field at the time of sampling. A copy will accompany each cooler shipped to any laboratory.

Field Chain of Custody Documentation

All signatures related to sample custody will be made in ink on the COC in a timely fashion. One or more signatures will be entered to identify the person or persons who are collecting the samples. Each time the custody of a sample or group of samples is transferred, a signature, date and time will be entered to document the transfer. A sample will be considered to be in custody if it is in any one of the following states:

- in actual physical possession
- in plain view of the custodian
- in physical possession and locked up so that no one can tamper with it
- in a secured area, restricted to authorized personnel

A secured area such as a locked storage shed or locked vehicle specified in the "comments" column, may be used for temporary storage. When using such an area, the time, date, and location of the secured area will be recorded in the "relinquished by" space. The time at which an individual regains custody will then be recorded in the "received by" space.

Sampling personnel will receive copies of sampling plans prior to the commencement of the sampling event. Pre-study briefings will be held to apprise participants of the objectives, sample locations, and chain-of-custody procedures to be followed. After samples are collected under chain of custody tracking, a de-briefing will be held in the field to verify the adherence to the chain-of-custody procedures and to determine whether additional samples are required.

Chain of Custody During Shipping and Transfer of Samples

When samples are shipped, the person sealing the shipping container will enter the time, date and their signature on the COC. The laboratory part of the COC will be enclosed in the container. A post office receipt, bill of lading, or similar document from the shipper will be retained as part of the permanent chain-of-custody documentation.

One or more custody seals will be affixed over the opening of the shipping container in a manner that precludes opening the container without breaking the seals. The container seals will be inscribed with the signature of the person sealing the container and the date and time sealed.

The receiving laboratory will be notified in advance of chain-of-custody procedures that must be followed for a group of samples. The laboratory will be instructed to note whether or not the container seals are intact and sign in the appropriate blank on the COC at the time of receipt. They will also be instructed to make a copy and return the original form to the MPCA. The final signed COC will be submitted with analytical results in the Sampling and Analysis Report.

5.3 Field Sampling Log

A daily field log of sampling activities will be kept by the field sampling crew leader. This record or log will supplement information entered on the Sampling Form. At a minimum, the log will contain a record of the following items:

- list of field personnel present
- field conditions as described below in Section 5.5 "Field Conditions"
- summary of how samples were transferred/trasported to laboratories
- description of exceptions to this protocol including specifications of which samples may have been impacted by exceptions (see below)

Information for each well sampled will include:

- the unique identifier used to label samples
- well name and Minnesota unique well number
- date and time that sampling began and ended
- list of primary and QA/QC samples sent to each laboratory
- if needed, an alias cross-reference list for QA/QC samples

5.4 Exceptions To Sampling Protocol

This protocol defines the procedures to be followed during this sampling event. Exceptions to this protocol will be noted on the Sampling Form and detailed in the Field Sampling Log (see above); The section titled “Exceptions to Protocol” in the Sampling and Analysis Report will include the following details for each exception:

- the reason for the exception
- the identification of all samples and individual parameters that may have been impacted either in terms of the quantitative or legal integrity of their reported values
- the significance of the potential impacts to the integrity of each parameter for each sample

If there has been any potentially significant impact on sample integrity, then the potential impact for each parameter for each sample affected will be footnoted whenever the results are reported or referred to in the Sampling and Analysis Report.

5.5 Field Conditions

Field conditions during the sampling event will be recorded on the Sampling Form. The Sampling and Analysis Report will include a statement regarding the likelihood that any unusual field conditions had a significant impact on the integrity of results. Field conditions reported will include but not be limited to the following:

- air temperature, wind direction, precipitation/moisture, ambient odors, airborne dust

After field record documentation is completed, the inner riser cap will be replaced and the well will be locked.

6.0 SAMPLE PRESERVATION, HANDLING AND TRANSPORT

This section describes procedures that will be followed between the time samples are collected and the time they are either shipped or delivered to an analytical laboratory.

6.1 Sample Preservation

Samples will be preserved as described in Table A-1. All Chemical preservatives, added to containers in the laboratory or field will be produced and controlled within the laboratory’s QA/QC program as reflected in the Laboratory Monitoring Protocol (QAPP). Field supplies of preservatives and sample containers with pre-dosed preservatives will be discarded and replaced with fresh preservatives no later than 14 days after receipt from the laboratory.

All samples will be thermally preserved in the field immediately after sample collection by placing the samples in an insulated ice chest containing uncontaminated ice. The ice chest containing volatile organic compound samples will be checked for temperature and recorded just before transporting samples and upon receipt at the laboratory, to verify whether or not samples are kept refrigerated at approximately 4 degrees C.

6.2 Sample Handling And Transport

All ice chests shipped will be accompanied by a COC and contain a complete address and return address both inside and outside. The samples will be kept at approximately 6 degrees C during transport to laboratories. Before transporting samples, field personnel will perform the following tasks:

- Verify that laboratory personnel will be present to receive samples when they arrive.
- Verify that laboratory personnel understand chain of custody and sample storage/preservation requirements.

- Check labeling and documentation to ensure sample identity will be clear to laboratory personnel.
- Hand deliver or ship samples in a manner that ensures samples will remain cool, about 4 degrees Celsius, until received by laboratory personnel.
- Maintain the chain-of-custody according to procedures described above.

Table A - 1: Sample Containers, Filling Method, Preservation and Holding Times

<i>PARAMETER GROUP¹</i>	<i>BOTTLE VOLUME/TY PE</i>	<i>FILL METHOD³</i>	<i>PRESERVATION⁴</i>	<i>HOLDING TIME</i>
MAJOR & MINOR IONS (Ca ²⁺ , Mg ²⁺ , Na ⁺ , K ⁺ , HCO ₃ ⁻ , SO ₄ ²⁻ , NO ₃ ⁻ , Cl ⁻)	1L HDPE	No head space	Cool If less than 24 hours cooled at 4 deg C and not preserved. If greater than 24 Hours then 2 ml H ₂ SO ₄ preserved and cooled.	28 days
NITROGEN SERIES	250 ml P	Leave head space	NaOH/pH>12 Lab, Cool	28 days
CYANIDE	500 ml HDPE	Leave head space		14 days
METALS (unfiltered)	250 ml HDPE	Leave head space	HNO ₃ /pH<2 Lab, Cool	6 months
(mercury)	120 ml HDPE	Fill to shoulder	HNO ₃ /HCL	28 days
	120 ml HDPE	Fill to shoulder	HNO ₃ /HCL	28 days
METALS (filtered)				
(mercury)	120 ml HDPE	Fill to shoulder	HNO ₃ /HCL	28 days
CHROMIUM VI (unfiltered)	125 ml P	No head space, adjust pH to 9 with 1N NaOH	Cool	24 hours 24 hours, 28 days if preserved with ammonium sulfate buffer solution and use method EPA 218.6 (method and buffer requires filtration)
CHROMIUM VI (filtered)	125 ml P	Filter 0.45 micron adjust pH to 9 with 1N NaOH	Cool	
MISCELLANEOUS				
TDS and TSS	1 L HDPE		4 deg C	7 days
specific conductance-lab	1 L HDPE		4 deg C	28 days
- BOD-5-day- - - - -	1 L HDPE		4 deg C	48 hours
- - - - -				
pH-lab	1LHDPE		Cool	2 hours
alkalinity	1 L HDPE		4 deg C	14 days.
COD	250 ml HDPE		4 deg C	28 days
VOLATILE ORGANICS	3 x 40 ml	Positive meniscus	HCl/pH<2 Field, Cool	14 days
purgeable halocarbons	GC/MS			analysis
purgeable aromatics non-halogenated volatiles				

