

**EPA Superfund  
Record of Decision:**

**SOUTH MUNICIPAL WATER SUPPLY WELL  
EPA ID: NHD980671069  
OU 01  
PETERBOROUGH, NH  
09/27/1989**

- IN-HOUSE RELEASES SUBSEQUENTLY WASHED OUT FLOOR DRAINS OR SINKS TO OUTFALLS, OR WASHED OUT FACILITY DOORS, AND
- EXTERIOR RELEASES THROUGH THE DRAINING OF A TRUCK MOUNTED WASTE SOLVENT TANK.

THE HIGHEST CONCENTRATIONS OF VOC CONTAMINATION CENTER ABOUT THE GZ-4 WELL CLUSTER AREA, AND THOSE AREAS IMMEDIATELY DOWNGRADIANT (EM-B1 AND GZ-104). THE DISTRIBUTION OF CONTAMINATION BETWEEN 1 AND 10 PPM IN THE UPPER PORTION OF THE AQUIFER EXTENDS ACROSS THE FRONT OF THE BUILDING AND DISPERSES DOWNGRADIANT TO THE AREA OF THE MW-5 WELL CLUSTER. CONTAMINATION IN CONCENTRATIONS LESS THAN 1 PPM EXTENDS FROM THE TUMBLE/GARAGE AREA UNDERNEATH THE NHBB FACILITY. THE PLUME DISPERSES DOWNGRADIANT TO THE NORTHEAST, AND IN THE UPPER PORTION OF THE AQUIFER, EXTENDS AT LEAST AS FAR AS BORING B-5 ON ROUTE 202.

THE CONTAMINANT DISTRIBUTION IN THE LOWER PORTION OF THE OVERBURDEN AQUIFER IS, IN GENERAL, VERY SIMILAR TO THE EXTENT AND DISTRIBUTION IN THE UPPER PORTION OF THE AQUIFER. AGAIN, CONTAMINATION IS PRESENT UNDER THE BUILDING AND IN THE TUMBLE/GARAGE AREA. THE DOWNGRADIANT DISTRIBUTION OF THE DILUTE PORTION OF THE PLUME, HOWEVER, IS LESS EXTENSIVE. TOTAL VOC CONTAMINATION BETWEEN 100 AND 1000 PPB EXTENDS TO AT LEAST EM-3 IN THE UPPER PORTION OF THE AQUIFER; HOWEVER, IN THE LOWER PORTION OF THE AQUIFER, THE SAME CONCENTRATION OF CONTAMINATION EXTENDS ONLY AS FAR AS THE MW-5 AREA. VERTICAL HYDRAULIC CONDUCTIVITY THROUGHOUT THE SITE IS LOW COMPARED TO RADIAL HYDRAULIC CONDUCTIVITY, AND CAN ACCOUNT FOR THE LESSER EXTENT OF LOWER OVERBURDEN CONTAMINATION. SURFACE RELEASE OF VOC CONTAMINANTS WOULD BE EXPECTED TO DISPERSE MORE RAPIDLY RADIALY THAN DOWNWARD INTO LOWER OVERBURDEN MATERIALS.

THE CENTERING OF HIGH CONCENTRATIONS OF VOCs IN THE GZ-4 AREA, COINCIDENT WITH THE HIGH SOIL CONTAMINATION DISCUSSED EARLIER, AND THE EVALUATION OF AIR PHOTOS STRONGLY INDICATE THAT THE AREA WAS THE LOCATION OF SIGNIFICANT VOC RELEASES TO THE GROUND SURFACE. THESE SOLVENTS HAVE MIGRATED AS A FREE PHASE (THE SOLVENT REMAINS IN CONCENTRATED FORM) TO A POSITION IN THE SATURATED ZONE APPROXIMATELY 50 FEET BELOW GROUND SURFACE IN THE GZ-4 AREA. WHILE THE EXACT EXTENT OF FREE PHASE CONTAMINATION IS NOT KNOWN, THE POTENTIAL VOLUME, BASED ON POSSIBLE TANK TRUCK RELEASES, IS QUITE LARGE. MIGRATION OF SOLUTE FROM THIS FREE PHASE CONTAMINATION IS BELIEVED TO BE THE MAJOR SOURCE FOR THE PLUME FOUND DOWNGRADIANT FROM THE GZ-4 AREA. THIS IS CONSISTENT WITH GROUNDWATER FLOW DIRECTIONS, WHICH ARE ORIENTED PARALLEL TO THE ELONGATE DIRECTION OF THE PLUME. HOWEVER, CONTINUED LEACHING OF VOCs FROM CONTAMINATED SOILS IS ALSO EXPECTED TO CONTRIBUTE SIGNIFICANTLY TO THE CONTAMINANT PLUME.

THE NORTHERN BOUNDARY OF THE PLUME NEAR OR BENEATH NOONE POND IS NOT EXACTLY DEFINED. HOWEVER, CONCENTRATIONS ARE VERY DILUTE IN THE EM-3/EM-109 AREA (SOUTH OF NOONE POND). AT EM-LLO, NORTH OF THE POND, NO VOCs WERE DETECTED. QUARTERLY MONITORING OF EM-109 DURING DECEMBER OF 1988, DID NOT DETECT ANY VOCs, INDICATING THAT THE PLUME TERMINATES AT SOME POINT NEAR EM-109 OR BETWEEN EM-109 AND EM-110.

A COMPLETE DISCUSSION OF SITE CHARACTERISTICS CAN BE FOUND IN THE REMEDIAL INVESTIGATION REPORT ON PAGES 63-225.

## #SSR

### VI. SUMMARY OF SITE RISKS

AN ENDANGERMENT ASSESSMENT (EA) WAS PERFORMED TO ESTIMATE THE PROBABILITY AND MAGNITUDE OF POTENTIAL ADVERSE HUMAN HEALTH AND ENVIRONMENTAL EFFECTS FROM EXPOSURE TO CONTAMINANTS ASSOCIATED WITH THE SITE. SIXTEEN (16) CONTAMINANTS OF CONCERN, LISTED ON PAGE 244 OF THE RI WERE SELECTED FOR EVALUATION IN THE EA. THESE CONTAMINANTS CONSTITUTE A REPRESENTATIVE SUBSET OF THE MORE THAN FORTY (40) CONTAMINANTS IDENTIFIED AT THE SITE DURING THE REMEDIAL INVESTIGATION. THE 16 CONTAMINANTS WERE SELECTED TO REPRESENT POTENTIAL ON-SITE HAZARDS BASED ON TOXICITY, CONCENTRATION, FREQUENCY OF DETECTION, AND MOBILITY AND PERSISTENCE IN THE ENVIRONMENT.

