

Disclaimer

EPA does not consider this internal planning document an official Agency dissemination of information under the Agency's Information Quality Guidelines, because it is not being used to formulate or support a regulation or guidance; or to represent a final Agency decision or position. This planning document describes the overall quality assurance approach that will be used during the research study. Mention of trade names or commercial products in this planning document does not constitute endorsement or recommendation for use.

The EPA Quality System and the HF Research Study

EPA requires that all data collected for the characterization of environmental processes and conditions are of the appropriate type and quality for their intended use. This is accomplished through an Agency-wide quality system for environmental data. Components of the EPA quality system can be found at <http://www.epa.gov/quality/>. EPA policy is based on the national consensus standard ANSI/ASQ E4-2004 *Quality Systems for Environmental Data and Technology Programs: Requirements with Guidance for Use*. This standard recommends a tiered approach that includes the development and use of Quality Management Plans (QMPs). The organizational units in EPA that generate and/or use environmental data are required to have Agency-approved QMPs. Programmatic QMPs are also written when program managers and their Quality Assurance (QA) staff decide a program is of sufficient complexity to benefit from a QMP, as was done for the study of the potential impacts of hydraulic fracturing (HF) on drinking water resources. The HF QMP describes the program's organizational structure, defines and assigns quality assurance (QA) and quality control (QC) responsibilities, and describes the processes and procedures used to plan, implement and assess the effectiveness of the quality system. The HF QMP is then supported by project-specific QA project plans (QAPPs). The QAPPs provide the technical details and associated QA/QC procedures for the research projects that address questions posed by EPA about the HF water cycle and as described in the *Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources* (EPA/600/R-11/122/November 2011/www.epa.gov/hydraulic_fracturing). The results of the research projects will contribute to EPA's report of results.

This QAPP provides information concerning the analysis of spills associated with hydraulic fracturing. This project is relevant to both the chemical mixing and flowback and produced water stages of the HF water cycle as found in the HF Study Plan. Appendix C of EPA's Study of the Potential Impact of Hydraulic Fracturing on Drinking Water Resources: Progress Report (EPA 601/R-12/011/December 2012/www.epa.gov/hfstudy) identified relationships between the Research Project questions and QAPPs available as of December 2012. This QAPP is a living document will be updated as needed as the project progresses.

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A3. Distribution

This QAPP will be distributed to the staff members of the U.S. EPA as listed in *Table 1*.

Table 1: QAPP Distribution List.

Name Title	Contact Information
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Jeanne Briskin Hydraulic Fracturing Study Plan Coordinator	(202) 564-4568 briskin.jeanne@epa.gov

A4. Project Organization

Project organization for the HF surface spills analysis is depicted below in *Figure 1*. Leigh DeHaven is responsible for the secondary data collection, analysis, and presentation, and will thus be responsible for ensuring that the quality of work meets the requirements of EPA's *Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources*. She also keeps the Quality Assurance Manager (QAM), Steve Watkins, advised of any quality problems that arise in this study. The QAM is responsible for maintaining QA activities and the official, approved QAPP throughout the course of the project.

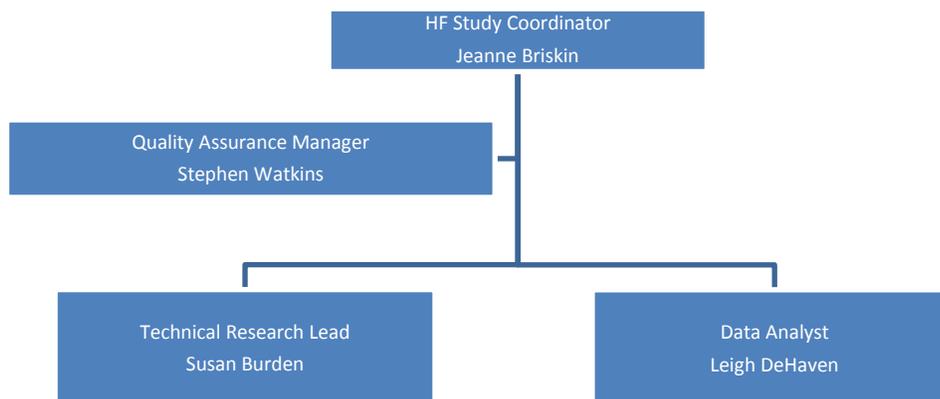


Figure 1: HF surface spills data analysis organizational chart.