<i>PARAMETER GROUP¹</i>	<i>BOTTLE VOLUME/TY PE</i>	<i>FILL METHOD³</i>	<i>PRESERVATION⁴</i>	<i>HOLDING TIME</i>
Dissolved gases: ethene, ethane, methane	60 mL Serum vial, crimp cap	No head space	H ₂ SO ₄	14 days
NON-VOLATILE ORGANICS base-neutral/acid extractable organics phthalate esters phenols polynuclear aromatic hydrocarbons chlorinated herbicides organochlorinated pesticides & PCBs organophosphorus pesticide acid herbicides carbamate pesticides 1,4-DIOXANE	1L AG	No head space	Na ₂ SO ₃ , HCL, Cool	14 days/extraction
DIOXINS AND DIBENZO FURANS	125 ml Positive meniscus 1 L Amber Glass	Freeze No head space	Cool	7 days extraction/40 days analysis

<i>PARAMETER GROUP¹</i>	<i>BOTTLE VOLUME/TY PE</i>	<i>FILL METHOD³</i>	<i>PRESERVATION⁴</i>
NATURAL ATTENUATION Chloride (not filtered)	1 L P		None 28 days
Sulfate (not filtered)	1 L P		4 deg C 28 days
Bromide (filtered)	250 ml		28 days
Ortho Phosphorus (filtered)	250 ml		4 deg C 48 hours
Nitrite (filtered)	250 ml		4 deg C 48 hours
Nitrate (filtered)	250 ml		4 deg C 48 hours
Ammonia, Nitrogen (not filtered)	250 ml		4 deg C, H ₂ SO ₄ 28 days
Calcium (filtered)	1 L P		HNO ₃ 6 months
Magnesium (filtered)	1 L P		HNO ₃ 6 months
Manganese (filtered)	1 L P		HNO ₃ 6 months
Potassium (filtered)	1 L P		HNO ₃ 6 months

<i>PARAMETER GROUP¹</i>	<i>BOTTLE VOLUME/TY PE</i>	<i>FILL</i>	<i>PRESERVATION⁴</i>
		<i>METHOD³</i>	
Sodium (filtered)	1 L P		HNO ₃ 6 months
Zinc (filtered)	1 L P		HNO ₃ 6 months
TOTAL COLIFORM BACTERIA	120 ml clear HDPE(sterile)	Leave head space	Na ₂ S ₂ O ₃ , Cool 8 hours
TOTAL ORGANIC CARBON	250 ml HDPE	Leave head space	H ₂ SO ₄ /pH<2 Lab, Cool 28 days
TOTAL PHOSPHORUS	250 ml HDPE	Leave head space	H ₂ SO ₄ /pH<2 Lab, Cool 28 days
SULFIDE	250 ml HDPE (unpreserved), 125 ml Serum, Glass Bottle	Leave head space	Zn(C ₂ H ₃ O ₂) ₂ *2H ₂ O& NaOH/pH>9 Lab, Cool (for serum bottle) 14 days
RADIUM, GROSS ALPHA, GROSS BETA	4 L LDPE Cubitrainer	Leave head space	HNO ₃ /pH<2 Lab 6 months
Caffeine	1000 m L clear HDPE	Fill to shoulder, leave headspace	Unpreserved
PCB Aroclors	1 L Amber	Fill to shoulder	Unpreserved 7 days to extract/40 days to analyze
PPCPs (Pharmaceuticals and Personal Care Products)	EPA 1694 1 L Amber (Collect 2 L Amber total)	Hold time is extended by freezing samples. Leave room for expansion	7 days @ 4 deg C to extract; 48 hours strongly recommended
PFAS	250 mL wide mouth HDPE Jar	Fill to shoulder; leave head space	None 28 days

(1) PARAMETER NAMES/GROUPS

Some of these parameter names actually represent groups of individual analytes. Specific analytes for each parameter/bottle type are listed in Appendix A1.

(2) BOTTLE TYPE

L: liters;
ml: milliliters;
P: polyethylene;

P & T: 40 ml purge and trap vial fitted with a Teflon® septum;
G: glass bottle fitted with Teflon®-lined cap

GG: glass bottle fitted with glass stopper
AG: amber glass bottle fitted with Teflon®-lined cap

(3) FILL METHOD

Positive meniscus: fill container completely with zero head space resulting in a positive meniscus with no air bubbles in container, add acid and cap container quickly;
No head space: fill container completely; container will not be rinsed; overfilling will be minimized.
Leave head space: fill container about 90 to 95 % full - do not allow preservative (if present) to be diluted by overfilling container

Fill from bottom: fill container completely from the bottom of container using tubing; allow several bottle-volumes of water to overflow before sealing bottle
Filter 0.45 micron: filter in-line with positive pressure through a filter with 0.45 micron pore size.

(4) PRESERVATION

Cool: place container inside sealed Zip-Lock bag; place in cooler with sufficient ice to quickly bring temperature down to 4 degrees C and hold at approximately 4 degrees C until received by laboratory personnel
HNO₃/pH<2: add a predetermined amount of high-purity HNO₃ to sample to bring the sample pH down to 2 or less;
HCL/pH<2: add a predetermined amount of high-purity HCL to sample to bring the sample pH down to 2 or below;
NaOH/pH>12: add a predetermined amount of high-purity NaOH to sample to bring the sample pH up to 12 or above; (for Cyanide, use 50% NaOH solution and add ascorbic acid if oxidizing agents are present)
Zn(C₂H₃O₂)₂*2H₂O: predetermined amount added by laboratory staff to prevent oxidation of sulfide
Field: preservative added in the field by field personnel
Lab: preservative added to container in laboratory before going into the field

(5) DISSOLVED OXYGEN

For Winkler method, if holding time might exceed 2 hours, field staff will make arrangements with the laboratory to prepare a separate 1 L glass stoppered (GG) bottle by adding preservatives in the field immediately after sample collection.

Table A - 2: Order of Purging and Sampling of Wells and Purging Rates

THIS TABLE WILL BE SAMPLING SITE/EVENT SPECIFIC.

Figure A - 1: Location of Sampling Points

SITE MAP SHOWING LOCATIONS OF ALL SAMPLING POINTS.

APPENDIX A1: SELECTED ANALYTICAL PARAMETERS, METHOD NUMBERS AND REPORTING LIMITS

THIS TABLE WILL BE SAMPLING SITE/EVENT SPECIFIC

APPENDIX A2: EQUIPMENT DESCRIPTIONS AND SPECIFICATIONS

APPENDIX A3: PURGING AND SAMPLING EQUIPMENT INSPECTION AND MAINTENANCE SCHEDULE

APPENDIX A4: EXAMPLE FORMS

Form GWS #1: Purging and Sampling Rate Test Form

Form GWS #2: Water-level Data Form

Form GWS #3: Well Purging/Field Water Quality Measurements Form

Form GWS #4: Groundwater Sampling Information Form

Form GWS #5: Sample Identification - Field Chain of Custody Record

APPENDIX A5: SUPPLEMENT TO FIELD WATER QUALITY MEASUREMENT PROCEDURES

Specifications on equipment descriptions, maintenance, calibration and operation will be supplied by contractor as part of bid language. Examples of approved equivalent forms, if used, will also be submitted by contractors.

