Superfund Environmental Indicators Guidance

Office of Superfund Remediation and Technology Innovation
U.S. Environmental Protection Agency
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Acronym List

AWQC	Ambient Water Quality Criteria
ARARs	Applicable or Relevant and Appropriate Requirements
CC	Construction Completion
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of Concern
CSM	Conceptual Site Model
D	Deleted (National Priorities List status)
EI	Environmental Indicators
EOFY	End of Fiscal Year
EPA	U.S. Environmental Protection Agency
F	Final (National Priorities List status)
FAQ	Frequently Asked Questions
FF	Federal Facility
FY	Fiscal Year
FYR	Five-Year Review
GM	Migration of contaminated groundwater
GMID	Insufficient data to determine migration of contaminated groundwater status
GMNA	Migration of contaminated groundwater not applicable
GMNC	Migration of contaminated groundwater not under control
GMUC	Migration of contaminated groundwater under control
GPRA	Government Performance Results Act
GPRAMA	Government Performance and Results Modernization Act of 2010
HE	Human exposure
HEID	Insufficient data to determine human exposure control status
HENC	Human exposure not under control
HEPR	Human exposures under control and protective remedies in place
HEUC	Human exposure under control
HHPA	Long-term human health protection achieved
HHRA	Baseline Human Health Risk Assessment
HI	Hazard Index
HQ	Headquarters
HRS	Hazard Ranking System
JSON	Java Script Object Notation
LTRA	Long-Term Response Actions
MCL	Maximum Contaminant Level
MNA	Monitored Natural Attenuation
NCP	National Contingency Plan
NPL	National Priorities List
NTCRA	Non-Time-Critical Removal Actions
ORCR	Office of Resource Conservation and Recovery
OSRTI	Office of Superfund Remediation and Technology Innovation

OU	Operable Unit
PCOR	Preliminary Close Out Report
PFAS	Per and Polyfluoroalkyl Substances
POLREPS	Pollution reports
PRP	Potentially Responsible Party
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
SAA	Superfund Alternative Approach
SARA	Superfund Amendments and Reauthorization Act
SCAP	Superfund Comprehensive Accomplishments Plan (SEMS report)
SDD	Sufficient Data Determination
SEMS	Superfund Enterprise Management System
SME	Subject Matter Experts
SVE	Soil Vapor Extraction
SWRAU	Site-Wide Ready for Anticipated Use
TMDL	Total Maximum Daily Limit
VOCs	Volatile Organic Compounds

1. INTRODUCTION AND PURPOSE OF EIS

In 1980, Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), to clean up abandoned or uncontrolled hazardous waste sites. CERCLA was amended in 1986 by the Superfund Amendments and Reauthorization Act (SARA). Where EPA determines that a situation may present a release or substantial threat of a release of a hazardous substance, or where a pollutant or contaminant presents an imminent and substantial endangerment to human health or the environment, the Agency has broad response (removal and remedial) and enforcement authority to take appropriate action. EPA began developing Environmental Indicators (EI) for the Superfund Program in the early 1990s to measure the progress in protecting human health and the environment that has occurred due to cleanup activities under CERCLA across the Nation.

This document is primarily intended to provide guidance regarding Superfund EIs for EPA's Superfund personnel, including Remedial Project Managers (RPMs). This guidance document provides an overview of Superfund EIs, including definitions, data elements/parameters/points, and descriptions of how Superfund EI data are collected and used to communicate progress at Superfund sites. The appendices to this manual provide guidance on entering, extracting, and using Superfund EI data from the Superfund Enterprise Management System (SEMS) to monitor the results of cleanup actions and to communicate incremental progress to the public. The appendices also provide more detailed guidance on EI evaluations in the frequently asked questions (FAQs) appendix.

This document does not provide guidance on removal or response actions or remedy selection. It is not a regulation and has no binding effect on EPA, States, the regulated community, or any other persons. The categorization of a particular site using EIs does not affect the Agency's authorities and actions under CERCLA, the National Oil and Hazardous Substances Pollution Contingency Plan (more commonly referred to as the National Contingency Plan or NCP), and existing Superfund guidance, or under any other Agency authority, and does not create any rights, obligations or defenses to liability. This guidance is intended to provide Superfund personnel with information to capture the most current and complete EI data available.

The Human Exposure (HE) and Migration of Contaminated Groundwater (GM) Superfund EIs are designed to evaluate and characterize incremental progress in reaching final cleanup goals at sites on the National Priorities List (NPL) and sites with Superfund Alternative Approach (SAA) agreements in place. HE and GM indicators as measures of interim progress supplement the goals of the Superfund Program (to protect human health and the environment, maintain protection over time, and minimize untreated waste - see, e.g., NCP, Section 300.430(a)(1)(I)). Achieving interim progress as documented by either the HE or GM EI is not a substitute for meeting final remedy requirements, expectations associated with sources of contamination, and the need to restore, wherever practicable, contaminated groundwater to beneficial use. Achieving the final category of Long-Term Human Health Protection Under Control (HHPA) for the Site-Wide Human Exposure is not a substitute for meeting final remedy requirements that are driven by ecological risks.

2. ENVIRONMENTAL INDICATORS OVERVIEW

2.1. History of EIs as Performance Measures

The 1993 Government Performance Results Act (GPRA) was enacted during an era of government reinvention to promote improved government performance and greater public confidence in government through better planning and reporting on results. GPRA requires federal agencies to develop results-oriented and outcome-related goals which are meant to align annual plans and budgets to long-term outcomes. A key component of the Act is to reform program performance by "setting program goals, measuring program performance against those goals, and reporting publicly on their progress." GPRA was updated in 2010 by the Government Performance and Results Modernization Act of 2010 (GPRAMA) which requires that progress be tracked via annual performance measures which are presented in EPA's Annual Performance Plans and Budgets. EPA reports out performance against these annual measures in the Annual Performance Reports, and tracks performance in bowling charts. This information is used to establish priorities, develop future budget submissions, and manage programs.

EPA initially developed three initial program-based environmental indicators that are no longer used today: Populations Protected, Progress Towards Permanent Cleanup, and Cleanup Technologies Applied, the third of which was later adapted to the Cleanup Volumes measure. Progress Toward Permanent Cleanup was functionally replaced by the development of the Construction Completion Superfund program measure. The Populations Protected Superfund EI was developed to measure the progress made in protecting individuals living at or near Superfund sites from immediate threats of exposure to contaminated media. Specifically, this EI was designed to measure the number of individuals protected through the provision of alternate drinking water supplies or relocation in response to contamination. The Cleanup Volumes Indicator was developed to measure the number of contaminated media that has been treated, stabilized, contained, or removed through the use of risk management technologies, engineering techniques, or institutional controls.

In 2001, the current indicators, Human Exposure (HE), and Migration of Contaminated Groundwater (GM), were developed to measure interim progress of protecting human health from contaminant exposure pathways and restoring groundwater to beneficial use. In 2004, both EIs were amended to apply site-wide and the HE EI progress categories were further refined to extend the focus of the HE EI beyond current conditions to measure progress in achieving long-term human health protection. These Superfund EIs are discussed individually in sections 3.0 through 4.5. Subsections 2.2 - 2.6 below provide an overview of EI reporting policies and more general information that applies to both HE and GM. Section 3 and section 4 provide indicator-specific guidance used to make EI evaluations and details on site-wide status types.

Superfund EI data enables the Agency to report on the number of sites at which current human exposure to contamination is under control, the number of sites at which long-term human health protection is achieved, and the number of sites where the migration of contaminated groundwater has been contained within the existing area of contamination. In addition to providing internal measures of interim progress, EIs are reported to the public. For example, human exposure evaluations of "not under control" or "insufficient data" are accompanied by a narrative provided on the Superfund webpage's Human Exposure dashboard. Therefore, EIs are a critical risk communication tool (see more details in section 3.5).

2.2. Coordination with ORCR

The Office of Superfund Remediation and Technology Innovation (OSRTI) developed the HE and GM Superfund indicators to be as similar as possible to the comparable HE and GM indicators developed by EPA's Office of Resource Conservation and Recovery (ORCR) for the Resource Conservation and Recovery Act (RCRA) Corrective Action program. ORCR uses these indicators for internal program management. ORCR captures EI data in its RCRA Info database and has its own guidance document to assist regional and state personnel when making EI decisions. OSRTI and ORCR have developed a working group that meets periodically to discuss EIs and ways in which the two programs can track deferrals/referrals between sites (Superfund) and facilities (RCRA) to ensure accurate reporting.

There are often situations where the two programs use their authority to clean up adjacent areas (referred to as "sites" for the Superfund program and "facilities" for the RCRA program) or to clean up specific media in the same area. It is important for the two programs to coordinate any public communication on EIs to avoid confusion as it might not always be appropriate to have the same EI evaluations for the two areas, which often share similar names, or for separate media. The respective Subject Matter Experts (SME) for EIs should engage periodically in the communication of HE and GM statuses on the Superfund Human Exposure Dashboard and the "Cleanups in My Community" pages. They should also periodically discuss the referral or deferral status for certain sites and ensure that these referrals and deferrals are accurately recorded in program databases.

2.3. Updating EI Data

Updating EI information helps the Superfund program have accurate data to report. At a minimum, every site should be evaluated at least once annually. However, as data collection & analysis or response actions occur, or as environmental conditions change, it is expected that Regions will consider any new information and update EI evaluations as soon as possible using the EI surveys in SEMS. As noted in table 1 below, the updates should be completed within 10 days of new information and should be reviewed and approved by the regional EI coordinator.

Table 1: Timeline for Updating EI Data

Action Item:	Due Date:
Update EI evaluations w/ SEMS questionnaire:	Within 10 days of new information
Review EI evaluations & HE pathway descriptions for all sites:	At a minimum annually
Additions/retractions from EI baseline:	Prior to October 1, inform HQ SME
End of Fiscal Year (EOFY) performance measure accomplishments:	Up to 10 working days after October 1

EI data is available for reporting purposes dating back to the early 2000s, when EI evaluations began being reported directly into CERCLIS (the precursor to SEMS). The capabilities were transferred into SEMS in 2014, and appendix C summarizes Environmental Indicator Reports available through SEMS. The EI evaluations reflect current, site-wide conditions. Site condition changes may be documented in a variety of sources throughout the investigative and cleanup phases. See table 2 for appropriate data/information sources.

Again, it is expected that Regions will review both EI evaluation statuses at a minimum annually for every site to confirm that each site has an accurate evaluation. This is especially true in a year with a Five-Year Review (FYR), see more details in section 2.6. For the Human Exposure EI, if there is no change in the status of the site, update the pathway description with the latest month and year of review. Data entry for SEMS is discussed in more detail in appendix B.

To keep the EI Baseline (see section 2.4) in SEMS up to date, Regions should attempt to make all EI status changes in SEMS prior to the end of the fiscal year, September 30th. In cases where this is not possible the region should contact the HQ EI SME for these measures, and they will work with the SEMS contracting team to back-date accomplishment and baseline additions. For end-of-year reporting purposes, EI changes entered during the first ten working days of the new fiscal year will be counted as accomplishments for the prior fiscal year.

2.4. EI Baseline

The EI baseline is a data flag in SEMS that determines which sites should be evaluated for EIs. The baseline provides a benchmark to measure EI changes and accomplishments throughout the fiscal year and currently consists of all Final (F) and Deleted (D) NPL sites and sites with SAA agreements in place. The baseline adjusts at the end of the fiscal year to either add or remove sites for the new baseline in the upcoming fiscal year. The HQ EI SME will work with the SEMS Reference Desk in September to perform an EI baseline data freeze in SEMS to capture baseline updates via a special initiative code. The new baseline is usually viewable in the SEMS production environment around the 3rd week of October. The EI SME will also work with the SEMS Reference Desk to update the Java Script Object Notation (JSON) file used on the public Human Exposure Dashboard. Regions should ask the OSRTI HQ EI SME to manually exclude sites from the baseline when baseline criteria no longer apply to sites or when they are no longer under EPA's response authority (ex. referred to RCRA program).

Prior to 2008, EI evaluations were made only for Superfund final and deleted National Priorities List (NPL) sites. Beginning in fiscal year (FY) 2008, Regions expanded their evaluations to include sites with SAA agreements in place. For SAA Sites, the HE evaluation should apply only to those sites that are actively using the SAA. These are non-NPL sites with a signed, enforceable agreement for remedial investigation/feasibility study (RI/FS), remedial design (RD), remedial action (RA), or Non-Time-Critical Removal Actions (NTCRA) finalized after June 2002 where: (a) the agreement contains the SAA provisions or has prior written approval to omit the provisions, or (b) the agreement is consistent with EPA SAA guidance. For more information regarding SAA evaluations, consult the 2012 SAA Guidance. Beginning in FY13, OSRTI began re-baselining for SAAs every year, resulting in significant baseline expansions annually.

2.5. Relation of EIs to Five-Year Reviews (FYR)

Consistent with CERCLA and the NCP, remedial actions that allow contaminants to remain on site above levels that allow for unlimited use and unrestricted exposure undergo review at least every five years to determine whether the remedy is or will be protective of human health and the environment. Among other things, these reviews assure that the remedy is operating as intended, that the exposure assumptions, toxicity data, and cleanup goals are still valid, and assess whether any new information has been discovered that could call into question the protectiveness of the remedy. The identification of new contaminants, as well as changes in exposure assumptions and toxicity data, call into question the assumptions underlying the risk

assessment and remedy, and thus merit scrutiny regarding the potential impact on the EIs. For a detailed explanation of FYRs and guidance on conducting FYRs, please see the "Comprehensive Five-Year Review Guidance" (OSWER 9355.7-03B-P, June 2001) and additional FYR resources on the Superfund FYR website.

Many of the activities required to make a FYR protectiveness determination are useful in confirming the environmental indicator status. The activities may include addressing newly promulgated standards, confirming current and expected land use, reviewing/evaluating monitoring data, and identifying new contamination or contaminant sources. Upon completion of any FYR, Regions should confirm that the information evaluated in the review is consistent with the current site-wide human exposure evaluation and the site-wide groundwater migration evaluation. If necessary, Regions should revise environmental indicator evaluations in SEMS to be consistent with the information identified and evaluated during the FYR.

Human exposure evaluations consider site-wide risks to human health under current conditions, and do not address future human health risks or ecological risks. FYRs, in contrast, do not always address the entire site, may consider future risks, and address ecological risks. Because of this, FYR protectiveness statements and human exposure evaluations are not direct corollaries. Additionally, it is expected that environmental indicators are updated annually, while FYRs are generally completed every five years representing the status at a point in time. For assuring consistency between FYRs and environmental indicator evaluations in that year, the information used to evaluate protectiveness and develop FYR protectiveness statements is generally more useful than the protectiveness determination itself.

2.6. Evaluating EIs for Emerging Contaminants

Emerging contaminants are generally chemicals whose human health impacts and presence in contaminated media are less well known, and present unique issues and challenges to cleaning up contaminated sites. Per and polyfluoroalkyl Substances (PFAS) are a group of manufactured chemicals that have been used in industry and consumer products since the 1940s because of their useful properties. There are thousands of different PFAS, some of which have been more widely used and studied than others. PFAS chemicals are good examples of new and emerging chemicals that can make EI evaluations more difficult.

EI evaluations are intended to be realistic, risk-based evaluations based on actual current land and groundwater use. The HE evaluation, specifically, should not consider hypothetical human exposures, but rather exposure that would be reasonably anticipated under current use. In making a HE evaluation, consider if there are complete exposure pathways to contamination that poses an unacceptable risk to humans based on the magnitude, frequency, duration, and route(s) of exposure relative to the exposure concentrations and chemical intakes. See more details in section 3.3 below.

In some cases, new information may trigger a review of environmental indicators based on the detection of new and/or emerging contaminants or potential exposure pathways. If any of these are identified, the underlying risk assessment and HE evaluations may need to be re-considered. If there *is* an unacceptable, complete exposure pathway that has not been mitigated, then an evaluation of HENC (human exposure not under control) would be appropriate. If and until this information can be confirmed, it may be appropriate to change the HE status to HEID (insufficient data to determine human exposure evaluation).

Risk-based HE evaluations should use all available toxicity data to help determine if there is any contamination that poses unacceptable risk to humans, even if a formal human health baseline risk assessment is not yet complete as part of the remedial investigation. New contaminants and exposure pathways may be identified at any time - during routine monitoring, or other targeted sampling events. See table 3 in section 3.3 below for a list of site documentation sources that may contain helpful information. For emerging contaminants with a Regional Screening Level (RSL), the RSL is the starting point for determining cumulative risk from the full list of contaminants present at your OU/site. PFAS and other emerging contaminants should be added with other contaminants for the Hazard Index (HI) sum. In the absence of RSLs, a qualitative approach should be carefully considered based on site-specific circumstances. When assessing drinking water exposure pathways there may be additional criteria, such as Maximum Contaminant Levels (MCLs), that would identify an unacceptable risk to humans.

Environmental media are routinely analyzed to assess trends for the contaminants of concern. The method used analyzes for a suite of Volatile Organic Compounds (VOCs), so additional VOCs may be detected, representing increasing concentrations of chemicals initially present at very low levels. A risk-based EI evaluation would need to be made considering the new information available, which would include the original Contaminants of Concern (COCs) and newly identified chemicals, and any complete exposure pathways.