POTENTIAL HUMAN HEALTH EFFECTS ASSOCIATED WITH THE CONTAMINANTS OF CONCERN IN SEDIMENTS, SOILS AND GROUNDWATER WERE ESTIMATED QUANTITATIVELY THROUGH THE DEVELOPMENT OF SEVERAL HYPOTHETICAL EXPOSURE SCENARIOS. INCREMENTAL LIFETIME CANCER RISKS AND A MEASURE OF THE POTENTIAL FOR NON-CARCINOGENIC ADVERSE HEALTH EFFECTS WERE ESTIMATED FOR THE VARIOUS EXPOSURE SCENARIOS. EXPOSURE SCENARIOS WERE DEVELOPED TO REFLECT THE POTENTIAL FOR EXPOSURE TO HAZARDOUS SUBSTANCES BASED ON THE CHARACTERISTIC USES AND LOCATION OF THE SITE. A FACTOR OF SPECIAL NOTE THAT IS REFLECTED IN THE ENDANGERMENT ASSESSMENT IS THAT THE SITE IS WITHIN THE ZONE OF INFLUENCE OF THE SOUTH MUNICIPAL WATER SUPPLY WELL WHEN THERE IS UNRESTRICTED PUMPING. LAND USE IN AND AROUND THE SITE, HOWEVER, IS INDUSTRIAL AND COMMERCIAL.

ALTHOUGH ON-SITE GROUNDWATER IS NOT CURRENTLY USED FOR DRINKING WATER, THIS AQUIFER WAS USED AS A DRINKING WATER SUPPLY UNTIL CONTAMINATION FROM THE SITE WAS DISCOVERED. THEREFORE, THE AQUIFER IS CLASSIFIED AS AN EXISTING SOURCE OF DRINKING WATER. AS SUCH, RISKS ASSOCIATED WITH THE CONSUMPTION OF GROUNDWATER WERE EVALUATED AND JUDGED TO BE A LIKELY EXPOSURE ROUTE WHICH WOULD RESULT IN POTENTIAL HEALTH HAZARDS. ANOTHER

EXPOSURE ROUTE JUDGED TO BE OF POTENTIAL HEALTH AND ENVIRONMENTAL CONCERN IS DIRECT CONTACT WITH SEDIMENTS ON THE NHBB PROPERTY. THE HUMAN HEALTH HAZARD WAS QUANTIFIED WHILE THE THREAT TO ENVIRONMENTAL RECEPTORS WAS DISCUSSED QUALITATIVELY. OTHER EXPOSURE ROUTES EVALUATED INCLUDE: DIRECT CONTACT WITH SOILS, INHALATION OF AIRBORNE CONTAMINANTS, DIRECT CONTACT WITH SURFACE WATERS AND INGESTION OF FISH.

#### A. INGESTION OF GROUNDWATER

THE INCREMENTAL LIFETIME CANCER RISKS ESTIMATED FOR INGESTION OF WATER PUMPED FROM THE SOUTH WELL WAS  $4.5 \times 10^{-5}$ . THE EXPOSURE SCENARIO DEVELOPED FOR EVALUATION OF THE RISKS ASSOCIATED WITH INGESTION OF GROUNDWATER INVOLVED A HYPOTHETICAL OFF-PROPERTY RESIDENTIAL WELL INTERSECTING THE CONTAMINANT PLUME. TOTAL INCREMENTAL LIFETIME CANCER RISKS FOR THE AVERAGE AND MAXIMUM SCENARIOS WERE  $2.22 \times 10^{-3}$  AND  $2.1 \times 10^{-4}$ , RESPECTIVELY. FOR THE MAXIMUM CASE SCENARIO ONLY, THERE IS THE POTENTIAL FOR CHRONIC TOXIC (NON-CARCINOGENIC) EFFECTS. THE MAJOR CONTRIBUTORS TO THE EXCESS CANCER RISK WERE TETRACHLOROETHYLENE AND VINYL CHLORIDE, WHILE THE MAJOR CONTRIBUTOR TO NON-CARCINOGENIC HEALTH RISKS WAS TETRACHLOROETHYLENE.

INGESTION OF GROUNDWATER FROM A HYPOTHETICAL RESIDENTIAL WELL ON NHBB PROPERTY WOULD RESULT IN EXCESS INCREMENTAL LIFETIME CANCER RISKS OF  $3.0 \times 10^{-2}$  AND  $3.5 \times 10^{-1}$  FOR THE AVERAGE AND MAXIMUM CASES, RESPECTIVELY. THIS LATTER SCENARIO, AS A REPRESENTATION OF THE WORST-CASE, IS AN ESTIMATION OF THE EXTREME RISKS ASSOCIATED WITH INGESTION OF GROUNDWATER FROM THE MOST CONTAMINATED AREA OF THE SITE.

#### B. DIRECT CONTACT WITH SEDIMENTS ON NHBB PROPERTY

DIRECT CONTACT WITH SEDIMENTS ON NHBB PROPERTY DIRECT CONTACT WITH SEDIMENTS IN THE WETLANDS AREA WOULD RESULT IN EXPOSURE TO CONTAMINANTS THROUGH DERMAL ABSORPTION AND INCIDENTAL INGESTION. THE EXPOSURE SCENARIO AND RISK ASSESSMENT EVALUATE HEALTH IMPACTS ON CHILDREN BETWEEN THE AGES OF 6 AND 15 WHO WOULD ACCESS THE SITE 50 TIMES ANNUALLY FOR 10 YEARS. IN THE MAXIMUM EXPOSURE SCENARIO, IT IS ASSUMED THAT THE CHILD CONTACTS THE MAXIMUM CONTAMINANT LEVELS DURING EACH THE INCREMENTAL LIFETIME CANCER RISKS WERE  $4.3 \times 10^{-5}$  AND  $2.1 \times 10^{-4}$  FOR THE AVERAGE AND MAXIMUM SCENARIOS, RESPECTIVELY. ASSESSMENT OF NON-CARCINOGENIC HEALTH RISKS FOUND NO POTENTIAL FOR CHRONIC TOXIC EFFECTS FOR BOTH AVERAGE AND MAXIMUM CASES. PAHS WERE THE MAJOR CONTRIBUTOR TO THE CANCER RISK IN THIS SCENARIO.