APPENDIX A6 : SEQUENCE OF FIELD SAMPLING ACTIVITIES

This is a general outline of the chain of events in the field. The detailed sampling protocol takes precedence over this. The following sequence of activities will be followed for sampling of monitoring wells at the facility:

1. Inspect the well for damage, missing parts, labeling, and for evidence of tampering; document field conditions

2. Review equipment list; prepare area around well for sampling; don protective gloves
3. Unlock well and remove inner riser cap to clean storage
4. Use explosivity meter and/or organic vapor monitor, as appropriate
5. Calibrate equipment within specified operating limits; document
6. Measure static water elevation and well depth; calculate well volume
7. Document field work in the field log book and other appropriate forms such as the well purging form
8. Measure field parameters while simultaneously purging the well based on predetermined rates
9. Consult parameter list; adequately label parameters
10. Collect the sample and field filter as appropriate, add preservatives as specified
11. Place the samples in a chilled shipment cooler
12. Measure final water level after pumping ends
13. Perform additional field analyses such as alkalinity, if specified
14. Prepare quality control samples
15. Complete documentation for the well on sampling form
16. Replace inner riser cap and lock well
17. Clean any reusable equipment and proceed to the next well
18. Initiate chain-of-custody controls
19. Ship the samples to the laboratory for analysis

Guidance for Per- and Polyfluoroalkyl Substances: Analytical

The Minnesota Pollution Control Agency (MPCA) intends to update the information within this per- and polyfluoroalkyl substances (PFAS) guidance document as new information becomes available. Users of this PFAS guidance are encouraged to visit the <https://www.pca.state.mn.us/about-mpca/mpca-quality-system> to access the current version of this document. See the MPCA Quality System webpage for the sampling guidance document.

PFAS are emerging contaminants composed of thousands of human-made, fluorinated organic chemicals. The actual number of compounds is continuously changing, as some PFAS are no longer produced in the United States due to regulatory and voluntary actions, while new ones are created as alternatives. Phased-out PFAS still exist in the environment, human bodies, and some products due to their extreme environmental persistence, presence in waste streams, and ongoing global production.

Purpose and objectives

This document is intended for use by laboratories, project managers and MPCA staff who generate, review or report PFAS data to the MPCA. The purpose of this document is to provide:

- MPCA data quality objectives.
- Consistency and data quality.
- Guidance to laboratories, MPCA staff, and contractors.

General PFAS analysis

Analytical methods are still evolving but the MPCA recommends that a multi-laboratory verified matrix appropriate method is used. Laboratories must incorporate the data quality objectives in this document if an approved method is unavailable or not followed. Laboratories and methods accredited by the Minnesota Department of Health Laboratory Accreditation Program can be found ([MNELAP Accredited laboratories](#)). The performance-based criteria included in this guidance document outlines specific quality processes for sample preparation, instrument calibration, and analysis when working with PFAS.

Isotope Dilution Analysis (IDA)

Isotope dilution technique involves quantitation of a compound of interest using a labeled isotope of that very compound. A variety of isotopically labeled analogs are added to each sample prior to extraction, or prior to analysis when extraction isn't required. The isotopically labeled analogs, sometimes referred to as surrogates or as extracted internal standard analytes, function from a data usability standpoint as both a surrogate standard (calculation of the recovery of the standard) and as an internal standard (used in the calculation of the target compounds). Include isotope analog recovery (IS, MS, etc.) for each sample and analyte in the data report. Analog recoveries need to be within $100 \pm 30\%$ and corrective action processes should be followed for ongoing failures. Analog are added to samples prior to preparation and/or analysis depending on the sample matrix; for example:

- Aqueous samples: added to samples prior to extraction.
- Solid samples and biota: added after homogenization and subsampling, prior to addition of water or extraction solvent.
- Serial dilution: Aqueous film forming foam (AFFF) and other foams: added after final dilution

Instrument and analyte identification

The analytical technique of choice for PFAS is liquid chromatography - mass spectrometry - mass spectrometry (LC/MS/MS). Quantify analytes by comparing the product ion of one precursor ion and retention time in samples to calibration standards. Additional product ions and their ion ratios can be used to distinguish analytes from matrix interference. It is recommended that branched standards are used when available, PFBA and PFPeA are exceptions. Use the ion transition recommendations below when monitoring for two or more ion transitions from parent to characteristic product ions. Ion transition ratio criteria should be determined based on information obtained from standards and used to detect potential bias in sample results.

Ion Transitions:

- PFOA: 413 → 369, 413 → 319, 413 → 269
- PFOS: 499 → 80, 499 → 99, 499 → 130
- PFHxS: 399 → 80, 399 → 99, 399 → 130
- PFBS: 299 → 80, 299 → 99, 299 → 130
- 4:2FTS: 327 → 307
- 6:2FTS: 427 → 407
- 8:2FTS: 527 → 507
- N-EtFOSAA:584 → 419
- NMeFOSAA:570 → 419

Quantitate samples by integrating the total response, accounting for peaks that are identified as linear and branched isomers. Sum the different transitions. Documentation of the primary and confirmation transitions is required. If these transitions are not used, the reason must be technically justified and documented.

Interferences

Laboratories must have a process to limit and log cross-contamination as PFAS could be found in laboratory items such as polytetrafluoroethylene products (PTFE), solvent lines, aluminum foil, and methanol, which could lead to method interferences and elevated baselines in chromatograms. Laboratory equipment and supplies that contact samples should be analyzed and contain less than 1/3 the method reporting limit for each PFAS method analyte and isotope performance standards.

Standards

Certified analytical standards when available are required. Products vary in purity and isomer profiles that can compromise accuracy, precision and reproducibility of data. Linear and branched isomers are not available for all analytes. Standards must be stored in glass ampules following manufacturer's directions on storage and shelf life for stock and working standards. Investigate stability of prepared analytical standards as some PFAS analytes form methyl esters over time in methanolic solutions.

Perfluoroalkyl carboxylic acids (PFCAs) including perfluorooctanoic acid (PFOA) have been widely recognized as persistent environmental contaminants. For accurate quantification of PFCAs, their stability in calibration solutions is important because they are criteria of quantification. Stability studies indicate that no methyl esters (perfluorooctanoate MePFOA, and methyl formate) were detected in methanol solutions immediately after preparation. MePFOA was detected in calibration solutions stored around 4 months and increased with increase in methyl formate. PFCAs including PFOA should be used immediately after preparation when methanol is used as a solvent.

Calibration

Mass calibration is done once or twice a year or as described by manufacturer. Analytical calibration curves should be run at the beginning of each day. The calibration curve should contain six, but preferably 8-10, non-zero calibration standards containing a consistent amount of stable isotope internal standards. Select the simplest curve fit possible. A linear curve fit is not likely due to the nature of PFAS. The lowest calibration point must be at or below the method reporting limit. Run appropriate blanks with the calibration curve. A calibration verification (ICV) from a source separate from the calibration standard must be analyzed after each calibration curve and before sample analyses can begin. Calibration curves should be evaluated against its regression analysis and standards equal to or less than the method reporting limit should be within $\pm 50\%$ of the true value. All other calibration points should be within $\pm 30\%$ of the true value.

Continuing calibration verifications (CCV) must be run prior to sample analysis, after every 10 field samples, and after the analytical sequence. The calibration acceptance criteria must be within $100 \pm 30\%$ of true known value. A standard at the method reporting limit must be analyzed prior to each analytical batch to document the instrument's ability to accurately quantitate down to the method reporting limit concentration. The acceptance criteria for the method reporting limit verification is $100 \pm 30\%$ of true known value. If these criteria are not met, the method reporting limit has been set too low and must be confirmed again at a higher concentration.