3. HUMAN EXPOSURE

3.1. Purpose of HE Indicator

The Human Exposure (HE) environmental indicator is designed to evaluate and categorize incremental human health protection by measuring EPA's and/or relevant PRPs' ability to control complete, unacceptable human exposure pathways at a Superfund site. These evaluations currently apply to final and deleted Superfund NPL sites and SAA Sites. The Human Exposure indicator is measured on a site-wide basis, meaning that one, unacceptable human exposure pathway at a single OU can determine the status of the entire site, and is intended to document current conditions. Evaluation of Long-Term Human Health Protection Achieved (HHPA) however, considers both current and future conditions. See more details in section 3.2 below.

Human exposures generally can be controlled in one of five ways:

1. Collecting sufficient data to determine that there are no unacceptable exposure pathways anywhere on site.
2. Reducing contamination below risk-based levels.
3. Eliminating exposure pathways to human receptors.
4. Preventing human receptors from contacting contaminants in place.
5. Influencing harmful, human receptor activity patterns (e.g., by reducing the frequency or duration of exposure).

Most Superfund remedies include a combination of components that control or mitigate exposure pathways (e.g., engineering or institutional controls designed to control contact with waste left in place) and components that altogether eliminate human exposures to contamination (e.g., excavation and treatment remedies). Where EPA determines that a situation may present a release or substantial threat of a release of a hazardous substance, or where a pollutant or contaminant presents an imminent and substantial endangerment to human health or the environment, the Agency has broad response (removal and remedial) and enforcement authority to take appropriate action.

3.2. HE Status Types

The five HE status types below provide a measure of EPA's incremental progress in controlling site-wide human exposure. Note that for the purposes of public communication (see section 3.5) or reporting EPA's GPRA accomplishments (see section 3.6), the latter three categories (HEUC, HEPR, and HHPA) are combined into a single category reported as "Human Exposure Under Control" (HEUC). For internal program tracking, however, the categories of HEPR and HHPA apply to sites where site-wide, current, human exposures are under control and signal progress in achieving more permanent, long-term control and protectiveness at these sites. Table 2 provides a description of each progress category and the typical site to which each category may apply.

Table 2: Description of Site Statuses for the Site-Wide Human Exposure Superfund Environmental Indicator

Category	Description	General Site Types
HEID: currently insufficient data to determine a human exposure evaluation	Due to uncertainty regarding exposures, one cannot draw conclusions as to whether human exposures are controlled - i.e., there is not sufficient information/data to fully evaluate whether there are any current, complete unacceptable human exposure pathways at the site.	This category would apply primarily to sites that are in the initial phases of remedial investigation newly listed NPL sites or sites at which an investigation is underway to assess a new exposure pathway (e.g., vapor intrusion, emerging contaminants, etc.).
HENC: current human exposure not under control	Sufficient data/information are available to support the evaluation that current, completed, or reasonably anticipated human exposure pathways exist and that they are unacceptable based on site-specific risk criteria.	This will typically include sites where response actions are underway but are not yet complete, and exposure pathways have not been controlled, mitigated, or eliminated for the entire site.
HEUC: current human exposures under control	Sufficient data/information are available to support the evaluation that there are currently no completed or reasonably anticipated human exposure pathways that are unacceptable based on site-specific risk criteria. However, there may be additional physical construction work required and/or institutional controls need to be implemented to address long-term human health exposure, where all human exposure-related cleanup goals have yet to be met.	For these sites, exposure pathways have currently been controlled, mitigated, or eliminated for the entire site. This status can include sites that are in the pre-construction or ongoing construction phases of work or can include Construction Completion (CC) sites where groundwater treatment systems are undergoing shake-down to demonstrate that they are operating as intended, and/or ICs are not in place or operating as intended to prevent reasonably anticipated exposures above acceptable levels.
HEPR: current human exposures under control and all protective remedy(ies) in place	The site is under control. In addition, these sites have achieved the Construction Completion status, remedies to human exposures are operating as intended, and engineering and/or institutional controls are in place and effective. However, one or more of the human exposure-related cleanup goals for the site have yet to be met.	This category includes sites where all physical construction is complete and remedies, ICs, and engineering controls to human-exposure pathways are all in place and effective, including those sites where long-term remedial actions (LTRAs), or operations and maintenance (O&M) activities are underway to achieve cleanup levels.
HHPA: long-term human health protection achieved	There site is under control. In addition, the site has achieved the Construction Completion status, remedies to human exposures are operating as intended, and engineering or institutional controls are in place and effective. Finally, all human exposure-related cleanup goals for the site have been achieved.	Whereas other categories depict current conditions, this category also reflects reasonably anticipated future, conditions. This category typically includes CC sites that do not involve long-term soil, groundwater or surface water restoration remedies and all institutional controls are in place and effective. Often this status is used for sites with the Site Completion status or are Deleted NPL sites.

3.3. Overview of the HE Evaluation

Human exposure evaluations describe site-wide risks to human health under current conditions and do not address future human health risks (except for HHPA, see details in table 2 above) or ecological risks. In making a risk based HE evaluation, analyze whether there are any complete exposure pathways to contamination that pose unacceptable risks to humans based on the magnitude, frequency, duration, and route(s) of exposure relative to the exposure concentrations and chemical intakes. In order to effectively evaluate for HE, Regions should have sufficient data, knowledge & information regarding:

1. A site's physical setting and how that contributes to human exposure.
2. Exposed populations.
3. Exposure pathways.
4. Estimates of exposure concentrations.
5. Estimates of chemical intakes.

Evaluations should be made whenever site conditions or information changes in such a way that calls into question the status of human exposure under current conditions. The evaluations should be made with reasonable certainty and based on the most current, available data/information for a site. Complete certainty, however, is not a necessary condition to make a human exposure evaluation at a site. The evaluation is intended to be a realistic, risk-based evaluation based on actual and reasonably anticipated current land, surface water and groundwater use. All response actions across all media should be considered when making these evaluations and should be revised as new information becomes available.

Before a Region can fully evaluate a site for the human exposure indicator, they should have sufficient data on the five items listed above to determine both the degree of risk to exposure and the control of the exposure itself (see step 1 in section 3.4). Although there are five distinct human exposure status types, whether the site is ultimately under control or not is a binary decision, with clear guidance in the following section. A sufficient data determination (SDD) will answer whether a site is under control and should be made before the HE EI can properly communicate risk to the public (see section 3.5 for more details on public-facing HE pathway descriptions). The primary source of information and data behind an SDD is the Baseline Human Health Risk Assessment (HHRA), which will identify exposure pathways and their associated risk levels.

A site should be given a status of HENC if there are known, completed, unacceptable exposure pathways or if unacceptable exposure pathways can be reasonably anticipated under current conditions. Reasonably anticipated exposures should be evidence-based and prompt Regions to take mitigating actions, whereas not every exposure possibility will warrant action. Of course, this judgment will have to be made by individual Regions to the best of their abilities and in consideration of unique site conditions.

The six-step HE evaluation process (see section 3.4) outlines the various considerations for HE decision-making, and each step has different documentation sources that may prove helpful. See table 3 for appropriate data/ information sources.

Table 3: Appropriate Data/Information Sources

Question	Documentation
Is there sufficient data?	• Human Health Risk Assessment(s) • RI/FS reports • Removal Action Memoranda • Site Assessment Reports • Site Investigation reports (Federal Facility (FF) sites) • Expanded Site Investigations (FF sites)

All long-term goals met?	• Final Close-Out Reports (FCORs)
	• Decision documents:
	  ○ Records of Decision (RODs)
	  ○ ROD Amendments
	  ○ Explanation of Significant Differences (ESDs)
	  ○ Early RODs
	  ○ Interim RODs
	  ○ Removal Action Memoranda
	• RA Reports
	• Ground/surface water monitoring reports
	• Deletion Notices
	• Five-Year Reviews (FYRs)

Are there completed pathways?	• Human Health Risk Assessment(s) ○ Conceptual Site Model (CSM) • RI/FS reports
Are exposures acceptable?	• Human Health Risk Assessment(s) • POLREPS • RA Project Reports
Is the site CC, etc.?	• Close-out reports (preliminary or final) • Five-Year Reviews (FYRs) • Operational and Functional (O&F) determinations
Are there continuing exposures at the site?	See section 3.4, step 6 below for documentation needed in these circumstances.

3.4. Six-Step HE Evaluation Process

For national consistency, EPA Regions should use the step-by-step process listed on the following pages to make a human exposure evaluation. These steps were developed in cooperation with representatives from all ten Regional Superfund programs and are designed to assist Remedial Project Managers (RPMs) in making accurate HE evaluations. See exhibit 1 below for a conceptual flowchart for the HE evaluation, which mirrors the SEMS questionnaire.

Please refer to appendix A for frequently asked questions regarding the evaluation process and appendix B for more detailed instructions regarding entering this data into SEMS. When making evaluations regarding the human exposure status at any site, regional personnel should document the sources of information used to make the evaluation in the "search for site documentation" field on the human exposure survey in SEMS.

In making a HE evaluation, the following five steps should be followed:

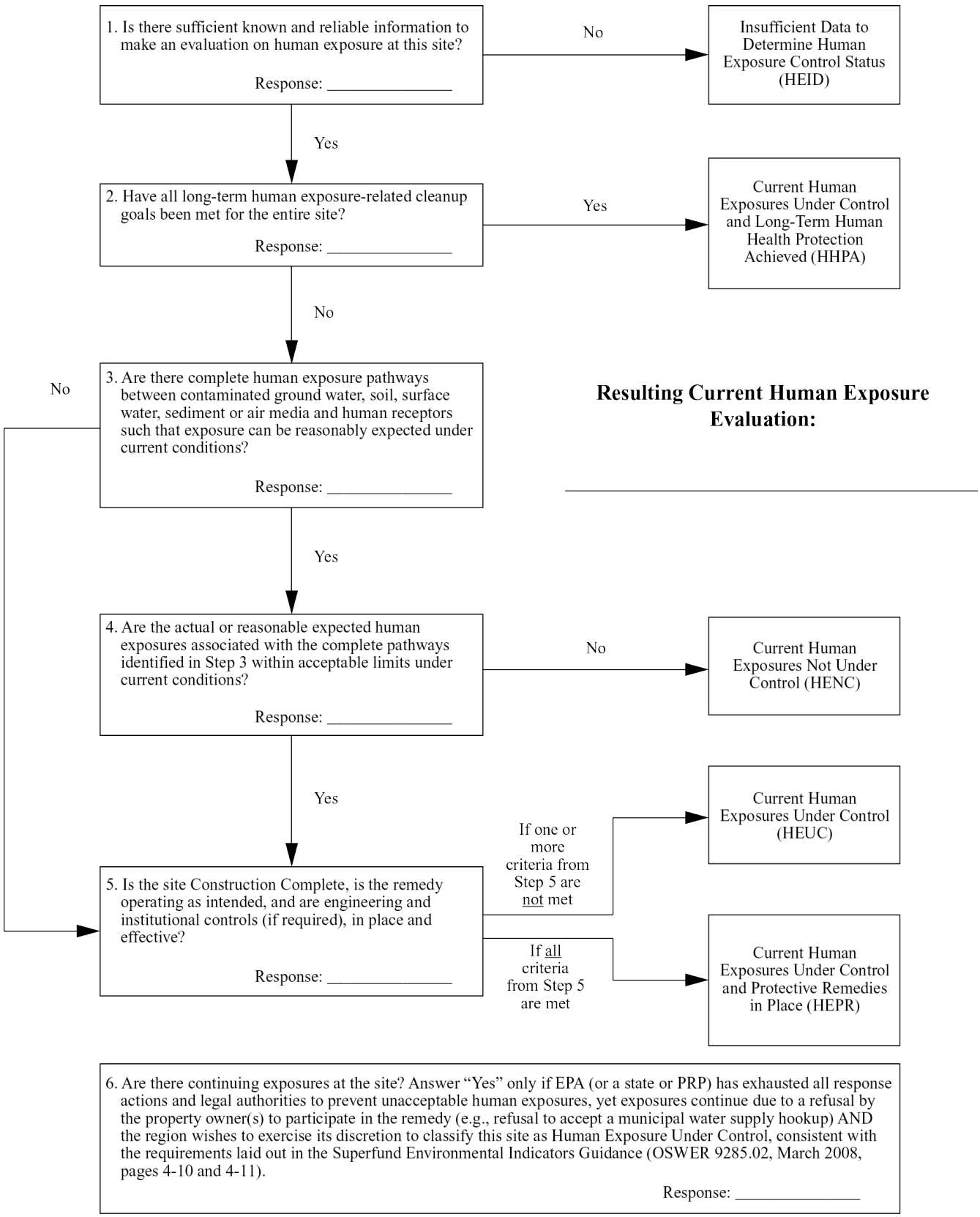
Step 1: Is there sufficient known and reliable information to make an evaluation on human exposure at this site?

The purpose of this step generally is to identify and screen for sites where information (i.e., human exposure and risk data) is insufficient to make a sufficient data determination (SDD) for Human Exposure. If "no," a site will be classified as "Insufficient data to determine human exposure control status" (HEID). If "yes," proceed to step 2. "Sufficient data" is defined here as reliable data and information on the five items listed in section 3.3 above. This information should allow Regions to objectively answer the remainder of the following questions, arriving at one evaluation decision other than "HEID."

The primary source of information to answer this question is the Baseline Human Health Risk Assessment (HHRA). Keep in mind that the Human Exposure measure is a site-wide measure; not every risk assessment for every operable unit (OU) necessarily needs to be completed before the Region could answer "yes" to this question, so long as one unacceptable, completed exposure pathway (see steps 3 and 4) has been identified. In this scenario, the data would be "sufficient" because it would allow the region to make an evaluation of Human Exposure Not Controlled (HENC).

There are limited situations where a completed risk assessment is not needed at all to answer "yes" to this question. For example, in the early stages of the Remedial Assessment (RI), it may be abundantly clear that there is sufficient data to make an evaluation of HENC. In these cases, regions should work with a risk assessor to determine how best to interpret limited information and make such an evaluation for public awareness. Still, regions should review and consider all other sources of information that are pertinent to the evaluation of human exposure, even if you decide to evaluate the indicator based on one source or a subset of sources. See table 3 above for appropriate data/information sources. Document the sources of information used to make the evaluation, if available, in the "search for site documentation" field on the human exposure survey in SEMS.

Exhibit 1: Superfund Human Exposure (HE) Evaluation Flowchart



Step 2: Have all long-term human exposure-related cleanup goals been met for the entire site?

The purpose of this step is to identify those sites where all human exposure-related cleanup goals at all OUs for the site have been met and long-term human health protection has been achieved. This would include the attainment of contaminant-specific cleanup levels and the implementation of engineering and institutional controls related to human exposures that are operating as intended. This measure does not consider ecological risk, even though cleanup goals for any given site may include those related to the protection of the environment as well as human health.

Sites that meet these criteria are typically in the very final stages of the remedial cleanup process. If "yes," all goals have been met, the site will be assigned a category of "Current human exposures under control and long-term human health protection achieved" (HHPA). If "no," proceed to step 3. This question is typically changed to "yes" in the questionnaire as the last step in the HE life cycle (see appendix B for details on SEMS data entry).

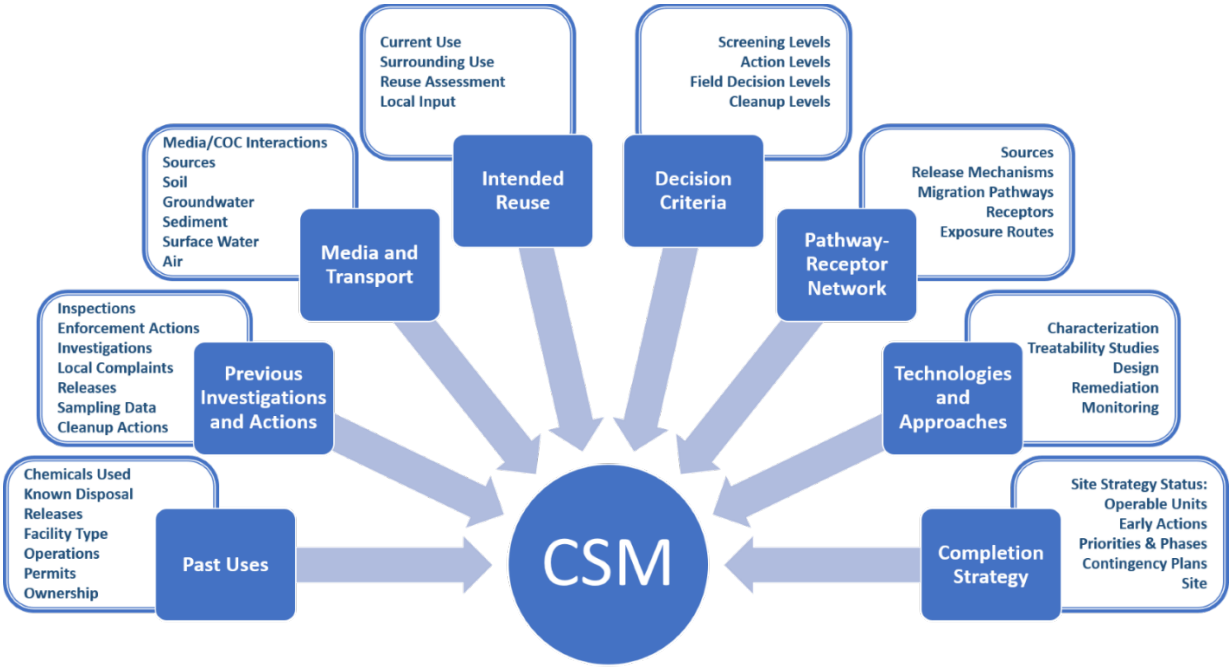
Cleanup goals are identified in Records of Decision (RODs) and are designed to provide a general description of what the cleanup will accomplish, form the basis for the design of remedies that will be protective of human health and the environment, and may include (but are not limited to) contaminant-specific numeric cleanup goals, as well as current and reasonably anticipated land use. See table 2 above for appropriate data/information sources. Document the sources of information used to make the evaluation in the "search for site documentation" field on the human exposure survey in SEMS.

