



Project Summary

Environmental Monitoring Reference Manual for Synthetic Fuels Facilities

D. Bruce Henschel and James T. Stemmler

The Energy Security Act, which establishes the U.S. Synthetic Fuels Corporation (SFC), specifies that applicants for SFC financial assistance must develop an acceptable plan for environmental monitoring of the construction and operation of the proposed synthetic fuels facilities, following consultation with EPA and other agencies. This manual is intended as a technical aid to applicants, the SFC, and environmental reviewers in developing and reviewing plans covering source and ambient monitoring around coal-, oil shale-, and tar sand-based synfuels plants, consistent with the Act.

This manual does not provide rigorous specifications for an "acceptable" monitoring plan. Rather, it describes approaches to consider and issues to address in developing a monitoring plan (or an outline of a plan). The exact content of the plan or outline for a specific facility would depend upon conditions associated with that plant.

This manual addresses approaches for selecting discharge streams and ambient media for monitoring substances/survey procedures to be addressed, monitoring frequencies, and sampling/analysis techniques. A phased monitoring approach is emphasized.

This Project Summary was developed by EPA's Industrial Environmental Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Purpose of Manual

The purpose of this manual is to aid applicants to the U.S. Synthetic Fuels Corporation (SFC) in developing Environmental Monitoring Plans (and outlines of such plans) covering source and ambient monitoring around coal-, oil shale-, and tar sands-based synthetic fuels facilities. The manual is also intended to assist the SFC and environmental agencies in reviewing these monitoring plans and plan outlines. The manual is provided as one component of EPA's consultation process in monitoring plan development, as specified in Section 131(e) of the Energy Security Act.

This manual does not provide rigorous specifications for an "acceptable" monitoring plan. Nor is the manual a comprehensive definition of the compliance monitoring that will be required by permits. Rather, the manual describes approaches that can be considered, and issues that need to be addressed, in the development of a monitoring plan or outline for a synthetic fuels plant. The exact content of the monitoring plan or outline for any specific facility would have to be developed taking into consideration the particular conditions associated with that plant.

Background

The Energy Security Act of 1980 (PL 96-294)—which establishes the SFC—includes the following requirement (Section 131(e) of the Act):

"Any contract for financial assistance shall require the de-

velopment of a plan acceptable to the Board of Directors (of the SFC), for the monitoring of environmental and health-related emissions from the construction and operation of the synthetic fuel project. Such plan shall be developed by the recipient of financial assistance after consultation with the Administrator of the Environmental Protection Agency, the Secretary of Energy, and appropriate State agencies."

The intent of Congress concerning Section 131(e) is discussed in the Joint Explanatory Statement, Committee of Conference for this Act:

"The monitoring of emissions—gaseous, liquid or solid—and the examination of waste problems, worker health issues and other research efforts associated with any synthetic fuel project receiving assistance pursuant to this Part will help to characterize and identify areas of concern and develop an information base for the mitigation of problems associated with the replication of synthetic fuel projects."

In implementing Section 131(e), the SFC is utilizing a two-stage approach under which an applicant (1) develops an *outline* of the monitoring plan for incorporation into the financial assistance contract, and (2) develops the monitoring plan itself, based upon the outline, after the financial assistance contract is executed. The SFC has published interim final Environmental Monitoring Plan Guidelines (April 1, 1983), setting forth the procedural steps and the broad substantive areas to be addressed in developing outlines and plans. These interim final Guidelines are being reviewed, and might be revised as a result of the review.

This Environmental Monitoring Reference Manual is a component of the mandated consultation process in monitoring plan development. Another component of the process is direct contact between EPA and applicants, to assist applicants in applying the manual to the specific circumstances of each proposed facility. The manual will aid in the development and review of both monitoring plan outlines, and the plans themselves, consistent with both the intent of Section 131(e) and current SFC monitoring guidelines.

Scope and Content of Manual

This manual addresses: coal-, oil shale-, and tar sands-based synthetic fuels processes; source and ambient monitoring; regulated and unregulated substances; pre-construction, construction, and operational monitoring; and control device performance monitoring.

- Coal-, oil shale-, and tar sands-based synthetic fuels processes. These processes include coal gasification (high-, medium-, and low-Btu), coal liquefaction (indirect and direct), surface and modified *in situ* oil shale retorting, and tar sands processing. The information in the manual should also be generally applicable in planning monitoring for heavy oil, peat, and other synfuels processes.
- Source and ambient monitoring. Source monitoring includes chemical and biological analysis of discharge streams (gaseous, aqueous, solids), including fugitive discharges inside the plant boundaries; source monitoring also includes monitoring of environmental control device performance. Ambient monitoring includes chemical and biological tests of the unconfined environment near the synfuels plant (atmosphere, surface waters, water in the unsaturated soil, surface and deep aquifers, and the soil). Source and ambient monitoring programs are envisioned as being integrated. The manual does not address industrial hygiene, wildlife, or socioeconomic monitoring.
- Regulated and unregulated substances. The intent of the monitoring—to develop a synfuels data base on environmental and health-related impacts, in order to mitigate problems in replications—is construed to necessitate that the monitoring address substances in addition to the pollutants currently regulated in the ambient and in related industries. Many substances which might be discharged from synfuels plants are not regulated. Accordingly, the monitoring approaches considered in this manual address unregulated substances as well as regulated pollutants. This consideration of unregulated substances is consistent with the SFC monitoring plan guidelines.
- Pre-construction, construction, and operational monitoring, in the case of ambient monitoring. Source monitoring addresses only monitoring during operation.

