Table of Contents

EXECUTIVE SUMMARY ES-1
ES.1 Introduction ES-1
ES.2 Background Information ES-1
ES.3 Data Evaluation, Reduction, and Screening ES-1
ES.3.1 Future Land Use ES-1
ES.3.2 Identification of Evaluation Units ES-2
ES.3.3 Media of Concern ES-2
ES.3.4 Preliminary Screening of COPCs ES-2
ES.4 Identification of Soil Cleanup Levels and Remediation Levels ES-2
ES.4.1 Soil Cleanup Levels ES-2
ES.4.2 Soil Remediation Levels ES-3
ES.4.3 Ecological Soil Screening Concentration for Lead ES-3
ES.4.4 Determination of Arsenic Background Level in Soil ES-3
ES.5 Comparison of Site Soil Concentrations to Cleanup Levels and Remediation Levels ES-3
ES.5.1 Comparison of EU Soil Concentrations to Cleanup Levels and Remediation Levels ES-4
ES.5.2 Comparison of EU Constituent Concentrations to MTCA Risk-Based Criteria ES-4
ES.5.3 Identification of EUs With COPCs in Soil That Exceed MTCA Three-Fold Criteria and/or MTCA Risk-Based Criteria ES-4
ES.5.4 Commercial Land Use EUs ES-4
ES.5.5 Golf Course Use EUs ES-4
ES.5.6 Historical Use EUs ES-4
ES.5.7 Industrial Use EUs ES-5
ES.5.8 Open Space Use EUs ES-5
ES.5.9 Summary of Results ES-5

CHAPTER 1 – INTRODUCTION 1-1
1.1 Introduction 1-1
1.2 Location and Setting 1-1
1.2.1 Location and Site Characteristics 1-1
1.2.2 Physical Setting 1-1
1.3 Risk Assessment Report Background 1-2
1.3.1 Preliminary Baseline Risk Assessment 1-2
1.3.2 Draft Risk Assessment Former DuPont Works Site, DuPont Washington 1-2
1.3.3 Final Risk Assessment 1-2
1.4 Overview of the Risk Assessment Process 1-3
1.5 Comparison of the MTCA Risk Assessment Process with the EPA Superfund Risk Assessment Process 1-3
1.6 References 1-7

CHAPTER 2 – FUTURE LAND USE, RA EVALUATION UNITS AND IDENTIFICATION OF COPCS 2-1
2.1 Introduction 2-1
2.2 Future Land Use 2-1
2.2.1 Commercial 2-1
2.2.2 Golf Course 2-1
2.2.3 Historical 2-1
2.2.4 Industrial 2-1
2.2.5 Open Space 2-2
2.3 Identification of Evaluation Units 2-2

2.4 Potentially Affected Media 2-2
2.5 Identification of COPCs 2-2
2.5.1 Screening of Non-Detected COPCs 2-3
2.5.2 Risk-Based Screening of COPCs 2-3
2.6 References 2-25

CHAPTER 3 – IDENTIFICATION OF CLEANUP LEVELS AND REMEDIATION LEVELS 3-1
3.1 Introduction 3-1
3.2 Soil Cleanup Levels 3-1
3.3 Determination of Arsenic Background Level in Soil 3-1
3.4 Ecological Soil Screening Concentration for Lead 3-1
3.5 Determination of Soil Remediation Levels 3-2
3.5.1 Scenarios for Future Site Use 3-2
3.5.2 Remediation Level Equations 3-3
3.5.3 Approach for Derivation of Soil Lead Remediation Levels 3-8
3.6 Summary of Site Cleanup Levels and Remediation Levels 3-11
3.7 References 3-37

