

West Valley Demonstration Project
Phase 1 Decommissioning Plan

PROPOSED DOSE MODELING APPROACH

A Briefing for the U.S. Nuclear Regulatory Commission

U.S. Department of Energy • July 24, 2008



EM *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

www.em.doe.gov

Note on presentation

The information in this presentation is based upon data and analysis associated with the presumptive Preferred Alternative in the Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center, which is still under development.

To the extent the presumptive Preferred Alternative is either modified or changed during the course of the NEPA process, the approach described in this presentation may correspondingly change.



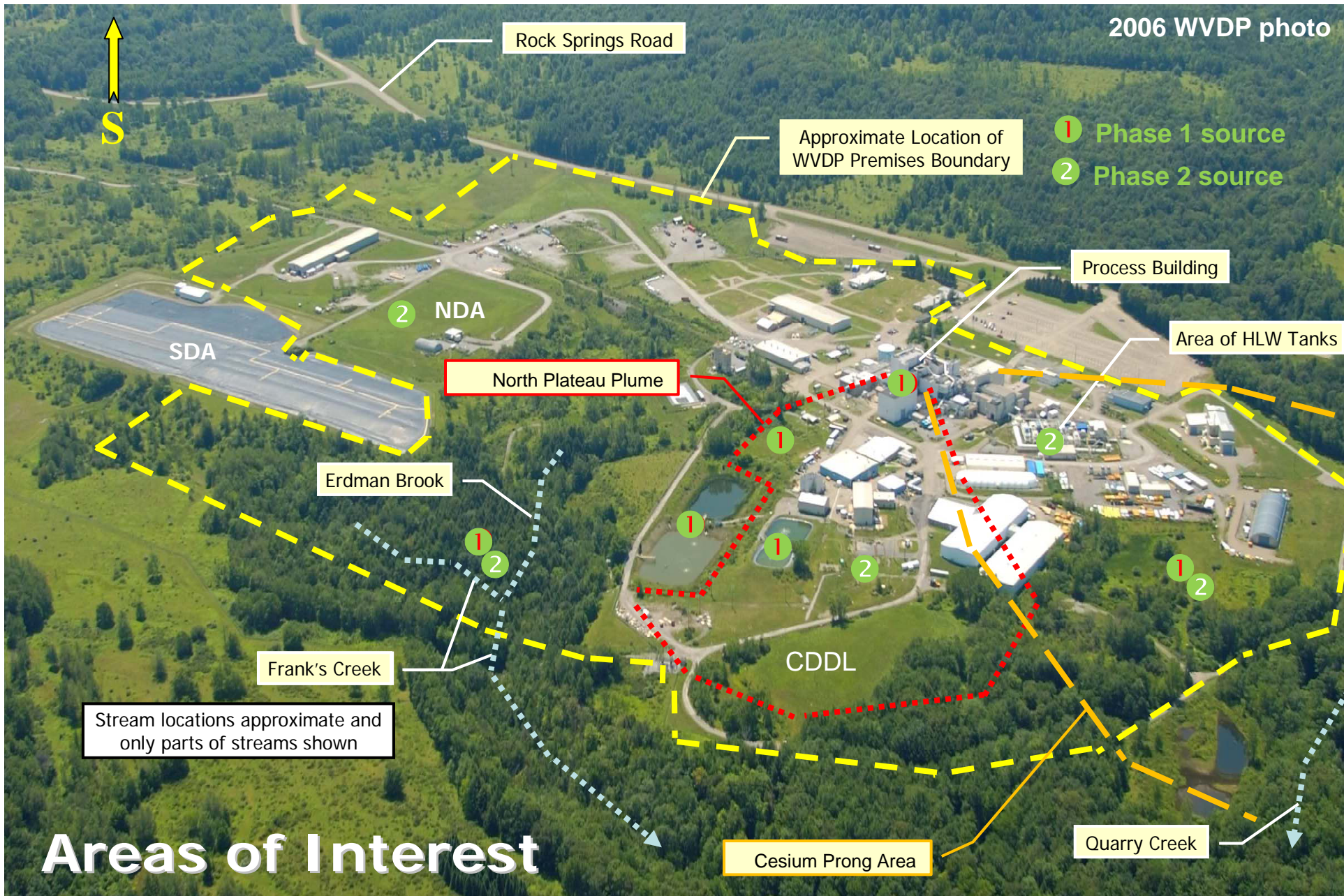
EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

Objective and agenda

- ❑ Objective:
 - To obtain NRC input on DOE's plans for developing DCGLs and for the limited site-wide dose assessment to be described in Section 5 of the WVDP Phase 1 DP
- ❑ Agenda:
 - 1) Background and general approach
 - 2) Planned content of Section 5 of the DP
 - 3) Approach to DCGL development
 - 4) Approach to the limited site-wide dose assessment
 - 5) Establishing cleanup goals to avoid limiting Phase 2 options
 - 6) Summary





Areas of Interest

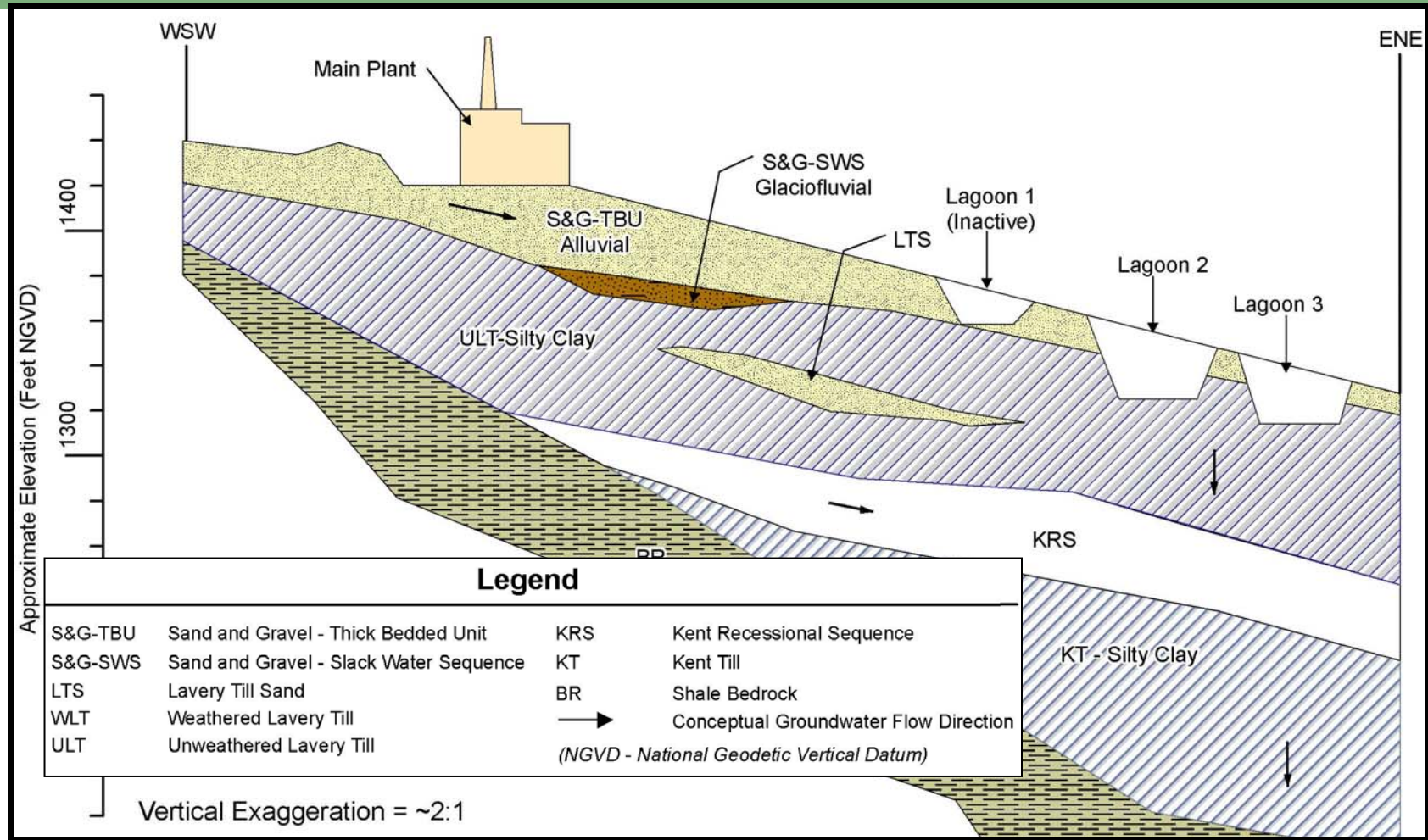


EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

www.em.doe.gov

North plateau geologic cross section



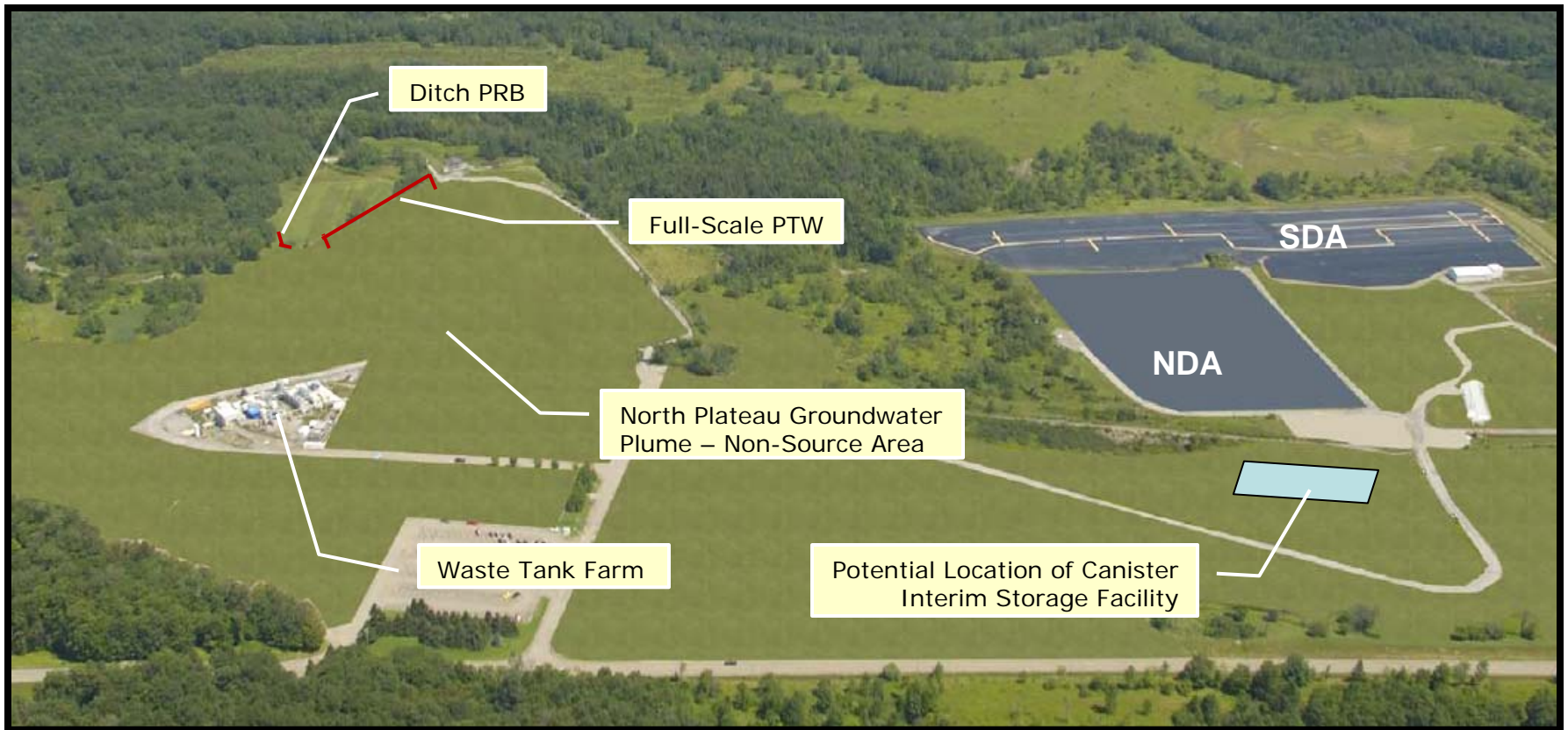
Major Phase 1 decommissioning activities