THERE IS LITTLE INFORMATION REGARDING THE TOXICITY OF SOIL CONTAMINATED WITH PCBS OR PAHS TO AQUATIC FRESHWATER ORGANISMS. IT IS THOUGHT THAT EXPOSURE TO, OR TOXIC EFFECTS FROM, CONTAMINATED SEDIMENTS IS PRIMARILY THE RESULT OF EXPOSURE TO CONTAMINATED INTERSTITIAL WATER IS CONTROLLED BY A NUMBER OF FACTORS, THE MOST IMPORTANT OF WHICH OF WHICH ARE THE ORGANIC CARBON CONTENT OF THE SOIL AND THE ORGANIC CARBON-WATER PARTITION COEFFICIENT OF THE CONTAMINANT. BECAUSE THE APPLICABILITY OF THE APPLICABILITY OF LABORATORY DETERMINED PARTITION COEFFICIENTS AND THE ORGANIC CARBON CONTENT OF SOILS AT THE SITE IS HIGHLY VARIABLE, MODEL CALCULATIONS DOES ARE APPROXIMATE. FOR THE WETLANDS AREA EAST AND NORTHEAST OF THE NHBB FACILITY, WITH AN ASSUMED FRACTION OF ORGANIC CARBON IN THE SEDIMENT OF 0.5 AND A K (ORGANIC CARBON PARTITION COEFFICIENT) OF  $1.3 \times 10^{-5}$  FOR PCBS (AROCLOR 1254, KADEG ET AL., 1986), THE AVERAGE AND MAXIMUM CONCENTRATIONS OF PCBS (BASED ON AN ASSUMED EQUILIBRIUM PARTITION MODEL) IN THE INTERSTITIAL WATER ARE 0.005 PPB AND 0.4 PPB, RESPECTIVELY. THIS MUST BE REGARDED AS A ROUGH ESTIMATE OF PCB CONCENTRATIONS IN INTERSTITIAL WATER. EPA HAS ESTABLISHED AN AMBIENT WATER QUALITY CRITERION FOR FRESHWATER AQUATIC LIFE UNDER CONTINUOUS EXPOSURE OF 0.014 PPB. PAHS AND METALS ARE EXPECTED TO ADD TO THE TOTAL TOXICITY ASSOCIATED WITH THE SEDIMENT CONTAMINATION.

BIOACCUMULATION AND BIOMAGNIFICATION OF CONTAMINATION IS A MATTER OF CONCERN WITH PCBS, PAHS, AND METALS. IT IS DIFFICULT, GIVEN LIMITED DATA, TO ESTIMATE THE MAGNITUDE OF THE POTENTIAL ADVERSE EFFECTS OF THIS ON ENVIRONMENTAL RECEPTORS, INCLUDING REPRODUCTORY PROBLEMS. OF PARTICULAR CONCERN IS THE POTENTIAL FOR MIGRATORY BIRDS INGESTING AQUATIC INVERTEBRATES, EMERGENT INSECTS AND SEDIMENTS WHICH ARE CONTAMINATED WITH PCBS.

A COMPLETE DISCUSSION OF SITE RISKS CAN BE FOUND IN THE REMEDIAL INVESTIGATION IN CHAPTER 5.

ACTUAL OR THREATENED RELEASES OF HAZARDOUS SUBSTANCES FROM THIS SITE, IF NOT ADDRESSED BY IMPLEMENTING THE RESPONSE ACTION SELECTED IN THIS ROD, MAY PRESENT AN IMMINENT AND SUBSTANTIAL ENDANGERMENT TO PUBLIC HEALTH, WELFARE, OR, THE ENVIRONMENT.

#DSC

#### **VII. DOCUMENTATION OF NO SIGNIFICANT CHANGES**

EPA ADOPTED A PROPOSED PLAN (PREFERRED ALTERNATIVE) FOR REMEDIATION OF THE SITE IN JULY, 1989. COMPONENTS OF THE PREFERRED ALTERNATIVE INCLUDED:

1. IN-SITU VACUUM EXTRACTION FOR CONTAMINATED SOILS;
2. EXCAVATION AND/OR DREDGING WITH DEWATERING OF SEDIMENTS AND OFF-SITE DISPOSAL;

3. WETLANDS RESTORATION;
4. GROUNDWATER EXTRACTION AND TREATMENT BY PHASE SEPARATION, AS NEEDED, AND AIR STRIPPING WITH CARBON COLUMNS FOR AIR EMISSION CONTROL;
5. LONG-TERM ENVIRONMENTAL MONITORING; AND
6. INSTITUTIONAL CONTROLS, INCLUDING RESTRICTIONS ON USE OF THE SOUTH MUNICIPAL WATER SUPPLY WELL.