A5. Problem Definition and Background

In recent decades, HF has been increasingly used to access natural gas and oil. In the process of hydraulic fracturing, natural gas or oil is extracted from so-called “unconventional” reservoirs via high-pressure injection of water, chemical additives, and proppants. In response to the growing use of HF in the United States, the U.S. Congress’ Appropriation Conference Committee urged EPA to study the relationship between HF and drinking water. In response to this request, EPA produced a *Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources*.¹ In this plan, EPA identified surface spills of HF fluids and wastewater as a research area by defining the following fundamental research questions:

- What are the possible impacts of surface spills on or near well pads of HF fluids on drinking water resources?
- What are the possible impacts of surface spills on or near well pads of flowback and produced water² on drinking water resources?

In each of these cases—surface spills of HF fluids or surface spills of flowback and produced water—EPA identified the following secondary research question:

- What is currently known about the frequency, severity, and causes of spills of HF fluids and wastewaters?

The goal of this project is to answer this secondary research question.

A6. Project/Task Description

Information from existing sources will be collected and reviewed in order to assess the frequency, severity, and causes of surface spills of HF fluids and wastewaters on or near the well pad site. Reported transportation-related spills of HF fluids or wastewaters on public roads will not be considered in this analysis. Existing sources of information that may inform this effort include, but are not limited to:

- National Response Center database
- State departments of environmental protection and quality
- State oil and gas agencies
- Information received by EPA from nine oil and gas operators and nine HF service companies

Types of databases from the sources listed above may include, but are not limited to:

- Compliance Reporting Databases
- Inspection/Incident Databases
- Spills databases

¹ U.S. Environmental Protection Agency. *Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources*. EPA/600/R-11/122. Office of Research and Development, November 2011.

² For this analysis, “flowback” is the fluid that returns to the surface after the HF procedure is completed and the injection pressure is released. “Produced water” is defined as the fluid that is produced when the well is put into production. Together, these fluids are referred to as “HF wastewaters.”

- Enforcement actions databases

The initial phase of this project focused on National Response Center spill notification data and publically available state databases from Texas, Colorado, Pennsylvania, New Mexico, and Wyoming. Additional state data from Louisiana, Oklahoma, North Dakota, Utah, and Arkansas are being added to the analysis using the criteria listed below. The additional states were selected based on high volumes of oil and gas activity related to hydraulic fracturing. The additional publicly available databases identified and evaluated in the spills data analysis would be disclosed with the study findings. Spills data from the nine oil and gas operators and nine HF service companies providing information to the EPA are also being reviewed. Some of the data provided by the nine oil and gas operators and nine services companies to EPA may be classified as confidential business information (CBI) under the Toxic Substance Control Act (TSCA). All of the CBI data will be handled in accordance with EPA's TSCA CBI Protection Manual.

The results of the spills data analysis will be examined together with other hydraulic fracturing sub-projects in the study, such as the well file review, the analysis of HF fluid formulations, and related literature reviews to identify possible groundwater contamination scenarios resulting from surface spills.

A6.1. Data, Sources and Rationale for Data Selection

The initial phase of this project will focus on National Response Center spill notification data and publically available state databases. EPA will first focus on states with significant oil and gas development activity, including Texas, Colorado, Pennsylvania, New Mexico, and Wyoming. To expand the data set, five additional states have been added to the study: Louisiana, Oklahoma, North Dakota, Utah, and Arkansas. Spills data from the nine oil and gas operators and nine HF service companies who provided information to EPA are also being reviewed.