- ❑ Characterization (and potential remediation) of surface soil and sediment
 - Within Phase 1 areas and outside Phase 1 areas on project premises
- ❑ Removal of WMA 1 facilities
 - Process Building, Vitrification Facility, etc., including subsurface structures and north plateau groundwater plume source area
 - With remediation of underlying subsurface soil in excavation
- ❑ Removal of WMA 2 facilities
 - Lagoons 1-3, Interceptors, Neutralization Pit, surrounding soils, with a single excavation, remediating subsurface soil in this area
 - Separately removing LLW2 Facility, Lagoons 4 and 5, and remaining floor slabs, with underlying soil removed to maximum depth of 2 feet

WMA 1 and WMA 2 hydraulic barrier walls will remain in place.



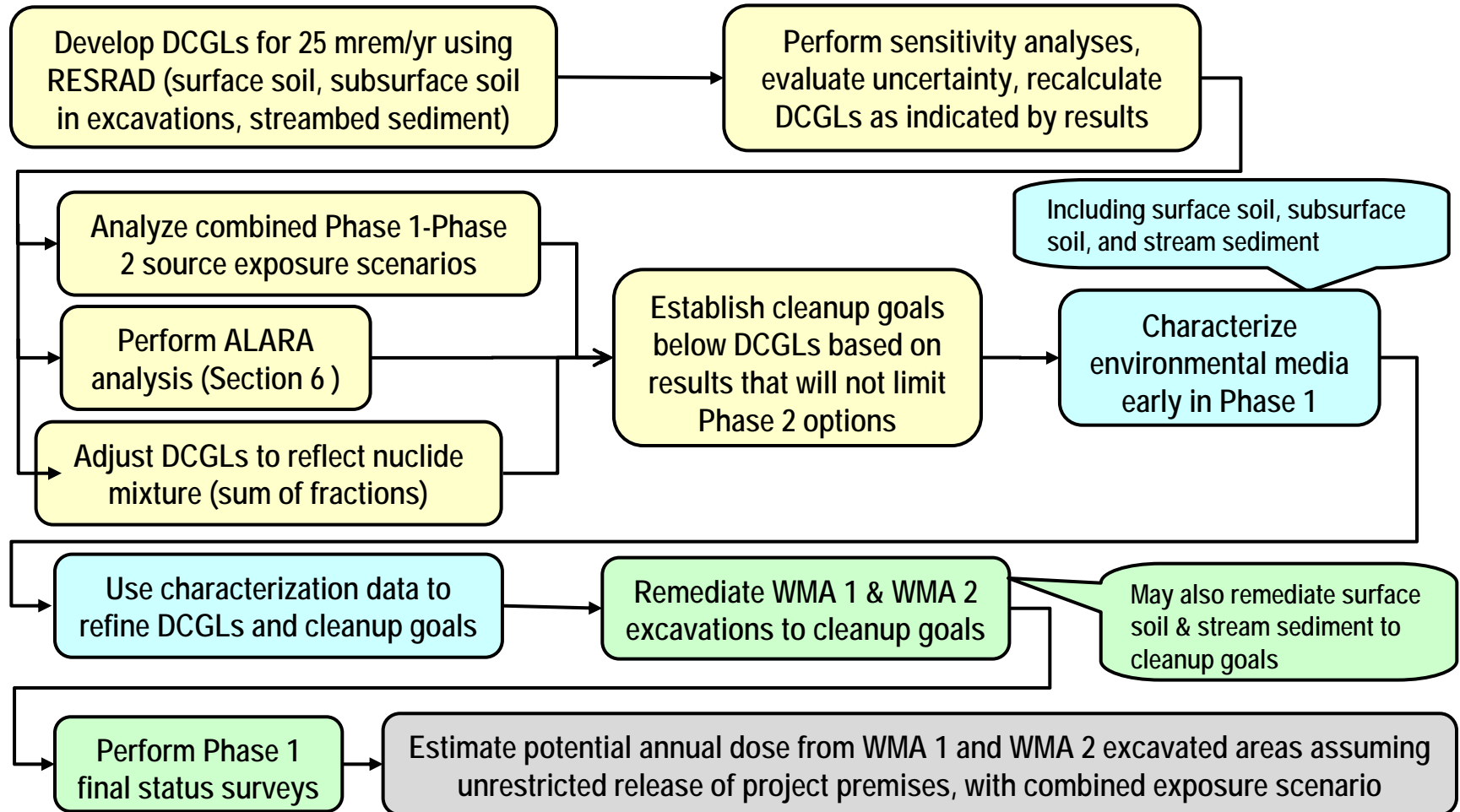
Appearance at the conclusion of Phase 1



EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

Basic approach planned



DP Table of Contents

Executive Summary

1. Introduction
2. Facility Operating History
3. Facility Description
4. Facility Radiological Status
5. Dose Modeling
6. ALARA Analysis
7. Planned Decommissioning Activities

8. Quality Assurance Program

9. Facility Radiation Surveys

Appendix A – Annotated DP Checklist

Appendix B – Environmental Radioactivity Data*

Appendix C – Supporting Information for DCGL Development and the Limited Site-Wide Dose Assessment**

Appendix D – Engineered Barriers and Post Remediation Activities

*Supplements Section 4

**Supplements Section 5, multiple appendices as needed



EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

Section 5 basic outline

- 5.1 Introduction
- 5.2 DCGL Development
- 5.3 Limited Site-Wide Dose Assessment

All applicable NUREG-1757 DP checklist topics will be addressed.



EM *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

Section 5.1 – Introduction

- ❑ Applicable requirements
- ❑ Context for DCGL development
 - Surface soil
 - Subsurface soil in WMA 1 and WMA 2 excavations
 - Streambed sediment
- ❑ Context for integrated dose assessment
 - Groundwater hydrology, erosion, source terms of interest, relationships between Phase 1 actions and potential Phase 2 actions



Section 5.2 – DCGL Development

- ❑ Conceptual models for DCGL development
 - Physical features of importance
 - Critical groups
 - Exposure scenarios considered and selected
- ❑ Mathematical model for environmental transport and exposure pathways (RESRAD)
- ❑ Results
 - DCGL values, area factors, etc.
- ❑ Discussion of sensitivity analyses and uncertainty
 - Based on selected deterministic sensitivity analyses



Section 5.3 – Limited Dose Assessment

- ❑ Discussion of dose integration considerations
- ❑ Analysis of limiting dose integration scenario involving combined doses from different source areas
 - Remediated Phase 1 excavation (resident farmer) combined with exposure to stream sediment remediated in Phase 2
 - Conceptual models, source terms, exposure scenarios, etc.
 - Results, discussion of sensitivity analyses and uncertainty
 - Impacts on DCGLs for subsurface soil and streambed sediment
- ❑ Discussion of related matters
 - Accounting for erosion

Engineered barriers and flow fields will be addressed in App D.



Appendix C, Supporting Details

- RESRAD input parameters and their bases for DCGL development
- Output files
- Area factor calculational methods and results



Approach to DCGLs – 1 of 5

- ❑ Develop sets of DCGLs
 - Surface soil, subsurface soil, and streambed sediment
 - Account for a 30-yr decay period (to year 2041) to coincide with the expected start of Phase 2
- ❑ Use RESRAD for the environmental transport and exposure pathway model*
- ❑ DCGLs to be based on 25 mrem/yr and will include
 - Radionuclide-specific $DCGL_W$ values
 - Area factors to be used in establishing $DCGL_{EMC}$ values
 - $DCGL_{EMC}$ values
- ❑ A 1000-year evaluation period will be used

**Based on suitability and experience with code.*



EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

Approach to DCGLs – 2 of 5

- Parameter selection hierarchy
 - 1) Site-specific values where available, e.g. groundwater and vadose zone parameters
 - 2) Semi site-specific literature values, e.g. physical values based on soil type from NUREG/CR-6697 and behavioral factors based on regional data in the EPA Exposure Factors Handbook
 - 3) Scenario-specific values using conservative industry defaults, e.g., from Exposure Factors Handbook, RESRAD Data Collection Handbook, NUREG/CR-6697
 - 4) The most likely values among default RESRAD parameters defined by a distribution, when available, otherwise mean values from NUREG/CR-6697



Approach to DCGLs – 3 of 5

- DCGLs will be re-evaluated early in the decommissioning process when additional characterization data becomes available or if default parameters change
 - Additional characterization performed early in the process will provide more information on radionuclide distributions and the lateral extent and depth of contamination (source geometry)
- DOE will remediate subsurface soil in WMA 1 and WMA 2 excavations below DCGLs based on results of ALARA analysis (Section 6 of DP) and integrated dose analysis
 - The ALARA analysis will include evaluation of use of the surface soil DCGLs as goals in remediation of the WMA 1 and WMA 2 excavations



Approach to DCGLs – 4 of 5

- DCGL development is intended to proceed as if each medium of interest (surface soil, subsurface soil at the bottom of the WMA 1 and WMA 2 excavations, and stream sediment) were the only source of interest
 - Lateral movement of contaminants is not modeled because the primary objective is to develop DCGLs and RESRAD models radionuclide transport in only the vertical direction

The potential combined doses from residual contamination in these areas and the Phase 2 sources will be addressed later in this presentation.