Calibration criteria for methods using isotope dilution must calibrate with the isotopically labeled analogs of the analytes. Laboratories must include the isotope analog recoveries for each sample and analyte in data reports, including the calibration curve data.

Instrument blanks

The ubiquitous nature of PFAS makes it critical to analyze instrument blanks to determine if the instrument is potentially affected by PFAS concentrations. Instrument blanks must be analyzed after highest calibration standard and daily prior to sample analysis. The concentration of each analyte must be $\leq \frac{1}{2}$ the method reporting limit. Method blanks must be PFAS-free, indicating each analyte must be $\leq \frac{1}{3}$ the method reporting limit.

Quality control samples

Recommended QA samples for PFAS analysis:

- Method blanks- two per batch of field samples, not to exceed 20 field samples. Same media as associated field samples and undergoes same sample prep. Each analyte must be $\leq \frac{1}{3}$ the method reporting limit.
- Instrument blank- minimum of 1 prior to start of daily analysis and after samples exceeding quantitation range. Must contain internal standards. Solvent
- Sample duplicate (DUP) - minimum 1 per batch of 20 field samples or fewer.
- Lab control spike (LCS) - In triplicate at 3 levels per analytical batch (low, medium, high). LCS must contain all project specific PFAS analytes in same media as associated samples. The recovery acceptance for each method analyte is $100 \pm 30\%$ and the percent relative standard deviation (RSD) of the recoveries $\leq 30\%$.
- Matrix spike and Matrix spike duplicate (MS/MSD) - one pair prepared with each analytical batch. The recovery acceptance for each analyte is $100 \pm 30\%$ and the RSD is $\leq 30\%$.

Representation sample

The following is recommended to ensure a representative sample/subsample is used for analysis:

- Use the entire sample for solid phase extraction (SPE) of aqueous samples.
- Sample filtration is not recommended with high particulate samples because retention of PFAS onto SPE filters is likely.

- Samples can be centrifuged to reduce sample particulate. This is not recommended unless target analyte absorption has been investigated.
- High PFAS concentrations can overload SPE cartridge capacity. Serial dilutions are recommended for known high concentration samples, such as AFFF.
- Homogenize soil samples prior to subsampling. SPE is not ideal for soil extraction.
- Cleanup procedures must be done on associated batch QC samples (method blank, lab control samples) if matrix interferences occur. PFAS loss may occur when extracts are evaporated to dryness or at temperatures greater than 30oC.

Dilutions

When isotope dilution samples require a dilution, the volume of the diluent contains the same concentration of labeled isotope compounds as what was originally spiked into the sample. The isotope recovery results from the initial analysis should not be used to adjust the data from the secondary dilution analysis.

When non-isotope dilution analyses require a dilution, quantitate target compounds and surrogates relative to internal standards. Note results are from a dilution on the final report. These results are not recovery-corrected.

Method reporting limits

Method reporting limits are based upon performance based method criteria and performance base instrument criteria and how they behave in each individual laboratory. Each lab has their own equipment and levels of background contamination. Below is a table of compounds broken up into different groups includes reporting limit goals the MPCA would like to work towards however, they may not be achievable for all compound or by all laboratories.

Compound	CAS number	Group	Aqueous RL goals (ng/L)	Solid RL goals (ng/L)	*Biota RL goals (ng/L)
Carboxylic Acids (C ₄ -C ₁₂ common acids)		Group 1			
Perfluorobutanoic acid (PFBA)	375-22-4	Group 1	5-10	5-10	10
Perfluoropentanoic acid (PFPeA)	2706-90-3	Group 1	5	5	10
Perfluorohexanoic acid (PFHxA)	307-24-4	Group 1	5	5	10
Perfluoroheptanoic acid (PFHpA)	375-85-9	Group 1	5	5	10
Perfluorooctanoic acid (PFOA)	335-67-1	Group 1	5	5	10
Perfluorononanoic acid (PFNA)	375-95-1	Group 1	5	5	10
Perfluorodecanoic acid (PFDA)	335-76-2	Group 1	5	5	10
Perfluoroundecanoic acid (PFUnA)	2058-94-8	Group 1	5	5	10
Perfluorododecanoic acid (PFDoA)	307-55-1	Group 1	5	5	10
Carboxylic Acids (C ₁₃ -C ₁₈ less common acids)		Group 3			
Perfluorotridecanoic Acid (PFTrA)	72629-94-8	Group 3	5	5	10
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	151772-58-6	Group 3	5	5	10
Perfluoro-3-methoxypropanoic acid (PFMPA)	377-73-1	Group 3	5	5	10
Perfluoro-4-methoxybutanoic acid (PFMBA)	863090-89-5	Group 3	5	5	10
Perfluorotetradecanoic acid (PFTeA)	376-06-7	Group 3	5	5	10

Compound	CAS number	Group	Aqueous RL goals (ng/L)	Solid RL goals (ng/L)	*Biota RL goals (ng/L)
Perfluorohexadecanoic acid (PFHxDA)	67905-19-5	Group 3	5	5	10
Perfluorooctadecanoic acid (PFODA)	16517-11-6	Group 3	5	5	10
Sulfonates (C ₄ -C ₁₂ common sulfonates)		Group 2			
Perfluorobutanesulfonic acid (PFBS)	375-73-5	Group 2	5	5	10
Perfluoropentanesulfonic acid (PFPeS)	2706-91-4	Group 2	5	5	10
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	Group 2	5	5	10
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	Group 2	5	5	10
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	Group 2	5	5	10
Perfluorononanesulfonic acid (PFNS)	474511-07-4	Group 2	5	5	10
Perfluorodecanesulfonic acid (PFDS)	335-77-3	Group 2	5	5	10
Perfluorododecanesulfonic acid (PFDoS)	79780-39-5	Group 2	5	5	10
Perfluoro(2-ethoxyethane)sulfonic acid (PFEEESA)	113507-82-7		5	5	10
Amides		Group 4			
Perfluorooctane Sulfonamide (FOSA)	754-91-6	Group 4	10	10	20
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	2355-31-9	Group 4	10	10	20
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	2991-50-6	Group 4	10	10	20
Telomer Sulfonic Acids		Group 5			
4:2 Fluorotelomer sulfonic acid (4:2 FTSA)	757124-72-4	Group 5	10	10	20
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	27619-97-2	Group 5	10	10	20
8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	39108-34-4	Group 5	10	10	20
8:2 Fluorotelomer alcohol (8:2 FTOH)	678-39-7	Group 5	10	10	20
8:2 Fluorotelomer unsaturated carboxylic acid (8:2 FTUCA)	70887-84-2	Group 5	10	10	20
8:2 Polyfluoroalkyl phosphate diester (8:2 diPAP)	678-41-1	Group 5	10	10	20
4:2 Fluorotelomer sulfonic acid (4:2 FTSA)	757124-72-4	Group 5	10	10	20
10:2 Fluorotelomer sulfonic acid (10:2 FTSA)	120226-60-0	Group 5	10	10	20
N-Methyl perfluorooctane sulfonamidoethanol (N-MeFOSE)	24448-09-7				
N-Ethyl perfluorooctane sulfonamidoethanol (N-EtFOSE)	1691-99-2				
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8				

