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5.0 OPERATIONS PLAN

Operation of the DBVS during the RD&D project will be conducted in two phases. During the first phase, up to three container loads of waste will be processed. During the second phase, approximately 47 to 49 container loads will be processed. The total number of containers processed for both phases is expected to be approximately 50. This section presents the general operating plan for both phases.

A campaign is defined as the receipt, processing, and vitrification of waste in a single container. A campaign may contain more than one vitrification cycle (i.e., a half-full container is vitrified under a set of parameters and another vitrification cycle is conducted in the remaining half of the container after cool-down to determine the effect on glass characteristics of multiple vitrification cycles). Another potential cause of a less than full container would be problems with the mixer/dryer or other equipment while the melt is in process. In this case, once the equipment problems were resolved, the melt could be resumed and the box filled to normal levels with waste. Each campaign will be conducted in accordance with a test plan.

5.1 OPERATIONS OVERVIEW

5.1.1 General

This section describes the parameters under which a campaign will be conducted. The previous testing programs (AMEC 2003) were performed at various scales using simulants to develop baseline operating envelopes for treatment of waste materials and to more closely define the range of acceptable system performance. It is anticipated that the processing conditions developed as a result of the RD&D project will be used as baseline conditions for full-scale system design and operation.

5.1.2 Operating Parameters

During each campaign, waste material will be treated under a fixed set or range of process conditions to determine the optimum set of vitrification parameters that will produce acceptable treated waste while protecting human health and the environment. Three types of test parameters have been identified:

- Waste characteristics – Characteristics of the waste material that are likely to be encountered during DBVS waste treatment and that may influence processing results.
- Process parameters – Process settings or methods that can be adjusted to optimize quality of the treated waste or to investigate specific aspects of process performance.
- Process additives – Variations in the composition or characteristics of process additives and their effect on the vitrification process.

Figure 5-1 is a graphical representation of the types of parameters and their overall relationships. The dark portion of the diagram represents the zone where test points will initially be selected. The values selected for each parameter type will be those that will produce acceptable treated waste. It is possible that the optimum processing conditions will fall outside the initial range of parameter values selected.

1 Boundary (“operating envelope”) values for optimized operating parameters will be determined
2 in the initial portion of Phase 2 and additional campaigns will be conducted within that phase
3 until optimized conditions have been determined.

4 The initial test parameter values (or settings) will be selected prior to conducting a campaign
5 based on engineering-scale test results and anticipated full-scale operating scenarios. As the
6 RD&D project progresses, the results of previously conducted campaigns will be used to select
7 new values and to establish process envelopes and control parameters. A draft test matrix and
8 objectives are included in Appendix A. The final test matrix will be developed jointly between
9 Ecology, ORP, and CH2M HILL. This matrix will be developed to support supplemental waste
10 treatment technology decisions required by the HFFACO (specifically, Milestones M-62-08 and
11 M-62-11) and to support waste form qualification. At this time, the range of parameter values
12 and their relationships have not been finalized.

13 Changes to process conditions during a campaign producing a specific treated waste will only be
14 made to keep the process equipment running consistently. Adjustment of these parameters will
15 be controlled in such a way that significant changes will not result in system upsets or result in
16 conditions that cannot be reproduced in full-scale processing.

17 Accurate determination of the effect of a given parameter change is critical to the testing project
18 in terms of system design, process optimization, and expansion of the potential system operating
19 envelope. Therefore, only a single parameter will be changed at a time within a campaign unless
20 the relationship between multiple parameters requires that more than one variable be changed
21 (e.g., treating material with high moisture content may require adjustment not only to feed
22 additives but also to the treatment rate).

23 **5.2 TEST PLAN**

24 Conducting a campaign requires documentation of activities and procedures to be performed,
25 therefore, a test plan will be prepared for each campaign. Test plans will include the following:

- 26 • Objective(s) of campaign
- 27 • Timing, duration, and schedule of campaign
- 28 • Description of feed materials and additives
- 29 • Pre-test preparations
- 30 • Baseline process parameters
- 31 • Range of parameter adjustments
- 32 • Operating procedures
- 33 • Management of treated waste
- 34 • Type, quantity, and sequence of data acquisition
- 35 • Reporting requirements
- 36 • Health and safety/contingency planning.

1 Testing of the bulk vitrification technology will incorporate a series of process variables that can
2 be varied over a predetermined range; with the goal of optimizing both treated waste quality and
3 process operations. In addition to the various technology-specific parameters, the characteristics
4 of the waste material and glass formers are also varied during the testing project. A range of
5 physical, chemical, and radioactive properties may be expected in the actual waste feed material.
6 The test plan will accommodate the expected range of these characteristics by including them as
7 testing variables.

8 **5.3 OPERATOR PREPARATION**

9 All RD&D activities will be conducted in compliance with applicable site activity constraints,
10 health and safety considerations, and site-wide policies. A complete understanding of the scope
11 and procedures involved in a campaign will be provided to all operating personnel before
12 treatment of materials is begun. CH2M HILL and the DBVS vendor have the responsibility for
13 providing this understanding through a formal classroom and field training program. The test
14 plan provides the basis for this preparation, which has two major components: equipment
15 operation and site operating constraints. The process operations portion of the preparation will
16 be both technology-specific and project goal-specific.