THE REMEDY SELECTED IN THIS DOCUMENT INCLUDES A MINOR CHANGE FROM THE PREFERRED ALTERNATIVE DESCRIBED IN THE PROPOSED PLAN IN ONE RESPECT REGARDING THE NUMBER OF GROUNDWATER TREATMENT FACILITIES THAT WILL BE REQUIRED TO TREAT THE GROUNDWATER EXTRACTED FROM BOTH THE NHBB AREA PLUME AND THE DILUTE PLUME. THE GROUNDWATER COMPONENT OF THE SELECTED REMEDY ESTABLISHES GROUNDWATER CLEANUP LEVELS, THE PERIOD OF TIME NECESSARY TO ACHIEVE THOSE LEVELS AND RESTORE THE GROUNDWATER TO DRINKING QUALITY STANDARDS, AND THE RATE FOR EXTRACTING AND TREATING CONTAMINATED GROUNDWATER NECESSARY TO ACHIEVE THE CLEANUP LEVELS IN THE SPECIFIED PERIOD OF TIME. THE NUMBER OF GROUNDWATER TREATMENT FACILITIES THAT MUST BE CONSTRUCTED TO TREAT THE SPECIFIED VOLUME OF EXTRACTED GROUNDWATER IS NOT SPECIFIED. THIS ASPECT OF THE SELECTED REMEDY IS A CHANGE FROM THE ANALYSES PRESENTED IN BOTH THE FS AND THE PROPOSED PLAN, WHICH DESCRIBED TWO SEPARATE AIR STRIPPING TREATMENT PLANTS, ONE TO HANDLE THE CONTAMINATED GROUNDWATER EXTRACTED FROM THE DILUTE PLUME, AND ONE TO HANDLE THE EXTRACTED GROUNDWATER FROM THE NHBB AREA PLUME. EPA DOES NOT CONSIDER THIS A SIGNIFICANT CHANGE TO THE PREFERRED ALTERNATIVE THAT WAS DESCRIBED IN THE PROPOSED PLAN. ALTHOUGH THE ANALYSIS OF GROUNDWATER REMEDIAL ALTERNATIVES AND THE PREFERRED ALTERNATIVE IN BOTH THE FS AND THE PROPOSED PLAN DISCUSSED TWO SEPARATE TREATMENT FACILITIES, EPA DOES NOT CONSIDER THE POSSIBLE USE OF ONE TREATMENT FACILITY TO CHANGE THE REMEDIAL OBJECTIVES TO BE ATTAINED BY THE SELECTED REMEDY. THE REMEDY SELECTED SPECIFIES THE CLEANUP LEVELS AND RATE OF AQUIFER RESTORATION, BUT LEAVES THE DECISION ON THE NUMBER OF FACILITIES TO THE MORE DETAILED ANALYSES TO BE UNDERTAKEN DURING THE REMEDIAL DESIGN. IF IT CAN BE SHOWN THAT ONE TREATMENT FACILITY RATHER THAN TWO, CAN MEET THE REMEDIAL ACTION OBJECTIVES AND THE STATUTORY REQUIREMENTS, AND PRESENT AN EQUIVALENT BALANCE OF THE EVALUATION CRITERIA, THEN ONE FACILITY MAY BE CONSTRUCTED. THE PRINCIPAL REMEDIAL ACTION OBJECTIVE WILL STILL BE MET, ATTAINMENT OF DRINKING WATER STANDARDS THROUGHOUT THE AQUIFER IN THE SHORTEST PRACTICABLE TIME. FURTHERMORE, THE ESTIMATED CLEANUP TIME FOR THE DILUTE PLUME OF 7.5 YEARS APPEARS TO BE A REALISTIC OBJECTIVE ON WHICH TO BASE PLANT CAPACITIES AND GROUNDWATER EXTRACTION RATES. THEREFORE, THE PROTECTIVENESS AND EFFECTIVENESS OF THE REMEDY WILL NOT BE AFFECTED.

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#### VIII. DEVELOPMENT AND SCREENING OF ALTERNATIVES

##### A. STATUTORY REQUIREMENTS/RESPONSE OBJECTIVES

PRIOR TO THE PASSAGE OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA), ACTIONS TAKEN IN RESPONSE TO RELEASES OF HAZARDOUS SUBSTANCES WERE CONDUCTED IN ACCORDANCE WITH CERCLA AS ENACTED IN 1980, AND THE REVISED NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN (NCP), 40 CFR PART 300, DATED NOVEMBER 20, 1985. UNTIL THE NCP IS REVISED TO REFLECT SARA, THE PROCEDURES AND STANDARDS FOR RESPONDING TO RELEASES OF HAZARDOUS SUBSTANCES, POLLUTANTS AND CONTAMINANTS SHALL BE IN ACCORDANCE WITH SECTION 121 OF CERCLA AND TO THE MAXIMUM EXTENT PRACTICABLE, THE CURRENT NCP.

UNDER ITS LEGAL AUTHORITIES, EPA'S PRIMARY RESPONSIBILITY AT SUPERFUND SITES IS TO UNDERTAKE REMEDIAL ACTIONS THAT ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. IN ADDITION, SECTION 121 OF CERCLA ESTABLISHES SEVERAL OTHER STATUTORY REQUIREMENTS AND PREFERENCES, INCLUDING: A REQUIREMENT THAT EPA'S REMEDIAL ACTION, WHEN COMPLETE, MUST COMPLY WITH APPLICABLE OR RELEVANT AND APPROPRIATE ENVIRONMENTAL STANDARDS ESTABLISHED UNDER FEDERAL AND STATE ENVIRONMENTAL LAWS UNLESS A STATUTORY WAIVER IS GRANTED; A REQUIREMENT THAT EPA SELECT A REMEDIAL ACTION THAT IS COST-EFFECTIVE AND THAT UTILIZES PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE; AND A STATUTORY PREFERENCE FOR REMEDIES THAT PERMANENTLY AND SIGNIFICANTLY REDUCE THE VOLUME, TOXICITY OR MOBILITY OF HAZARDOUS WASTES OVER REMEDIES THAT DO NOT ACHIEVE SUCH RESULTS THROUGH TREATMENT. RESPONSE ALTERNATIVES WERE DEVELOPED TO BE CONSISTENT WITH THESE CONGRESSIONAL MANDATES.

A NUMBER OF POTENTIAL EXPOSURE PATHWAYS WERE ANALYZED FOR RISK AND THREATS TO PUBLIC HEALTH AND THE ENVIRONMENT IN THE ENDANGERMENT ASSESSMENT AND THE WETLANDS ASSESSMENT INCLUDED IN THE REMEDIAL INVESTIGATION REPORT, APRIL, 1989. GUIDELINES IN THE SUPERFUND PUBLIC HEALTH EVALUATION MANUAL (EPA, 1986) REGARDING DEVELOPMENT OF DESIGN GOALS AND RISK ANALYSES FOR REMEDIAL ALTERNATIVES WERE USED TO ASSIST EPA IN THE DEVELOPMENT OF RESPONSE ACTIONS. AS A RESULT OF THESE ASSESSMENTS, REMEDIAL RESPONSE OBJECTIVES WERE DEVELOPED TO MITIGATE EXISTING AND FUTURE THREATS TO PUBLIC HEALTH AND THE ENVIRONMENT. THESE RESPONSE OBJECTIVES ARE:

ELIMINATE OR MINIMIZE, TO THE MAXIMUM EXTENT PRACTICABLE, THE THREAT POSED TO THE PUBLIC HEALTH, WELFARE, AND ENVIRONMENT BY THE CURRENT EXTENT OF CONTAMINATION FOR GROUNDWATER, SOILS, AND SEDIMENTS;

- ELIMINATE OR MINIMIZE THE MIGRATION OF CONTAMINANTS FROM THE SOILS INTO THE GROUNDWATER; AND

- MEET FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS).