CHAPTER 4 – COMPARISON OF SITE CONCENTRATIONS TO CLEANUP AND REMEDIATION LEVELS 4-1
4.1 Introduction 4-1
4.2 Comparison of EU Soil Concentrations to Cleanup and Remediation Levels 4-1
4.2.1 MTCA Three-Fold Criteria 4-1
4.2.2 MTCA Non-Cancer and Cancer Risk-Based Criteria 4-1
4.2.3 Calculation of EU Soil Concentrations 4-2
4.3 Identification of EUs With COPCs That Exceed MTCA Three-Fold Criteria 4-2
4.3.1 Commercial Land Use EUs 4-2
4.3.2 Golf Course Use EUs 4-2
4.3.3 Historical Use EUs 4-2
4.3.4 Industrial Use EUs 4-3
4.3.5 Open Space Use EUs 4-3
4.4 Identification of EUs that Exceed the MTCA Risk-Based Criteria 4-3
4.4.1 Commercial Land Use EUs 4-3
4.4.2 Golf Course Use EUs 4-3
4.4.3 Historical Use EUs 4-3
4.4.4 Industrial Use EUs 4-3
4.4.5 Open Space Use EUs 4-3
4.5 Summary of Screening Results 4-3

CHAPTER 5 – UNCERTAINTY ANALYSIS 5-1
5.1 Introduction 5-1
5.2 Uncertainties 5-1
5.2.1 Future Land Use 5-1
5.2.2 Exposure Factors 5-1
5.2.3 Groundwater as a drinking water source 5-1
5.2.4 Arsenic Area Background Concentration 5-2
5.2.5 Ecological Evaluation 5-2
5.3 Conclusion 5-2
5.4 References 5-5

APPENDIX A – ECOLOGICAL RISK ASSESSMENT SUMMARY A-1
A.1 Introduction A-1
A.2 Nature and Extent of Contamination A-1

A.3 Ecological Risk Assessment A-1
A.3.1 General A-1
A.3.2 Top Down Approach A-2
A.3.3 Bottom Up Approach A-2
A.4 Site-Specific Ecological Studies - A Top Down Approach A-2
A.5 Site-Specific Ecological Studies - A Bottom Up Approach A-3
A.6 Conclusions A-3
A.7 References A-7

APPENDIX B – EVALUATION UNIT SAMPLE GROUPINGS B-1
B.1 Introduction B-1

APPENDIX C – LETTERS AND OTHER DOCUMENTATION OF SITE-SPECIFIC DETERMINATIONS BY ECOLOGY C-1
C.1 Introduction C-1
C.2 Arsenic and Lead Soil Cleanup and Remediation Levels C-3
C.2.1 Cleanup Levels and Remediation Levels for the Former DuPont Works Site C-3
C.2.2 Residential Soil-Lead Cleanup Level and Remediation Level for Former DuPont Works Site C-7
C.2.3 Non-Residential Remediation Levels at the Former DuPont Works Site C-11
C.2.4 Arsenic Non-Residential Soil Remediation Levels C-17
C.2.5 Arsenic Area Background Soil Concentration C-25
C.3 DNT Soil Cleanup Level Protective of Groundwater C-29
C.4 Mercury Cleanup Levels Summary and Mercury/Lead Leaching Study C-47
C.5 TNT Soil Cleanup Level Protective of Groundwater C-53
C.6 TPH Soil Cleanup Level Protective of Groundwater C-57
C.6.1 Review of TPH Soil Cleanup Level Protective of Groundwater C-57
C.6.2 TPH/PAH Cleanup Level Summary C-63

APPENDIX D – TOXICITY INFORMATION FOR SELECT CONSTITUENTS. D-1
D.1 Monomethyl Amine Nitrate – Monomethylamine D-1
D.1.1 Derivation of Oral Reference Dose D-1
D.1.2 References D-1
D.2 Toxicity Profile for Arsenic D-2
D.2.1 Introduction D-2
D.2.2 Health Effects D-2
D.2.3 Basis for Toxicity Values Used in the Risk Assessment D-2
D.2.4 References D-2
D.3 Toxicity Profile for Lead D-3
D.3.1 Introduction D-3
D.3.2 Health Effects D-3
D.3.3 Basis for Toxicity Evaluation in the Risk Assessment D-3
D.3.4 References D-3
D.4 Toxicity Profile for Mercury D-4
D.4.1 Introduction D-4
D.4.2 Health Effects D-4
D.4.3 Basis for Toxicity Value Used in the Risk Assessment D-4
D.4.4 References D-4
D.5 Toxicity Profile for 2,4,6-Trinitrotoluene (TNT) D-5
D.5.1 Introduction D-5
D.5.2 Health Effects D-5
D.5.3 D.5.3 Basis for Toxicity Values Used in the Risk Assessment D-5
D.5.4 References D-5
D.6 Toxicity Profile for Total Petroleum Hydrocarbons (TPH)–as Bunker C Fuel D-6