Approach to DCGLs – 5 of 5

□ Application of DCGLs

- Surface soil and streambed sediment outside of the Phase 1 areas on the project premises may be remediated in Phase 1
 - Depending on characterization results and funding
 - Otherwise may be remediated in Phase 2, depending on Phase 2 approach selected
- Subsurface soil in WMA 1 excavation and WMA 2 Lagoon 1-3 area excavation will be remediated to DCGLs in Phase 1



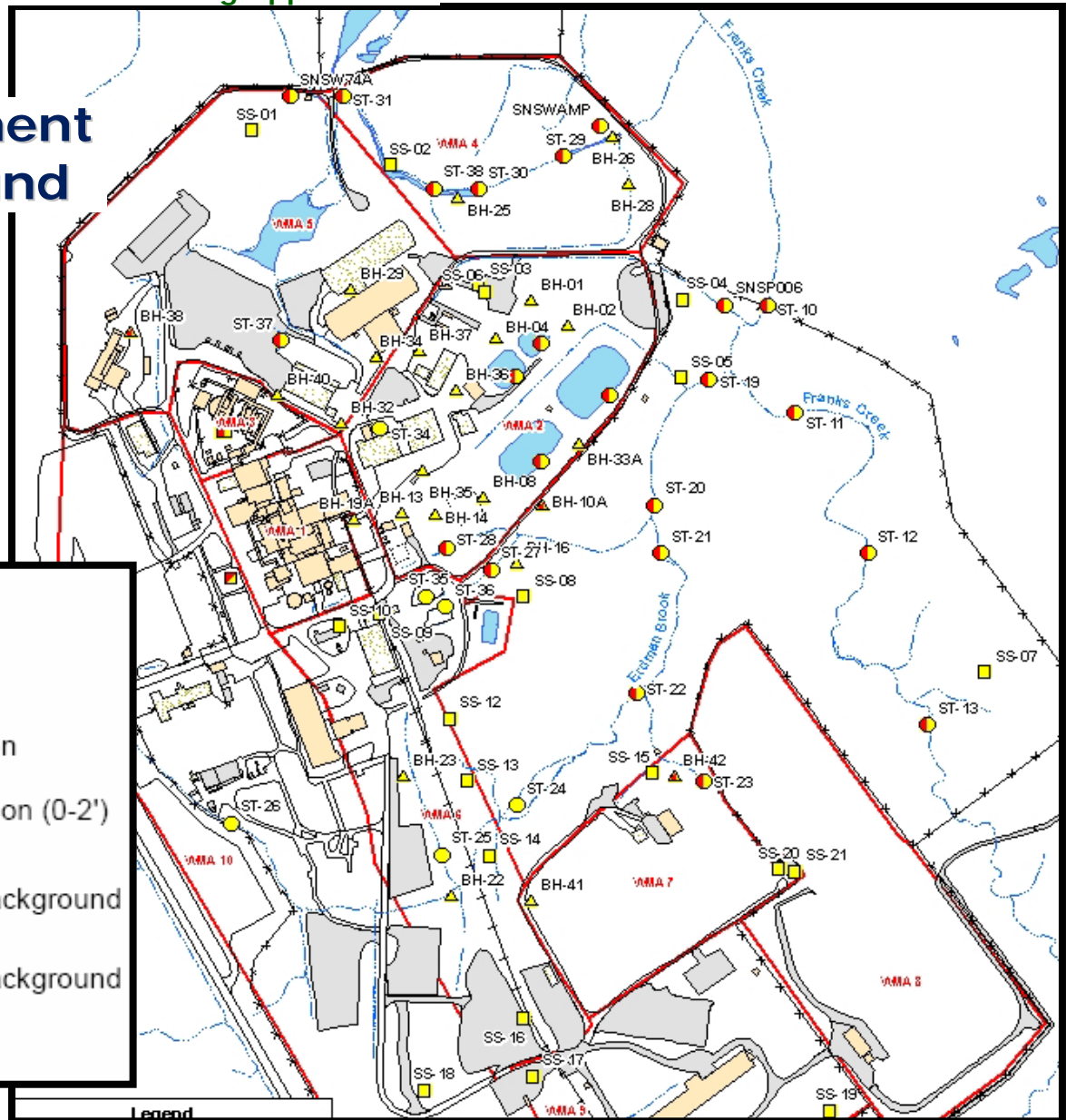
Surface soil DCGLs

- Will discuss using the next 6 slides
 - Locations of surface soil samples with results > background
 - Available data on radioactivity in surface soil
 - The conceptual model
 - Exposure pathways and scenarios to be evaluated
 - DOE has considered various combinations of pathways and scenarios in determining the limiting ones to use
 - Key input parameters
 - Evaluation of uncertainty



Surface soil & Sediment Samples > background

NOTE: Extent of surface soil contamination not well defined – Slide 38 addresses streambed sediment.



Legend	
○	Sediment Sampling Location
□	Surface Soil Sampling Location
△	Borehole Soil Sampling Location (0-2')
● (Red)	Gross Alpha or Alpha-Emitting Radionuclides in Excess of Background
● (Yellow)	Gross Beta or Beta-Emitting Radionuclides in Excess of Background
● (Red/Yellow)	Both Alpha and Beta Emitters in Excess of Background



Surface soil source characteristics

Available north plateau sample analytical data in pCi/g

Nuclide	Obs	Mean Bkg	Max	Screen DCGL*	Location of Maximum
Co-60	35	<0.0019	2.1	3.8	
Sr-90	35	0.15	12	1.7**	WMA 4, near CDDL drainage
Cs-137	35	0.45	280	11**	WMA 2, near interceptors (BH-13)
U-238	5	0.79	0.11	14	Onsite values < offsite background
Pu-238	5	<0.0054	0.036	2.5	
Am-241	5	<0.015	0.37	2.1	

*From NUREG-1757, vol.2, Table H.2, screening values for 25 mrem/yr.

**With the 30-year decay period, the DCGLs to achieve 25 mrem/yr in 2041 would be approximately 2X these values.

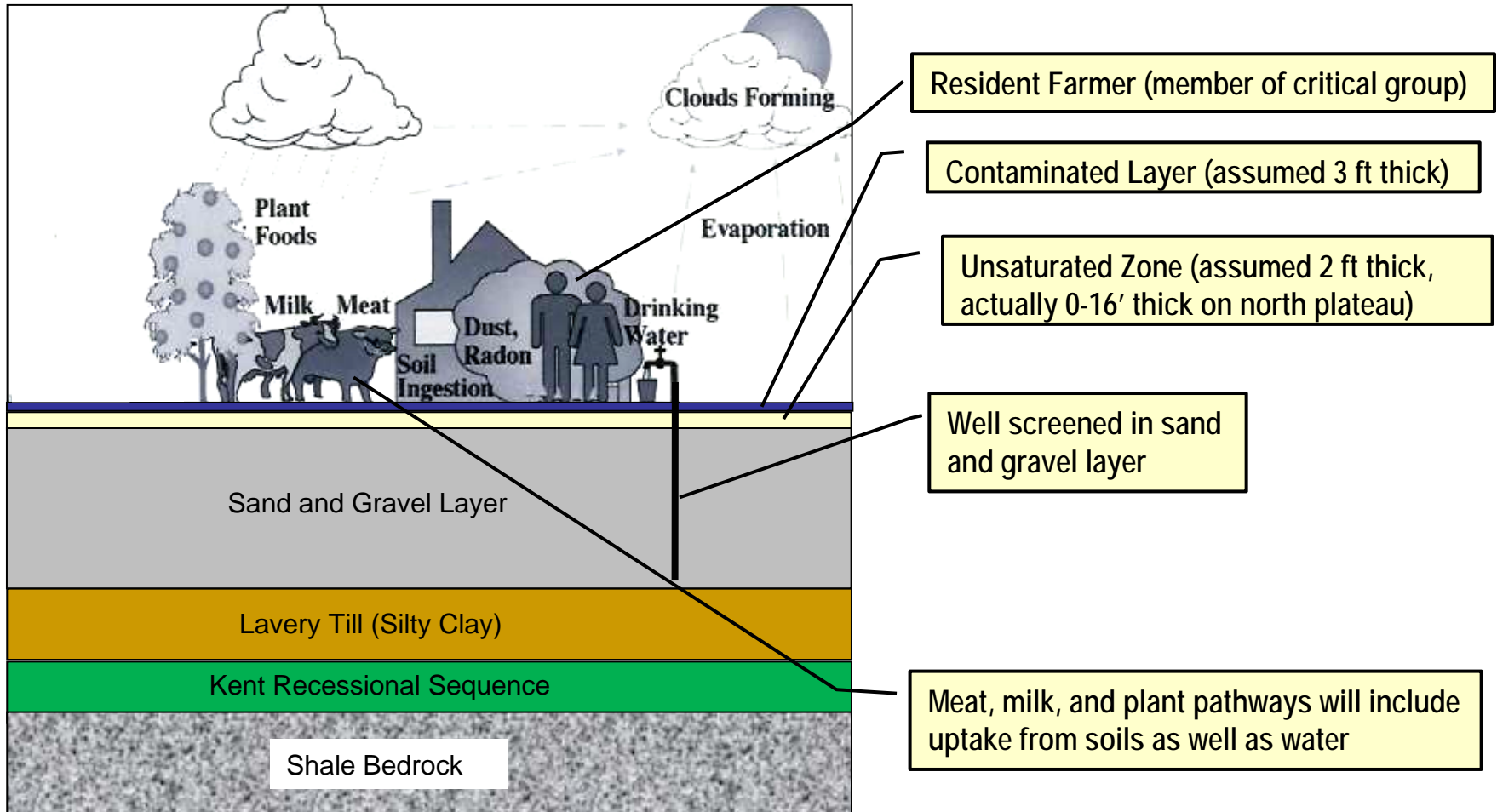
Available data indicate that Sr-90 and Cs-137 are the radionuclides of primary interest and that low-levels of contamination are present in many areas.



EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

Conceptual Model – surface soil DCGLs



Pathways for resident farmer Surface soils DCGLs

Pathway	Active	Remarks
External gamma radiation	Yes	
Inhalation of dust	Yes	
Radon inhalation	No	Ra predominately naturally occurring
Ingestion of plant foods	Yes	
Ingestion of meat	Yes	
Ingestion of milk	Yes	
Ingestion of fish	No	Streams analyzed separately
Ingestion of soil	Yes	
Ingestion of water	Yes	Groundwater from well and through indirect pathways (irrigation, livestock)



Other key input parameters

Parameter	Value	Basis
Source area	1-10,000 m ²	Range to be evaluated
Aquifer productivity	330-1520 m ³	NUREG/CR-6697
Sr soil K _d	5 cm ³ /g	Site-specific value used in DEIS
Cs soil K _d	447cm ³ /g	Site-Specific value used in DEIS
Am soil K _d	1450 cm ³ /g	Site-Specific value used in DEIS



Addressing sensitivities and uncertainty

- Plan to evaluate the impacts of variations in selected input parameters, e.g.,
 - Contaminated layer geometry
 - Unsaturated zone thickness
 - Aquifer pump rate
 - Plant transfer factors
 - Root depth
- Will make adjustments in the conceptual model if appropriate based on analysis results

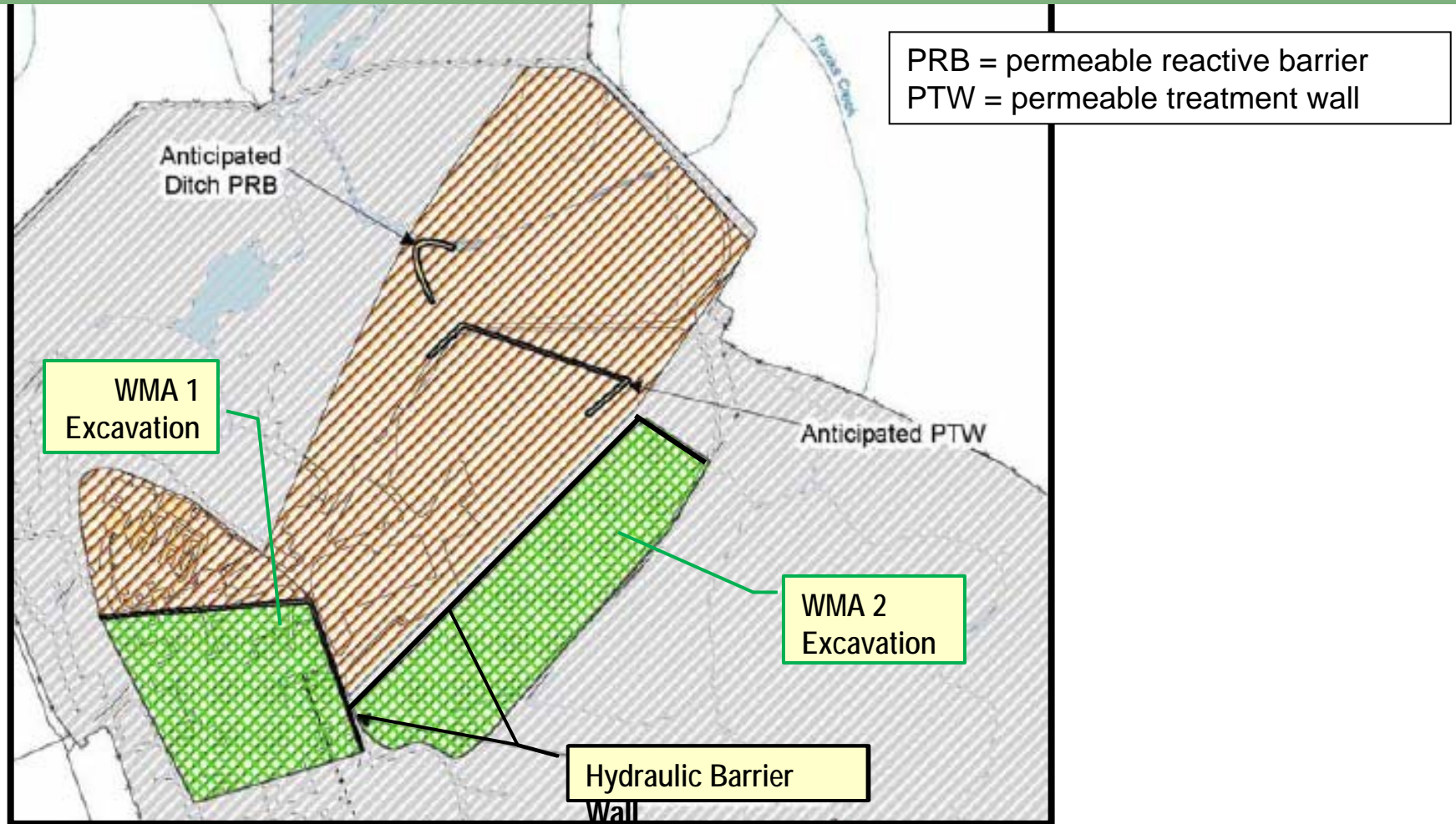


Subsurface soil DCGLs

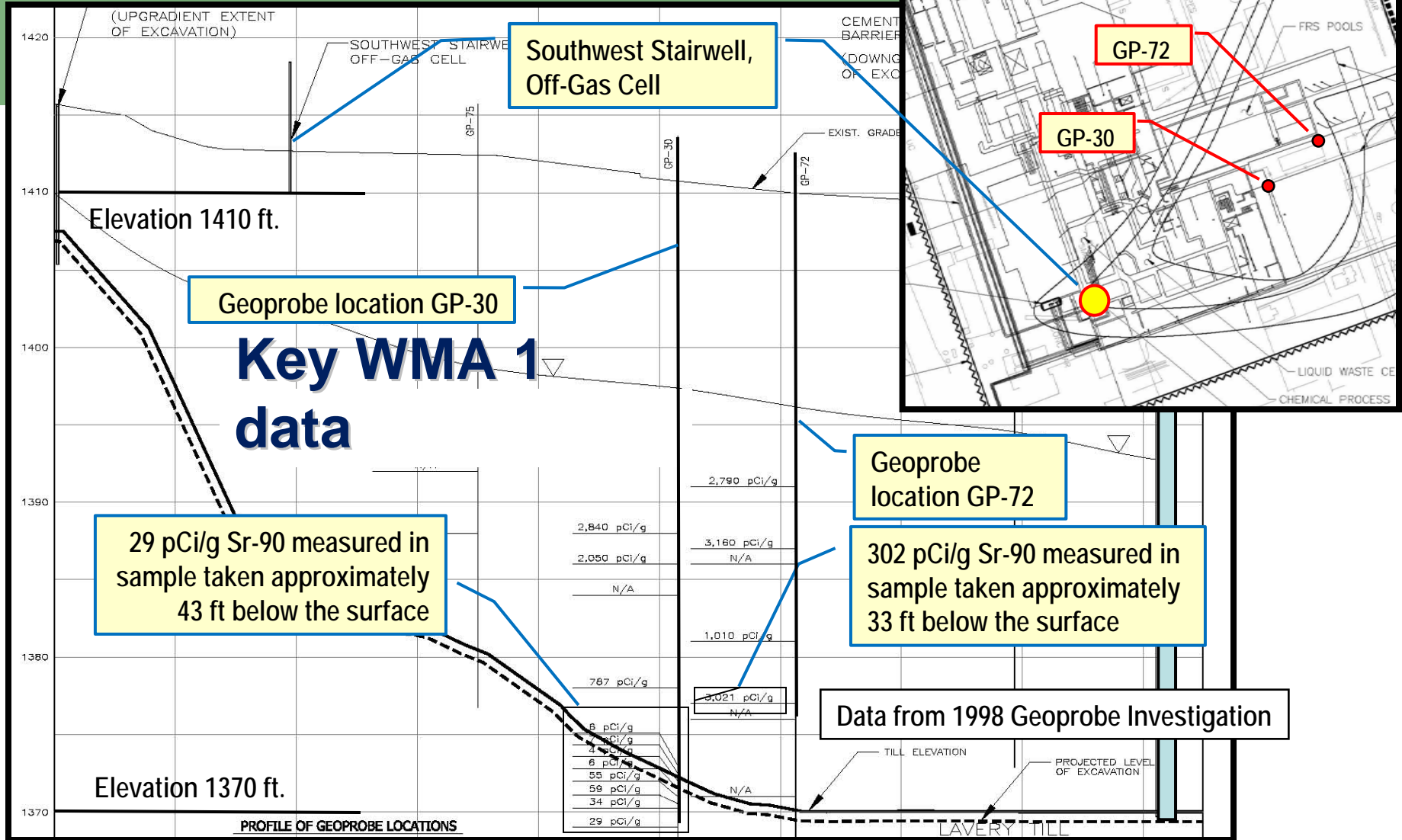
- Will discuss using the next 9 slides
 - Areas of interest
 - Key data on radioactivity in subsurface soil in WMA 1
 - The conceptual model for the WMA 1 excavation
 - Exposure pathways and scenarios to be evaluated
 - As with surface soil, DOE has considered various combinations of pathways and scenarios in determining the limiting ones to use
 - Key input parameters
 - Consideration of sensitivity to important input parameters and uncertainty
 - Similar information for WMA 2 excavation