## B. TECHNOLOGY AND ALTERNATIVE DEVELOPMENT AND SCREENING

CERCLA, THE NCP, AND EPA GUIDANCE DOCUMENTS, INCLUDING, "GUIDANCE ON FEASIBILITY STUDIES UNDER CERCLA," DATED MARCH, 1988, AND THE "INTERIM GUIDANCE ON SUPERFUND SELECTION OF REMEDY" {EPA OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE (OSWER) DIRECTIVE NO. 9355.0-19 (DECEMBER 24, 1986)}, SET FORTH THE PROCESS BY WHICH REMEDIAL ACTIONS ARE EVALUATED AND SELECTED. IN ACCORDANCE WITH THESE REQUIREMENTS AND GUIDANCE DOCUMENTS, TREATMENT ALTERNATIVES WERE DEVELOPED FOR THE SITE RANGING FROM AN ALTERNATIVE THAT, TO THE DEGREE POSSIBLE, WOULD ELIMINATE THE NEED FOR LONG-TERM MANAGEMENT (INCLUDING MONITORING) AT THE SITE TO ALTERNATIVES INVOLVING TREATMENT THAT WOULD REDUCE THE MOBILITY, TOXICITY, OR VOLUME OF THE HAZARDOUS SUBSTANCES AS THEIR PRINCIPAL ELEMENT. IN ADDITION TO THE RANGE OF TREATMENT ALTERNATIVES, A CONTAINMENT OPTION INVOLVING LITTLE OR NO TREATMENT AND A NO-ACTION ALTERNATIVE WERE DEVELOPED IN ACCORDANCE WITH SECTION 121 OF CERCLA.

SECTION 121 (B)(1) OF CERCLA PRESENTS SEVERAL FACTORS THAT, AT A MINIMUM, EPA IS REQUIRED TO CONSIDER IN ITS ASSESSMENT OF ALTERNATIVES. IN ADDITION TO THESE FACTORS AND THE OTHER STATUTORY DIRECTIVES OF SECTION 121, THE EVALUATION AND SELECTION PROCESS WAS GUIDED BY THE EPA DOCUMENT "ADDITIONAL INTERIM GUIDANCE FOR FY 87 RECORDS OF DECISION" DATED JULY 24, 1987. THIS DOCUMENT PROVIDES DIRECTION ON THE CONSIDERATION OF SARA CLEANUP STANDARDS, AND SETS FORTH NINE FACTORS THAT EPA SHOULD CONSIDER IN ITS EVALUATION AND SELECTION OF REMEDIAL ACTIONS. THE NINE FACTORS ARE:

1. COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS);
2. LONG-TERM EFFECTIVENESS AND PERMANENCE;
3. REDUCTION OF TOXICITY, MOBILITY OR VOLUME;
4. SHORT-TERM EFFECTIVENESS;
5. IMPLEMENTABILITY;
6. COMMUNITY ACCEPTANCE;
7. STATE ACCEPTANCE;
8. COST; AND
9. OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT.

SECTIONS 4.1 AND 4.2 OF THE FS IDENTIFIED, ASSESSED AND SCREENED TECHNOLOGIES BASED ON IMPLEMENTABILITY, EFFECTIVENESS, AND COST. THESE TECHNOLOGIES WERE COMBINED INTO SOURCE CONTROL (SC) AND MANAGEMENT OF MIGRATION (MM) ALTERNATIVES. SECTION 4.3 IN THE FS PRESENTED THE REMEDIAL ALTERNATIVES DEVELOPED BY COMBINING THE TECHNOLOGIES IDENTIFIED IN THE PREVIOUS SCREENING PROCESS IN THE CATEGORIES REQUIRED BY OSWER DIRECTIVE NO. 9355.0-19. THE PURPOSE OF THE INITIAL SCREENING WAS TO NARROW THE NUMBER OF POTENTIAL REMEDIAL ACTIONS FOR FURTHER DETAILED ANALYSIS WHILE PRESERVING A RANGE OF OPTIONS. EACH ALTERNATIVE WAS THEN EVALUATED AND SCREENED IN SECTION 4.4 OF THE FS. IN SUMMARY, OF THE EIGHTEEN SOURCE CONTROL AND NINE MANAGEMENT OF MIGRATION REMEDIAL ALTERNATIVES SCREENED IN CHAPTER 4, TWELVE SOURCE CONTROL AND SEVEN MANAGEMENT OF MIGRATION ALTERNATIVES WERE RETAINED FOR DETAILED ANALYSIS. TABLES 4-10, 11 AND 12 OF THE FS IDENTIFY THE ALTERNATIVES THAT WERE RETAINED THROUGH THE SCREENING PROCESS, AS WELL AS THOSE THAT WERE ELIMINATED FROM FURTHER CONSIDERATION.

#DSDC

## **IX. DESCRIPTION/SUMMARY OF THE DETAILED AND COMPARATIVE ANALYSIS OF ALTERNATIVES**

THIS SECTION PRESENTS A NARRATIVE SUMMARY AND BRIEF EVALUATION OF EACH ALTERNATIVE ACCORDING TO THE EVALUATION CRITERIA DESCRIBED ABOVE. A DETAILED TABULAR ASSESSMENT OF EACH ALTERNATIVE CAN BE FOUND IN TABLES 5-3, 5-4, AND 5-5 OF THE FS.

### A. SOURCE CONTROL (SC) ALTERNATIVES ANALYZED

THE SOURCE CONTROL ALTERNATIVES ANALYZED FOR THE SITE HAVE BEEN SUBDIVIDED INTO SOIL (SL) OR SEDIMENT (SD) ALTERNATIVES AND INCLUDE MINIMAL NO ACTION ALTERNATIVES (SL #1 AND SD #1); DISPOSAL OF CONTAMINATED SOILS AT AN OFF-SITE LANDFILL (SL #3); ON-SITE INCINERATION (SL #5); ON-SITE MECHANICAL AERATION (SL #6); IN-SITU VACUUM EXTRACTION (SL #7); IN-SITU SOIL FLUSHING (SL #8); CONTAINMENT OF SEDIMENTS WITH AN IMPERMEABLE CAP

(SD #3); CONTAINMENT OF SEDIMENTS WITH A PERMEABLE CAP (SD #4); DISPOSAL OF CONTAMINATED SEDIMENTS AT AN OFF-SITE LANDFILL (SD #5); ONSITE INCINERATION OF CONTAMINATED SEDIMENTS (SD #7); AND ON-SITE SEDIMENT WASHING (SD #8).