D.6.1 Introduction D-6
D.6.2 Health Effects D-6
D.6.3 Derivation of a Bunker C Cleanup Level D-6
D.6.4 References D-6

APPENDIX E – SOIL CLEANUP LEVEL AND REMEDIATION LEVEL CALCULATIONS E-1
E.1 Introduction E-1

APPENDIX F – SUMMARY STATISTICS AND COMPARISON TO STANDARDS F-1
F.1 Introduction F-1
F.2 Summary Statistics For Each Evaluation Unit F-1
F.3 Statistical Formulas Used To Calculate the Summary Statistics F-1
F.3.1 Geometric Mean F-1
F.3.2 Logarithmic Upper Confidence Limit for the Mean F-1
F.3.3 Mean (arithmetic) F-2
F.3.4 Median F-2
F.3.5 Maximum Detected Value F-2
F.3.6 Maximum Non-Detected Value F-2
F.3.7 Minimum Detected Value F-2
F.3.8 Minimum Non-Detected Value F-2
F.3.9 Mode F-2
F.3.10 Sample Standard Deviation F-3
F.3.11 Upper Confidence Limit for the Mean F-3
F.3.12 Distribution Tests F-3
F.4 Comparison to Standards F-5

List of Tables

Table ES-1 – Soil Cleanup Levels and Remediation Levels Used for Evaluating EUs.....ES-7
Table ES-2 – Summary of EUs to be Evaluated in the FS ES-9
Table 2-1 – Evaluation Unit Size..... 2-5
Table 2-2 – Summary of Constituents Detected in Each Depth Interval 2-7
Table 2-3 – Constituents That Exceed Risk-Based Screening Concentrations for Soil ≤ 1 Foot BGS..... 2-9
Table 2-4 – Constituents That Exceed Risk-Based Screening Concentrations for Soil > 1 Foot and ≤ 15 Feet BGS 2-11
Table 2-5 – Constituents That Exceed Risk-Based Screening Concentrations for Soil > 15 Feet BGS..... 2-13
Table 2-6 – Summary of Constituents That Exceeded Soil-to-Groundwater Screening Criteria in Each Depth Interval 2-15
Table 2-7 – Summary of Constituents to be Evaluated in Risk Assessment for Each Depth Interval 2-17
Table 3-1 – Human Health Industrial Cleanup Levels 3-13
Table 3-2 – Site-Specific Soil Cleanup Levels..... 3-15
Table 3-3 – Exposure Factors Used to Calculate Site-Specific Soil Remediation Levels..... 3-17
Table 3-4 – EPA Weight-of-Evidence Categories for Carcinogenicity..... 3-19
Table 3-5 – Toxicity Equivalency Factors (TEF) for Carcinogenic PAHs 3-21
Table 3-6 – Oral Reference Doses and Carcinogenic Potency Factors Used in Remediation Level Calculations..... 3-23
Table 3-7 – Site-Specific Remediation Levels 3-25
Table 3-8 – Site-Specific Input Parameters and Results of the Adult Lead Model..... 3-27
Table 3-9 – Soil Cleanup Levels and Remediation Levels Associated with Future Site Use 3-29
Table 3-10 – Soil Cleanup and Remediation Levels Used for Evaluating Commercial and Golf Course Land Uses 3-31
Table 3-11 – Soil Cleanup Levels Used for Evaluating Industrial Land Use 3-33
Table 3-12 – Soil Cleanup and Remediation Levels Used for Evaluating Historical and Open Space Land Uses 3-35
Table 4-1 – Summary of COPCs that Exceed MTCA Three-Fold Criteria for Commercial EUs 4-5
Table 4-2 – Summary of COPCs that Exceed MTCA Three-Fold Criteria for Golf Course EUs 4-7
Table 4-3 – Summary of COPCs that Exceed MTCA Three-Fold Criteria for Industrial EU 4-9
Table 4-4 – Summary of COPCs that Exceed MTCA Three-Fold Criteria for Open Space EUs 4-11
Table 4-5 – Summary of COPCs that Exceed MTCA Three-Fold Criteria for Historical EUs 4-13
Table 4-6 – Individual COPC Hazard Quotients and Cancer Risks 4-15
Table 4-7 – Cumulative Hazard Indices and Cancer Risks for Each EU..... 4-17
Table 4-8 – Summary of EUs to be Evaluated in the FS..... 4-19
Table 5-1 – Summary of Uncertainties in the Human Health Evaluation and Site-Specific Characteristics..... 5-3
Table A-1 – Soil Bioassay Results.....A-5
Table B-1 – Commercial Area Samples <= 1 Foot BGS B-3
Table B-2 – Commercial Area Samples >1 Foot and <=15 Feet.....B-17
Table B-3 – Golf Course Area Samples <=1 Foot B-21
Table B-4 – Golf Course Samples >1 Foot and <=15 Feet B-33
Table B-5 – Historical Area Samples <=1 Foot B-39
Table B-6 – Industrial Area Samples <=1 Foot.....B-41
Table B-7 – Industrial Area Samples >1 Foot and <=15 Feet B-45
Table B-8 – Open Space Area Samples <=1 Foot B-47
Table B-9 – Open Space Area Samples >1 Foot and <=15 Feet.....B-51