Step 3: Are there complete human exposure pathways between contaminated groundwater, soil, surface water, sediment, or air media and human receptors such that exposures can be reasonably anticipated under current conditions?

The purpose of this step is to identify whether there are any complete human exposure pathways between human receptors and contaminated media under current land and groundwater use conditions. If "no," proceed ahead to step 5. If "yes," there are completed human exposure pathways, proceed to step 4.

The primary source of information on human exposure pathways should be the Conceptual Site Model (CSM) and the Baseline Human Health Risk Assessment. For sites with a ROD that pertains to the exposure pathway, regions should consider Contaminants of Concern and risk-based levels documented in the ROD; however, if the exposures driving the remedy as outlined in the ROD are based on future use only, and future use conditions are different than current conditions, then data from the baseline risk assessment should be used to evaluate exposure pathways rather than those detailed in the ROD. Document the sources of information used to make the evaluation, if available, in the "search for site documentation" field on the human exposure survey in SEMS.

Exhibit 2: Sample Exposure Pathway Conceptual Site Model



Step 4: Are the actual or reasonably anticipated human exposures associated with the complete pathways identified in step 3 within acceptable limits under current conditions?

The purpose of this step is to identify whether the complete exposure pathways identified in step 3 could result in unacceptable human exposures under current conditions. If "no," the exposures are not within acceptable limits, the site will be assigned a category of "current human exposures not under control" (HENC). If "yes," the exposures are within acceptable limits, proceed ahead to step 5.

For our purposes here, "acceptable limits" are generally defined as when cumulative carcinogenic site risk to an individual is less than 10^{-4} Reasonable Maximum Exposure (RME) and when the non-carcinogenic hazard index is less than 1. The primary source of information regarding acceptable, risk-based limits should be derived from the baseline risk assessment, and/or acceptable protectiveness standards identified in the applicable RODs, if available. Note that sometimes the cleanup activity driving the remedy as defined in the ROD is based on future reuse purposes. If future use conditions are different than current conditions, then to ensure that the HE evaluation reflects current conditions, data from the baseline risk assessment for current exposures should be used to evaluate acceptable current exposure risk rather than the future protectiveness standards outlined in the ROD.

A positive evaluation ("yes") could be made for this step if the frequency and/or duration of exposure associated with complete pathways is such that the risk is acceptable and/or the only cleanup goals that have yet to be met (see step 2) address future reuse purposes. The risk assessment will analyze these factors and aid in the decision-making for this question. Anecdotal or random evidence would not necessarily result in an evaluation of "not under control" unless conditions are such that exposure at unacceptable levels is reasonably anticipated to occur (see section 3.3).

Step 5: Is the Site Construction Complete, is the remedy operating as intended, and are engineering and institutional controls (if required) in place and effective?

The purpose of this step is to categorize sites where not only are current human exposures under control, but that also have more permanent mitigation remedies AND long-term human health protection has yet to be attained. If at least one of these criteria is not met, the answer should be "no" and the site should be assigned the category of "current human exposures under control" (HEUC). If all of these criteria are met, the answer should be "yes," and the site should be assigned a category of "current human exposures under control and protective remedy or remedies in place" (HEPR). HEPR and HHPA are the only HE statuses that allow a site to be eligible for the SWRAU designation (see section 3.6 below).

This step is intended to distinguish between sites where current human exposures are under control and sites where there is also a protective remedy in place, and sites where all long-term human exposure-related cleanup goals have yet to be met (the criteria for the HHPA evaluation – see step 2). Sites with a "protective remedy in place" typically would include Construction Completion (CC) sites where long-term response actions (LTRAs) or O&M activities are underway to achieve final cleanup levels, and institutional controls to prevent unacceptable human exposures are in place. For the purposes of this EI, remedies at sites that are CC should also be operating as intended in order to answer "yes" to this question.

If the remedies, engineering controls, or institutional controls are not operating as intended, but such that the protectiveness of human health is unlikely to be impacted, it may be appropriate to change the site status back to HEUC and develop a plan to make them fully operational again. This status change would simply designate a remedy failure and not necessarily a completion of an unacceptable exposure pathway. Of course, if the remedy failures result in a reasonably anticipated or actual, unacceptable exposure pathway, the site status should change to HENC.

Step 6: Are there continuing exposures at this site?

This is an optional step occasionally used to document where EPA and/or a state agency, a PRP or another Federal Agency may have exhausted all response actions, including all relevant enforcement actions to prevent human exposures, yet some exposures may continue based on a decision by a property owner to either not participate in the remedy or allow access. In these cases, the region has determined that it would not be appropriate to compel access, and the region has the discretion to categorize a site as HEUC in situations where the negative impacts of property owners' decisions are limited to the owner and/or their property. For example, at some sites, property owners have chosen to drink contaminated well water instead of accepting free bottled water from federal agencies. This step may be used when this situation is encountered, regardless of the HE status for the site.

In contrast, a site would not be eligible to be categorized as HEUC where an owner does not allow access to remediate his/her property, and contamination from that owner's property also contaminates adjoining properties above risk-based levels. Further, regions should not exercise this discretion in the case of rental properties, where tenants may not have the power to make such decisions. Where such situations are encountered, and a region decides to classify such site in one of the HE categories, a region should:

1. Document in SEMS all steps taken to inform property owners and occupants of the contamination and the exposure risk that may result from their decision to refuse access

or assistance. The property owner/resident's response should be included in such documentation. In cases where the region has determined that it is not appropriate to compel access, the site file should contain information that provides the underlying justification.

2. Include a set schedule for frequent periodic reviews of the site so that owners/occupants are reminded that exposures have yet to be addressed. This gives property owners periodic opportunities to reconsider allowing access or accept a remedy and the region to ensure that the EI status is still current.
3. Draft a concise explanation of the exposure conditions at the site, describing the actions taken to address exposures at the site as well as the nature of any continuing exposures.
4. Notify the OSRTI HQ EI SME of the documentation, periodic review process, and exposure explanation listed above, or ask for assistance with the evaluation.

3.5. Human Exposure Pathway Descriptions

As a key program target and performance measure, EPA reports HEUC accomplishments to external parties and publicly communicates risks about exposure pathways. EPA has committed to providing the public with real-time, current human exposure evaluations and pathway descriptions for all sites via its Human Exposure Dashboard. As part of this effort, the Agency provides both the HE status of a site and exposure pathway descriptions when a site is categorized as "Insufficient Data" (HEID) or "Not Under Control" (HENC).

This information is directly linked to SEMS. Consequently, it is critical regions maintain the quality of the exposure pathway descriptions in the SEMS database (see more details on SEMS data entry in appendix B). When making a HEID or HENC evaluation in SEMS, regions should record exposure descriptions in the "Human Exposure Pathway Description" tab, and the text will save as a draft. Upon OSRTI HQ review and approval of the text, the human exposure evaluation will be saved in SEMS as final, and the description will be published to the public-facing dashboard. To help standardize descriptions entered in SEMS, and to assure that similar exposure scenarios are described consistently across regions, the templates below should be used on the "Human Exposure Pathway Description" tab.

A. Template for Sites with a HE Evaluation of HENC

"As of [month] [year], the [insert site name] Superfund site is considered "Current Human Exposure Not Under Control" (HENC). [Insert a detailed description of all pathways and contaminants of concern, which media and/or OUs are impacted, and whether there are known exposures occurring or if they can be reasonably anticipated instead]. This exposure pathway is considered unacceptable based on EPA risk-based criteria because [as appropriate, insert concentration level, cancer-risk range details, and/or other data used to make the HENC evaluation as well as information sources used]."

"Currently, the planned activities to address this pathway are [detail the actions planned but not yet taken to control human exposure, including any planned removal actions and the remedy as outlined in the ROD, if available]. If you are impacted by risks inherent at this site, [insert ways in which individuals can reduce their exposure risk, coordinate with the Community Involvement Coordinator for details]. EPA (or state, or PRP or Federal Agency as appropriate) currently anticipates that human exposure will be under control by [HEUC date in SEMS from last regional review date] because [provide reasoning for planned HEUC date in SEMS]."

As appropriate, add:

"In addition, EPA (or state, or PRP or Federal Agency as appropriate) is currently [insert summary descriptions of actions underway or previously taken to address human exposures, including any temporary controls that have been put in place to address this exposure scenario (e.g., fish advisory, fencing, signs) or removal actions taken to address immediate risks]."

(If necessary, detail any property access issues and efforts taken to inform the property owner and/or occupants of the exposure risks).

(Also consider detailing any community involvement efforts to communicate risks about the site. This is a good opportunity to highlight these efforts in conjunction with our community involvement program).

B. Template for New Sites with a HE Evaluation of HEID

"As of [month] [year], the [insert site name] Superfund site is considered "Insufficient Data to make a Human Exposure evaluation" (HEID). [Insert site name] was recently finalized on the NPL on [MM/DD/YY], and there has not yet been an evaluation of the human health exposure risks."

"EPA uses this Human Exposure status when there is insufficient data/evidence to determine whether actual or reasonably anticipated human exposures are occurring, and/or whether those exposures are above acceptable risk-based levels. The planned activities to collect sufficient information to make a human exposure evaluation are [insert a detailed summary of what data will be collected and how, whether through a Human Health Risk Assessment (HHRA) or information about the human interactions with contaminated media. Discuss OUs and/or media that samples will be collected on, and exposure pathways to be investigated]. EPA (or state, or PRP, or Federal Agency as appropriate) currently anticipates that there will be sufficient data to make a Human Exposure determination by [SDD date in SEMS from last regional review date] because [provide reasoning for planned SDD date in SEMS]."

As appropriate, add:

"Currently, EPA (or state, or PRP or Federal Agency as appropriate) suspects that [add information about possible contamination source areas, contaminated media, contaminants of concern, etc. based on the best of regional knowledge about the site (consider using Hazard Ranking System (HRS) package information)]. This does not necessarily mean that unacceptable exposures are occurring, however. Out of an abundance of caution, if you live near this site [insert ways in which individuals can reduce their exposure risk, coordinate with the Community Involvement Coordinator for details]."

(If necessary, detail any property access issues and efforts taken to inform the property owner and/or occupants of the exposure risks.)

(Also consider detailing any community involvement efforts to communicate risks about the site. This is a good opportunity to highlight these efforts in conjunction with our community involvement program.)

C. Template for sites with a HE Evaluation of HEID Due to a Newly Identified Exposure Pathway and/or Contaminant(s)

"As of [month] [year], the [insert site name] Superfund site is considered "Insufficient Data to make a Human Exposure evaluation" (HEID) because of a newly identified exposure pathway and/or contaminant(s) [insert a detailed description of the human exposure pathway of concern, include the contaminants of concern and media]. The site was previously categorized as [HENC, HEUC, spell out acronym, discuss the remedy and its protectiveness and whether the new pathway impacts that remedy (if the site was HEUC), or, if the site was HENC, what new information calls into question the evaluation and how that information relates to the previously defined risks]."

"EPA uses this Human Exposure status when there is a lack of evidence to suggest that actual or reasonably anticipated human exposures are occurring and that those exposures are above acceptable risk-based levels. The planned activities to collect sufficient information to evaluate this new exposure pathway and/or contaminants(s) are [insert a detailed summary of what data will be collected and how, whether through a Human Health Risk Assessment (HHRA) or information about the human interactions with contaminated media. Discuss OUs and/or media that samples will be collected on, and exposure pathways to be investigated]. EPA (or state, or potentially responsible party (PRP), or Federal Agency as appropriate) currently anticipates that there will be sufficient data to make a Human Exposure evaluation by [SDD date in SEMS from last regional review date] because [provide reasoning for planned SDD date in SEMS]."

As appropriate, add:

"In addition, EPA (or state, or PRP or Federal Agency as appropriate) is currently [insert summary descriptions of actions underway or previously taken to address human exposures, including any temporary controls that have been put in place to address this exposure scenario (e.g., fish advisory, fencing, signs) or removal actions taken to address immediate risks]." Out of an abundance of caution, if you live near this site [insert ways in which individuals can reduce their exposure risk, coordinate with the Community Involvement Coordinator for details]." This does not necessarily mean that unacceptable exposures are occurring, however."

(If necessary, detail any property access issues and efforts taken to inform the property owner and/or occupants of the exposure risks.)

(Also consider detailing any community involvement efforts to communicate risks about the site. This is a good opportunity to highlight these efforts in conjunction with our community involvement program.)

3.6. Relation of HE to Other Performance Measures

The Human Exposure status of HEUC is a Superfund performance measure intertwined with other performance measures. As noted in section 3.2, to report EPA's Government Performance and Results Act (GPRA) accomplishments, the latter three categories (HEUC, HEPR, and HHPA) are combined into a single category reported as "Human Exposure Under Control" (HEUC). The Construction Completion (CC) measure is one of the pre-requisites for an evaluation of HEPR or HHPA, however.

It's important for regional and HQ staff involved with EIs to communicate changing site conditions with other performance measure lead staff, as a change in a site's Human Exposure status can impact the status of other performance measures. HEPR and CC are both pre-requisites for the Site-Wide Ready for Anticipated Use (SWRAU) performance measure. When a new exposure pathway is identified at a site previously evaluated as HEPR, the Human Exposure status often changes back to insufficient data (HEID), which triggers a SWRAU retraction. Similarly, upon completion of any FYR, regions should confirm that the information evaluated in the review is consistent with the current site-wide human exposure evaluation, which may in turn impact the SWRAU designation for the site.

An NPL deletion marks when EPA and the state concur that all response actions are implemented and/or any releases pose no significant threat to public health and the environment. Deleted sites, however, need to continue to be evaluated for Human Exposure and Migration of Contaminated Groundwater, as they are still included in the EI baseline (see section 2.5). Deleted sites will almost always be categorized as HHPA but may still be assessed for exposure risks during an FYR, during which time new pathways or changed site conditions (ex. toxicity levels) are sometimes identified.

4. MIGRATION OF CONTAMINATED GROUNDWATER

4.1. Purpose of GM Indicator

The Migration of Contaminated Groundwater (GM for shorthand) EI categorizes whether the migration of contaminated groundwater is stabilized such that contamination stays within the existing plume area and does not provide unacceptable discharge into surface water. This indicator is limited to sites with known groundwater contamination or sites that have been investigated for groundwater contamination in the past. These evaluations currently apply to Final and Deleted Superfund NPL sites and SAA Sites. The GM indicator is intended to document current conditions, and is measured on a site-wide basis, meaning that one instance of contaminated groundwater migration can determine the status of the entire site. Additionally, unlike the HE EI, GM considers ecological impact in its evaluation.

The migration of contaminated groundwater can generally be controlled in one of three ways:

1. Collecting sufficient data to determine that contaminated groundwater stays within existing plume areas and does not discharge into surface water.

2. Stabilizing or preventing the migration of contaminated groundwater or discharge into surface water.

3. Reducing contamination in groundwater below risk-based levels.

The "existing area of contamination" is an area that has been verifiably demonstrated to contain all relevant groundwater plumes associated with a site-wide evaluation, using groundwater monitoring locations designated at the time of the GM evaluation. It is defined by designated locations proximate to the outer perimeter of contamination and should include horizontal and vertical dimensions. EPA recognizes that a plume boundary may be more realistically defined by a zone rather than a line. Fluctuations within this zone are likely to occur due to several factors (e.g., analytical, spatial, or seasonal variability), which may or may not be indicative of a trend in plume migration.

4.2. GM Status Types

There are four distinct status types for the GM EI, and they provide a measure of EPA's incremental progress in identifying contamination in groundwater and controlling whether the contamination is stabilized. Table 4 provides a description of each status and a general description of sites that meet the conditions.