A DESCRIPTION OF EACH SOURCE CONTROL ALTERNATIVE IS PRESENTED BELOW. THE SIX SOIL ALTERNATIVES ARE DESCRIBED, FOLLOWED BY THE SIX SEDIMENT ALTERNATIVES.

#### **SL #1**

##### **NO ACTION**

ANALYSIS OF THE NO ACTION ALTERNATIVE IS REQUIRED BY THE NCP AND IS INCLUDED FOR COMPARISON WITH OTHER REMEDIAL ALTERNATIVES. UNDER THIS ALTERNATIVE, NO ACTION WOULD BE TAKEN TO REMEDIATE CONTAMINATED SOILS AT THE SOUTH MUNICIPAL WELL SITE. A NO ACTION ALTERNATIVE WOULD BE SELECTED ONLY IF THE SITE POSED AN ACCEPTABLE RISK TO PUBLIC HEALTH AND THE ENVIRONMENT, AND THE REMEDIAL OBJECTIVES COULD BE ATTAINED WITH NO FURTHER RESPONSE. AN EVENTUAL DECREASE IN SOIL CONTAMINANT CONCENTRATIONS WOULD RESULT FROM THE INFILTRATION OF RAINWATER AND FLUCTUATION OF GROUNDWATER LEVELS, THEREBY CAUSING VOC CONTAMINANTS TO LEACH FROM THE SOIL. HOWEVER, SOME CONTAMINANTS WOULD ADHERE TO SOIL PARTICLES RATHER THAN MIGRATE INTO THE GROUNDWATER, PREVENTING SOILS FROM BECOMING COMPLETELY "CLEAN" WITH THE NO ACTION ALTERNATIVE. IN ADDITION, A LARGE PERCENTAGE OF THE MOST HIGHLY CONTAMINATED SOILS ARE COVERED WITH EITHER PAVEMENT OR THE NHBB FACILITY, IMPEDING THE INFILTRATION OF RAINWATER AND SUBSEQUENT LEACHING OF SOIL CONTAMINANTS.

THE NO ACTION ALTERNATIVE WOULD NOT DECREASE RISKS TO HUMAN HEALTH AND THE ENVIRONMENT ASSOCIATED WITH THE CONTAMINATED SOILS OVER THE SHORT-TERM AND IT WOULD NOT BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. ARARS FOR DRINKING WATER WOULD NOT BE MET DUE TO THE CONTINUED LEACHING OF CONTAMINANTS FROM SOILS TO GROUNDWATER. WITHOUT REMEDIATION, SOIL CONTAMINANTS WILL CONTINUE TO MIGRATE INTO THE GROUNDWATER AT THE SITE, INCREASING THE TIME NEEDED TO ACHIEVE TARGET GROUNDWATER CONTAMINANT CONCENTRATIONS BEYOND THE FORESEEABLE FUTURE. THIS ALTERNATIVE WOULD NEITHER PROVIDE A PERMANENT SOLUTION TO SITE CONTAMINATION, NOR REDUCE THE MOBILITY, TOXICITY, OR VOLUME OF CONTAMINANTS.

#### **SL #3**

##### **DISPOSAL OF CONTAMINATED SOILS AT AN OFF-SITE LANDFILL**

FOR THIS ALTERNATIVE, CONTAMINATED SOILS WOULD BE DISPOSED IN AN OFF-SITE LANDFILL WHICH COMPLIES WITH THE REQUIREMENTS OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA). APPROXIMATELY 7500 CUBIC YARDS OF CONTAMINATED SOIL WOULD BE EXCAVATED FROM THE VICINITY OF THE NORTHEAST CORNER OF THE NHBB FACILITY AS WELL AS THE AREAS NEAR OUTFALL 002 AND THE GZ-105 WELLS. THESE SOILS WOULD THEN BE TRANSPORTED TO A PERMITTED RCRA LANDFILL FOR DISPOSAL.

SINCE CONTAMINANTS WOULD BE PERMANENTLY REMOVED FROM THE SITE UNDER THIS ALTERNATIVE WITHIN TWO MONTHS, THE LONG-TERM EFFECTIVENESS OF THE REMEDY AT THE SITE WOULD BE ACHIEVED AND ALL ARARS WOULD BE MET. HOWEVER, EXCAVATION OF ALL CONTAMINATED SOILS ABOVE THE WATER TABLE, INCLUDING SOILS UNDER THE NHBB BUILDING, WOULD POSE SIGNIFICANT PROBLEMS OF MAINTAINING THE STRUCTURAL INTEGRITY OF THE BUILDING, THUS MAKING IMPLEMENTATION OF THIS ALTERNATIVE NOT PRACTICABLE. ALSO, THE REMEDY WOULD PRESENT A SLIGHT INCREASE IN RISK TO THE COMMUNITY DURING THE PERIOD OF REMEDIAL ACTION DUE TO THE TRANSPORT OF HAZARDOUS WASTE OFF-SITE. IN ADDITION, EXCAVATING ALL CONTAMINATED SOILS COULD POTENTIALLY RELEASE VOCs AND DUST INTO THE AIR, WHICH WOULD BE CONTROLLED TO THE EXTENT PRACTICABLE DURING CONSTRUCTION ACTIVITIES. THIS ALTERNATIVE MOVES WASTE FROM ONE SITE TO AN OFF-SITE LANDFILL, WHERE THE LONG-TERM EFFECTIVENESS OF THE LANDFILL IS UNCERTAIN, AND IT DOES NOT REDUCE MOBILITY, TOXICITY, OR VOLUME OF THE CONTAMINANTS OR THE CONTAMINATED MEDIA.

ESTIMATED PERIOD OF REMEDIATION: 2 MONTHS

ESTIMATED CAPITAL COST (NET PRESENT WORTH): \$4,021,718

ESTIMATED TOTAL COST (NET PRESENT WORTH): \$4,021,718

#### **SL #5**

##### **ON-SITE INCINERATION**

ON-SITE INCINERATION OF CONTAMINATED NHBB SOILS WOULD INVOLVE EXCAVATING APPROXIMATELY 7500 CUBIC YARDS OF SOIL, AS IN SL #3. THE SOILS WOULD BE TREATED ON-SITE WITH A MOBILE INCINERATOR, AND THE TREATED MATERIAL WOULD BE REPLACED IN EXCAVATED AREAS, AND COVERED WITH CLEAN FILL. FOLLOWING THESE ACTIVITIES, THE EXCAVATED AREAS WOULD BE SEEDED IF NOT UNDER THE BUILDING OR PARKING AREAS.