This project will address the following key issues:

- Define differences among spill notifications, spill violations, and complaints
- Identify spill databases that provide specific information about spills associated with HF fluids and wastewaters, focusing on:
 - Name and management source of the database
 - Location and accessibility of database (website)
 - Reporting timeframe
- Summarize specific spill incidents in a table that will include the following information:
 - Database name (source of information)
 - Spill incident date
 - Generic incident number
 - Location of spill (county, state)
 - Chemical/product spilled
 - Estimated/reported volume of spill
 - Cause of spill

- Reported impact to nearby water resources, if applicable
- Compile summary statistics based on specific spill incidents, including:
 - Frequency of spills
 - Chemicals and/or fluids spilled
 - Severity (based on spill volume)
 - Cause of the spill
 - Spill containment
 - Spill response (action or remedy taken)
 - Relationship to hydraulic fracturing
- Discuss examples of HF-related spills using information from state spill databases and other, relevant sources. The examples will illustrate different types of spills that have occurred at hydraulic fracturing locations.

A7. Quality Objectives and Criteria

EPA does not make any claims on the quality or accuracy of the data or information found in the data sources listed in Section A6. This QAPP aims to ensure that secondary data used for this evaluation are of sufficient quality necessary to achieve proper data analysis. This section addresses the quality criteria used to assess the adequacy of secondary data used in this project, as well as the uncertainty in the results derived from the use of these data sources.

All project results will include documentation of data sources and the assumptions and uncertainties inherent within that data, as well as computations and calculations made with secondary data. Data assessment and acceptance criteria for this project are outlined in Section A7.1.

To the extent possible, recorded information will be quantitative. Information that cannot be described quantitatively will be recorded in an organized format if the information is relevant to the study objectives. Individual queries will be developed for the spreadsheet or database to allow quantification of the results where possible.

A7.1. Hydraulic Fracturing Spills Data Acceptance Criteria

The data acceptance criteria used to evaluate the HF spill data includes timeliness, relevancy, completeness, and comparability. Spills data from January 1, 2006, to April 30, 2012, are being considered for the analysis. Hydraulic fracturing-related spills are being identified based on information available in the spills databases. A spill is considered "hydraulic fracturing-related" if the information specifically states that the spill was associated with hydraulic fracturing or includes keywords describing hydraulic fracturing processes, products or terminology. Example keywords include "hydraulic fracturing," "fracking" or "flowback."

The spills databases will be evaluated to describe the extent to which the spill data values (i.e., spill frequency, substance spilled, spill volume, and cause of the spill) in different states and the National Response Center may be compared. An evaluation of how complete the data are from each of the spills databases will be conducted by reviewing the presence/absence of each of

the spill data values listed above. Because each of the spills databases have different formats, data collected from the databases may or may not include all of the spill data values.

A8. Special Training/Certification

During the course of this project, Ms. DeHaven and some members of the surface spills data analysis team will access and analyze spill data claimed to be confidential business information (CBI) under TSCA. Throughout this project they will adhere to CBI procedures when handling confidential information and will manage all reports, documents, and other materials developed in accordance with the procedures set forth in EPA's TSCA CBI Protection Manual.³ Team members that will access TSCA CBI will maintain active TSCA CBI clearance, and all work involving TSCA CBI will be completed on the approved TSCA CBI computer.

A9. Documentation and Records

Documents and records generated during this project will be handled, stored and archived as described in the study's Quality Management Plan⁴ and other existing agency guidelines. The final draft report will be submitted to the HF Study Coordinator, Jeanne Briskin. The final report will include a detailed description of the methods used to produce the data tables, as well as any assumptions or uncertainties inherent in those methods.

The final report will contain an appendix listing the specific spills databases used and the locations of those data online. This appendix will also specify any modifications that were made to data extracted from the original databases obtained. All errors and uncertainties associated with each data set will be documented and included in this section.

CBI submitted in response to EPA's information requests will be reviewed and included in a CBI version of the final report. All CBI documents will be handled in accordance with EPA's TSCA CBI Protection Manual and will be kept separate from public data to protect CBI claims.

B. Data Generation and Acquisition

This section addresses data acquisition and management activities, including the following elements identified by EPA:

- Element B5: Quality Control
- Element B9: Non-direct Measurements
- Element B10: Data Management

B5. Quality Control

All data used in this project will meet the criteria listed in Section A7.1 and will be examined to ensure that they meet these criteria at each stage (data acquisition, manipulation, and analysis).

³ U.S. Environmental Protection Agency, *TSCA CBI Protection Manual*, EPA Office of Pollution Prevention and Toxics (7407 M), October 20, 2003.

⁴ Available online at <http://www2.epa.gov/hfstudy/quality-assurance-integrity>.