Table 4: Description of Site Statuses for the Migration of Contaminated Groundwater Environmental Indicator

Category	Description
GMNA: migration of contaminated groundwater not applicable.	Sites are assigned to this category when assessments for GM indicate that either the groundwater is not contaminated, or site conditions do not warrant investigation or remediation of groundwater. Sites with past or present groundwater contamination should be evaluated.
GMID: insufficient data to determine GM status	Sites are assigned to this category when evaluations for GM lack sufficient data or information to determine whether groundwater is contaminated above risk-based levels or is stabilized.
GMNC: migration of contaminated groundwater not under control	Sites are assigned to this category when contaminated groundwater is above a protective, risk-based level, and the migration of contaminated groundwater is unstable such that it can be reasonably anticipated to migrate outside of existing areas of contamination, or there is unacceptable discharge into surface water.
GMUC: migration of contaminated groundwater under control	Sites are assigned to this category when the contamination of groundwater is below protective, risk-based levels or, if not, when the migration of contaminated groundwater is stabilized AND there is no unacceptable discharge into surface water.

4.3. Overview of the GM Evaluation

The GM evaluation should be made on a site-wide basis, looking at distinct plumes across the entire site. An evaluation of "migration of contaminated groundwater under control" (GMUC) does not always necessarily depend on the reduction of contamination, but rather the stabilization of the contaminated plume(s). The evaluation should be based on the existing area of contamination rather than property or projected exposure point boundaries. The "existing area of contamination" is an area that has been verifiably demonstrated to contain all relevant groundwater plumes associated with a site-wide evaluation. It is defined by designated locations proximate to the outer perimeter of contamination and should include horizontal and vertical dimensions.

Evaluations on groundwater migration should be done at sites with past or present groundwater contamination. Data for sites where groundwater was previously contaminated (but has since been cleaned up) should be evaluated to ensure that the indicator accurately records program progress. The evaluation should also be made with reasonable certainty, using the most current, available data/information for a site. Complete certainty, however, is not a necessary condition to make a GM evaluation at a site. The evaluation is intended to be a data-informed, risk-based evaluation of actual and reasonably anticipated groundwater migration and contamination. Ongoing monitoring should consider both stabilization of migration and impacts of contamination to surface water. Limited migration may be consistent with an evaluation of GMUC if the contaminant migration is associated with a monitored natural attenuation (MNA) remedy (see more details on MNA in section 4.5 below).

Before a Region can fully evaluate a site for the GM indicator, they should have sufficient data on the following:

1. Contamination levels in groundwater for both human health and ecological risk.
2. Existing area of contaminated groundwater.
3. Hydrologic information on groundwater migration or discharge into surface water.

A sufficient data determination (SDD) will answer whether a site is under control and should be made before the GM EI can properly categorize the stabilization of contaminated groundwater. The primary sources of information and data behind a GM SDD are human health and ecological risk assessments, which will help confirm whether the groundwater is contaminated above risk-based levels, and periodic groundwater & surface water monitoring reports to assess whether the contaminated groundwater is stabilized. Many other documents listed in section 3.3, table 3 for the HE EI may also be useful sources of information for GM evaluations.

The GM indicator is related to the HE indicator in that there can often be an exposure pathway to contaminated groundwater, but that does not mean that a site's two EIs necessarily need to reflect similar measures of site-wide control. For example, if vapor intrusion from contaminated groundwater is the exposure pathway that causes a site to be HEID or HENC, but the groundwater itself is not migrating or discharging into surface water, it would be appropriate to evaluate the site as "migration of contaminated groundwater under control" (GMUC). Likewise, if monitoring wells indicate that contaminated groundwater is migrating, and thus evaluated as "contaminated groundwater migration not under control (GMNC), but does not provide an unacceptable human exposure pathway, it may be appropriate to evaluate the HE indicator as HEUC (if no other exposure pathways are identified).

4.4. Six-Step GM Evaluation Process

For national consistency, regions should use the step-by-step process as highlighted in exhibit 4 and in the six steps described below to evaluate the GM EI. Please refer to appendix B of this guidance for more detailed instructions regarding SEMS data entry. When making evaluations regarding the groundwater migration status at any site, regional personnel should document the sources of information used to make the evaluation in the "search for site documentation" field on the GM survey in SEMS.

In making a GM evaluation, the following five steps should be followed:

Question: does the site currently have contaminated groundwater or did site conditions warrant groundwater investigation or remediation in the past?

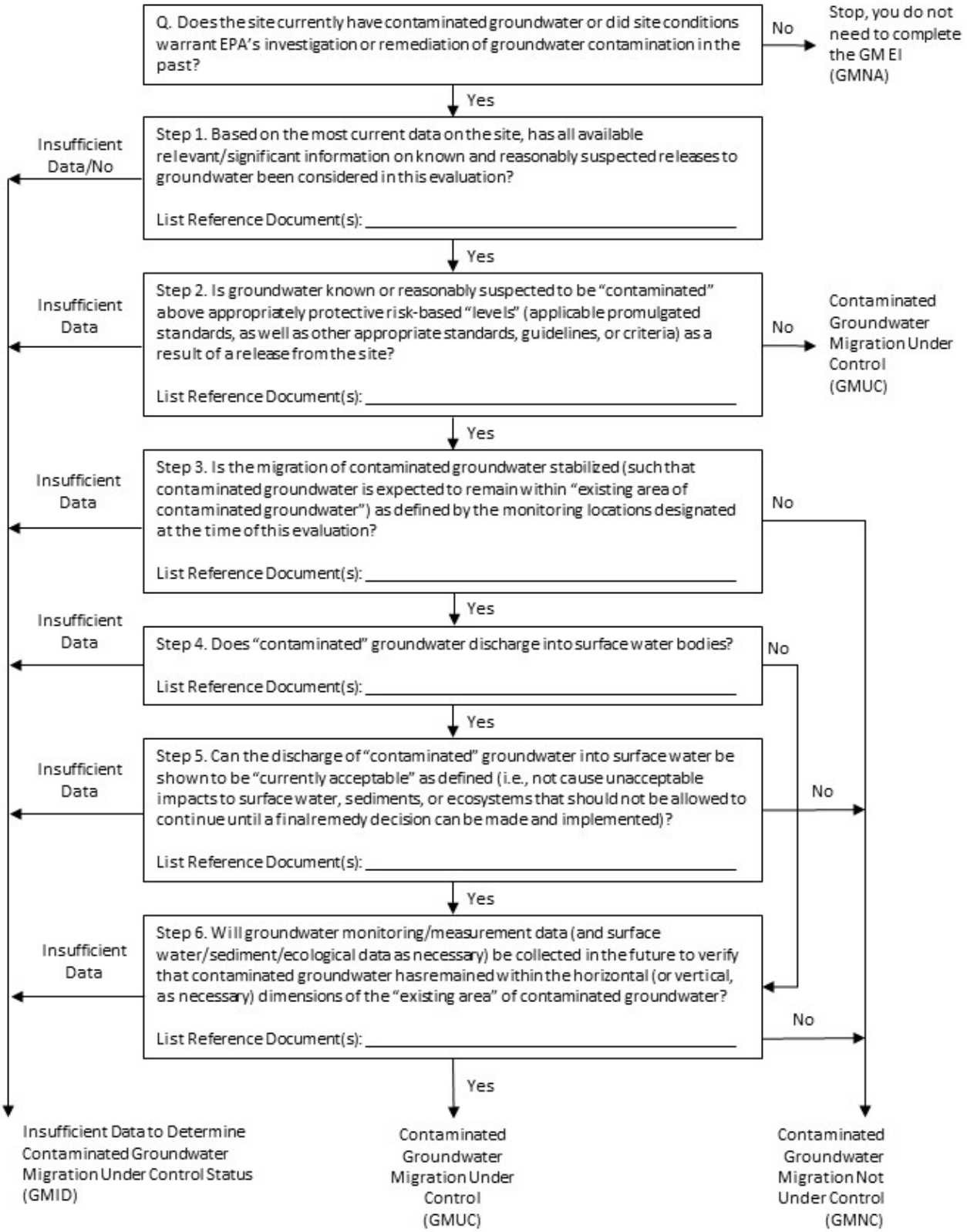
This preliminary question is needed to determine whether a site should be evaluated for the Migration of Contaminated Groundwater EI. If the answer is "no," there is no need to perform the following steps and the GM status will be GMNA (not applicable).

Step 1: Has all available and relevant information on known and reasonably suspected releases to groundwater been considered in this evaluation?

The purpose of this step generally is to identify and screen for sites where information is insufficient to make a sufficient data determination (SDD) for GM. If "no," a site will be classified as "Insufficient data to determine migration of contaminated groundwater control status" (GMID). If "yes," proceed to step 2. "Sufficient data" is defined here as reliable data and information on the three items listed in section 4.3 above. This information should allow Regions to objectively answer the remainder of the following questions, arriving at an evaluation decision other than "GMID."

The primary sources of information and data behind a GM SDD are human health and ecological risk assessments and periodic groundwater & surface water monitoring reports. Keep in mind

that the GM measure is a site-wide measure; not every contaminated groundwater plume necessarily needs to be understood before the Region could answer "yes" to this question, so long as any contaminated groundwater migration has been identified. In this scenario, the data would be "sufficient" because it would allow the region to make an evaluation of Migration of Contaminated Groundwater Not Under Control (GMNC). Many other documents listed in section 3.3, table 3 for the HE EI may also be useful sources of information for GM evaluations.


Q. Does the site currently have contaminated groundwater or did site conditions warrant EPA's investigation or remediation of groundwater contamination in the past?
No
Stop, you do not need to complete the GM EI (GMNA)
Yes
Insufficient Data/No
Step 1. Based on the most current data on the site, has all available relevant/significant information on known and reasonably suspected releases to groundwater been considered in this evaluation?
List Reference Document(s): _____
Yes
Insufficient Data
Step 2. Is groundwater known or reasonably suspected to be "contaminated" above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, or criteria) as a result of a release from the site?
List Reference Document(s): _____
No
Contaminated Groundwater Migration Under Control (GMUC)
Yes
Insufficient Data
Step 3. Is the migration of contaminated groundwater stabilized (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater") as defined by the monitoring locations designated at the time of this evaluation?
List Reference Document(s): _____
No
Yes
Insufficient Data
Step 4. Does "contaminated" groundwater discharge into surface water bodies?
List Reference Document(s): _____
No
Yes
Insufficient Data
Step 5. Can the discharge of "contaminated" groundwater into surface water be shown to be "currently acceptable" as defined (i.e., not cause unacceptable impacts to surface water, sediments, or ecosystems that should not be allowed to continue until a final remedy decision can be made and implemented)?
List Reference Document(s): _____
No
Yes
Insufficient Data
Step 6. Will groundwater monitoring/measurement data (and surface water/sediment/ecological data as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area" of contaminated groundwater?
List Reference Document(s): _____
No
Yes
Insufficient Data to Determine Contaminated Groundwater Migration Under Control Status (GMID)
Contaminated Groundwater Migration Under Control (GMUC)
Contaminated Groundwater Migration Not Under Control (GMNC)

Step 2: Is groundwater known or reasonably suspected to be contaminated above appropriately protective, risk-based levels because of a release from the site?

The first concern that the GM measure identifies is whether *contaminated* groundwater is stable – if groundwater is migrating, but is not contaminated, there is no concern. If "no," the site will be assigned a category of "migration of contaminated groundwater under control" (GMUC). If "yes," the groundwater is contaminated, proceed ahead to step 3. This question may seem redundant with the preliminary screening question, but for sites that have been evaluated for the GM measure in the past, it is important to consider them for evaluation of this indicator to show progress in restoring groundwater to beneficial use.

For our purposes here, "contaminated" refers to concentrations of contaminants that exceed appropriately protective risk-based levels such as chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs) or risk-based levels developed in the HHRA or ROD. "Risk-based levels" are generally defined as when cumulative carcinogenic site risk to an individual is less than 10^{-4} Reasonable Maximum Exposure (RME) and when the non-carcinogenic hazard index is less than 1.

Step 3: Is the migration of contaminated water stabilized such that contamination is expected to remain within "existing areas of contaminated groundwater"?

This question serves to evaluate whether plume migration is occurring. If contaminated groundwater migration is not stabilized, select "no" in SEMS, and the site will be assigned a status of "contaminated groundwater migration not under control" (GMNC). If contaminated groundwater migration is stabilized, proceed to step 4.

The "existing area of contamination" is an area that has been verifiably demonstrated to contain all relevant groundwater plumes associated with a site-wide evaluation, using groundwater monitoring locations designated at the time of the GM evaluation. It is defined by designated locations proximate to the outer perimeter of contamination and should include horizontal and vertical dimensions. This area should be monitored in the future to physically verify that the plume is contained within and does not discharge into surface water. For Pump and Treat (P&T) remedies, the evaluation should be based on multiple lines of evidence for groundwater capture (see Elements for Effective Management of Operating Pump and Treat Systems (Publication 9355.4-27FS-A, December, 2002). If monitored natural attenuation (MNA) is the selected remedy for the site, it can be evaluated as GMUC if post-selection monitoring results are consistent with the assumptions used to support the MNA remedy selection (see section 4.5 below).

Step 4: Does contaminated groundwater discharge into surface water bodies?

This question raises the second element of contaminated groundwater "stabilization," which is whether contaminated groundwater reaches surface water despite staying within existing areas under the surface. If contaminated groundwater does not discharge into surface water, skip step 5 and proceed to step 6. If contaminated groundwater does discharge into surface water, proceed to step 5.

"Surface water bodies" include lakes, rivers, estuaries, etc., and related sediment and ecosystems. Regions should base their answers for this step on hydraulic information, considering contaminant information only to the extent that it demonstrates with reasonable certainty that there is no hydraulic connection between the contaminated groundwater and surface water. Regions should consider both constant and intermittent (e.g., seasonal) discharges.

Step 5: Can the discharge of contaminated groundwater into surface water be shown to be currently acceptable?

This step evaluates the risk of surface water discharge. If the discharge is unacceptable, select "no" in SEMS and the site will be given the status of GMNC. If the discharge is "currently acceptable," proceed to step 6.

For our purposes here, "currently acceptable" would mean that discharge does not cause unacceptable impacts to surface water, sediments, or ecosystems that should not be allowed to continue until a final remedy decision can be made and implemented. You should base your decision on contaminant levels identified or developed specifically for the protection of surface water, such as Ambient Water Quality Criteria (AWQC), freshwater quality ARARs, information derived from ecological risk assessments, or other contaminant levels being used for risk-based decisions for the site, as outlined in applicable decision documents.

Step 6: Will groundwater monitoring and measurement data be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the existing area of contaminated groundwater?

This question prompts Regions to indicate whether groundwater monitoring/measurement data (and surface water/sediment/ecological data, as necessary) will be collected in the future to verify that contaminated groundwater has remained within the "existing area of contaminated groundwater." If monitoring/measurement data will not be collected, select "no" in SEMS and the site will be given the status of GMNC. If monitoring/measurement data will be collected, the site meets the standards for GMUC. Select "yes" in SEMS to finish the questionnaire.

This question is focused on the future, as ongoing monitoring will verify that the groundwater contamination remains stable and helps ensure that surface water impacts remain acceptable. Regions should consider whether there are plans for monitoring, not whether monitoring has been completed in the past. "Plans for monitoring" will usually be documented in the remedy decision documents, remedial designs, Interim RA, Preliminary Close Out Report (PCOR), or similar document. Regions should review groundwater and surface water monitoring reports on a regular basis (i.e., at the same frequency as monitoring - e.g., quarterly, annually, etc.) and compare them to historical data to evaluate the status of the EI evaluation.

4.5. Considering Monitored Natural Attenuation Remedies

A conclusion that "contaminated groundwater migration is under control" is possible for sites with Monitored Natural Attenuation (MNA) as the selected remedy for contaminated groundwater. Decisions to employ MNA as the sole remedy or a component of the remedy should be thoroughly and adequately supported with site-specific characterization and analysis in a CERCLA decision document. MNA should not be used when it would result in plume

migration or unacceptable impacts on environmental resources. See the 1999 MNA guidance and the 2015 MNA guidance for additional details.

EPA recognizes that a plume boundary may be more realistically defined by a zone rather than a line. Fluctuations within this zone are likely to occur due to several factors (e.g., analytical, spatial, or seasonal variability), which may or may not be indicative of a trend in plume migration. Limited plume migration can be acceptable as part of the MNA remedy if it is determined that such migration does not indicate a trend, thus GMUC may be an appropriate evaluation where other conditions for this conclusion are met. However, if post-selection monitoring results suggest that the contamination is not attenuating as expected, the remedy decision may need to be reviewed, and a re-evaluation of the GM indicator would be needed.

APPENDIX A – FREQUENTLY ASKED QUESTIONS

The purpose of the FAQ appendix is to provide more detailed evaluation guidance for both environmental indicators than are provided in section 3.4 and section 4.4. The frequently asked questions are organized by steps in the EI worksheets and were compiled with regional expertise on a range of situations that many RPMs may encounter in the field.

This appendix contains the following sections:

- A.1 Human Exposure Evaluation
- A.2 Migration of Contaminated Groundwater Evaluation

A.1 Frequently Asked Questions – Human Exposure Evaluation

Step 1: Is sufficient known and reliable information available to make an evaluation?