Table E-1 – Commercial Land Use Soil Remediation Levels E-3
Table E-2 – Golf Course Land Use Soil Remediation Levels E-5
Table E-3 – Historical Land Use Soil Remediation Levels E-7
Table E-4 – Industrial Land Use Soil Cleanup Levels E-9
Table E-5 – Open Space Land Use Soil Remediation Levels E-11
Table F-1 – Commercial Evaluation Unit 1 (0 to <=1 foot) F-7
Table F-2 – Commercial Evaluation Unit 1 (>1 to <=15 feet) F-9
Table F-3 – Commercial Evaluation Unit 2 (0 to <=1 foot) F-11
Table F-4 – Commercial Evaluation Unit 2 (>1 to <=15 feet) F-13
Table F-5 – Commercial Evaluation Unit 3 (0 to <=1 foot) F-15
Table F-6 – Commercial Evaluation Unit 3 (>1 to <=15 feet) F-17
Table F-7 – Commercial Evaluation Unit 4 (0 to <=1 foot) F-19
Table F-8 – Commercial Evaluation Unit 4 (>1 to <=15 feet) F-21
Table F-9 – Commercial Evaluation Unit 5 (0 to <=1 foot) F-23
Table F-10 – Commercial Evaluation Unit 5 (>1 to <=15 feet) F-25
Table F-11 – Commercial Evaluation Unit 6 (0 to <=1 foot) F-27
Table F-12 – Commercial Evaluation Unit 6 (>1 to <=15 feet) F-29
Table F-13 – Commercial Evaluation Unit 7 (0 to <=1 foot) F-31
Table F-14 – Commercial Evaluation Unit 7 (>1 to <=15 feet) F-33
Table F-15 – Commercial Evaluation Unit 8 (0 to <=1 foot) F-35
Table F-16 – Commercial Evaluation Unit 8 (>1 to <=15 feet) F-37
Table F-17 – Commercial Evaluation Unit 9 (0 to <=1 foot) F-39
Table F-18 – Commercial Evaluation Unit 9 (>1 to <=15 feet) F-41
Table F-19 – Golf Course Evaluation Unit 1 (0 to <=1 foot) F-43
Table F-20 – Golf Course Evaluation Unit 1 (>1 to <=15 feet) F-45
Table F-21 – Golf Course Evaluation Unit 2 (0 to <=1 foot) F-47
Table F-22 – Golf Course Evaluation Unit 2 (>1 to <=15 feet) F-49
Table F-23 – Golf Course Evaluation Unit 3 (0 to <=1 foot) F-51
Table F-24 – Golf Course Evaluation Unit 3 (>1 to <=15 feet) F-53
Table F-25 – Golf Course Evaluation Unit 4 (0 to <=1 foot) F-55
Table F-26 – Golf Course Evaluation Unit 4 (>1 to <=15 feet) F-57
Table F-27 – Golf Course Evaluation Unit 5 (0 to <=1 foot) F-59
Table F-28 – Golf Course Evaluation Unit 5 (>1 to <=15 feet) F-61
Table F-29 – Golf Course Evaluation Unit 6 (0 to <=1 foot) F-63
Table F-30 – Golf Course Evaluation Unit 6 (>1 to <=15 feet) F-65
Table F-31 – Golf Course Evaluation Unit 7 (0 to <=1 foot) F-67
Table F-32 – Golf Course Evaluation Unit 7 (>1 to <=15 feet) F-69
Table F-33 – Golf Course Evaluation Unit 8 (0 to <=1 foot) F-71
Table F-34 – Golf Course Evaluation Unit 8 (>1 to <=15 feet) F-73
Table F-35 – Golf Course Evaluation Unit 9 (0 to <=1 foot) F-75
Table F-36 – Golf Course Evaluation Unit 9 (>1 to <=15 feet) F-77
Table F-37 – Historical Evaluation Unit 1 (0 to <=1 foot) F-79
Table F-38 – Historical Evaluation Unit 2 (0 to <=1 foot) F-81
Table F-39 – Historical Evaluation Unit 3 (0 to <=1 foot) F-83
Table F-40 – Industrial Evaluation Unit 1 (0 to <=1 foot) F-85
Table F-41 – Industrial Evaluation Unit 1 (>1 to <=15 feet) F-87
Table F-42 – Open Space Evaluation Unit 1 (0 to <=1 foot) F-89
Table F-43 – Open Space Evaluation Unit 2 (0 to <=1 foot) F-91
Table F-44 – Open Space Evaluation Unit 2 (>1 to <=15 feet) F-93
Table F-45 – Open Space Evaluation Unit 3 (0 to <=1 foot) F-95
Table F-46 – Open Space Evaluation Unit 3 (>1 to <=15 feet) F-97
Table F-47 – Open Space Evaluation Unit 4 (0 to <=1 foot) F-99
Table F-48 – Open Space Evaluation Unit 4 (>1 to <=15 feet) F-101
Table F-49 – Comparison of Commercial EUs to Soil Cleanup Levels and Remediation Levels F-103