Compound	CAS number	Group	Aqueous RL goals (ng/L)	Solid RL goals (ng/L)	*Biota RL goals (ng/L)
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2				
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2355-31-9				
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2991-50-6				
Decafluoro-4-(pentafluoroethyl) cyclcohexanesulfonic acid (PFecHS)					
2-perfluorohexyl ethanoic acid (FHEA)					
2-perfluorooctyl ethanoic acid (FOEA)					
2-perfluorodecyl ethanoic acid (FDEA)					
2H-perfluoro-2-decenoic acid (FOUEA)					
3-perfluoroheptyl propanoic acid (FHpA)	812-70-4				
2H-perfluoro-2-octenoic acid (FHUEA)					
2,3,3,3-tetrafluoro-2-(heptafluoropropoxy) propanoate (CF ₃ CF ₂ CF ₂ OCF(CF ₃)COO-NH ₄ ⁺ (Gen-X)	62037-80-3				
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11CL-PF3OUdS)	763051-92-9				
2-(6-Chloro-1,1,2,2,3,3,4,4,5,5,6,6-dodecafluorohexoxy)-1,1,2,2-tetrafluoroethanesulfonate (9Cl-PF3ONS)	73606-19-6				
3H-Perfluoro-3-[(3-methoxy-propoxy) propanoic acid] (ADONA)	919005-14-4				
Hexafluoropropylene oxide dimer acid (HFPO-DA)	13252-13-6				
9-Chlorohexadecafluoro-3-oxane-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1				
3- Perfluoropropyl propanoic acid (3:3FTCA)	356-02-5				
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	914637-49-3				

*Biota reporting limits will depend on the biota sampled. Biota can cause matrix enhancement and greatly increase the method reporting limits.



Environmental Health Division
 Drinking Water Protection Section
 P.O. Box 64975
 St. Paul, Minnesota 55164-0975
 651-201-4700

EXHIBIT C - SUPPLEMENT 5

Drinking Water Protection Staff Contacts

REPORTING POSITIVE TOTAL COLIFORM ANALYTICAL RESULTS. Positive total coliform results will be reported electronically to DWP within 24 hours of determination.

REPORTING POSITIVE E. COLI ANALYTICAL RESULTS. Positive E. coli results will be reported immediately to DWP via person to person communication, and electronically within 24 hours of determination.

Contact DWP staff during business hours, followed up with an e-mail. If 1st person on list is not available, contact 2nd person listed or “0” out to receptionist.

Community Public Water Supply Unit; Community public water supply ID numbers begin with the # 1

Primary; Samantha Miltz
 651/201-6734
samatha.miltz@state.mn.us

Secondary; Vacant

or, “0” out to receptionist

and, email; health.drinkingwateradvisory@state.mn.us

Noncommunity Public Water Supply Unit; Noncommunity public water supply ID numbers begin with the #5

Primary; Rochelle Steinbruckner
 651/201-4689
rochelle.steinbruckner@state.mn.us

Secondary; Christine Felling
 651/201-4682
christine.Felling@state.mn.us

or, “0” out to receptionist

and, email; health.noncommunitycompliance@state.mn.us

For all Delegated Programs, contact

Cody Bahr
 651/201-4657
cody.bahr@state.mn.us

DWP Contract Coordinator

Anita Smith
 651/201-4664
anita.smith@state.mn.us



Environmental Health Division
Drinking Water Protection Section
P.O. Box 64975
St. Paul, Minnesota 55164-0975
651-201-4700

EXHIBIT C SUPPLEMENT 6

TOTAL COLIFORM BACTERIA REPLACEMENT SAMPLE KIT

Date: _____

Public Water Supply: _____

You must resample as soon as possible because your sample arrived:

- More than 30 hours after collection.
- Sample was received damaged or leaked during shipment.
- Inadequate sample volume.
- Other _____.

Included is a new test kit. Please resubmit another sample as soon as possible. Samples must be shipped the same day. Samples must arrive to the lab within 30 hours after collection.

Samples should be collected Monday thru Wednesday

If you have any questions, contact _____ at _____ or, by e-mail at _____.

Thank you.

EXHIBIT C – SUPPLEMENT 7

FEDERAL REQUIREMENTS (SUBPART O)

Applicable Regulations:

Activities funded under this agreement are subject to applicable sections of the following federal regulations, which are passed on to the Contractor and hereby incorporated into this agreement:

- Code of Federal Regulations Title 40 (Protection of the Environment), Part 35 (State And Local Assistance), Subpart O (Cooperative Agreements and Superfund State Contracts for Superfund Response Actions); and,
- Code of Federal Regulations Title 40 Part 31 Uniform Administrative Requirements For Grants And Cooperative Agreements To State And Local Governments.

Guidance:

- Title 40 of the Code of Federal Regulations Part 35 may be abbreviated as “40 CFR 35,” and its sections will follow as decimal places to the right. (e.g. 40 CFR 35.6450).
- Where a reference is underlined and includes an “*” as a suffix in this Attachment (e.g. 40 CFR 35.6450*), the text of the reference will be provided in an indented format and immediately below the section for the Contractor’s reference, with the reference preceded by an “*” (e.g. *40 CFR 35.6450). The included and expanded citations do not necessarily represent all applicable regulations that have bearing upon this Agreement, especially where entire parts of U.S. Code are referenced.

Location of Citations:

- Citations from the Code of Federal Regulations may be referenced at: <http://www.gpoaccess.gov/cfr/retrieve.html>.
- Citations from the United States Code may be referenced at: <http://www.gpoaccess.gov/uscode/index.html>.

Definitions:

- *Agreement*. This Request for Proposals (RFP) and any of its incorporated attachments.
- *Recipient*. The Minnesota Pollution Control Agency (MPCA), which accepted the U.S. Environmental Protection Agency (EPA) Cooperative Agreement(s) that funds this Agreement, and where applicable, the Contractor where a section is directed to apply.
- *Contractor*. Any party to whom the Recipient awards a contract, and where applicable, any party to whom the Contractor awards a contract

NOTE:

- In order to satisfy federal regulation related to activities under this Agreement, a report or other submission may be required from the Contractor. If a report or other submission is required, the requirement and instructions for satisfying that requirement will be included in a work order or other agreement issued under this Agreement.

40 CFR 35.6550 Procurement System Standards

(b) *Contractor standards*

- (1) *Disclosure requirements regarding Potentially Responsible Party relationships.* The recipient must require each prospective contractor to provide with its bid or proposal:
 - (i) Information on its financial and business relationship with all PRPs at the site and with the contractor's parent companies, subsidiaries, affiliates, subcontractors, or current clients at the site. Prospective contractors under a Core Program Cooperative Agreement must provide comparable information for all sites within the recipient's jurisdiction. (This disclosure requirement encompasses past financial and business relationships, including services related to any proposed or pending litigation, with such parties);
 - (ii) Certification that, to the best of its knowledge and belief, it has disclosed such information or no such information exists; and
 - (iii) A statement that it shall disclose immediately any such information discovered after submission of its bid or proposal or after award. The recipient shall evaluate such information and if a member of the contract team has a conflict of interest which prevents the team from serving the best interests of the recipient, the prospective contractor may be declared nonresponsible and the contract awarded to the next eligible bidder or offeror.
- (2) *Conflict of interest*
 - (i) *Conflict of interest notification.* The recipient must require the contractor to notify the recipient of any actual, apparent, or potential conflict of interest regarding any individual working on a contract assignment or having access to information regarding the contract. This notification shall include both organizational conflicts of interest and personal conflicts of interest. If a personal conflict of interest exists, the individual who is affected shall be disqualified from taking part in any way in the performance of the assigned work that created the conflict of interest situation.
 - (ii) *Contract provisions.* The recipient must incorporate the following provisions or their equivalents into all contracts, except those for well-drilling, fence erecting, plumbing, utility hook-ups, security guard services, or electrical services:
 - (A) *Contractor data.* The contractor shall not provide data generated or otherwise obtained in the performance of contractor responsibilities under a contract to any party other than the recipient, EPA, or its authorized agents for the life of the contract, and for a period of five years after completion of the contract.
 - (B) *Employment.* The contractor shall not accept employment from any party other than the recipient or Federal agencies for work directly related to the site(s) covered under the contract for five years after the contract has terminated. The recipient agency may exempt the contractor from this requirement through a written release. This release must include EPA concurrence.