SINCE CONTAMINANTS WOULD BE TREATED TO ACHIEVE TARGET LEVELS UNDER THIS ALTERNATIVE WITHIN SIX MONTHS, THE LONG-TERM EFFECTIVENESS OF THE REMEDY WOULD BE ACHIEVED AND ALL ARARS WOULD BE MET. HOWEVER, EXCAVATION OF ALL CONTAMINATED SOILS ABOVE THE WATER TABLE, INCLUDING SOILS UNDER THE NHBB BUILDING, WOULD POSE SIGNIFICANT PROBLEMS OF MAINTAINING THE STRUCTURAL INTEGRITY OF THE BUILDING, THUS GIVING THIS ALTERNATIVE A VERY LOW IMPLEMENTABILITY RATING. POTENTIAL RISKS TO THE COMMUNITY, SITE WORKERS, AND THE ENVIRONMENT ASSOCIATED WITH

THE OPERATING INCINERATORS WOULD BE CONTROLLED BY THE USE OF APPROPRIATE TECHNOLOGIES AND CONTROL DEVICES. IN ADDITION, EXCAVATING ALL CONTAMINATED SOILS COULD POTENTIALLY RELEASE VOCS AND DUST INTO THE AIR, WHICH WOULD BE CONTROLLED TO THE EXTENT PRACTICABLE DURING CONSTRUCTION ACTIVITIES. INCINERATION TECHNOLOGY IS READILY AVAILABLE AND PERMANENTLY DESTROYS 99.99% OF THE CONTAMINANTS.

ESTIMATED PERIOD OF OPERATION: 6 MONTHS  
ESTIMATED CAPITAL COST (NET PRESENT WORTH): \$4,355,078  
ESTIMATED TOTAL COST (NET PRESENT WORTH): \$4,355,078

**SL #6**  
**ON-SITE MECHANICAL AERATION**

ON-SITE MECHANICAL AERATION INVOLVES EXCAVATING APPROXIMATELY 7500 CUBIC YARDS OF CONTAMINATED SOILS, AS IN SL #3 AND #5. THE EXCAVATED SOILS WOULD BE TREATED ON-SITE WITH MECHANICAL AERATION, WHICH TRANSFERS VOLATILE ORGANICS FROM THE SOIL INTO THE AIR STREAM BY PHYSICALLY MIXING THE SOILS IN THE PRESENCE OF AN INDUCED AIR FLOW. EXCAVATION AND REPLACEMENT ACTIVITIES PARALLEL THOSE DESCRIBED IN SL #5 AND, THEREFORE, WILL NOT BE DISCUSSED FURTHER HERE.

MECHANICAL AERATION IS IMPLEMENTABLE AND OFFERS SHORT-TERM AND LONG-TERM EFFECTIVENESS. IN ADDITION, ALL ARARS WOULD BE MET AND THE ALTERNATIVE WOULD ACHIEVE A PERMANENT REDUCTION IN TOXICITY, MOBILITY AND VOLUME OF CONTAMINANTS. HOWEVER, EXCAVATION OF ALL CONTAMINATED SOILS ABOVE THE WATER TABLE, INCLUDING SOILS UNDER THE NHBB BUILDING, WOULD POSE SIGNIFICANT PROBLEMS OF MAINTAINING THE STRUCTURAL INTEGRITY OF THE BUILDING, THUS GIVING THIS ALTERNATIVE A VERY LOW IMPLEMENTABILITY RATING. POTENTIAL RISKS TO THE COMMUNITY, SITE WORKERS, AND THE ENVIRONMENT ASSOCIATED WITH AIR EMISSIONS FROM THE MECHANICAL AERATORS WOULD BE CONTROLLED BY THE USE OF APPROPRIATE TECHNOLOGIES AND CONTROL DEVICES. IN ADDITION, EXCAVATING ALL CONTAMINATED SOILS COULD POTENTIALLY RELEASE VOCS AND DUST INTO THE AIR, WHICH WOULD BE CONTROLLED TO THE EXTENT PRACTICABLE DURING CONSTRUCTION ACTIVITIES.

ESTIMATED PERIOD OF PERFORMANCE: 9 MONTHS  
ESTIMATED CAPITAL COST: \$2,218,404  
ESTIMATED OPERATION AND MAINTENANCE COSTS (NET PRESENT WORTH): \$443,025  
ESTIMATED TOTAL COST (NET PRESENT WORTH): \$2,661,429

**SL #7**  
**IN-SITU VACUUM EXTRACTION**

THIS IS THE PREFERRED ALTERNATIVE FOR SOIL REMEDIATION AND IS DESCRIBED IN SECTION X., THE SELECTED REMEDY.

**SL #8**  
**IN-SITU SOIL FLUSHING**

SOIL FLUSHING WOULD INJECT WASHING AGENTS (WATER, STEAM, OR SURFACTANTS) INTO AREAS OF SOIL CONTAMINATION, AND THE INJECTED FLUIDS AND CONTAMINATION WOULD BE EXTRACTED FOR TREATMENT AND RECYCLING. THE FLUIDS WOULD MOBILIZE THE SOLUBLE VOCS WHICH ARE ADSORBED TO SOIL PARTICLES. THE WASHING SOLUTION WOULD THEN BE EXTRACTED VIA AN EXTRACTION WELL, TREATED, AND REINJECTED TO FORM A CLOSED LOOP CONTINUOUS FLUSHING SYSTEM. THUS, SOIL FLUSHING MUST BE CONSIDERED IN CONNECTION WITH GROUNDWATER REMEDIATION, SINCE EXTRACTION OF FLUSHING SOLUTIONS WILL INCLUDE CONCURRENT EXTRACTION OF GROUNDWATER. THEREFORE, THE DESIGN OF THIS SYSTEM WOULD INCLUDE GROUNDWATER REMEDIATION CONSIDERATIONS.