FREQUENTLY ASKED QUESTIONS AND ANSWERS

1. What are the best sources of information for me to consider for this EI evaluation?

Documents such as Human Health Risk Assessments, RI/FS reports, Removal Action Memoranda, Site Assessment reports, Site Investigation reports, and Expanded Site Investigations (FF sites), and decision documents are all reliable sources of information, depending on the site. Document the sources of information used to make the evaluation in the "search for site documentation" field on the human exposure survey in SEMS.

2. There may be several different sources of information (e.g., State, EPA, Federal facility, or PRP). Do I need to be familiar with all of this information to answer this question?

Regions should be familiar with all, available information pertinent to the evaluation of human exposure, regardless of the source.

3. What if a PRP has drawn different conclusions than EPA regarding the status of human exposures associated with the site? Do I need to consider the PRP's data?

Yes. However, the region decides how to weigh the PRP's data when determining whether it will be useful for identifying contaminated media and evaluating human exposures for this EI. Regions are expected to be able to explain the basis of their evaluations.

4. What if I am aware of information that another Agency or a PRP has collected but cannot obtain a copy of it?

If after making a good faith effort to obtain the information, it is not available for review, a Region should document in the site's Administrative Record their attempt and indicate that it wasn't used.

5. We have yet to start the RI, and there is little information available regarding exposure pathways. How should I answer this question?

If data are unavailable or insufficient to make the HE evaluation, answer "no" and select "Insufficient data to determine human exposure control status" in SEMS.

Step 2: Where there is sufficient known and reliable information to make an evaluation, have all long-term human exposure-related cleanup goals been met for the entire site?

FREQUENTLY ASKED QUESTIONS AND ANSWERS

6. Where can I find the information to answer this question?

Cleanup goals are identified in Records of Decision (RODs). Regions should also review the administrative record for a site, ROD amendments, action memo(s), and other appropriate decision documents to determine the cleanup goals established for a site. As available, refer to Final Close-Out Reports (FCORs), RA Reports, FYRs, and site Deletion Notices for documentation of whether the remedial action (RA) achieved the cleanup goals to reduce

human health risks from the site. Document the sources of information used to make the evaluation in the "search for site documentation" field on the human exposure survey in SEMS.

7. Why is this step seemingly out of order in the decision tree? Why not have the question for HHPA come after step 5 for determining if a site is HEPR?

Step 2 is functionally the end goal for human exposure evaluations because it not only signified when a site is "under control" based on current conditions, but also that all cleanup goals related to human health (as outlined in all decision documents) have been met. Remember, HHPA signifies that long-term human health protection has been achieved. The reason this step does not necessarily come after a site first becomes HEPR is that in situations where a site requires "no further action," a site can be listed as HHPA without going through the full remedial process.

8. Cleanup goals have been met for the contaminated medium of primary concern (e.g., groundwater). Can I answer "yes" to this question (i.e., cleanup goals have been met)?

If this is the only medium to be addressed for the site, generally answer "yes." If there is a reasonable possibility that there will be another investigation to assess human health risks for the site, a region should answer "no" and proceed through the remaining steps to determine whether all current human exposures are under control for the site. This EI reflects a site-wide evaluation. If cleanup goals have been or will be established for other media, generally answer "no." The key word in these questions is "all."

9. Activities to date have focused on the most significant and have achieved the cleanup goals established for this OU. There is a possibility that further actions will be required to address human health risks associated with another OU. How should I consider the possibility of future actions when answering this question?

If this is the only OU to be addressed for the site, generally answer "yes." If there is a reasonable possibility that there will be another investigation to assess human health risks for the site, a region should answer "no" and proceed through the remaining steps to determine whether all current human exposures are under control for the site. This EI reflects a site-wide evaluation. If cleanup goals have been or will be established for other media, generally answer "no." The key word in these questions is "all."

10. The only cleanup goals that have yet to be met for the site address ecological risks. How should I answer this question?

Generally, answer yes. This EI is designed to measure progress in attaining long-term human health protection through human exposure control. It does not measure progress in addressing ecological risks.

11. If a site is Construction Complete, can I assume that the answer to this question is "yes" (and long-term human health protection has been achieved)?

Generally, no, because Construction Completion status can be achieved at some sites where all cleanup goals have not yet been met. This may include sites where long-term groundwater or surface water restoration remedies are in place and operating as intended, but cleanup

levels have yet to be achieved. This may also include sites where all institutional controls necessary to meet cleanup goals have yet to be implemented.

12. If a site has achieved the Site Completion milestone, can I assume that the answer to this question is "yes" (and long-term human health protection has been achieved)?

Generally, yes. Site Completion status generally signifies that all cleanup goals specified in all RODs have been met, institutional controls are in place, the site is protective of human health (and the environment), and the only remaining activities, if any, consist of O&M by the state, Federal facility, or responsible parties. However, these sites may still be assessed for exposure risks during an FYR, during which time new pathways or changed site conditions (ex. toxicity levels) are sometimes identified, which can cause the site to retract to HEID or HENC.

13. Can a site be re-evaluated from HEID to HHPA?

Occasionally, yes. If a no-action ROD is issued, there is likely no risk to human health, and no action is taken. In these situations, it is appropriate to answer "yes" to questions 1 and 2.

Step 3: Are there completed human exposure pathways between contaminated groundwater, soil, surface water, sediment, or air media and human receptors such that exposures can be reasonably expected under current conditions?

FREQUENTLY ASKED QUESTIONS AND ANSWERS

1. Where can I find the information to answer this question?

The primary source of information on human exposure pathways should be the Conceptual Site Model (CSM) used in the Baseline Human Health Risk Assessment. For sites with a ROD that pertains to the exposure pathway, regions should consider Contaminants of Concern and risk-based levels documented in the ROD; however, if the exposures driving the remedy as outlined in the ROD are based on future use only, and future use conditions are different than current conditions, then data from the baseline risk assessment should be used to evaluate exposure pathways rather than those detailed in the ROD. Document the sources of information used to make the evaluation in the "search for site documentation" field on the human exposure survey in SEMS.

2. Do I need to consider all media at the site when answering this question?

One should consider those media that are known or reasonably suspected to be contaminated above appropriately protective risk-based levels. For example, regions should not only consider soil-based media, but also consider indoor air or food chain organisms, such as fish, shellfish, and other edible plants and animals, as possible contaminated media in making this evaluation.

3. What contaminants should I consider when identifying whether a medium is "contaminated?"

For pre-ROD sites, consider all potential contaminants of concern present at the site above risk-based screening levels. For sites with a ROD, consider the contaminants of concern identified in the Risk Assessment.

4. **What about new contaminants or emerging contaminants of concern, such as PFAS? Do they need to be included?**

   Yes. The presence of new and/or emerging contaminants calls into question exposure assumptions, the risk assessment conclusions, and ultimately protectiveness. The region should consider if there is sufficient information to draw conclusions regarding human exposure.

5. **Actions have been taken to eliminate exposure to the contaminated medium of primary concern (e.g., groundwater) based on current conditions. Should I answer "no" to this question (i.e., human exposures are not reasonably expected under current conditions)?**

   If this is the only medium in which contaminants exist above appropriately protective risk-based levels, answer "no." If the conceptual site model indicates that there is a reasonable expectation of exposure to a medium for which an exposure assessment has yet to be completed (e.g., sediment), a region should answer "yes" and proceed through subsequent steps. This EI reflects a site-wide evaluation.

6. **Should I consider the indoor air inhalation pathway (associated with vapor intrusion) and food chain exposure pathway when answering this question?**

   Consider all exposure pathways of concern identified across the site. If indoor air or food chain pathways are pathways of concern, they should be considered in your answer. In cases where an exposure assessment has yet to be completed, a region should use its best professional judgment to complete the evaluation with reasonable certainty.

7. **If the only complete exposure pathway for the entire site (all media) is for the "trespasser" scenario, should I still answer "yes" to this question?**

   If exposure pathways can be reasonably expected under any current exposure scenario, you should answer "yes" to this question and continue the worksheet.

   Generally, anecdotal evidence of trespassing does not necessarily result in an evaluation of "not under control." The risk assessment will consider the frequency and/or duration of likely exposure along with the nature and extent of contamination to decide whether it is reasonably expected that people will be exposed to contamination that would result in unacceptable exposures.

8. **The exposure scenarios driving the remedy, as presented in the ROD, are based on future land or groundwater use conditions that are different than current use conditions. Should I base the response to this step on current use scenarios that are not driving the remedy?**

   Generally, yes. Use the exposure scenarios that consider current use, as developed in the baseline risk assessment, to make this evaluation.

9. A fish consumption advisory is in place to eliminate/mitigate exposure to contaminated fish. What should I consider when making the HE evaluation based on this exposure scenario?

This is a site-specific judgment. Consider not only the presence of controls intended to eliminate or mitigate exposure, but also their effectiveness. If evidence suggests that some people are catching and eating fish despite the advisory, this remains a pathway of concern.

However, the likely frequency and duration of exposure are critical when making a judgment as to whether it could reasonably be expected that people are exposed to contamination at unacceptable levels.

Mere anecdotal evidence of an occasional violation (or recreational "catch and release" fishing) might not rise to the level of concern that would result in a “not under control” evaluation. However, knowledge that the area is used for subsistence fishing at levels that likely result in unacceptable exposures remains a valid justification for a “not under control” evaluation.

10. What should I do if, after completing the HE evaluation for a site, new complete exposure pathways are identified or complete exposure pathways are eliminated due to response actions or a better understanding of the site?

If exposure pathway information changes based on new data, a region should consider whether the information would yield different answers to the evaluation questionnaire. If so, a region should update the EI evaluation to reflect the new information.

11. How do I handle vapor intrusion concerns, particularly at sites where cleanup has progressed significantly?

In general, if a region has an approved work plan to conduct vapor intrusion investigation(s) at a site, the region should consider the site to have "insufficient data" until such time a definitive evaluation can be made. Site managers should evaluate this pathway as they would any other, using the worksheet and guidance provided in this document.

12. The site has a groundwater plume contaminated above health-based levels, the plume is migrating, and the region does not know if someone has installed (or will not install) a well in an aquifer affected by the migrating plume. Except for this concern, the site conditions are otherwise under control. What is the appropriate Human Exposure evaluation?

In these situations, any evidence of well installations makes the difference. The human exposure evaluation is made for current site conditions and does not consider the mere "potential" for exposure, but rather “reasonably-anticipated” exposure pathways (see section 3.3). A potential yet unlikely scenario of an exposure is different from actual evidence of an exposure pathway that is likely to lead to human exposures. Reasonably anticipated exposure pathways should be evidence-based and prompt regions to take mitigating actions, whereas not every pathway possibility will warrant action.

In this example, the region has no information to suggest that unacceptable human exposures are occurring; therefore, an evaluation of under control is appropriate. If in the future, evidence becomes available that indicates people are using wells in the contaminated area

and may be exposed at unacceptable levels, it would be appropriate to change the evaluation to insufficient data or not under control.

If, on the other hand, evidence of new wells or intentions to create new wells is known, regions are expected to take appropriate response actions to prevent exposure. In this scenario, a contaminated groundwater plume threatens drinking water supplies. Regions should attempt to control the migration of the plume or provide alternative drinking water to prevent a reasonably anticipated exposure pathway. The site should either be listed as HEID or HENC until controls are in place.

13. How do I make the HE evaluation when the only pathway of concern is the on-site worker scenario?

Generally, if this pathway is of concern, the risk assessment and/or conceptual site model will identify it, and the cleanup goals will take this pathway into account. In general, this pathway should be evaluated similarly to any other when making the HE evaluation. Should this scenario result in exposures at levels that could cause harm, a "not under control" evaluation is generally warranted.

Step 4: Are the actual or reasonably expected human exposures associated with complete pathways identified under step 3 within acceptable limits under current conditions?

FREQUENTLY ASKED QUESTIONS AND ANSWERS

1. Where can I find the information to answer this question?

The primary source of information regarding acceptable, risk-based limits should be derived from human health screening levels in the baseline risk assessment, ARARs, and/or acceptable protectiveness standards identified in applicable RODs, if available. Note that if the exposures driving the remedy are based on future use only, and future use conditions are different than current conditions, then data from the baseline risk assessment should be used to evaluate acceptable exposure risk rather than protectiveness standards outlined in the ROD. POLREPS and RA project reports may also contain useful information. Document the sources of information used to make the evaluation in the "search for site documentation" field on the human exposure survey in SEMS.

2. What are "acceptable limits"?

For our purposes here, "acceptable limits" are generally defined as when cumulative carcinogenic site risk to an individual is less than 10^{-4} Reasonable Maximum Exposure (RME) and when the non-carcinogenic hazard index is less than 1. Base your evaluation on the risk limits being used in the baseline risk assessment. For sites with a ROD, generally use the risk value used to establish cleanup levels. If the appropriate risk limit is uncertain, return to step 1 and answer "no" (which would result in a HEID evaluation).

3. **How could risks be within acceptable limits if cleanup goals have yet to be met and there are complete exposure pathways between contaminated media and human receptors (i.e., how could the answer to this question be "yes" if the answers to steps 2 and 3 were "no" and "yes," respectively?).**

   In most cases, the response to this step will be "no." However, a positive evaluation ("yes") could be made for this step if the frequency and/or duration of exposure associated with complete pathways is such that the risk is acceptable and/or the only cleanup goals that have yet to be met (see step 2) address reasonably anticipated future exposures. (An example is a site where there is an exposure pathway to a utility worker under current conditions, but likely, current exposures are infrequent enough that the exposure is acceptable for the specific contaminants of concern.)

4. **Actions have been taken to reduce exposures to the contaminated medium of primary concern (e.g., groundwater) to within acceptable limits under current conditions. Should I answer "yes" to this question (i.e., exposures are within acceptable limits)?**

   If this is the only medium in which contaminants exist above appropriately protective risk-based levels, answer "yes" and proceed to step 5. If the conceptual site model or baseline risk assessment indicates that there is a reasonable expectation of exposure to a separate medium which would result in unacceptable exposures, a region should answer "no" (which would result in a HENC evaluation) or consider returning to step 1 and answering "no" if additional risk assessments are needed but have not yet been collected (which would result in an HEID evaluation).

5. **We have yet to complete a baseline risk assessment for the site; however, some contaminant concentrations exceed appropriately protective risk-based levels in media for which complete pathways are reasonably expected under current conditions. Can I answer this question without a risk assessment?**

   In the absence of a completed risk assessment, base your evaluation on the best available information. If the medium is contaminated above the risk-based levels that have been identified at this stage of the assessment and complete exposure pathways are reasonably expected, a region could answer "no" (which would result in a HENC evaluation) or return to step 1 and answer "no" (which would result in a HEID evaluation), based on its knowledge of the site and the RPM's best judgment.

6. **How do I answer this question if the human health risks from exposure to some contaminants are above acceptable limits and others are within acceptable limits?**

   If the exposures to any contaminant represent an unacceptable human health risk, a region should answer "no" to this question (which would result in a HENC evaluation). This EI reflects a site-wide evaluation.

7. **The exposures to individual contaminants are within acceptable limits under current conditions; however, cumulative risks under current conditions are above acceptable limits. Should I use single-contaminant or cumulative risk as the basis for this evaluation?**

   Single-contaminant and cumulative risks are both considered in the Baseline Human Health Risk Assessment and should be considered for the HE evaluation. If unacceptable risk exists,

either individually or cumulatively, the risk assessment will provide insight on whether to use individual vs. cumulative (or both).

8. **The risks vary depending on the exposure assumptions and the approach used to estimate the exposure point concentrations. What approach should be used to assess the risk from exposures to evaluate this EI?**

   The basis for this evaluation is the approach used in the Baseline Human Health Risk Assessment.

9. **If the only unacceptable exposures for the entire site, including all media, are associated with the "trespasser" scenario, should I still answer "no?"**

   If exposures are not within acceptable limits for any scenario based on current conditions, the region should answer "no," especially if the trespasser exposure pathway can be reasonably expected.

   Generally, anecdotal evidence of trespassing does not necessarily result in an evaluation of "not under control." The risk assessment will consider the frequency and/or duration of likely exposure to trespassers along with the nature and extent of contamination to decide whether it is reasonably expected that people will be exposed to contamination, resulting in unacceptable exposures.

10. **At present, contamination in drinking water wells does not present an unacceptable risk, but contaminant concentrations could be rising. What is the correct evaluation?**

    In these situations, any evidence of rising contamination levels makes the difference. The human exposure evaluation is made for current site conditions and does not consider the mere "potential" for unacceptable concentration levels, but rather "reasonably-anticipated" unacceptable exposures (see section 3.3). A potential yet unlikely scenario of an unacceptable exposure is different from actual evidence of an unacceptable human exposure. Reasonably anticipated exposures should be evidence-based and prompt regions to take mitigating actions, whereas not every exposure will warrant action.

    In this example, "could" is the keyword, and the region has no information to suggest that unacceptable human exposures are occurring; therefore, an evaluation of under control is appropriate. If, in the future, data becomes available that indicates rising contaminant concentrations in drinking water wells may expose people to unacceptable levels, it would be appropriate to change the evaluation to HEID or HENC. Regions should then take appropriate response actions to prevent exposure if the rising contaminant concentrations threaten drinking water supplies (e.g., provide alternative water supply).