- Monitoring of control device performance, as one component of source monitoring. Such monitoring could address inlet and outlet streams associated with the control device, and suitably selected device operating parameters. The performance/reliability of conventional control techniques on synfuels plants has not been demonstrated in most cases; an improved understanding of control performance, obtained by monitoring of initial synfuels plants, could help mitigate environmental problems in future synfuels plants.

To aid in the development of monitoring plans and monitoring plan outlines, this manual: describes a reasonable "information base" for the synfuels plant, discusses alternative potential approaches to effectively develop the data base, presents alternative monitoring procedures, and suggests a meaningful quality assurance/quality control program.

- A reasonable "information base" for the synfuels plant (in accordance with the wording in the congressional explanatory statement), would involve: analysis for specific chemical substances; application of analytical survey techniques, to screen for classes of substances where the specific chemical components of a synfuels stream cannot be predicted *a priori*; and biological testing. This data base was derived considering: currently regulated substances (in the ambient and in related industries); substances which are typically specified for monitoring in environmental permits for related industries, unregulated substances which have been observed in existing source test data from synfuels facilities; and unregulated substances, included in various recognized pollutant lists which might reasonably be expected to be discharged from a synfuels plant. The presentation of the content of the data base includes suggestion: concerning which specific substances/survey techniques/bioassays might reasonably be considered in which streams (source monitoring) or which ambient media (ambient monitoring) under different circumstances.
- Alternative potential approaches that might be considered for effectively developing the data base, in most cases involve phasing of the monitoring program, e.g., a fairly compr

hensive survey is conducted in the first phase, followed by a reduced second phase which is based on the first-phase results. The monitoring frequency and the duration of each phase can be selected based on site-specific statistical considerations.

- Alternative monitoring procedures (sampling, sample handling, analysis) might be considered for each substance and each survey technique included in the data base. Capabilities of, and estimated cost ranges for, individual procedures are indicated.
- A meaningful quality assurance/quality control program is suggested.

Use of Manual

In using this manual, two important considerations need to be recognized.

- The manual does not provide rigorous specifications for an "acceptable" monitoring plan. Nothing in the manual is a "requirement." The manual only describes alternative approaches that can be considered in developing the data base referred to in the Congressional explanation. These alternatives can be considered in structuring a monitoring plan (or plan outline) tailored to a specific facility.
- Suggestions in this manual which conflict with permit (compliance) monitoring requirements for a specific facility are superseded by the permit requirements. As a practical matter, most of the compliance monitoring required by permits for a particular facility will generally be found in this manual. However, it cannot be ensured that the monitoring approaches described in the manual will be inclusive of, and consistent with, every conceivable set of permit requirements that might be encountered in practice. These requirements will be established by the cognizant permitting agency based on the particular conditions associated with a specific site.

The interim final SFC monitoring plan guidelines include specifications regarding the content of monitoring plan outlines and of monitoring plans themselves. According to these guidelines, the outline should:

- Summarize compliance monitoring obligations
- Indicate the regulated and unregulated substances that will be moni-

tored (or, where specific unregulated substances cannot be identified beforehand, indicate the classes of substances that will be addressed).

- Indicate the general location of the monitoring (stream, ambient medium).
- Generally indicate how the monitoring will be performed (e.g., high-volume sampler); where specific unregulated substances cannot be identified beforehand, indicate the method(s) by which the specific substances will be identified.
- Indicate the duration of monitoring.
- Provide background information on the synfuels projects to enable review of the outline (e.g., overall process description, process block flow diagram, control system performance design, plot plans, detailed site description, supporting environmental data).

The monitoring plan should include:

- Further definition of the substances to be monitored.
- Detailed indication of monitoring site locations.
- Specific sampling/sample handling/analytical protocols, including equipment and methods.
- Monitoring frequency for each substance at each monitoring location.
- Background information, as for the outline above.

This monitoring reference manual can be used to address each of the above specifications for monitoring outlines and plans.

- To help select specific substances for monitoring—or classes of unregulated substances, where specific substances cannot be identified beforehand—tables present the substances (or survey techniques, where specific substances cannot be defined) in the "information base." The user would supplement these tables with engineering judgment, additional data, and permit requirements.
- To help select monitoring location, the tables referenced above can be used (source monitoring), indicating the streams in which the substances/survey techniques might be considered; also a section is provided on ambient monitoring station siting.
- To help select monitoring techniques, a section and an appendix list alternative source monitoring techniques

that might be considered for each substance and each survey procedure; capabilities and costs of alternative techniques are presented. Specific techniques and detailed protocols can be selected for a given plant by an experienced analyst, based on (for example) desired analytical sensitivity, potential interferences, and capabilities of available laboratories. Similarly, a section and five appendices list information on ambient monitoring techniques.

- To help select monitoring frequency and duration, practical and statistical considerations are described for the phased monitoring approach. In applying the statistical considerations, the user would need to make site-specific decisions (in particular, the accuracy desired in the monitoring program).

The SFC monitoring guidelines specify the formation of a Monitoring Review Committee, representing the developers, the SFC, and Federal and State agencies consulting in the monitoring plan development. This committee will review the monitoring results and advise the SFC. If a phased monitoring approach is utilized, the committee could help guide the activity to design the second phase program based on the first phase results.

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The complete report, entitled "Environmental Monitoring Reference Manual for Synthetic Fuels Facilities," (Order No. PB 83-251 850; Cost: \$41.50, subject to change) will be available only from:

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