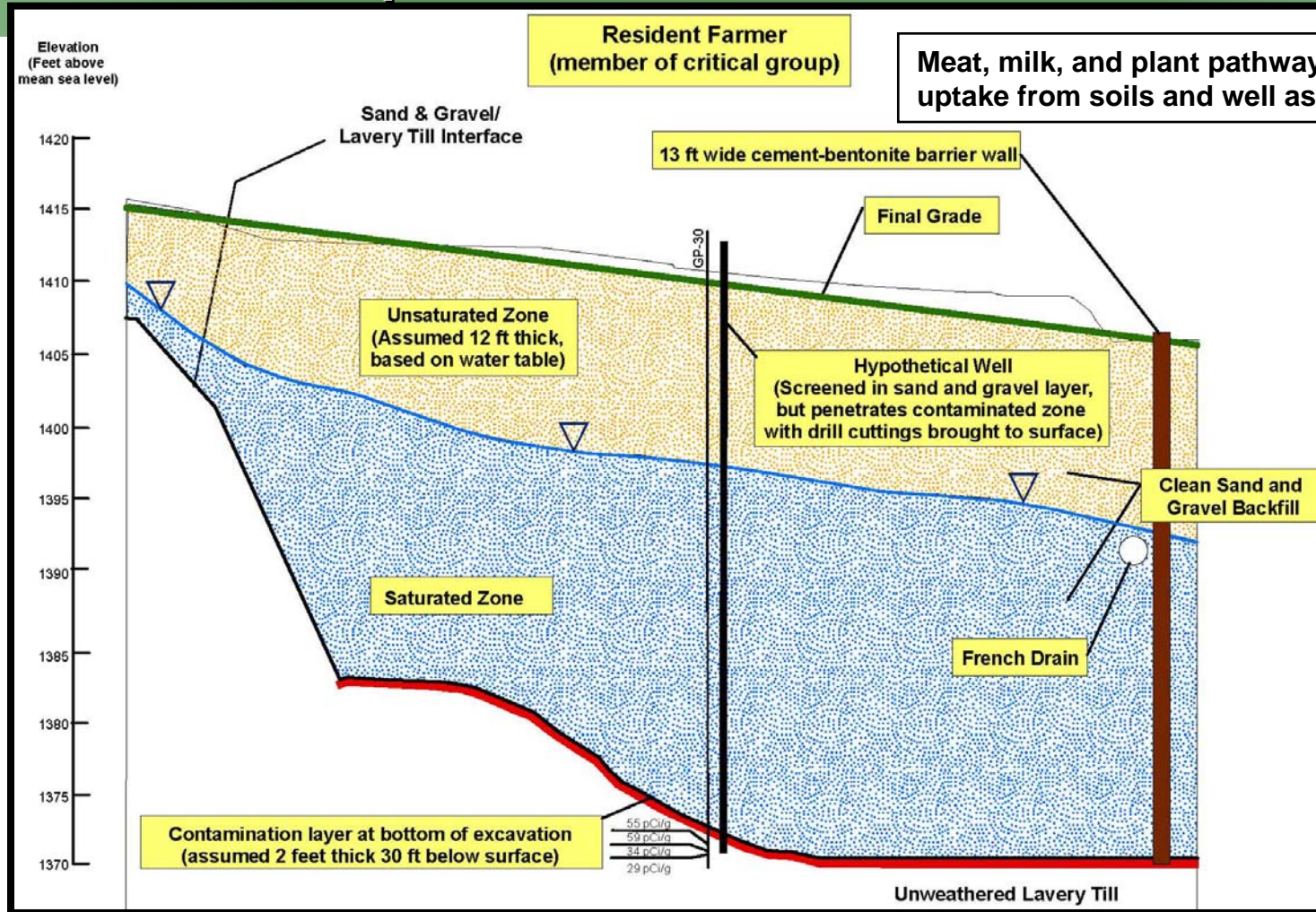
Subsurface soil DCGL areas of interest



**WVDP Phase 1 Decommissioning Plan Dose Modeling Approach
DCGL Development**



WMA 1 conceptual model, subsurface soil DCGLs



EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

Pathways for resident farmer, subsurface soils DCGLs

Pathway	Active	Remarks
External gamma radiation	Yes	From contamination in drill cuttings
Inhalation of dust	Yes	Contaminated by drill cuttings
Radon inhalation	No	Ra predominately naturally occurring
Ingestion of plant foods	Yes	Grown in soil contaminated by cuttings
Ingestion of meat	Yes	Contamination from drill cuttings
Ingestion of milk	Yes	Contamination from drill cuttings
Ingestion of fish	No	Streams analyzed separately
Ingestion of soil	Yes	Contaminated by drill cuttings
Ingestion of water	Yes	Groundwater from well and through indirect pathways (irrigation, livestock)



Other key input parameters

Parameter	Value	Basis
Source area	1-12,000 m ²	Assumed range to be evaluated.*
Aquifer productivity	330-1520 m ³	NUREG/CR-6697
Well geometry	0.2 -1.4 m dia.	Represents well and cistern size
Sr soil K _d	5 cm ³ /g	Site-specific value used in DEIS
Cs soil K _d	447cm ³ /g	Site-Specific value used in DEIS
Am soil K _d	1450 cm ³ /g	Site-Specific value used in DEIS

RESRAD dose-to-source ratios for water dependent pathways used to evaluate continuing contributions of subsurface Lavery till DCGLs to groundwater using dissolution and diffusive modeling.

*The WMA 1 excavation footprint will be ~ 3 acres (~12,000 m²)

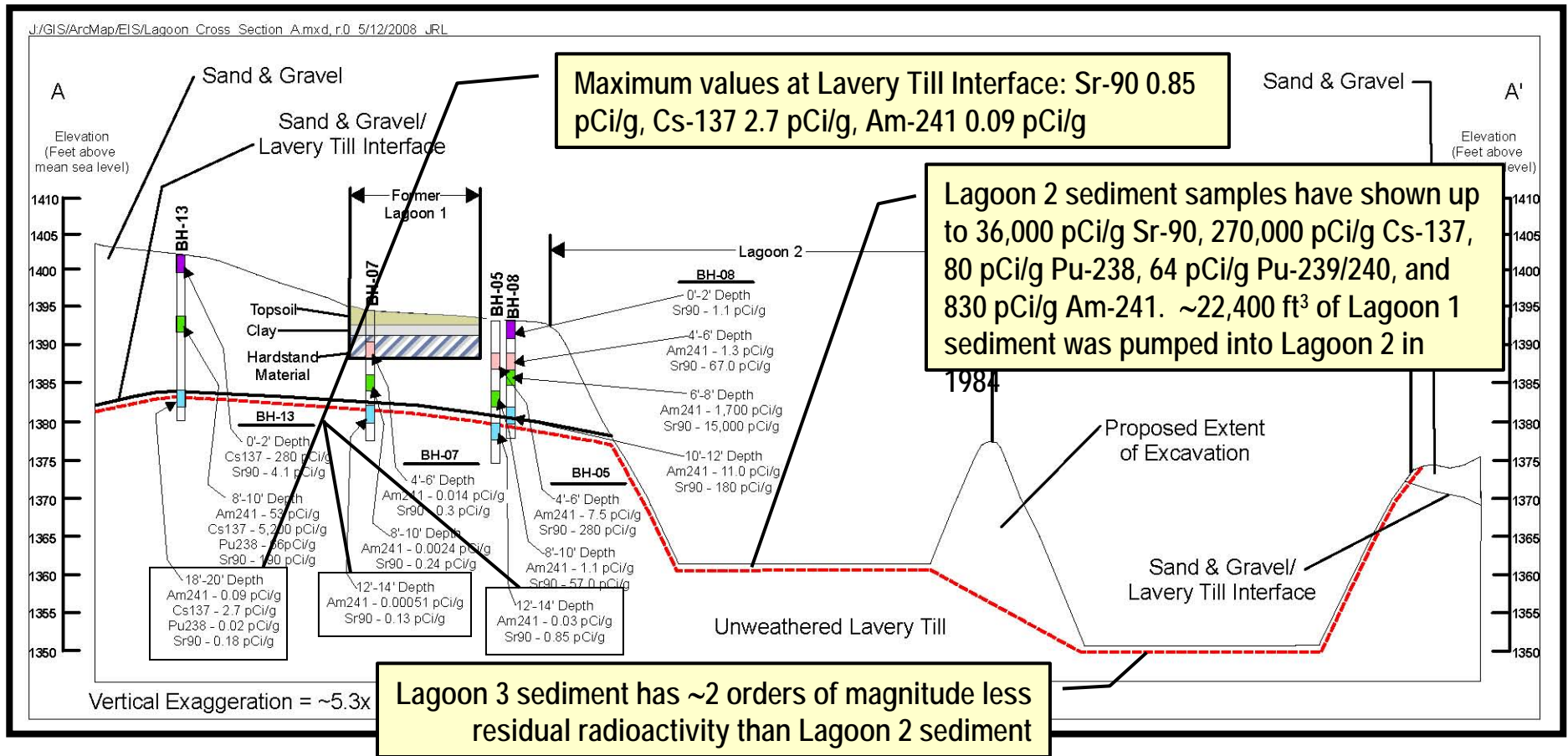


Addressing sensitivities and uncertainty

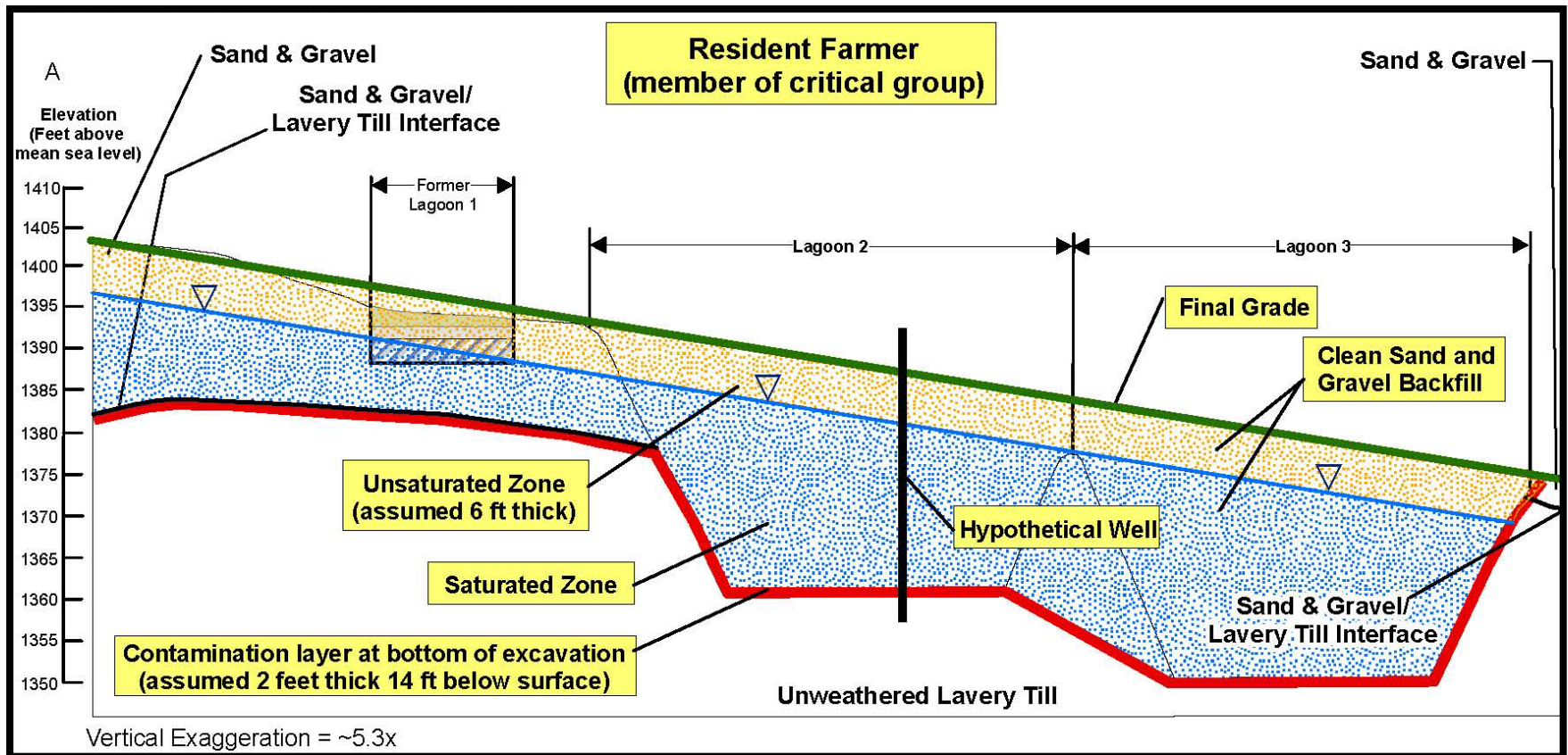
- ❑ Analyses to be performed as with development of surface soil DCGLs
- ❑ Results to also be evaluated and any appropriate adjustments to the conceptual model made



WMA 2 lagoon area key data



WMA 2 conceptual model, subsurface soil DCGLs



WMA 2 Excavation modeling

- ❑ Exposure pathways and scenarios the same as for WMA 1 excavation
- ❑ Uncertainty will be evaluated in the same manner as for the WMA 1 excavation
- ❑ Will evaluate larger range of source areas
 - The WMA 2 excavation footprint will be ~4.2 acres, ~17,000 square meters