11. **The exposure scenarios driving the remedy, as presented in the ROD, are based on future land or groundwater use conditions that are different than current use conditions. Should I base the response to this step on current use scenarios that are not driving the remedy?**

    Yes. Use exposure scenarios that consider current use, as developed in the baseline risk assessment, to make this evaluation.

12. What should I do if, after completing the HE EI for a site, the degree of risk based on current conditions is reevaluated as we gain a better understanding of the site?

If the degree of risk is reevaluated based on new data, consider whether the change would affect the HE EI evaluation for the site. If so, update the HE evaluation to reflect the new information and make sure the information is updated in SEMS (see section 3.5 for information on public-facing human exposure pathway descriptions and appendix B for SEMS data entry details).

13. What should I do if the cleanup standards used to make the HE EI evaluation for my site change (e.g., the promulgated maximum contaminant level for groundwater is changed)?

In these cases, review the revised standard and re-assess the HE evaluation to decide whether the contaminants are within acceptable limits for current conditions. The HE evaluation should be consistent with the new standard and should be revised as appropriate if the revised standard changes your evaluation of protectiveness.

14. How do I determine whether human exposures associated with complete pathways are within acceptable limits if the nature of the exposure differs from that evaluated in the baseline risk assessment? For example, recent information indicates that trespassing is a problem at my site, but the exposure pathways evaluated in the baseline risk assessment assume a 30-year residential use scenario.

In cases such as these, a region should ensure that the contaminant levels of concern are appropriate for the specific exposure scenario that affects your Human Exposure evaluation. For example, the concentration levels of concern for a 30-year residential use scenario will generally be lower than those that would pose an unacceptable risk for trespassing. However, where evidence suggests that trespassing is frequent or where it results in exposure pathways that were not identified in the risk assessment documents for the site (e.g., the risk data deal with dermal exposure but not inhalation) a region should consult a risk assessor and work to identify contaminant levels of concern specific to the pathway in question.

Step 5: Is the site Construction Complete, is the remedy operating as intended, and are engineering and institutional controls, if required, in place and effective?

FREQUENTLY ASKED QUESTIONS AND ANSWERS

1. Where can I find the information to answer this question?

Documents such as Close Out Reports (preliminary or final), and Five-Year Reviews are known and reliable sources of information. Document the sources of information used to make the evaluation in the "search for site documentation" field on the human exposure survey in SEMS.

2. A PCOR has been signed for a groundwater site, and it has achieved Construction Completion. An operational and functional (O&F) determination for the fund-lead pump and treat system is expected within a year. How should I answer this question?

For the purposes of this EI, remedies at Construction Completion sites should be operating as intended to achieve credit for a “protective remedy in place.” If an O&F determination is

needed at this site but not yet final, generally answer "no" to this question. An exception to this general rule would be when the only outstanding requirements for O&F identified during the pre-final inspection are considered "routine and minimal" and do not affect protectiveness.

3. **An in-situ soil vapor extraction (SVE) system has been installed and is operating as intended. Studies indicate that the system will achieve cleanup goals within the next 2-3 years. This is the last action required for cleanup, and the site is Construction Complete. How should I answer this question?**

   Assuming the institutional controls required for the remedy to remain protective are in place and effective, generally you should answer "yes." The remedy has yet to achieve cleanup goals site-wide (question #2 in the evaluation is still "no"), but the site is Construction Complete and the remedy is operating as intended.

4. **What should I do if, after completing the HE evaluation for a Construction Completion site, an O&F determination is made, or it is documented that institutional controls are in place and effective?**

   If the new information documents that the remedy is operating as intended and institutional controls are in place and effective, you should update the EI evaluation to reflect this information.

A.2 Frequently Asked Questions – Migration of Contaminated Groundwater Evaluation

FREQUENTLY ASKED QUESTIONS AND ANSWERS

Step 1: Based on the most current site data, has all available relevant/significant information on known and reasonably suspected releases to the groundwater been considered in this EI evaluation?

1. **What are the best sources of information for me to consider for this EI evaluation?**

   The primary sources of information and data behind a GM SDD are human health and ecological risk assessments, which will help confirm whether the groundwater is contaminated above risk-based levels, and periodic groundwater & surface water monitoring reports to assess whether the contaminated groundwater is stabilized. Many other documents listed in section 3.3, table 3 for the HE EI may also be useful sources of information for GM evaluations.

2. **No known groundwater contamination exists at the site. Do I need to evaluate this EI?**

   Do not consider this EI if no known or suspected groundwater contamination exists or has existed in the past at the site. If groundwater contamination is known or suspected or if contamination once was present but has since been cleaned up, you should complete all appropriate steps for this evaluation.

3. **There may be several different sources of information (e.g., State, EPA, PRP). Do I need to be familiar with all of this information to answer this question?**

   You should be familiar with the information that is pertinent to the evaluation of migration of contaminated groundwater and available to the region. If the information from other sources is both relevant and available, generally consider the contents of this information for this evaluation.

4. **What if a PRP has drawn different conclusions than EPA regarding the status of contaminated groundwater migration? Do I need to consider the PRP's data?**

   Generally, yes. However, you can decide what weight to place on the PRP's data when determining whether they will be useful for evaluating the migration of contaminated groundwater for this EI.

5. **What if I am aware of information that another Agency or a PRP has collected but cannot obtain a copy of it?**

   If after making a good faith effort to obtain the information, it is not available for review, a Region should document in the site's Administrative Record their attempt and indicate that it wasn't used.

6. **The site investigation is in the early stages, and it is unknown whether the plume is naturally attenuating (i.e., contained). How should I answer this question?**

   If data are unavailable or insufficient to evaluate the GM EI, you should answer "data incomplete" and select "Insufficient Data" in SEMS.

7. **The pump and treat remedy has been operating for only a short time, and it is unknown whether the plume has been captured. How should I answer this question?**

   If data are unavailable or insufficient to evaluate the GM EI, answer "data incomplete" and select "Insufficient Data" in SEMS.

Step 2: Is groundwater known or reasonably suspected to be contaminated above appropriately protective risk-based levels as a result of a release from the site?

FREQUENTLY ASKED QUESTIONS AND ANSWERS

1. **Where can I find the information to answer this question?**

   Documents such as Human Health Risk Assessments, RI/FS reports, Removal Action Memoranda, Site Assessment reports, Site Investigation reports, and Expanded Site Investigations (FF sites), and decision documents are all reliable sources of information, depending on the site.

2. **What risk levels should I use to evaluate this step?**

   For our purposes here, "contaminated" refers to concentrations of contaminants that exceed appropriately protective risk-based levels such as chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs) or risk-based levels developed in the HHRA or ROD. "Risk-based levels" are generally defined as when cumulative carcinogenic site risk to an individual is less than 10^{-4} Reasonable Maximum Exposure (RME) and when the non-carcinogenic hazard index is less than 1.

3. **How should I interpret whether groundwater is "reasonably suspected" to be contaminated if my sampling data are limited?**

   In the absence of extensive sampling and analytical data, you should use your best judgment. If evidence–even limited evidence–indicates that there is a reasonable possibility of groundwater contamination, you should answer either "yes" or "insufficient data." The EI requires that you make your evaluation with "reasonable certainty."

4. **How do I answer this question if some groundwater contaminant levels are below their respective risk-based levels and others are above?**

   If the concentration of any contaminant in groundwater exceeds its appropriately protective risk-based level, you should answer "yes" to this question.

5. **If more than one distinct contaminated plume exists at a site, should I make the evaluation based on only one plume or multiple plumes?**

   Base the evaluation on all contaminated plumes. If more than one distinct plume exists at a site and only one plume contains contaminants above risk-based levels, generally you should answer "yes" to this question and continue with step 3. The GM indicator applies-site-wide.

6. **What should I do if the risk-based levels that I used to answer this question change as we learn more about the site?**

   If risk-based levels change, you should consider whether the change would affect the GM EI evaluation for the site. If so, you should update the EI evaluation to reflect the new information.

7. **What should I do if the Contaminants of Concern (COCs) in groundwater change or contaminant concentrations are reevaluated as we learn more about the site?**

   If COCs in groundwater change or contaminant concentrations are reevaluated based on new data, generally you should consider whether the change would affect the GM evaluation for the site. If so, you should update the EI evaluation to reflect the new information.

Step 3: Is the migration of contaminated water stabilized such that contamination is expected to remain within "existing areas of contaminated groundwater"?

FREQUENTLY ASKED QUESTIONS AND ANSWERS

1. **If more than one distinct contaminated plume exists at a site, should I make the evaluation based on only one plume or multiple plumes?**

   Base the evaluation on all contaminated plumes. The GM indicator applies-site-wide, so if any contaminated plumes are migrating, the answer should be "no." If more than one distinct plume exists at a site, but only one plume contains contaminants above risk-based levels and is expected to remain within existing areas, you should answer "yes" to this question and continue with step 3.

2. **What should I do if the risk-based levels that I used to answer this question change as we learn more about the site?**

   If risk-based levels change, you should consider whether the change would affect the GM EI evaluation for the site. If so, you should update the evaluation to reflect the new information.

3. **What should I do if the Contaminants of Concern (COCs) in groundwater change or contaminant concentrations are reevaluated as we learn more about the site?**

   If COCs in groundwater change or contaminant concentrations are reevaluated based on new data, generally you should consider whether the change would affect the GM evaluation for the site. If so, you should update evaluation to reflect the new information.

4. **Where should I find information to answer this question?**

   Documents such as periodic groundwater and surface water monitoring reports, RI/FS reports, RODs, Action Memoranda, POLREPS, Close Out Reports, Five-Year Reviews, etc.,

are good sources of information. The "existing area of contamination" is an area that has been verifiably demonstrated to contain all relevant groundwater plumes associated with a site-wide evaluation. It is defined by designated locations proximate to the outer perimeter of contamination and should include horizontal and vertical dimensions.

5. **If monitored natural attenuation has been selected as the remedy for a site, can I answer "yes" to this question**

   Monitored natural attenuation does not preclude you from answering "yes" to this question. If the selected remedy is monitored natural attenuation and the plume meets conditions outlined in steps 1- 3, you should answer "yes" to this question and proceed to step 4. See section 4.5 for more details.

6. **How is the "existing area of contamination" determined?**

   The "existing area of contamination" is an area that has been verifiably demonstrated to contain all relevant groundwater plumes associated with a site-wide evaluation, using groundwater monitoring locations designated at the time of the GM evaluation. It is defined by designated locations proximate to the outer perimeter of contamination and should include horizontal and vertical dimensions.

7. **I have very limited data on which to judge the stability of the plume. Can I answer "insufficient data" to this question? What is "sufficient?"**

   Generally, yes, you should answer "insufficient data" in such an instance. At its most basic, "sufficient data" includes information on contamination levels in groundwater for both human health and ecological risk, existing area of contaminated groundwater, and hydrologic information on groundwater migration or discharge into surface water. You should use your best professional judgment and determine your answers based on reasonable certainty.

8. **Evidence indicates contamination beyond the existing area, but the contamination is below risk-based levels. How would this question be answered for this scenario?**

   Contamination levels outside of the area of contamination need not exceed risk-based levels to show migration of the plume. If contamination has been identified outside of the existing area of contamination, you should consider all of the information available, including capture zone analyses (for P&T remedies) and use your best judgment to assess whether migration of the plume is stabilized. In this example, this information could indicate that concentration levels outside of this area are likely to rise, in which case an answer of "no" may be appropriate.

9. **Only some contaminants associated with a site were detected outside the area of existing contamination. Should I consider the plume not stable?**

   Any contaminant associated with the groundwater plume that has migrated beyond the area of existing contamination could be an indication that the plume is not stabilized. Generally, you should consider all available analytical and hydraulic information and use your best judgment to assess whether the migration of the plume is stabilized.

10. Multiple plumes exist at a site. At least one is stabilized. How do I record this for this EI step?

The EI evaluation should be made on a site-wide basis. If any plume for which you answered "yes" in step 2 is not stable, you should answer "no" to this question.

11. What should I do if the COCs in groundwater change or contaminant concentrations are reevaluated as we learn more about the site?

If COCs in groundwater change or contaminant concentrations are reevaluated based on new data, you should consider whether the change would affect the GM evaluation for the site. If so, you should update the EI evaluation to reflect the new information.

12. What if monitoring locations change in the future?

If monitoring locations for the existing area of contamination change, you need not update the GM evaluation unless contamination is found outside of the area of contamination as determined by the new monitoring locations. If so, you should update the EI evaluation to reflect the new information.

13. What should I do if the risk-based levels that I used to answer this question change as we learn more about the site?

If risk-based levels change, you should consider whether the change would affect the GM EI evaluation for the site. If so, you should update the evaluation to reflect the new information.

Step 4: Does contaminated groundwater discharge into surface water bodies?

FREQUENTLY ASKED QUESTIONS AND ANSWERS

14. Where can I find the information to answer this question?

Documents such as periodic groundwater and surface water monitoring reports, RI/FS reports, RODs, Action Memoranda, POLREPS, Close Out Reports, Five-Year Reviews, etc., are good sources of information.

15. If surface water data are limited (e.g., no surface water samples have been collected), how should I evaluate this question?

In the absence of a complete characterization of the groundwater to surface water pathway, you should use your best judgment. Groundwater and hydrological investigations collected during the RI may provide enough information to evaluate this question with "reasonable certainty." You could also consult the Conceptual Site Model (CSM) to determine whether it would be reasonable to assume groundwater discharge. If no information is available, consider going back to step 1 and answering "no," changing the GM status to GMID.

16. Groundwater to surface water discharge is not constant or is very sporadic. Should I answer "yes" to this question?

If groundwater has been documented to discharge to surface water at any time, you should answer "yes" to this question.

17. Groundwater to surface water discharge has been documented; however, sampling did not show contamination in the surface water at the discharge point. Therefore, I cannot assume "contaminated" groundwater is discharging at this point. Should I answer "no" to this question?

You should base your answer on "reasonable certainty." If you are reasonably certain no contaminated groundwater is discharging to surface water, you should answer "no" to this question. However, if you are unsure or your professional judgment leads you to think contaminated groundwater is discharging to surface water (e.g., contamination exists at the groundwater table just upgradient of the surface water body), you should answer "insufficient data" or "yes" based on your level of certainty.

18. Multiple plumes exist at the site. Only one plume discharges contamination into a surface water body. How do I answer this question?

The EI evaluation is made on a site-wide basis. If contaminated groundwater associated with a plume for which you answered "yes" in step 3 discharges into surface water, you should answer "yes" to this question and proceed to step 5.

19. Should future/past discharges be considered when evaluating this question?

Because groundwater levels and discharge to surface water can fluctuate throughout the year, future or past discharges should be considered when answering this question. If there is evidence of past discharges or likelihood of future discharges, you should answer "yes" to this question regardless of current conditions. If conditions change, preventing future discharge you should answer "no" to this question.

20. What if conditions change and a remedy prevents future discharges?

Generally, you should reevaluate the answer to this question if conditions change. If a remedy addresses contaminated groundwater discharge into surface water so that surface water is unlikely to receive future groundwater discharge, you should answer "no" to this question.

Step 5: Can the discharge of contaminated groundwater into surface water be shown to be currently acceptable as defined (i.e., not cause unacceptable impacts to surface water, sediments, or ecosystems that should not be allowed to continue until a final remedy decision can be made and implemented)?

FREQUENTLY ASKED QUESTIONS AND ANSWERS

21. Where can I find the information to answer this question?

Documents such as RI/FS reports, RODs, Action Memoranda, POLREPS, Close Out Reports, annual or periodic groundwater and surface water monitoring reports, Five-Year Reviews, etc., are good sources of information.

22. Should I use groundwater contaminant levels (identified in step 2) to determine if discharge of contaminated groundwater to surface water is within currently acceptable limits?

Generally, no. You should base your decision on contaminant levels identified or developed specifically for the protection of surface water, such as Ambient Water Quality Criteria (AWQC) or other contaminant levels being used for risk-based decisions for the site.

23. What if surface water contaminant levels are above one standard, but below another? How should I answer this question?

Generally, you should base your answer on the standards being used for risk-based decisions for the site. If contaminant levels are above a standard that has been deemed the "acceptable" level for a site, you should answer "no" to this question.

24. Water quality standards (e.g., TMDLs, AWQC) have not been developed for any contaminants at the site. How should I evaluate this question?

In the absence of water quality standards, you should base your evaluation on the best available information. If evidence suggests that groundwater discharge has resulted in unacceptable impacts on surface water (e.g., if remedial actions are planned for the surface water pathway), you should answer "no" to this question.

25. At present, discharge of contaminated groundwater to surface water is acceptable. Should I answer "yes" now and change the response to "no" if and when the surface water contaminant concentrations reach a level such that the surface water, sediment, or ecosystems are negatively impacted?

Generally, you should use your professional judgment or consult the risk assessment for aid in making this decision with reasonable certainty. You should answer "no" only if future impacts to surface water are imminent (i.e., are expected to occur before remedial actions can be implemented).

26. The only contaminants detected in the surface water are not present in the groundwater plume. If these contaminants are above acceptable levels, but might not be related to the groundwater plume, should I answer "yes?"