17 **5.4 DATA ACQUISITION**

18 Collection of accurate and relevant data during a campaign is necessary to determine that
19 satisfactory material processing and treated waste generation has occurred. The subsequent
20 correlation of this data will determine the suitability of a given set of operating conditions. Data
21 acquisition frequency will vary, depending on the relationship between the parameter altered and
22 the data type. The sampling type and frequency are presented in Section 6.0, Waste Analysis
23 Plan.

24 Data acquisition requirements must assure that all personnel are aware of the level of observation
25 and data acquisition accuracy expected during the campaign. Data acquired will be used for
26 assessing system performance, treatment results, waste form performance, and LDR compliance.

27 **5.5 CAMPAIGN DURATION**

28 Actual duration may vary greatly based on the amount of material placed in the waste container
29 and the vitrification process parameters. A detailed determination of the total number of
30 campaigns to be conducted, and the duration of those sessions cannot be made at this time. The
31 anticipated number of campaigns is approximately 50 conducted over 365 operating days, which
32 may require more than one calendar year to complete (OSWER Guidance Manual).

33 **5.6 SYSTEM OPTIMIZATION**

34 Given the steady-state nature of the DBVS process and the batch size(s) of treated waste
35 produced during a single campaign, it is not likely that significant process adjustments will need
36 to be made during the course of a campaign. Instead, the system will be controlled to match the
37 stated test parameter values for the campaign as closely as possible.

1 Therefore, process optimization for this technology for each campaign will be limited to step
2 changes in material composition, process settings, and operational changes made once testing
3 using the initial set of test parameters (Section 5.1.2) has been completed. Changes made
4 between campaigns during the initial portion of Phase 2 will be based, where applicable, on the
5 testing results from the preceding campaign(s), operating data, operator observations, a
6 predetermined amount of change to one or more parameters, and/or other criteria described in the
7 test plan.

8 Those test conditions and parameter values that indicate a trend toward optimization will be used
9 as baseline conditions for additional campaigns with the goal of defining one or more acceptable
10 operating scenarios during Phase 2. In this context, “acceptable” means a cost-effective
11 reproducible set of operating conditions that results in treated waste that meets the waste
12 acceptance criteria of the IDF or other permitted Hanford Site disposal facility.

13 In addition, data will be collected on the performance of the main offgas system for both phases
14 to optimize the production system configuration and to minimize emissions of both gaseous
15 pollutants and radionuclides.

16 **5.7 NORMAL OPERATIONS**

17 Normal operations include waste feed and process additive preparation, feed staging, startup,
18 process operations, and system shutdown. These are the routine conditions for the processing
19 equipment and address basic system performance and operational, quality assurance, safety, and
20 data acquisition activities.

21 The sequence and conduct of these activities will be noted in the test plan prepared for each
22 campaign and will serve as the baseline conditions for conducting testing under the RD&D
23 project. The system manufacturers’ operations and maintenance documentation will serve as the
24 primary guidance for operating the system, while the individual test plan for a given campaign
25 and the Waste Analysis Plan (Section 6.0) will serve as the guidance documents for production
26 and analysis of treated waste products.

27 **5.8 UPSET CONDITIONS**

28 Upset conditions consist of deviations from normal conditions that can occur, even though
29 operational impairment may not occur. An example of an upset condition is loss of vacuum in
30 the mixer/dryer. Upset conditions can occur due to equipment malfunction, loss of process
31 control, or inability of the processing system to maintain steady-state operating conditions. The
32 control system will contain monitoring sensors, control logic, and alarm points consistent with
33 the types and ranges of upset conditions that may occur. The duties of operating personnel
34 include visual observation of process equipment and parameters in order to detect and, if
35 feasible, correct trends in conditions that may precede annunciation of an upset condition by the
36 control system.

37 Recovery from upset conditions will be initially attempted by adjustment of process conditions
38 using either manual or automatic changes in control system settings. If this effort is not

1 successful, a normal shutdown of the process system will be conducted followed by performance
2 of system adjustment and/or maintenance.

3 **5.9 EMERGENCY CONDITIONS**

4 Emergency conditions are postulated from safety analyses and are discussed in more detail in the
5 Contingency Plan (Section 10.0 and Appendix C). Examples of emergency conditions would be
6 loss of system electrical power, failure of a critical mechanical or powered component, or
7 unstable process conditions. The intent of the safety analyses is to identify these low-probability
8 accidents during conceptual and preliminary design. Plant conditions resulting from such
9 conditions will preclude further operation until repairs or adjustments are made. System and
10 structural designs will address design-based accidents. Recovery from any such incidents will
11 require specific plans to return the plant to normal operational conditions. Appendix E contains
12 operational parameters, measurement methods, limit values, and response actions.