- (3) *Certification of independent price determination.* The recipient must require that each contractor include in its bid or proposal a certification of independent price determination. This document certifies that no collusion, as defined by Federal and State antitrust laws, occurred during bid preparation.
- (4) *Recipient's Contractors.* The recipient must require its contractor to comply with the requirements in §§35.6270(a)(1) and (2)*; 35.6320 (a) and (b) *; 35.6335*; 35.6700*; and 35.6705*. For additional contractor requirements, see also §35.6710(c) *; 35.6590(b) *; and 35.6610*.

As per 40 CFR 35.6550 (b)(4), contractors must comply with the following:

*40 CFR 35.6270(a)(1) and (2) Standards for financial management systems

(a) *Accounting system standards*

- (1) *General.* The recipient's system must track expenses by site, activity, and, operable unit, as applicable, according to object class. The system must also provide control, accountability, and an assurance that funds, property, and other assets are used only for their authorized purposes. The recipient must allow an EPA review of the adequacy of the financial management system as described in 40 CFR 31.20(c) *.
- (2) *Allowable costs.* The recipient's systems must comply with the appropriate allowable cost principles described in 40 CFR 31.22*.

*40 CFR 31.20(c) Standards for financial management systems

- (c) An awarding agency may review the adequacy of the financial management system of any applicant for financial assistance as part of a preaward review or at any time subsequent to award.

*40 CFR 31.22 Allowable costs. Costs deemed to be allowable for reimbursement under this agreement include those required for the completion of tasks identified in the approved workplan or work order, and are further governed by this subpart.

(a) *Limitation on use of funds.* Grant funds may be used only for:

- (1) The allowable costs of the grantees, subgrantees and cost-type contractors, including allowable costs in the form of payments to fixed-price contractors; and
 - (2) Reasonable fees or profit to cost-type contractors but not any fee or profit (or other increment above allowable costs) to the grantee or subgrantee.
- (b) *Applicable cost principles.* For each kind of organization, there is a set of Federal principles for determining allowable costs. Allowable costs will be determined in accordance with the cost principles applicable to the organization incurring the costs. The following chart lists the kinds of organizations and the applicable cost principles.

[Table follows on next page]

For the costs of a-	Use the principles in-
State, local or Indian tribal government	2 CFR part 225
Private nonprofit organization other than an (1) institution of higher education, (2) hospital, or (3) organization named in OMB Circular A-122 as not subject to that circular	2 CFR part 230
Educational institutions.	2 CFR part 220
For-profit organization other than a hospital and an organization named in OMB Circular A-122 as not subject to that circular	48 CFR part 31, Contract Cost Principles and Procedures, or uniform cost accounting standards that comply with cost principles acceptable to the Federal agency.

*40 CFR 35.6320 (a) and (b) Usage rate

- (a) *Usage rate approval.* To charge EPA a fee for use of equipment purchased with recipient funds or to allocate the cost of equipment by site, activity, and operable unit, as applicable, the recipient must apply a usage rate. The recipient must submit documentation of the usage rate computation to EPA. The EPA-approved usage rate must be included in the Cooperative Agreement before the recipient incurs these equipment costs.
- (b) *Usage rate application.* The recipient must record the use of the equipment by site, activity, and operable unit, as applicable, and must apply the usage rate to calculate equipment charges by site, activity, and operable unit, as applicable. For Core Program and pre-remedial activities, the recipient is not required to apply a usage rate.

*40 CFR 35.6335 Property management standards

The recipient must comply with the following property management standards for property purchased with Comprehensive Environmental Response Compensation and Liability Act (CERCLA) funds. The recipient may use its own property management system if it meets the following standards.

- (a) *Control.* The recipient must maintain:
- (1) *Property records* for CERCLA-funded property which include the contents specified in §35.6700(c) (full citation found below, page 6);
 - (2) *A control system* that ensures adequate safeguards for prevention of loss, damage, or theft of the property. The recipient must make provisions for the thorough investigation and documentation of any loss, damage, or theft;
 - (3) *Procedures* to ensure maintenance of the property are in good condition and periodic calibration of the instruments used for precision measurements;
 - (4) *Sales procedures* to ensure the highest possible return, if the recipient is authorized to sell the property;
 - (5) *Provisions for financial control and accounting* in the financial management system of all equipment; and

- (6) *Identification* of all federally owned property.
- (b) *Inventory and reporting for CERCLA-funded equipment*
 - (1) *Physical inventory*. The recipient must conduct a physical inventory at least once every two years for all equipment except that which is part of the in-place remedy. The recipient must reconcile physical inventory results with the equipment records.
 - (2) *Inventory reports*. The recipient must comply with requirements for inventory reports set forth in §35.6660*.
- (c) *Inventory and reporting for federally owned property*
 - (1) *Physical inventory*. The recipient must conduct a physical inventory:
 - (i) Annually;
 - (ii) When the property is no longer needed; and
 - (iii) Within 90 days after the end of the project period.
 - (2) *Inventory reports*. The recipient must comply with requirements for inventory reports in §35.6660*.

*40 CFR 35.6660 Property inventory reports

(a) CERCLA-funded property - (1) Content. The report must contain the following information:

- (i) Classification and value of remaining supplies;
- (ii) Description of all equipment purchased with CERCLA funds, including its current condition;
- (iii) Verification of the current use and continued need for the equipment by site, activity, and operable unit, as applicable;
- (iv) Notification of any property which has been stolen or vandalized; and
- (v) A request for disposition instructions for any equipment no longer needed on the project.

(2) Reporting frequency. The recipient must submit an inventory report to EPA at the following times:

- (i) Within 90 days after completing any CERCLA-funded project or any response activity at a site; and
- (ii) When the equipment is no longer needed for any CERCLA-funded project or any response activity at a site.

(b) Federally owned property - (1) Content. The recipient must include the following information for each federally owned item in the inventory report:

- (i) Description;
- (ii) Decal number;
- (iii) Current condition; and
- (iv) Request for disposition instructions.

(2) Reporting frequency. The recipient must submit an inventory report to the appropriate EPA property accountable officer at the following times:

- (i) Annually, due to EPA on the anniversary date of the award;
- (ii) When the property is no longer needed; and
- (iii) Within 90 days after the end of the project period.

*40 CFR 35.6700 Project records

The lead agency for the response action must compile and maintain an administrative record consistent with section 113 of CERCLA, the National Contingency Plan, and relevant EPA

policy and guidance. In addition, recipients of assistance (whether lead or support agency) are responsible for maintaining project files described as follows.