Streambed sediment DCGLs

- Will discuss using the next 5 slides
 - Areas of interest
 - Key data on radioactivity in Erdman Brook and Frank's Creek
 - The conceptual model for streambed sediment
 - Exposure pathways and scenarios to be evaluated
 - DOE has considered various combinations of pathways and scenarios in determining the limiting ones to use
 - Key input parameters
 - Consideration of sensitivity and uncertainty

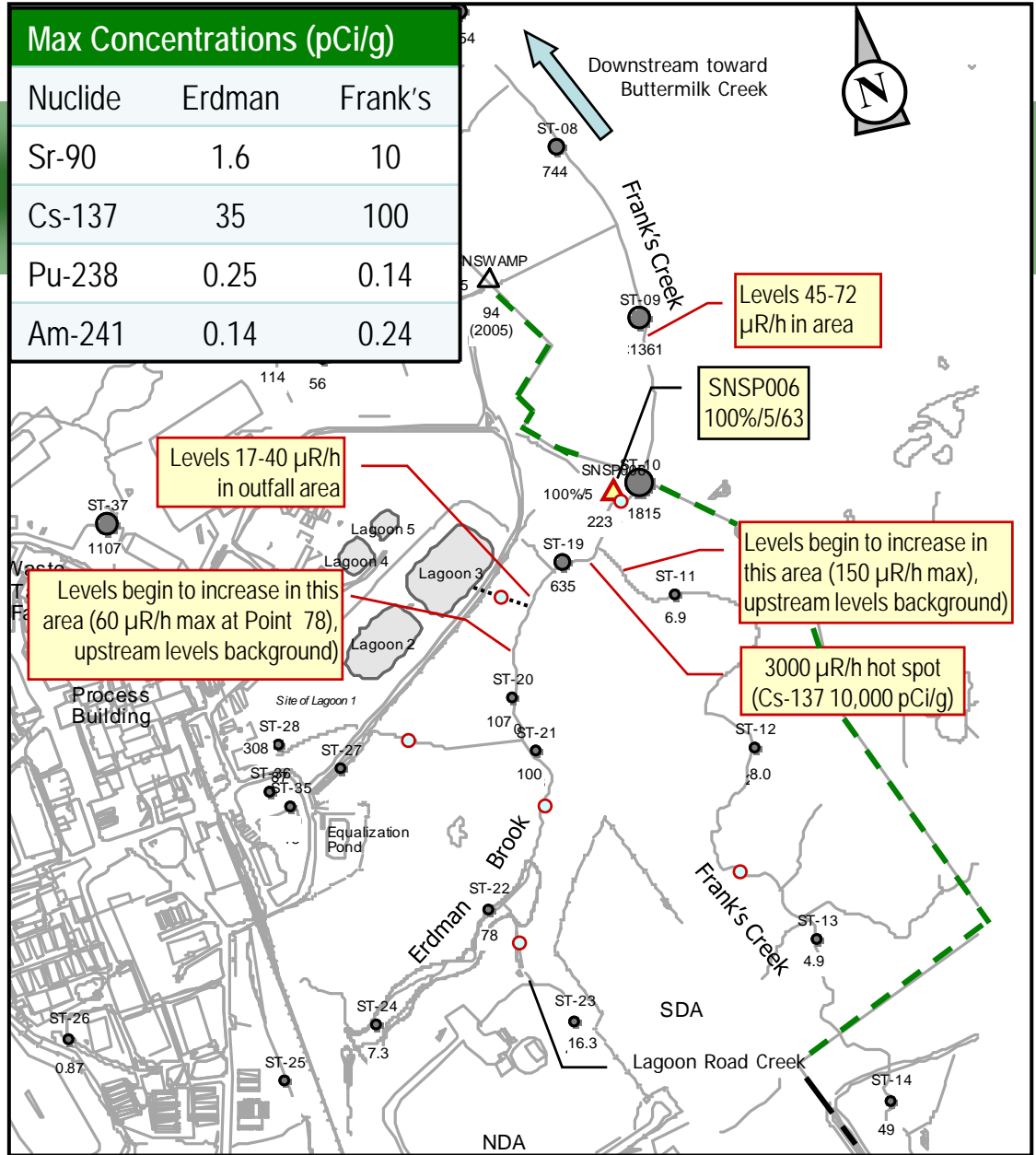


Streambed contamination

LEGEND

- 1993 RFI sample with ratio of Cs-137 to background
- ▲ Routine sediment sample location with % exceeding background/ number of 2000-2004 samples/ratio of mean Cs-137 to background

Radiation level data are from 1990 ground-level survey, including 5-10 $\mu\text{R/hr}$ background



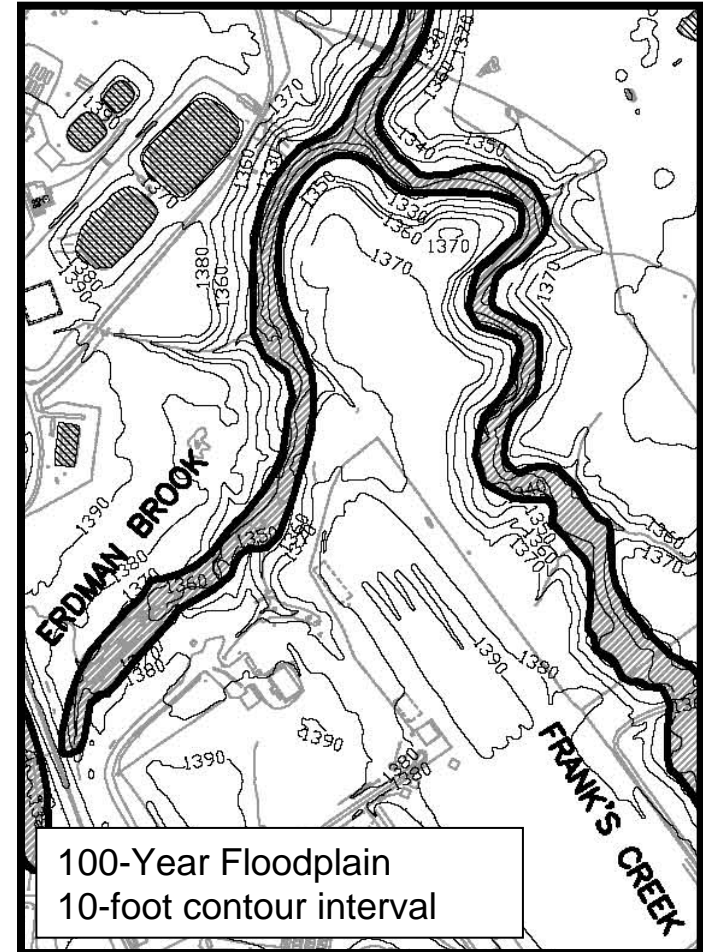
EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

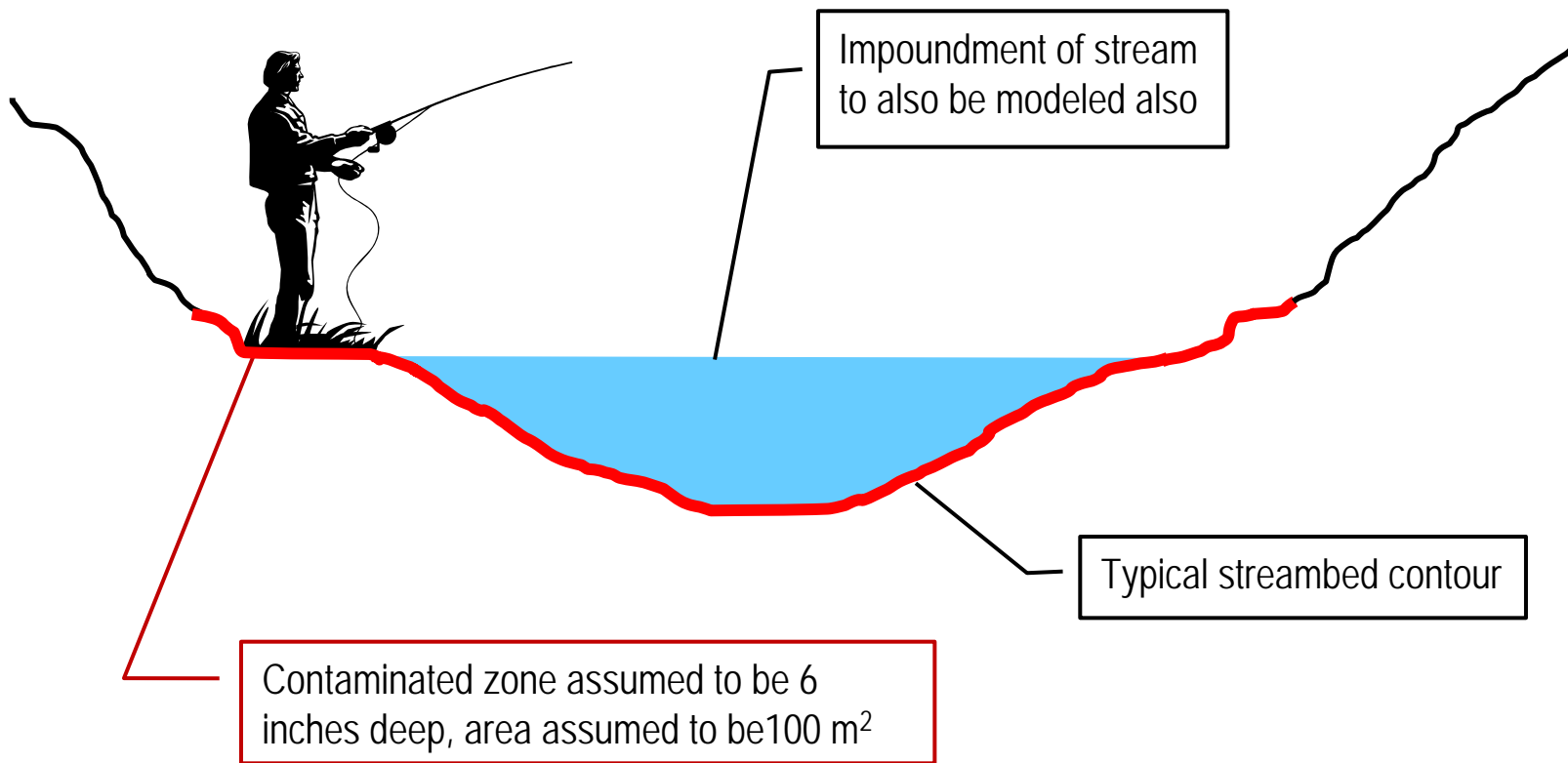
Streambed conceptual model

- ❑ Member of critical group – fisherman
 - Exposed to contamination in streambed, water, and fish
 - Exposure duration assumed to be 104 hrs/yr
- ❑ Impoundment scenario will also be considered
 - With use of stream water as the primary water source for irrigation but not drinking water

Due to steep banks, farming in areas of Erdman Brook and Frank's Creek not considered to be reasonable.