Generally, you should use your professional judgment and consider all aspects of the site, including the extent of sampling conducted at the time of evaluation, in order to determine the answer. If the contaminants are clearly not related to groundwater, you should answer "yes" to this question and continue with the worksheet.

27. Some contaminants in surface water are at acceptable levels, others are not. How should I answer this question?

If any contaminant associated with the discharge of groundwater is found in surface water above acceptable limits, you should answer "no" to this question.

28. Contaminants associated with groundwater discharge were found in sediment samples at unacceptable levels, but not in surface water samples. Is it appropriate to answer "yes" to this question if only sediment contamination is found?

Generally, no, sediments should be considered when evaluating this question. Past releases could be "trapped" in sediments after surface water contamination has been cleared. Because of this, sediment contaminant levels may not correlate directly with surface water contaminant levels. It is conceivable that sediment contamination may be measured even if surface water contamination is not detected. Therefore, assuming the contamination can be associated with present or past groundwater discharge, you should answer "no" to this question.

29. How do I answer this question if contaminant levels in surface water/sediment/ecosystems have decreased to acceptable limits?

If groundwater discharge continues, yet surface water contaminant levels are within currently acceptable limits, you should answer "yes" to this question and continue to step 6.

Step 6: Will groundwater monitoring/measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the existing area of contaminated groundwater?

FREQUENTLY ASKED QUESTIONS AND ANSWERS

30. Where can I find the information to answer this question?

Documents such as RODs, Action Memoranda, POLREPS, Close Out Reports, Five-Year Reviews, etc., are good sources of information.

31. What if future monitoring shows the migration of the groundwater plume?

Your answer to this step should be based only on whether or not monitoring is planned for the future. If the plume characteristics change in the future, the EI should be reevaluated.

32. Contaminated groundwater discharges to surface water at the site. However, adverse surface water impacts have not been shown from discharging contaminated groundwater. No future monitoring is planned. Should I answer "no" to this question, even if future impacts to surface water are possible?

The decision not to monitor surface water impacts from contaminated groundwater will result in a GM status of GMNC.

33. The groundwater contamination has been cleaned up and monitoring efforts are ceasing. Should I answer "no" to this question if EPA ceases monitoring in the future?

If the site has been cleaned-up or otherwise addressed, groundwater will likely be below protective risk-based levels. If this is the case, you should answer "no" to step 2 and the site status will now be GMUC.

APPENDIX B – SEMS DATA ENTRY AND VIEWING

The purpose of the data entry and viewing appendix is to provide instructions for entering Environmental Indicator data into SEMS and to identify and define the data elements displayed on each screen. This data will serve as an effective tool to help the regions monitor their cleanup progress, support Government Performance and Results Act (GPRA) reporting, and construct accurate fact sheets.

This appendix contains the following sections:

- B.1 Environmental Indicators Summary Tab
- B.2 Human Exposure Survey Tab
- B.3 Human Exposure Pathway Description Tab
- B.4 Groundwater Migration Survey Tab

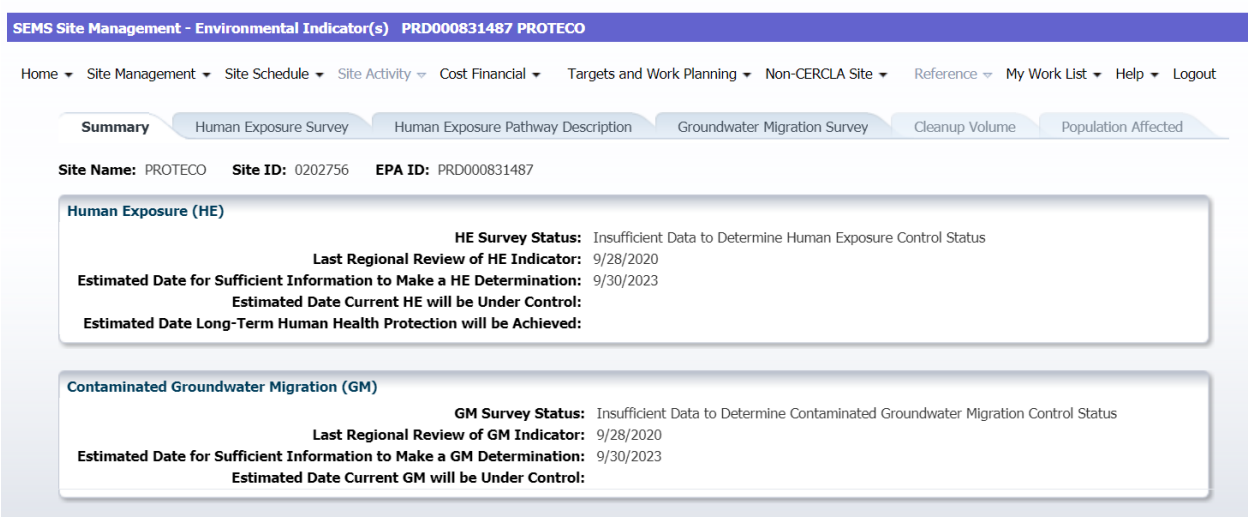
B.1 Environmental Indicators Summary Tab

The EI data entry and viewing module currently resides in the Site Management portion of SEMS. From the SEMS homepage, choose "Site Management" in the "Home" dropdown. Search for the site and click on the pencil icon. Once inside the "Edit Site Information" screen, choose "Environmental Indicators" in the "Site Schedule" dropdown. The user is now in the "EI Module" of SEMS.

The Summary tab is the first tab that appears when entering the EI module. The Summary displays a roll-up of the data entered for each indicator on the subsequent tabs. Data are summarized under the following headings:

1. Human Exposure (HE) – displays HE evaluation, last regional review date, and estimated control dates as applicable.
2. Contaminated Groundwater Migration (GM) – displays GM evaluation, last regional review date, and estimated control dates as applicable.
3. Obsolete performance measures – Cleanup Volume Table and Affected Population Totals, there is likely no data to display in these sections.

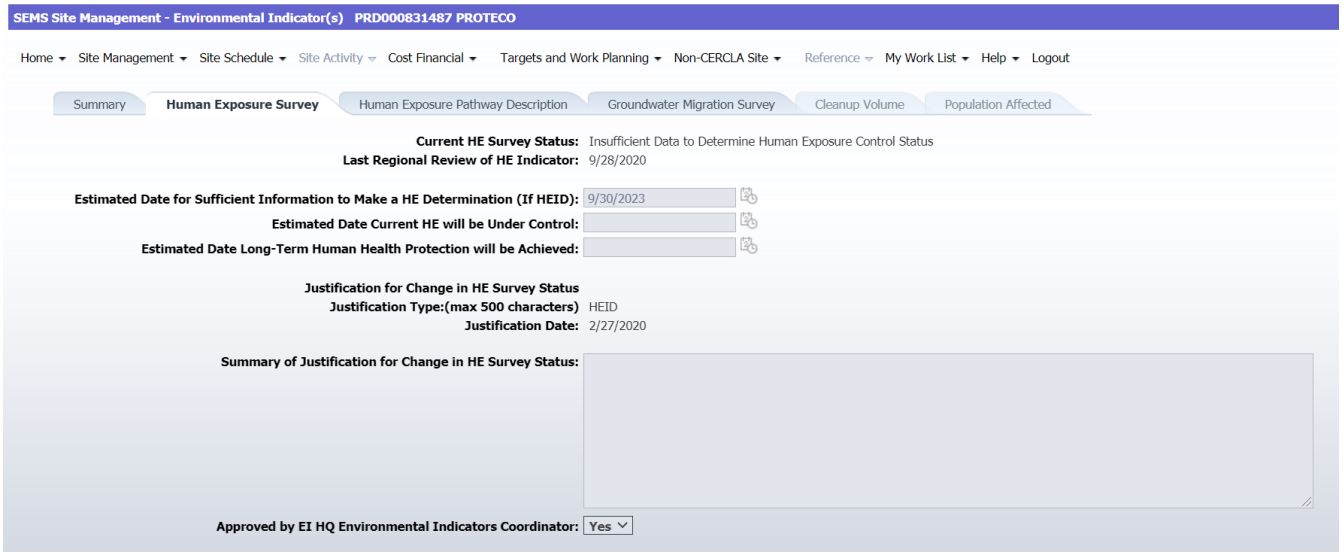
Exhibit 4: Environmental Indicators Summary Tab



B.2 Human Exposure Survey Tab

The HE Survey tab displays the human exposure survey questions and responses, the documentation supporting survey responses, and projected dates for achieving human exposure control and long-term human health protection. Table 5 lists each of the data fields displayed on the HE survey tab and their definitions.

Exhibit 5: Human Exposure (HE) Survey Tab



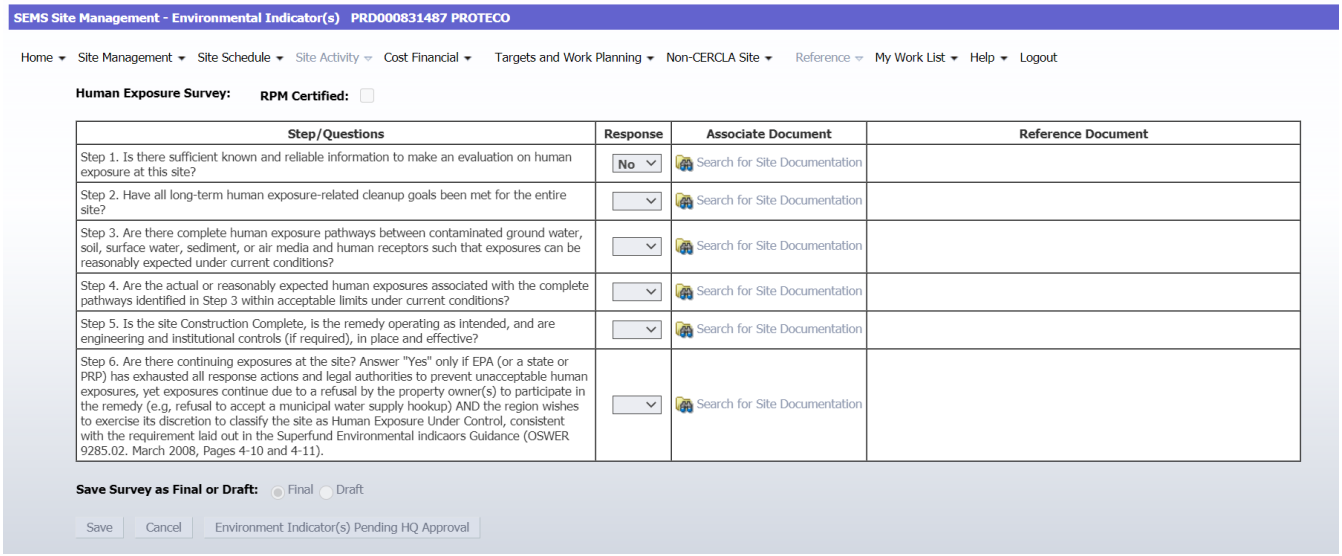


Table 5: Human Exposure (HE) Tab Data Field Definitions

Data Field	Definition
HE Survey Status	Displays current HE evaluation based on HE survey results. This field is automatically generated.
Last Regional Review of HE Indicator	Displays the date the HE Indicator was last reviewed by the region. This field is automatically generated and used to check that each site is reviewed annually.
Estimated Date for Sufficient Information to Make a HE evaluation (If HEID)	Estimated date site conditions will result in a sufficient data determination (SDD). This field is required for sites with a HE status of HEID.
Estimated Date Current HE will be Under Control	Estimated date site conditions will warrant an evaluation of at least HEUC. The required field for sites with a HE status of HENC.
Estimated Date Long-Term Human Health Protection will be Achieved	Estimated date site conditions will warrant an evaluation of HHPA. This field is required for sites with a HE status of HEUC or HEPR.
Justification for Change in HE Survey Status Justification Type	Shows the most recent change in HE status. Displays prior HE status (if applicable) followed by current HE status.
Justification Date	Date the Justification for Change field was populated. This field is automatically generated.
Summary of Justification for Change in HE Survey Status	Explanation of the rationale for the change in HE evaluation. The required field when a site changes HE status. This field is different from the "Exposure Pathway Description" field, which SEMS prompts the user to enter.
Approved by EI HQ Environmental Indicators Coordinator Drop Down	Flag indicating whether the change in HE status has been reviewed by the HQ Environmental Indicators Coordinator.
RPM-Certified Checkbox	Flag indicating that the HE survey has been reviewed by the RPM.
Step 1 – Step 6	Series of questions that generate a site-wide Human Exposure evaluation.
Final vs. Draft Button	Indicates whether the HE survey is saved as a draft or saved as final.

Entering Human Exposure Data

1. The EI data entry and viewing module currently resides in the Site Management portion of SEMS. From the SEMS homepage, choose "Site Management" in the "Home" dropdown. Search for the site and click on the pencil icon. Once inside the "Edit Site Information" screen, choose "Environmental Indicators" in the "Site Schedule" dropdown. The user is now in the "EI Module" of SEMS.

2. On the "Human Exposure Survey" tab, enter responses to the "steps/questions" until enough information has been entered to generate a HE status, and a popup says, "thank you, the HE survey is now complete." Click "save" in the bottom left corner

of the screen. Depending on your response to a survey question, the subsequent question may not be applicable, and the response field will be greyed out, and you will need to move on to the next question (the next applicable question will have a drop-down box that can be edited).

3. IMPORTANT: if the status change resulted in HEID or HENC, a SEMS pop-up window will prompt the user to write an exposure pathway description. The templates can be found in section 3.5, and the user can either provide the descriptions at this stage (ex., a user could have pre-prepared a description with the templates to copy and paste into this pop-up box), or simply save a draft sentence and navigate to the "human exposure pathway descriptions" tab afterwards. See section B.3 below for more details.

4. Provide documentation of your response in the "Associate Document" column for whichever question resulted in a status change. See table 3 for appropriate data/information sources. If you know the SEMS document ID associated with the reference document, please enter it in the "search for site document" popup screen.

5. Once all survey responses have been entered, the results of the responses will be displayed in the HE Survey Status field on the top of the tab and on the Summary tab. The user can now revise planning dates (estimated dates for sufficient data, estimated HEUC date, estimated HHPA date). Depending on the site-wide status change, the planning dates may not be applicable, and the response fields might be greyed out.

6. Please enter a couple sentences in the "summary of justification for change in HE survey status" box explaining the exact reason why the HE status changed. This summary is required for all status changes. This is NOT the same as the exposure pathway description on the next tab and DOES NOT need to follow the pathway description templates.

7. Once all data have been entered, click on the "RPM Certified" checkbox, if applicable.

8. Select either the "Final" or "Draft" button. Please note: The "Draft" option is not meant to be a substitute for cases when insufficient data are available at a site. It is included in the survey as a short-term placeholder for cases where the user has not completed the survey and wishes to save without losing information. Once a survey is saved as "Draft," the survey will display the evaluation of the "Human Exposure Saved as Draft" (HESD). Once the user can complete the survey, the "Final" radio button should be selected.

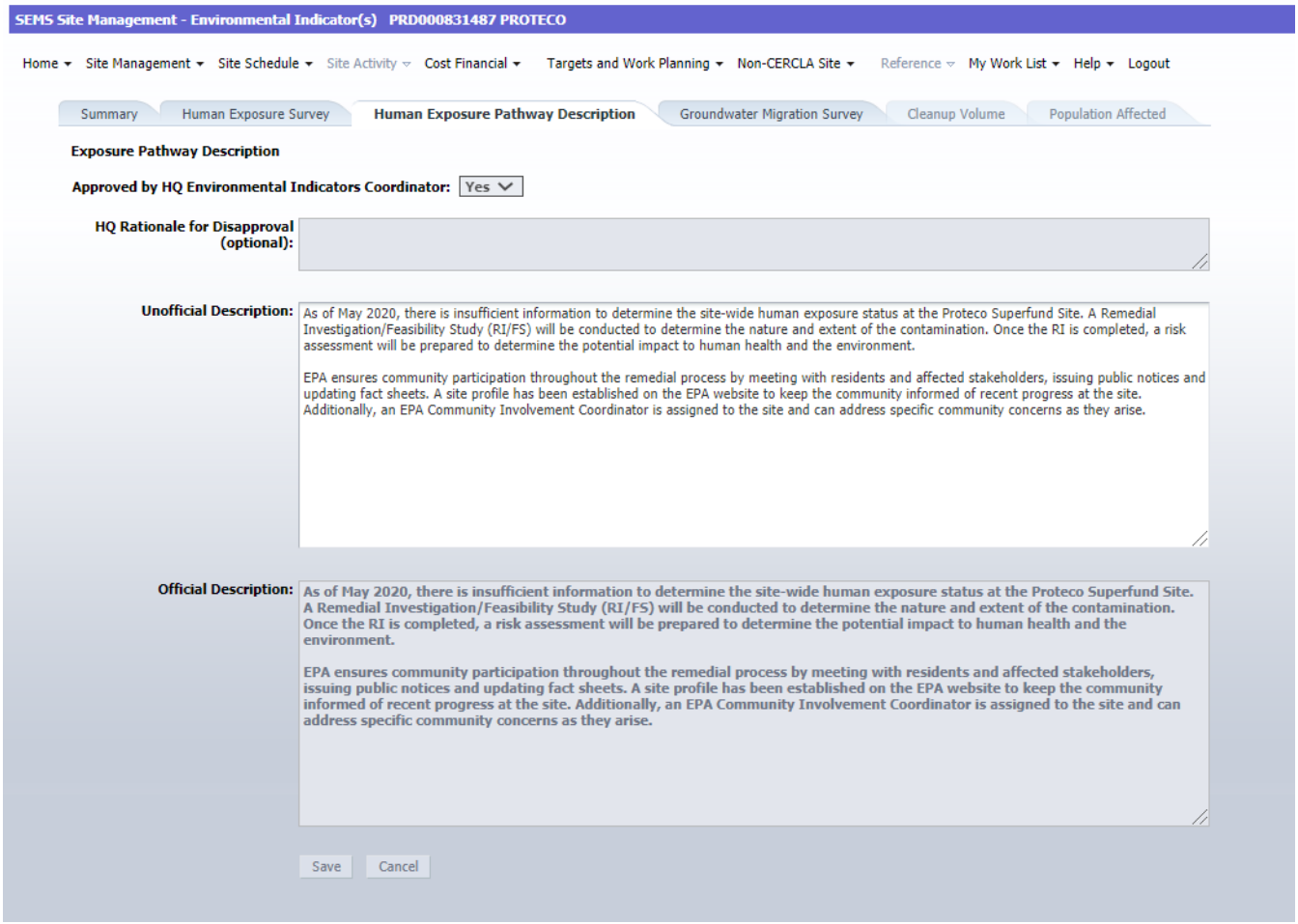
9. When the user attempts to exit the screen, they will be prompted to update the "last regional review date" field. If you are entering data for the first time, are making an update to the survey, or if you reviewed each survey response but no changes were required, select "yes." If you are entering data in another module and haven't reviewed the HE survey, select "no."