Table F-50 – Comparison of Golf Course EUs to Soil Cleanup Levels and Remediation Levels F-107
Table F-51 – Comparison of Historical EUs to Soil Cleanup Levels and Remediation Levels F-113
Table F-52 – Comparison of Industrial EU to Soil Cleanup Levels and Remediation Levels F-115
Table F-53 – Comparison of Open Space EUs to Soil Cleanup Levels and Remediation Levels F-117

List of Figures

Figure ES-1 – Former Dupont Works Site Vicinity Map ES-11
Figure ES-2 – Risk Assessment Evaluation Units ES-13
Figure ES-3 – EU Compliance Status for Arsenic and Lead in Surface Soil ES-15
Figure ES-4 – EU Compliance Status for Arsenic and Lead in Subsurface Soil ES-17
Figure 1-1 – Site Vicinity Map 1-5
Figure 2-1 – Parcel 1 Future Land Use 2-19
Figure 2-2 – Risk Assessment Evaluation Units 2-21
Figure 2-3 – Comparison of RI Areas and RA Evaluation Units 2-23
Figure 4-1 – EU Compliance Status for Arsenic and Lead in Surface Soil 4-21
Figure 4-2 – EU Compliance Status for Arsenic and Lead in Subsurface Soil 4-23

Table of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
BGS	Below Ground Surface
COPC	Constituent of Potential Concern
CPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbons
CPF	Cancer Potency Factor
DNT	Dinitrotoluene
DuPont	E.I. duPont de Nemours and Company, Inc.
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
EU	Evaluation Unit
FS	Feasibility Study
IEUBK	Integrated Exposure Uptake Biokinetic Model for Lead
MSL	Mean Sea Level
MTCA	Model Toxics Control Act
NGRR	Narrow Gauge Railroad
PAHs	Polycyclic Aromatic Hydrocarbons
RA	Risk Assessment
RfD	Reference Dose for Noncarcinogenic Health Effects
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
Subsurface	Greater than 1 foot to less than or equal to 15 feet below ground surface
Surface	0 to less than or equal to 1 foot below ground surface
TEF	Toxic Equivalency Factor
TNT	2,4,6-Trinitrotoluene
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
WAC	Washington Administrative Code
Weyerhaeuser	Weyerhaeuser Company
WRECO	Weyerhaeuser Real Estate