- (a) *General*. The recipient must maintain project records by site, activity, and operable unit, as applicable.
- (b) *Financial records*. The recipient must maintain records which support the following items:
 - (1) Amount of funds received and expended; and
 - (2) Direct and indirect project cost.
- (c) *Property records*. The recipient must maintain records which support the following items:
 - (1) Description of the property;
 - (2) Manufacturer's serial number, model number, or other identification number;
 - (3) Source of the property, including the assistance identification number;
 - (4) Information regarding whether the title is vested in the recipient or EPA;
 - (5) Unit acquisition date and cost;
 - (6) Percentage of EPA's interest;
 - (7) Location, use and condition (by site, activity, and operable unit, as applicable) and the date this information was recorded; and
 - (8) Ultimate disposition data, including the sales price or the method used to determine the price, or the method used to determine the value of EPA's interest for which the recipient compensates EPA in accordance with §§35.6340, 35.6345, and 35.6350.
- (d) *Procurement records*
 - (1) *General*. The recipient must maintain records which support the following items, and must make them available to the public:
 - (i) The reasons for rejecting any or all bids; and
 - (ii) The justification for a procurement made on a noncompetitively negotiated basis.
 - (2) *Procurements in excess of the simplified acquisition threshold*. The recipient's records and files for procurements in excess of the simplified acquisition threshold must include the following information, in addition to the information required in paragraph (d)(1) of this section:
 - (i) The basis for contractor selection;
 - (ii) A written justification for selecting the procurement method;
 - (iii) A written justification for use of any specification which does not provide for maximum free and open competition;
 - (iv) A written justification for the choice of contract type; and
 - (v) The basis for award cost or price, including a copy of the cost or price analysis made in accordance with §35.6585* and documentation of negotiations.
- (e) *Other records*. The recipient must maintain records which support the following items:
 - (1) Time and attendance records and supporting documentation;
 - (2) Documentation of compliance with statutes and regulations that apply to the project; and
 - (3) The number of site-specific technical hours spent to complete each pre-remedial product.

*40 CFR 35.6585 Cost and price analysis

- (a) *General*. The recipient must conduct and document a cost or price analysis in connection with every procurement action including contract modification.
 - (1) *Cost analysis*. The recipient must conduct and document a cost analysis for all negotiated contracts over the simplified acquisition threshold and for all change orders regardless of price. A cost analysis is not required when adequate price competition exists and the recipient can establish price reasonableness. The recipient must base its determination of price

reasonableness on a catalog or market price of a commercial product sold in substantial quantities to the general public, or on prices set by law or regulation.

- (2) *Price analysis*. In all instances other than those described in paragraph (a)(1) of this section, the recipient must perform a price analysis to determine the reasonableness of the proposed contract price.
- (b) *Profit analysis*. For each contract in which there is no price competition and in all cases in which cost analysis is performed, the recipient must negotiate profit as a separate element of the price. To establish a fair and reasonable profit, consideration will be given to the complexity of the work to be performed, the risk borne by the contractor, the contractor's investment, the amount of subcontracting, the quality of its record of past performance, and industry profit rates in the surrounding geographical area for similar work.

*40 CFR 35.6705 Records retention

- (a) *Applicability*. This requirement applies to all financial and programmatic records, supporting documents, statistical records, and other records which are required to be maintained by the terms, program regulations, or the Cooperative Agreement, or are otherwise reasonably considered as pertinent to program regulations or the Cooperative Agreement.
- (b) *Length of retention period*. The recipient must maintain all records for 10 years following submission of the final Financial Status Report unless otherwise directed by the EPA award official, and must obtain written approval from the EPA award official before destroying any records. If any litigation, claim, negotiation, audit, cost recovery, or other action involving the records has been started before the expiration of the ten-year period, the records must be retained until completion of the action and resolution of all issues which arise from it, or until the end of the regular ten-year period, whichever is later.
- (c) *Substitution of an unalterable electronic format*. An unalterable electronic format, acceptable to EPA, may be substituted for the original records. The copying of any unalterable electronic format must be performed in accordance with the technical regulations concerning Federal Government records (36 CFR parts 1220 through 1234) and EPA records management requirements.
- (d) *Starting date of retention period*. The recipient must comply with the requirements regarding the starting dates for records retention described in 40 CFR 31.42(c) (1) and (2) *.

*40 CFR 31.42(c) (1) and (2) Retention and access requirements for records

(c) Starting date of retention period

- (1) General. When grant support is continued or renewed at annual or other intervals, the retention period for the records of each funding period starts on the day the grantee or subgrantee submits to the awarding agency its single or last expenditure report for that period. However, if grant support is continued or renewed quarterly, the retention period for each year's records starts on the day the grantee submits its expenditure report for the last quarter of the Federal fiscal year. In all other cases, the retention period starts on the day the grantee submits its final expenditure report. If an expenditure report has been waived, the retention period starts on the day the report would have been due.

- (2) Real property and equipment records. The retention period for real property and equipment records starts from the date of the disposition or replacement or transfer at the direction of the awarding agency.

*40 CFR 35.6710(c) Records access

- (a) *Recipient requirements*. The recipient must comply with the requirements regarding records access described in 40 CFR 31.42(e) *.
- (b) *Availability of records*. The recipient must, with the exception of certain policy, deliberative, and enforcement documents which may be held confidential, ensure that all files are available to the public.
- (c) *Contractor requirements*. The recipient must require its contractor to comply with the requirements regarding records access described in 40 CFR 31.36(i)(10) *.

*40 CFR 31.42(e) Retention and access requirements for records

(e) Access to records

- (1) Records of grantees and subgrantees. The awarding agency and the Comptroller General of the United States, or any of their authorized representatives, shall have the right of access to any pertinent books, documents, papers, or other records of grantees and subgrantees which are pertinent to the grant, in order to make audits, examinations, excerpts, and transcripts.
- (2) Expiration of right of access. The rights of access in this section must not be limited to the required retention period but shall last as long as the records are retained.

*40 CFR 31.36(i)(10) Procurement

(i) Contract provisions. A grantee's and subgrantee's contracts must contain provisions in paragraph (i) of this section. Federal agencies are permitted to require changes, remedies, changed conditions, access and records retention, suspension of work, and other clauses approved by the Office of Federal Procurement Policy.

(10) Access by the grantee, the subgrantee, the Federal grantor agency, the Comptroller General of the United States, or any of their duly authorized representatives to any books, documents, papers, and records of the contractor which are directly pertinent to that specific contract for the purpose of making audit, examination, excerpts, and transcriptions.

*40 CFR 35.6590(b) Bonding and insurance

- (b) *Accidents and catastrophic loss*. The recipient must require the contractor to provide insurance against accidents and catastrophic loss to manage any risk inherent in completing the project.

*40 CFR 35.6610 Contracts awarded by a contractor

The recipient must require its contractor to comply with the following provisions in the award of contracts (i.e. subcontracts). (This section does not apply to a supplier's procurement of materials to produce equipment, materials and catalog, off-the-shelf, or manufactured items.)

- (a) The requirements referenced in §35.6020*.
- (b) The limitations on contract award in §35.6550(a)(6) *.
- (c) The requirements regarding minority and women's business enterprises, and small business in §35.6580*.
- (d) The requirements regarding specifications in §35.6555 (a)(6) and (c)*.
- (e) The Federal cost principles in 40 CFR 31.22*.
- (f) The prohibited types of contracts in §35.6575(a)*.
- (g) The cost, price analysis, and profit analysis requirements in §35.6585*.
- (h) The applicable provisions in §35.6595 (b)*.
- (i) The applicable provisions in §35.6555(b)(2)*.

*40 CFR 35.6020 Requirements for both applicants and recipients

Applicants and recipients must comply with the applicable requirements of 40 CFR part 32, "Governmentwide Debarment and Suspension (Non-procurement); and Statutory Disqualification under the Clean Air Act and Clean Water Act," and of 40 CFR part 36, "Governmentwide Requirements for Drug-Free Workplace (Financial Assistance)."