13 **5.10 EMISSION SAMPLING**

14 CEMS calibration, testing, and operation will be conducted in compliance with EPA Regulation
15 40 CFR 60, Appendix B, applicable WAC test methods, and the *New Source Review Notification*
16 *of Construction for the Supplemental Treatment Test and Demonstration Facility*
17 (Schepens 2004). Stack testing will be conducted in compliance with EPA regulation 40 CFR 60,
18 Appendix A, applicable sections of SW-846, and applicable WAC test methods.

19 **5.11 REPORTING**

20 At the completion of the campaign and subsequent data analysis, a summary report will be
21 prepared addressing the conduct of the campaign, operational data acquired, and emissions and
22 treated waste analysis results. It is anticipated that the testing results can be applicable to
23 additional campaign(s) and/or the transition to full-scale operation of a bulk vitrification facility.
24 Potentially applicable aspects of system design, operation, and data acquisition will be discussed
25 in the report and presented along with recommendations for implementation. Test reports will be
26 made available for Ecology review and use at the Test and Demonstration Facility.

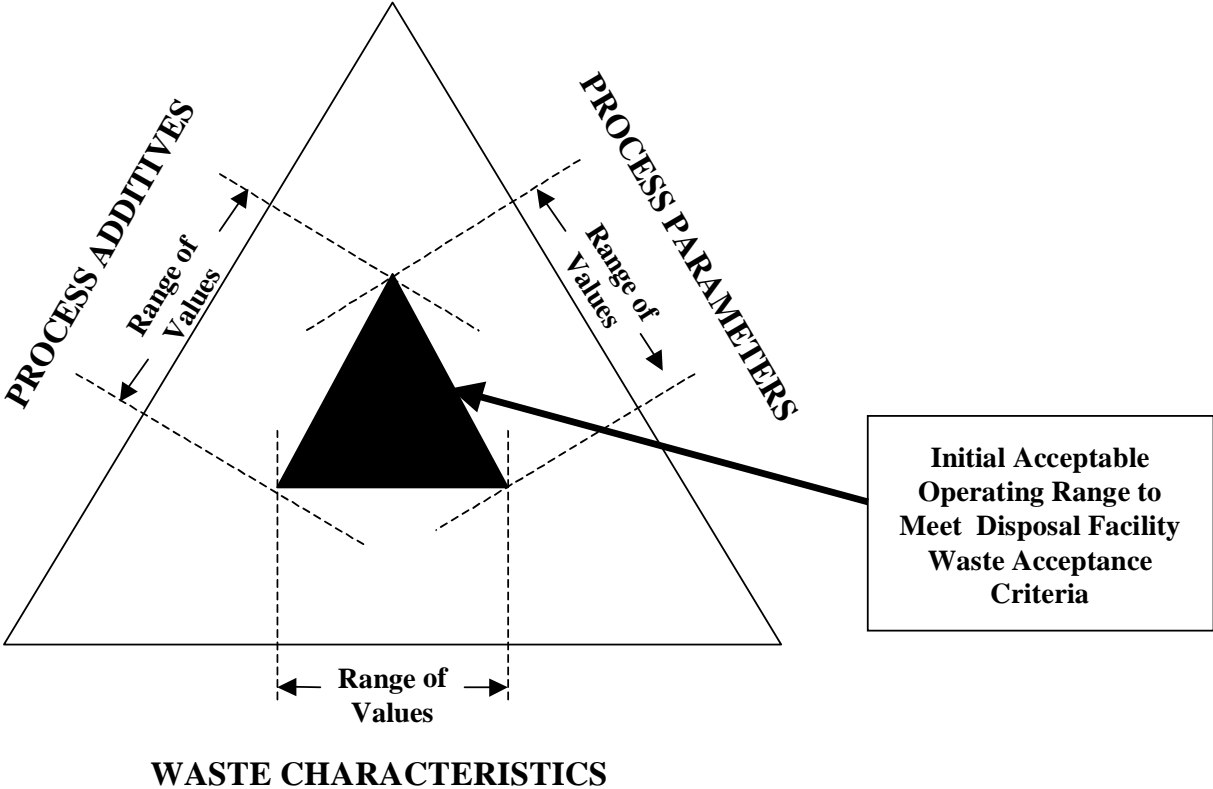
27 At the completion of Phase 1, a report on test conduct, findings, and conclusions will be
28 prepared. The various campaign reports will be incorporated into a comprehensive report for
29 Phases 1 and 2 (Section 9.0) to be submitted at the completion of the RD&D project or on
30 date(s) noted in the RD&D Permit.

31 **5.12 EQUIPMENT OPERATING CONSIDERATIONS**

32 Safe and consistent equipment operation is essential to achieving the RD&D project objectives.
33 Accordingly, prior to final treatment equipment design and installation for the DBVS, conditions
34 that may result in unscheduled equipment shutdowns, out-of-bounds process operation, or
35 incomplete/ineffective waste treatment will be identified. Equipment and control system designs
36 will ensure that safe shutdown and recovery can be conducted should upset or emergency
37 conditions occur.

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Figure 5-1. Test Parameter Relationships



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