Streambed geometry model



Pathways for streambed sediment DCGLs

Pathway	Active	Remarks
External gamma radiation	Yes	From streambed sediment during recreation
Inhalation of dust	Yes	Potential sediment drying and release
Radon inhalation	No	Radon predominantly naturally occurring
Ingestion of plant foods	No	No farming on steep banks
Ingestion of meat	No	No farming on steep banks
Ingestion of milk	No	No farming on steep banks
Ingestion of fish	Yes	Potential impoundment of stream
Ingestion of sediment	Yes	Incidental during recreation
Ingestion of water	Yes	Stream primary source for household and irrigation, source for incidental drinking water



Key input parameters

Parameter	Value	Basis
Stream geometry	Slide 40	Reasonable representation
Contamination thickness	6 inches	Reasonable assumption
Source area	100 m ²	Conservative assumption
Sr soil K _d	5 cm ³ /g	Site-specific value used in DEIS
Cs soil K _d	447cm ³ /g	Site-Specific value used in DEIS
Am soil K _d	1450 cm ³ /g	Site-Specific value used in DEIS

RESRAD dose-to-source ratios are being used to evaluate sediment as a continuing source to surface water based on erosion and transport modeling.

The EIS erosion modeling results (Appendix F) have been considered. However, it is more conservative not to include erosion effects that could: (1) reduce the source by erosion of bottom sediment and (2) increase shielding of radiation from the bottom sediment by increasing the water depth.

Assume no source depletion due to erosion (no use of erosion rate in RESRAD model).



Addressing sensitivities and uncertainty

- Analyses to be performed as with development of soil DCGLs, focusing on
 - Contaminant source geometry
 - Use of soil K_d values for sediment
 - Fish bioaccumulation factors
- Results to also be evaluated and any appropriate adjustments to the conceptual model made



Limited site-wide dose assessment

- Will discuss using next 14 slides
 - Conditions at the end of Phase 1 decommissioning work
 - Relationship between the remediated Phase 1 areas and the Phase 2 source areas for a site-wide removal approach and conclusions
 - Relationship between the remediated Phase 1 areas and the Phase 2 source areas for a close-in-place approach and conclusions
 - Planned approach to the limited site-wide dose assessment

While another approach may be selected for Phase 2 of the decommissioning, the approaches being evaluated in the Decommissioning EIS would bound the range of potential approaches insofar as compatibility with the Phase 1 actions is concerned.

Key question: will the Phase 1 actions limit phase 2 options?



EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

www.em.doe.gov

Phase 1 and Phase 2 sources at the conclusion of Phase 1 activities



No.	Source	Nature
1	WMA 1 excavation	Area 30-45 ft. below grade remediated below DCGLs* for unrestricted release
2	WMA 2 excavation	Area 12-26 ft. below grade remediated below DCGLs* for unrestricted release
3	Waste Tank Farm	Underground tanks with ~345,000 Ci in 2011
4	North plateau plume	Contaminated subsurface soil and groundwater, ~40 Ci Sr-90 in 2041
5	Surface soil	Some low-level contamination, may be remediated below DCGLs
6	Streambeds	Low-level contamination, especially Cs-137, may be remediated below DCGLs
7	NDA	Buried waste containing ~180,000 Ci in 2011

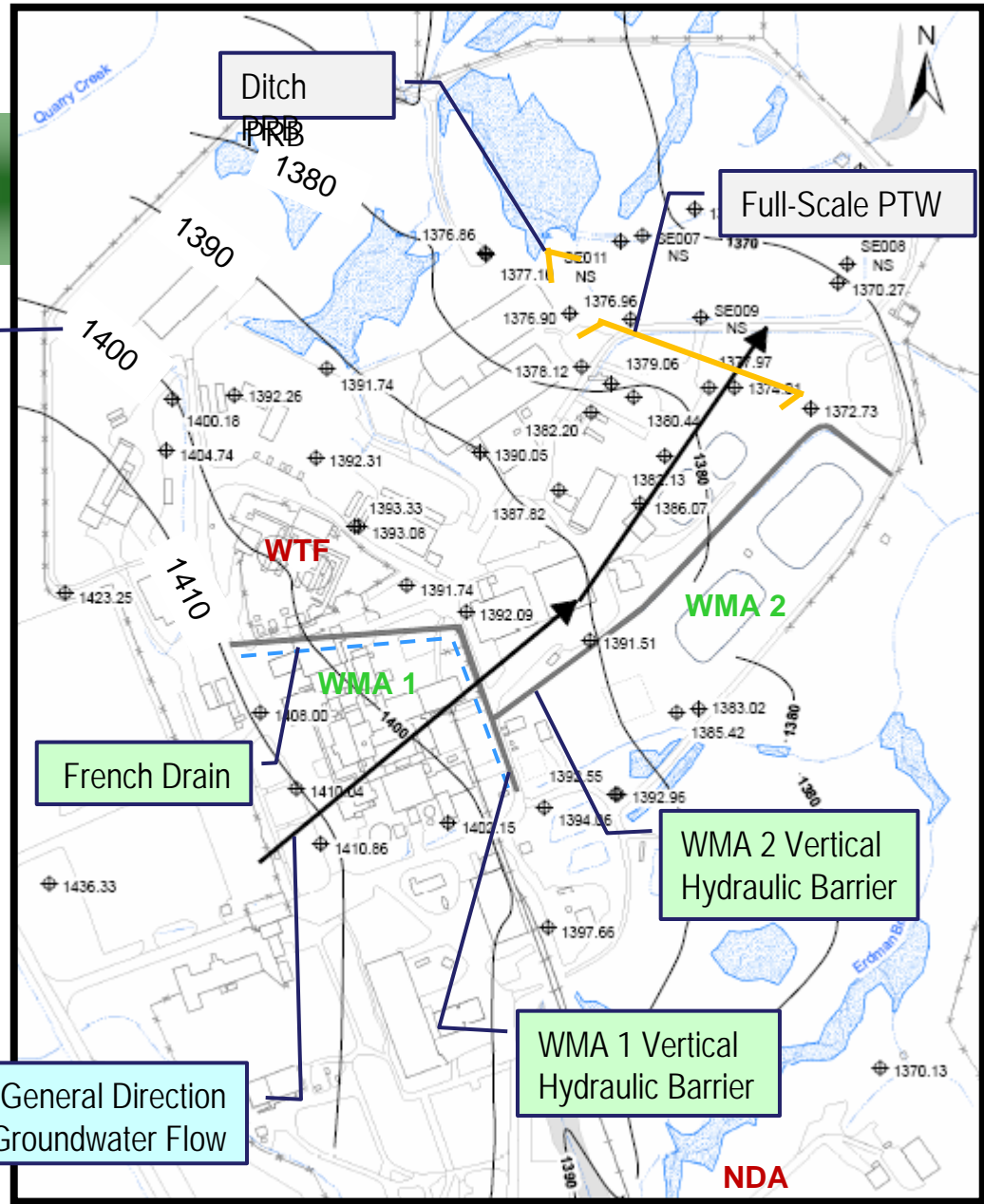
*subsurface soil DCGLs

Hydraulic barriers

- Section 7 of the DP will describe the conceptual design of the vertical hydraulic barrier walls
- These barriers would prevent recontamination of the remediated WMA 1 and WMA 2 excavations in unlikely event of groundwater flow direction changes
- DCGLs being developed assuming current groundwater flow pattern

Water Table Elevation

Current General Direction of Groundwater Flow



Site-wide removal alternative at the conclusion of Phase 1 activities (Phase 2)

□ Under this alternative

- All site facilities would be removed, environmental media would be decontaminated, and all radioactive, hazardous, and mixed waste would be shipped off site for disposal*
- This approach would enable the property to be released without restrictions

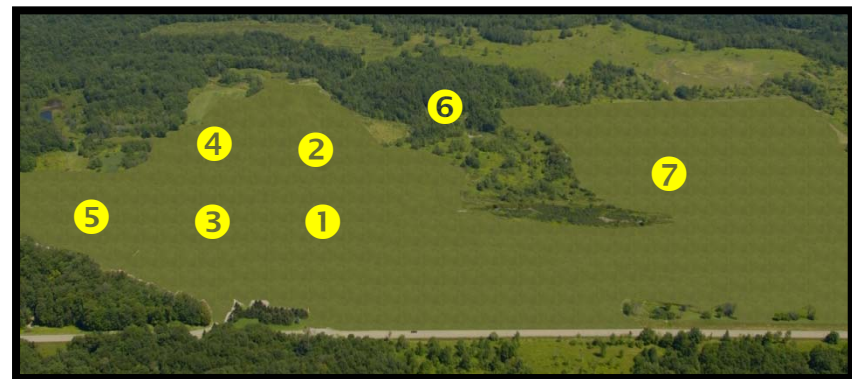
*Except for residual radioactivity below the cleanup criteria



Site-wide removal alternative (Phase 2)

- 1) WMA 1 excavation remediation below subsurface soil DCGLs
- 2) WMA 2 excavation remediation below subsurface soil DCGLs
- 3) Underground waste tanks removed, soil remediated to DCGLs
- 4) Non-source area of plume removed, soil remediated to DCGLs
- 5) Surface soil remediated to DCGLs
- 6) Stream sediment remediated to DCGLs
- 7) Waste in NDA exhumed, shipped off site, area remediated to DCGLs

All DCGLs would be based on <25 mrem/yr, ALARA for unrestricted release.



EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

Conclusions

- ❑ The Phase 1 removal action in the WMA 1 and WMA 2 excavations is consistent with the approach to remove the Phase 2 source areas and remediate the surface soil, subsurface soil, and streambed sediment to DCGLs for unrestricted release (<25 mrem/yr, ALARA)
 - DCGLs for the Phase 2 removal actions could be derived using the same methodology as the Phase 1 DCGLs and made consistent to ensure unrestricted release criteria are achieved
- ❑ Since the critical group for the streambed area is different from the critical group for the other source areas, a hypothetical individual could be exposed to two different sources



Site-wide close-in-place alternative at the conclusion of Phase 1 activities (Phase 2)

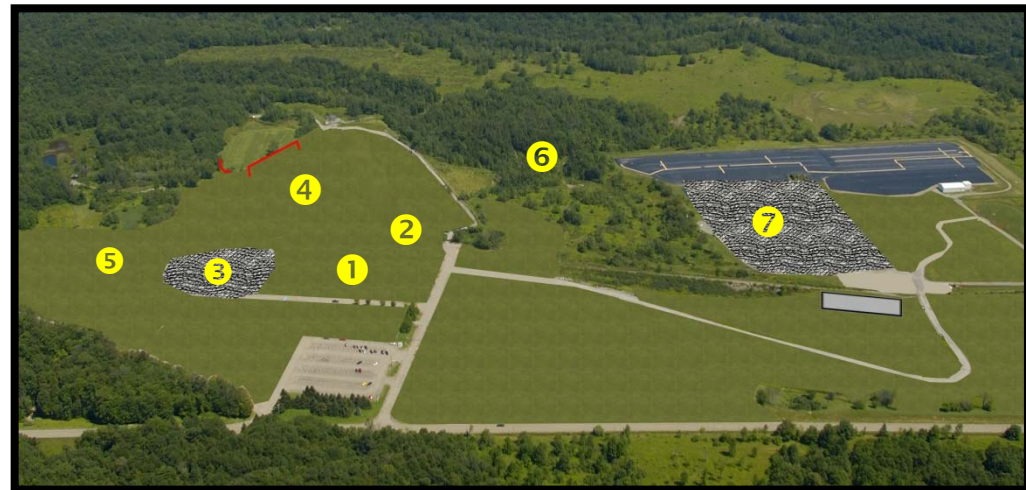
- ❑ Under this alternative
 - The major facilities would be closed in place
 - Residual radioactivity in the WTF and NDA would be isolated by closure structures and engineered barriers
 - The non-source area of the north plateau groundwater plume would be allowed to decay in place

- ❑ With this approach, the closed Waste Tank Farm and NDA would remain under long-term or perpetual license and the non-source area of the plume would remain under long-term license or restrictions for approximately 200 years



Site-wide close-in-place alternative at the conclusion of Phase 1 activities (Phase 2)

- 1) WMA 1 excavation remediated below subsurface soil DCGLs
- 2) WMA 2 excavation remediated below subsurface soil DCGLs
- 3) Grouted waste tanks in place under multi-layer cap, circumferential slurry wall installed
- 4) Non-source area of plume allowed to decay in place
- 5) Surface soil not remediated
- 6) Stream sediment not remediated
- 7) NDA covered with multi-layer cap with upgradient slurry wall in place



Conclusions

- The Phase 1 removal action is compatible with the site-wide close-in-place alternative
 - The WMA 1 area would be remediated below DCGLs for unrestricted release, rather than the facilities demolished to grade level and the rubble contained under a multi-layer cap
 - The lagoon area of WMA 2 would be remediated below DCGLs for unrestricted release, rather than closed in place
 - These conditions would support the close-in-place approach for the Waste Tank Farm and NDA
 - The possible low levels of residual radioactivity in the bottoms of the WMA 1 and 2 excavations would decay significantly during the decay period for the non-source area of the plume and, in any case, would be expected to be negligible from a health and safety standpoint compared to the large remaining Phase 2 source terms



Integrated dose analysis

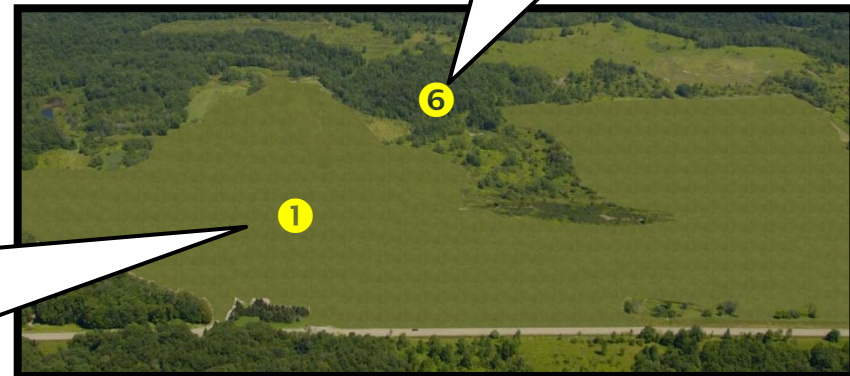
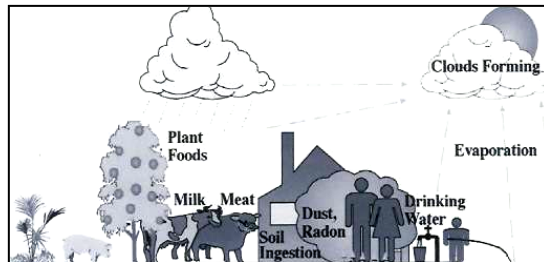
- ❑ QUESTION: Given the conclusions discussed previously, what type of limited integrated site-wide dose analysis would be most meaningful?
- ❑ ANSWER: An analysis that addresses multiple source areas under the site-wide removal approach

The results of this analysis would be used to establish cleanup goals below the calculated DCGLs to ensure potential exposures to a hypothetical individual at the remediated site would meet the unrestricted release cleanup criteria



Combined analysis approach

- ❑ Will evaluate combined pathway/exposure scenarios
 - Resident farmer in remediated WMA 1 area
 - Recreationist (fishing) in areas of Erdman Brook and Frank's Creek (resident farmer would spend time there fishing)
 - Streambed geometry will consider remediation to DCGLs but not erosion (accounting for erosion would be non-conservative)



Combined analysis pathways

Pathway	Active	Remarks
External gamma	Yes	From both WMA 1 area and streambed
Inhalation of dust	Yes	From remediated WMA 1 area and streambed
Radon inhalation	No	
Ingestion of plant foods	Yes	Grown in remediated WMA 1 area
Ingestion of meat	Yes	Raised on remediated project premises
Ingestion of milk	Yes	From livestock grazing on project premises
Ingestion of fish	Yes	From stream
Ingestion of soil and sediment	Yes	From garden in WMA 1 and stream bank
Ingestion of water	Yes	Direct from well and incidental from stream

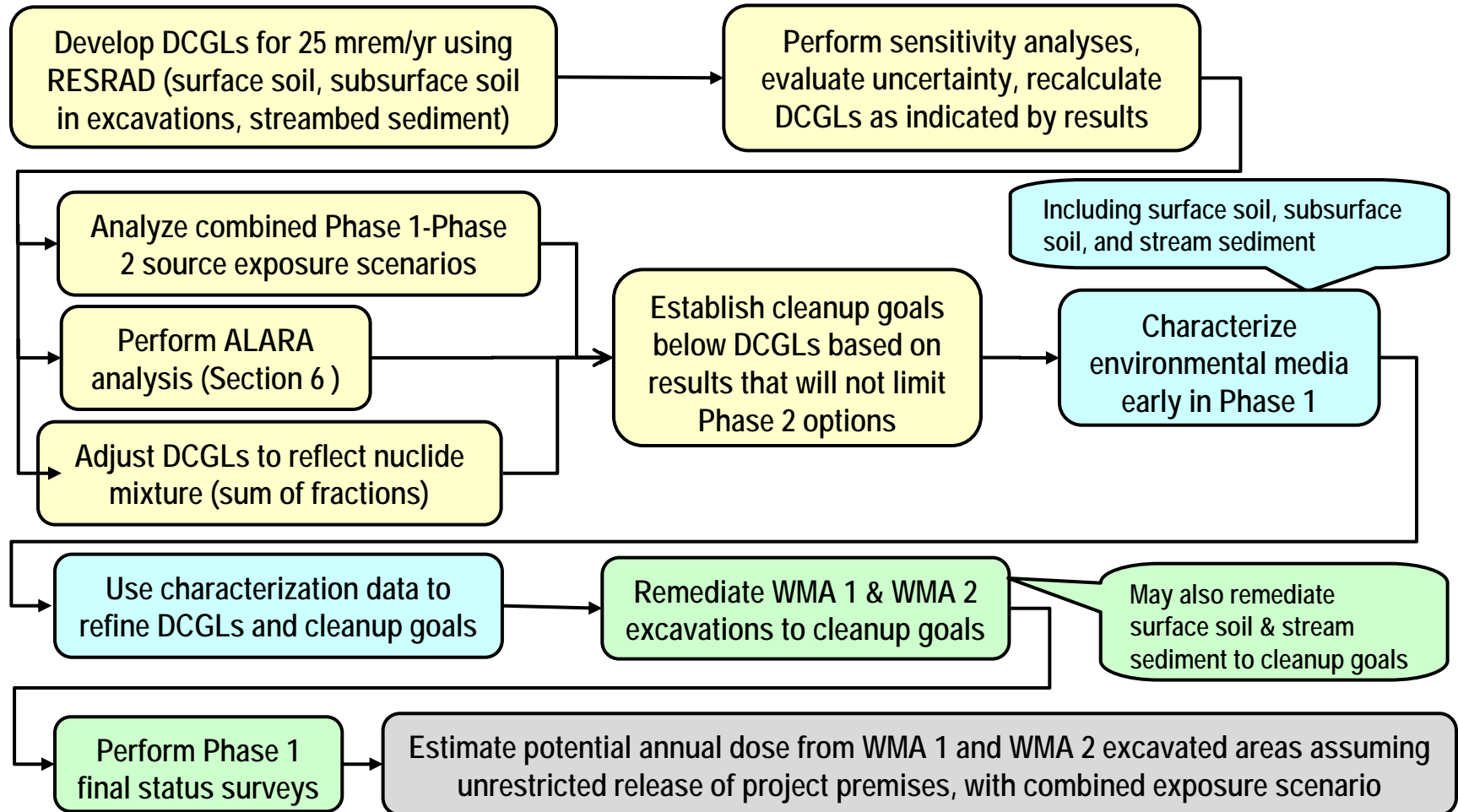
The source of contamination would be residual contamination below cleanup goals in surface soil, contaminated drill cuttings from installation of the well, residual contamination in the Lavery till, and contaminated well water.

Cleanup goals

- ❑ Cleanup goals appropriately below the DCGLs will be established and used in the remediation work, based on
 - The results of the combined analysis
 - The ALARA analysis to be described in Section 6
- ❑ The Section 6 ALARA analysis will
 - Evaluate cost-benefits of remediation to residual radioactivity concentrations below the DCGLs, considering the costs of incremental removal of additional soil or sediment
 - Follow the methodology of Appendix N to NUREG-1757, vol. 2
 - Provide for a two-stage analysis: before remediation (with the results in the DP) and during the remediation process when more data about residual radioactivity become available



Basic approach planned



In summary

- ❑ DOE will develop DCGLs for unrestricted release for surface soil, subsurface soil in the WMA 1 and WMA 2 excavations, and streambed sediment using appropriate conceptual models and RESRAD
- ❑ An ALARA analysis will evaluate remediation below DCGLs
- ❑ The relationships between the Phase 1 removal actions and the potential decommissioning approaches for Phase 2 will be addressed by an analysis that combines exposure scenarios for the site-wide removal approach
- ❑ The cleanup goals to be used in the Phase 1 decommissioning work will be established based on the results of the ALARA analysis and the combined exposure scenario analysis to ensure that the Phase 1 end state does not limit Phase 2 decommissioning options
- ❑ The DP will require an analysis to be performed after the Phase 1 work is completed that will use actual data to estimate the potential doses from the residual radioactivity from the areas remediated in Phase 1