B.3. Human Exposure Pathway Description Tab

The Human Exposure Pathway Description tab displays a textual summary explaining why a site has a human exposure status of either HEID or HENC. Regions should enter the description in the "unofficial description" box, and they will become “official descriptions” (i.e., public facing on the Human Exposure Dashboard) once approved by the HE EI SME, which is noted by a checkbox at the top of the screen. Regions should update these descriptions at least once annually, or as site conditions change (see section 2.3 on updating EI data in SEMS).

It is very important to always begin the exposure pathway descriptions with “As of [month] [year],”. More details on the exposure pathway description templates can be found in section 3.5.

Exhibit 6: Human Exposure (HE) Pathway Description Tab



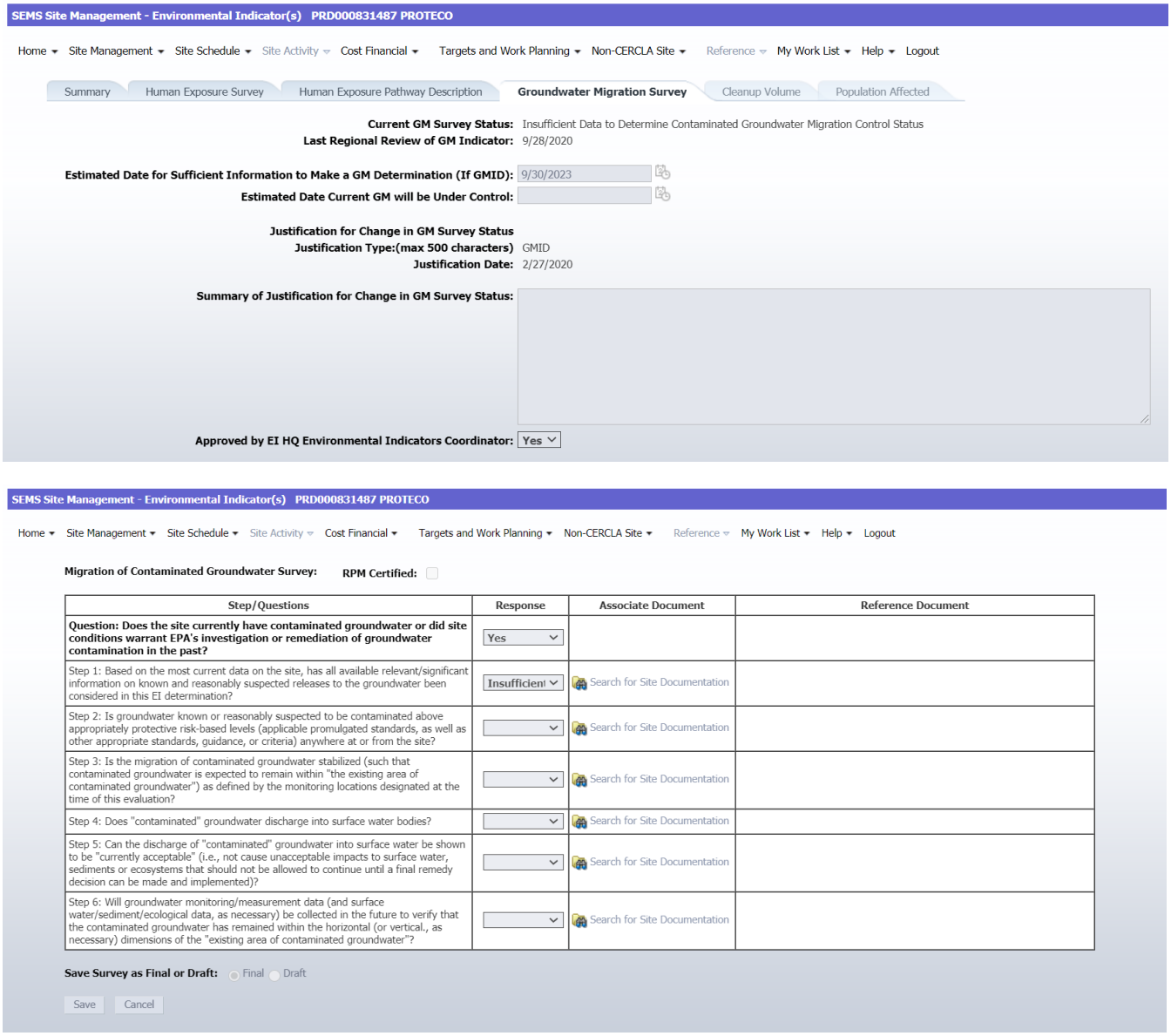
B.4 Groundwater Migration Survey Tab

The GM tab displays the migration of contaminated groundwater survey questions and responses, the documentation supporting survey responses, and projected dates for achieving groundwater migration control. Table 6 lists each of the data fields displayed on the GM tab and their definition.

Table 6: Groundwater Migration Survey Tab Field Definitions

Data Field	Definition
GM Survey Status	Displays current GM evaluation based on GM survey results. This field is automatically generated.
Last Regional Review of GM Indicator	Displays the date the GM Indicator was last reviewed by the region. This field is automatically generated.
Estimated Date for Sufficient Information to Make a GM evaluation (If GMID)	Estimated date site conditions will result in sufficient data to determine a GM status. The required field for sites with a GM status of "Insufficient Data."
Estimated Date Current GM will be Under Control	Estimated date site conditions will warrant an evaluation of at least Groundwater Migration Under Control. The required field for sites with a GM status of "Not Controlled."
Justification for Change in GM Survey Status Justification Type	Shows the most recent change in GM status. Displays prior GM status (if applicable) followed by current GM status.
Justification Date	Date the Justification Summary field was populated. This field is automatically generated.
Summary of Justification for Change in GM Survey Status	Explanation of the rationale for the change in GM evaluation. The required field when a site changes GM status.
Approved by EI HQ Environmental Indicators Coordinator Drop Down	Flag indicating whether the change in GM status has been reviewed by the HQ Environmental Indicators Coordinator.
RPM Certified Checkbox	Flag indicating that the GM survey has been reviewed by the RPM.
Question and Step 1 – Step 6	Series of questions that generate a site-wide Groundwater Migration evaluation.
Final vs. Draft Button	Indicates whether the GM survey is saved as a draft or saved as final.

Exhibit 7: Groundwater Migration Survey Tab



Entering Groundwater Migration Data

1. The EI data entry and viewing module currently resides in the Site Management portion of SEMS. From the SEMS homepage, choose “Site Management” in the “Home” dropdown. Search for the site and click on the pencil icon. Once inside the “Edit Site Information” screen, choose “Environmental Indicators” in the “Site Schedule” dropdown. The user is now in the “EI Module” of SEMS.

2. On the “Groundwater Migration Survey” tab, enter responses to the “steps/questions” until enough information has been entered to generate a GM status, and a popup says, “thank you, the GM survey is now complete.” Click “save” in the bottom left corner of the screen. Depending on your response to a survey question, the subsequent question may not be applicable, and the response field will be greyed out, and you will need to move on to the next question (the next applicable question will have a drop-down box that can be edited).

3. Provide documentation of your response in the “Associate Document” column for whichever question resulted in a status change. The primary sources of information and data behind a GM SDD are human health and ecological risk assessments, which will help confirm whether the groundwater is contaminated above risk-based levels, and periodic groundwater & surface water monitoring reports to assess whether the contaminated groundwater is stabilized. Many other documents listed in section 3.3, table 3 for the HE EI may also be useful sources of information for GM evaluations.

4. Once the survey is completed, the survey evaluation will be displayed as the Current GM Survey Status box at the top of the Groundwater Migration Survey tab and the Summary tab.

5. Once all data have been entered, and the survey has been certified by the appropriate person(s), click on the RPM Certified checkbox.

6. Select either the "Final" or "Draft" button. Please note: The "Draft" option is not meant to be a substitute for cases when insufficient data are available at a site. It is included in the survey as a short-term placeholder for cases where the user has not completed the survey and wishes to save without losing information. Once a survey is saved as "Draft," the survey will display the evaluation of the “Groundwater Migration Saved as Draft” (GMSD). Once the user can complete the survey, the "Final" radio button should be selected.

7. If the survey status at the top of the screen does not result in "Groundwater Migration Under Control," upon exiting the module, you will be required to enter an estimated date for which control of the migration of contaminated groundwater is expected to be achieved.

8. Additionally, if the survey status at the top of the screen is either "Insufficient Data" or "Groundwater Migration Not Controlled," you will be prompted to enter a summary explaining the rationale as to why the site is not yet considered "Contaminated Groundwater Migration Under Control." Enter this summary in the Justification text box.

10. When the user attempts to exit the screen, they will be prompted to update the “last regional review date” field. If you are entering data for the first time, are making an update to the survey, or if you reviewed each survey response but no changes were required, select "yes." If you are entering data in another module and haven't reviewed the GM survey, select "no."

APPENDIX C – EI REPORTS AND DASHBOARDS

The purpose of the EI Reports and Dashboards appendix is to document and list the various tools we have for recording and reporting on EIs. It is important for all Superfund personnel who work on EIs to know how to use these tools, as they are instrumental in our ability to perform analysis on EIs and respond to Congressional and budgetary inquiries.

This appendix contains the following sections:

- C.1 Superfund Comprehensive Accomplishments Plan (SCAP) and EI Reports
- C.2 Internal OSRTI Program Dashboards
- C.3 Human Exposure Web Dashboard

C.1 SCAP and EI Reports

Environmental Indicator Reports were developed to assist the regions with data entry to facilitate National and site-specific report viewing. OSRTI refines the EI reporting system by noting any defects and enhancements that appear in the Jira System, as well as through contact with EPA Headquarters and regional personnel.

Available Reports

- *EI-001 - Environmental Indicators Current Status*

  Lists all sites in the Groundwater Migration universe and the status of the data; all sites in the Human Exposure universe and the status of the HE fields; sites that are HE Not Under Control or Insufficient Data Environmental Indicators.

- *EI-003 - EI Data Entry Worksheets Headquarters Data Sponsor Approved*

  Worksheet report for Human Exposure and Groundwater Migration EI Data entry.

- *EI-004 - HQ Unapproved Determination or Pathway Headquarters Data Sponsor Approved*

  Lists all sites with unapproved exposure pathway descriptions or Human Exposure/Groundwater Migration Statuses.

- *EI-005 - EI Sufficient Data or Under Control Projects - Next Year's Headquarters Data Sponsor Approved*

  Worksheet report displays EI Sufficient Data/Under Control Projects projected for the next years.

- *EI-006 - HE Exposure Scenario Report (HENC/HEID) Sites Headquarters Data Sponsor Approved*

  Lists all sites that have a Human Exposure Status of HENC or HEID with Unapproved Scenario field information.

- *EI-010 - Environmental Indicator Groundwater Migration and Human Exposure Justification Text Headquarters Data Sponsor Approved*

  Worksheet report displays the Groundwater Migration justification text and Human Exposure justification text, as well as Groundwater Migration and Human Exposure status for sites where not considered Under Control.

- *SCAP-015 - Government Performance and Results Act (GPRA) Report*

  The SCAP 15 Report is used by Headquarters to assess Superfund's status in meeting the performance goals stated in the annual performance plan. The SCAP 15 is the official report used to report program performance to Congress. This version of the SCAP 15 displays Environmental Indicator Detailed information.

- *SCAP-015e – GPRA Report, EI Detail*

  Worksheet report displays detail for the Environmental Indicator section of the SCAP 15 report logic.

Viewing Reports

1. Open the SEMS Reporting Tool.
2. In the "Reports by Program Area" column, select "Environmental Indicators" or "SCAP" as applicable.
3. Select any of the reports described above.
4. Filters on different fields (e.g., region, NPL Status) will be available at the top of each screen. Click apply after changing the filters. Different tabs show different views of the report (e.g., Summary, Detail).
5. Once you have selected a view, you may need to click the refresh button. Click the cog to export if desired.

C.2 Internal OSRTI Program Dashboards

The Environmental Indicators Dashboard was designed to track targets and necessary updates for EIs within headquarters and the regions.

Available Dashboard Views

- *EI Net Accomplishments*

  Graphically displays HE and GM evaluations and net accomplishments by fiscal year.

- *EI Status Pie Charts*

  Shows the proportion of different HE and GM status evaluations by fiscal year. Each chart can be filtered by fiscal year.

- *EI Data*

  Breaks down the number of sites in the EI baseline at each status of HE and GM by region in a given fiscal year.

- *EI Bowling Charts*

  Shows a bowling chart of accomplishments and retractions by month and region for HE and GM in the current fiscal year. Underneath each bowling chart, there is a list of the site names and EPA IDs of the sites referred to in the bowling chart. This whole tab can be filtered by region or fiscal year.

- *EI Estimated Control & Sufficient Data Plans*

  The four tables on this tab display information about the sites that are scheduled to have a specific change in status in the current fiscal year sorted by the date that change is scheduled to occur. The tables show HENC sites scheduled to come under control, HEID sites scheduled to have sufficient data, GMNC sites scheduled to come

under control, and GMID sites scheduled to have sufficient data. The whole tab can be filtered by region, fiscal year, section, or RPM.

- *HEID & HENC Paragraph Updates*

  Shows the sites that have HE pathway description updates for either HEID or HENC sites that are overdue or coming due. The first section shows a count of overdue pathway description updates by region and HE status. Below that, a detailed view shows information about each site with an overdue pathway description, along with the draft HE pathway description status (either "not submitted" or "awaiting HQ approval") and the current HE pathway official description that has been approved or previously approved, if update is pending HQ review. The second section shows a count of pathway descriptions coming due in the next three months by region and HE status, then a detailed view provides more information on the individual sites. This whole tab can be filtered by region, section, or RPM to make managing the pathway description updates easy.

- *HEID Accomplishments*

  Shows the sites that have moved from HEID to any other HE status in the given fiscal year broken out by region and month. The first table shows a count of the sites, then a detailed table provides more information on the individual sites. This whole tab can be filtered by region or fiscal year.

Accessing the Environmental Indicators Dashboard

1. Open the SEMS Reporting Tool.
2. Open "Environmental Indicators Dashboard" under the Management Dashboard column.
3. Navigate between the different tabs described above. Apply filters as desired.

C.3 Human Exposure Web Dashboard

In January 2018, EPA launched a public Human Exposure Dashboard to improve public access to HE data and information. The dashboard provides live SEMS data on HE for Superfund sites in a single, easily accessible webpage. HE evaluations are made for all Final and Deleted NPL sites and sites with SAA agreements in place. Note that for the purposes of public communication (see section 3.5) or reporting EPA's GPRA accomplishments (see section 3.6), the latter three categories (HEUC, HEPR, and HHPA) are combined into a single category reported as "Human Exposure Under Control" (HEUC).

The dashboard includes a national overview of the cumulative number of sites with each status. Further down the page, site-specific status reports can be populated in a data table. Filter panes for HE status, FF status, and Region allow the user to query the SEMS HE data for specific criteria. Detailed exposure pathway descriptions are available for all HEID and HENC sites and can be accessed by clicking on the hyperlinks under the "Human Exposure Status" column of the data table.

The Human Exposure Web Dashboard can be accessed at https://www.epa.gov/superfund/superfund-human-exposure-dashboard