B9. Non-Direct Measurements

As described in Section A.6, all data used in this project will be obtained from existing databases managed by the National Response Center, state data, and data from nine oil and gas operators and nine HF service companies that provided information to EPA. The intended uses of the spills information from the databases are listed in detail in Section A6.1.

B10. Data Management

The data under this task will be maintained in Excel, Word and Access files to allow for ease of analysis in those programs. Some of the data used for this project will be TSCA CBI. All such data and products utilizing this data will be managed following the procedures set forth in EPA's TSCA CBI Protection Manual.

C. Assessment and Oversight

This section describes the audits and other assessments needed to determine whether this QAPP is being implemented as approved and to increase confidence in the information obtained and produced as a result of this project.

C1. Assessments and Response Actions

All work conducted for the HF surface spills data analysis project will be subject to technical review by the HF Study Coordinator, Jeanne Briskin, and the HF Data Analysis Technical Research Lead, Susan Burden. Steve Watkins will serve at the QA Manager for this project and will review this QAPP for completeness and applicability. He will be available to assist Ms. DeHaven with QA issues as they arise and will periodically review compliance with this QAPP. This project will also undergo periodic data quality audits and technical systems audits, as described below.

C1.1. Data Quality Audit

The spills data used in this study will be collected from existing data sources. EPA does not make any claims on the quality or accuracy of the existing data gathered and used in the spills analysis. Each of the databases has its own existing data quality. However, the products developed with these data will be reviewed by the Data Analysis Technical Research Lead and the Quality Assurance Manager to ensure that they accurately reflect the collected data. EPA will conduct spot checks to understand the natural variability in the databases consulted in this study.

C1.2. Technical Systems Audit

A technical systems audit will occur toward the beginning of the spills data analysis to ensure that the appropriate methods are used in the analysis as outlined in this QAPP, and that the data are being handled in a manner consistent with TSCA CBI requirements. Necessary deviations from procedures outlined in this QAPP will be addressed through revisions to the QAPP.

C2. Reports to Management

Ms. DeHaven will supply a draft report on the products and findings of this analysis to the HF Study Coordinator, the HF Data Analysis Technical Research Lead, and the QA manager for comment and will incorporate their comments into the final report. Ms. DeHaven will keep the HF study team involved

through weekly technical progress updates in which any problems encountered will be described and feedback will be solicited as necessary to ensure the quality of the finished product

D. Data Validation and Usability

This section addresses the quality of the completed final report to see if this product will conform to the objectives outlined in this QAPP, especially given this project's use of existing data sets.

D1-D2. Data Review, Verification, Validation, and Validation Methods

All data will be reviewed for timeliness, completeness, relevancy and comparability. Uncertainties of existing data sets will be examined to ensure that all data adhere to the criteria outlined in this QAPP. All final products will be examined to ensure that data are correctly displayed in tables and figures. In addition, data will be reviewed and examined to determine if there are data entry errors as data are collected from existing sources.

D3. Reconciliation with User Requirements

The checks that will be used to determine the timeliness, completeness and comparability of all existing data and final products are described in Section C. These measures will be reported in all project deliverables, which will allow the HF study team and future data users to determine if the data are of sufficient quality for other uses.

Ms. DeHaven will work with the study team and the QA staff to determine to what extent the data that do not meet the specified data acceptance criteria may or may not be used to support further study and how this determination will be documented. In addition to an evaluation of data quality, Ms. DeHaven will identify data sources, assumptions made and changes or modifications to data used in their development in the draft and final reports.

Revision History

Revision Number	Date Approved	Revision
0	8/6/2012	New Document
1	4/8/2013	Section A6. Project /Task Description – Addition of 5 states to the Surface Spills Data Analysis (Louisiana, Oklahoma, North Dakota, Utah, and Arkansas). Section A.6 .1 Data Sources and Rational for Data Selection – Addition of 5 states to the Surface Spills Data Analysis (Louisiana, Oklahoma, North Dakota, Utah, and Arkansas).
2	9/16/2013	Section A3, Table 1 – Updated team member. Section A6.1. Data, Sources and Rationale for Data Selection – Updated table heading, statistic topics and added spill scenario examples.