*40 CFR 35.6550(a)(6) Procurement system standards

- (6) Award. The recipient may award a contract only to a responsible contractor, as described in 40 CFR 31.36(b)(8), and must ensure that each contractor performs in accordance with all the provisions of the contract. (See also §35.6020. (full citation immediately above))

*40 CFR 35.6580 Contracting with minority and women's business enterprises (MBE/WBE), small businesses, and labor surplus area firms

- (a) Procedures. The recipient must comply with the six steps described in 40 CFR 31.36(e)(2) * to ensure that MBEs, WBEs, and small businesses are used whenever possible as sources of supplies, construction, and services. Tasks to encourage small, minority, and women's business utilization in the Superfund program are eligible for funding under Core Program Cooperative Agreements.
- (b) Labor surplus firms. EPA encourages recipients to procure supplies and services from labor surplus area firms.
- (c) "Fair share" objectives. It is EPA's policy that recipients award a fair share of contracts to small, minority and women's businesses. The policy requires that fair share objectives for minority and women-owned business enterprises be negotiated with the States and/or recipients, but does not require fair share objectives be established for small businesses.
 - (1) Each recipient must establish an annual "fair share" objective for MBE and WBE use. A recipient is not required to attain a particular statistical level of participation by race, ethnicity, or gender of the contractor's owners or managers.
 - (2) If the recipient is awarded more than one Cooperative Agreement during the year, the recipient may negotiate an annual fair share for all

Cooperative Agreements for that year. It is not necessary to have a fair share for each Cooperative Agreement. When a Cooperative Agreement is awarded to a recipient with which a “fair share” agreement has not been negotiated, the recipient must not award any contracts under the Cooperative Agreement until the recipient has negotiated a fair share objective with EPA.

*40 CFR 31.36(e)(2) *Contracting with small and minority firms, women's business enterprise and labor surplus area firms*

(2) Affirmative steps shall include:

- (i) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
- (ii) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
- (iii) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority business, and women's business enterprises;
- (iv) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority business, and women's business enterprises;
- (v) Using the services and assistance of the Small Business Administration, and the Minority Business Development Agency of the Department of Commerce; and
- (vi) Requiring the prime contractor, if subcontracts are to be let, to take the affirmative steps listed in paragraphs (e)(2) (i) through (v) of this section.

*40 CFR 35.6555 (a)(6) and (c) *Competition*

The recipient must conduct all procurement transactions in a manner providing maximum full and open competition.

(a) *Restrictions on competition.* Inappropriate restrictions on competition include the following:

(6) Specifying only a “brand name” product, instead of allowing “an equal” product to be offered and describing the performance of other relevant requirements of the procurement; and

(c) *Written specifications.* The recipient's written specifications must include a clear and accurate description of the technical requirements and the qualitative nature of the material, product or service to be procured.

(1) This description must not contain features which unduly restrict competition, unless the features are necessary to:

- (i) Test or demonstrate a specific thing;
- (ii) Provide for necessary interchangeability of parts and equipment; or
- (iii) Promote innovative technologies.

(2) The recipient must avoid the use of detailed product specifications if at all possible.

*40 CFR 31.22 (full citation found above, page 3)

*40 CFR 35.6575(a) Restrictions on types of contracts

(a) Prohibited contracts. The recipient's procurement system must not allow cost-plus-percentage-of-cost (e.g., a multiplier which includes profit) or percentage-of-construction-cost types of contracts.

*40 CFR 35.6585 (full citation found above, pages 6-7)

*40 CFR 35.6595(b) (full citation found below, page 12)

*40 CFR 35.6555(b)(2) *Indian Tribe*. Any contract or subcontract awarded by an Indian Tribe or Indian intertribal consortium shall comply with the requirements of 40 CFR 31.38, "Indian Self Determination Act."

40 CFR 35.6580 Contracting with minority and women's business enterprises (MBE/WBE), small businesses, and labor surplus area firms. As per 40 CFR 31.36(e)(2), prime contractor is required to follow the affirmative steps listed below in paragraphs (e)(2) (i) through (v), and if subcontracts are to be let, to take the affirmative steps listed in paragraphs (e)(2) (i) through (v):

- (i) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
- (ii) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
- (iii) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority business, and women's business enterprises;
- (iv) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority business, and women's business enterprises;
- (v) Using the services and assistance of the Small Business Administration, and the Minority Business Development Agency of the Department of Commerce.

40 CFR 35.6595 Contract Provisions applicable to Contractor

(b) *Other contract provisions*. Recipients' contracts must include the following provisions:

- (1) *Energy efficiency*. A contract must comply with mandatory standards and policies on energy efficiency contained in the State's energy conservation plan, which is issued under 10 CFR part 420.
- (2) *Patents inventions, and copyrights*. All contracts must include notice of EPA requirements and regulations pertaining to reporting and patent rights under any contract involving research, developmental, experimental or demonstration work with respect to any discovery or invention which arises or is developed while conducting work under a contract. This notice shall also include EPA requirements and regulations pertaining to copyrights and rights to data contained in 40 CFR 31.34*.

(3) *Labor standards*. The recipient must comply with 40 CFR 31.36(i)(3) through (6)*.

(4) *Conflict of interest*. The recipient must include provisions pertaining to conflict of interest as described in §35.6550(b)(2)(ii)*.

*40 CFR 31.34 Copyrights.

The Federal awarding agency reserves a royalty-free, nonexclusive, and irrevocable license to reproduce, publish or otherwise use, and to authorize others to use, for Federal Government purposes:

- (a) The copyright in any work developed under a grant, subgrant, or contract under a grant or subgrant; and
- (b) Any rights of copyright to which a grantee, subgrantee or a contractor purchases ownership with grant support.

*40 CFR 31.36(i)(3) through (6) Procurement

(i) *Contract provisions*. A grantee's and subgrantee's contracts must contain provisions in paragraph (i) of this section. Federal agencies are permitted to require changes, remedies, changed conditions, access and records retention, suspension of work, and other clauses approved by the Office of Federal Procurement Policy.

- (3) Compliance with Executive Order 11246 of September 24, 1965, entitled "Equal Employment Opportunity," as amended by Executive Order 11375 of October 13, 1967, and as supplemented in Department of Labor regulations (41 CFR chapter 60). (All construction contracts awarded in excess of \$10,000 by grantees and their contractors or subgrantees)
- (4) Compliance with the Copeland "Anti-Kickback" Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 CFR part 3). (All contracts and subgrants for construction or repair)
- (5) Compliance with the Davis-Bacon Act (40 U.S.C. 276a to 276a-7) as supplemented by Department of Labor regulations (29 CFR part 5). (Construction contracts in excess of \$2000 awarded by grantees and subgrantees when required by Federal grant program legislation)
- (6) Compliance with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330) as supplemented by Department of Labor regulations (29 CFR part 5). (Construction contracts awarded by grantees and subgrantees in excess of \$2000, and in excess of \$2500 for other contracts which involve the employment of mechanics or laborers)

*40 CFR 35.6550(b)(2)(ii) (full citation found above, page 2)

40 CFR 35.6610 Contracts awarded by a contractor

Contractor must comply with the following provisions in the award of contracts (i.e. subcontracts). (This section does not apply to a supplier's procurement of materials to produce equipment, materials and catalog, off-the-shelf, or manufactured items.) (full citation found above, pages 9-11)

40 CFR 35.6710 Records access

(c) *Contractor requirements*. The recipient must require its contractor to comply with the requirements regarding records access described in 40 CFR 31.36(i)(10). (full citation found above, page 8)