IN-SITU SOIL FLUSHING MAY BE EFFECTIVE IN PROVIDING A LONG-TERM, PERMANENT SOLUTION. UPON IMPLEMENTATION, ADVERSE IMPACTS TO HUMAN HEALTH OR THE ENVIRONMENT, SUCH AS DUST EMISSIONS DURING INSTALLATION OF INJECTION AND EXTRACTION WELLS, COULD BE CONTROLLED. FURTHERMORE, THE REMEDY WOULD COMPLY WITH ALL ARARS WHEN THE SOIL CLEANUP LEVELS ARE REACHED, AND MEET THE STATUTORY PREFERENCE FOR ON-SITE REMEDIATION AND FOR ALTERNATIVES THAT SIGNIFICANTLY AND PERMANENTLY REDUCE THE TOXICITY, MOBILITY OR VOLUME OF CONTAMINANTS. THE SHORT-TERM EFFECTIVENESS IN REACHING TARGET SOIL CLEANUP LEVELS IS UNCERTAIN, WITH AN ESTIMATED 30 YEARS OF FLUSHING REQUIRED. THIS REMEDY WOULD REQUIRE LONG-TERM OPERATION, MAINTENANCE AND MONITORING IN ORDER TO ENSURE EFFECTIVENESS.

ESTIMATED PERIOD OF OPERATION: 30 YEARS  
ESTIMATED CAPITAL COST: \$758,747  
ESTIMATED OPERATION AND MAINTENANCE COSTS (NET PRESENT WORTH): \$3,119,605  
ESTIMATED TOTAL COST (NET PRESENT WORTH): \$3,878,352

**SD #1**  
**NO ACTION**

UNDER THIS ALTERNATIVE, NO SEDIMENT REMEDIATION WOULD BE PERFORMED. THIS ALTERNATIVE IS INCLUDED IN THE FS AS REQUIRED BY THE NCP TO SERVE AS A BASIS FOR COMPARISON WITH OTHER REMEDIAL ALTERNATIVES CONSIDERED. A NO ACTION ALTERNATIVE WOULD BE SELECTED ONLY IF THE SITE POSED AN ACCEPTABLE RISK TO PUBLIC HEALTH AND THE ENVIRONMENT, AND THE REMEDIAL OBJECTIVES COULD BE ATTAINED WITH NO FURTHER RESPONSE.

THE NO ACTION ALTERNATIVE FOR REMEDIATING THE WETLANDS WOULD NOT PROVIDE OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT. THIS ALTERNATIVE WOULD NOT REDUCE THE TOXICITY, MOBILITY, OR VOLUME OF CONTAMINANTS, AND WOULD NOT ABATE THE RISKS TO HUMANS AND ENVIRONMENTAL RECEPTORS POSED BY THE CONTAMINATED SEDIMENTS. ALLOWING THE SEDIMENTS TO REMAIN IN-PLACE WILL CONTINUE TO ALLOW THE THREAT THAT CONTAMINANTS MAY MIGRATE OFF-SITE BY MOVEMENT OF SURFACE WATERS. THEREFORE, THE ALTERNATIVE WOULD NOT BE EFFECTIVE IN ADDRESSING THE CONTAMINATION PROBLEMS IN EITHER THE LONG-TERM OR THE SHORT-TERM.

**SD #3**  
**CONTAINMENT OF SEDIMENTS WITH AN IMPERMEABLE CAP**

THIS ALTERNATIVE WOULD COVER AN ESTIMATED 15,800 SQUARE FEET OF CONTAMINATED SEDIMENTS LOCATED IN ON-SITE WETLANDS WITH A MULTI-LAYERED IMPERMEABLE CAP. CONTAMINATED SEDIMENTS ARE LOCATED IN AN AREA OF GROUNDWATER FLUCTUATION, AND ARE, AT TIMES, SATURATED AND EVEN

COVERED WITH WATER. ALTHOUGH IMPERMEABLE CAPPING WOULD ELIMINATE RAINWATER INFILTRATION AND SUBSEQUENT LEACHING, IT WOULD HAVE NO EFFECT ON LEACHING AS A RESULT OF WATER TABLE FLUCTUATIONS. IMPERMEABLE CAPPING WOULD ISOLATE CONTAMINATED SEDIMENTS AND WOULD ELIMINATE RISKS TO HUMAN HEALTH AND THE ENVIRONMENT ASSOCIATED WITH DIRECT CONTACT WITH AND INGESTION OF CONTAMINATED AROUND THE CAP TO PREVENT PUBLIC ACCESS TO THE AREA, AND THE PROPERTY DEED WOULD BE AMENDED TO INDICATE THAT THESE AREAS ARE NEVER TO BE EXCAVATED.

THE DESIGN OF THE IMPERMEABLE CAP WOULD CONFORM TO THE RCRA LANDFILL CLOSURE REQUIREMENTS. EPA'S GUIDANCE UNDER RCRA RECOMMENDS THAT CAPS BE A THREE-LAYERED SYSTEM CONSISTING OF AN UPPER VEGETATIVE LAYER, UNDERLAIN BY A DRAINAGE LAYER OVER A LOW-PERMEABILITY LAYER (US EPA, 1982). THE CAP WOULD FUNCTION BY DIVERTING INFILTRATING LIQUIDS FROM THE VEGETATIVE LAYER THROUGH THE DRAINAGE LAYER AND AWAY FROM THE UNDERLYING WASTE MATERIALS. BECAUSE THE SEDIMENTS WOULD BE CAPPED IN-PLACE, NO LINER OR LEACHATE COLLECTION SYSTEM WOULD BE CONSTRUCTED.

CAPPING WOULD BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, BUT ITS EFFECTIVENESS OVER BOTH THE SHORT- AND LONG-TERMS IS UNCERTAIN. WHILE CAPPING WOULD ISOLATE CONTAMINANTS, CONSTRUCTION OF THE CAP COULD ADVERSELY AFFECT THE ENVIRONMENT IN THE SHORT-TERM BY RE-SUSPENDING CONTAMINATED SEDIMENTS AND PERMITTING MIGRATION OF SITE CONTAMINANTS. IT MAY BE POSSIBLE, HOWEVER, TO MINIMIZE RE-SUSPENSION OF CONTAMINATED SEDIMENTS IF CAP CONSTRUCTION IS TIMED TO TAKE PLACE DURING A PERIOD WHEN THE WATER TABLE IS LOW. IN ADDITION, A CAP WOULD EFFECTIVELY ELIMINATE PORTIONS OF THE WETLANDS, CHANGE SURFACE WATER AND GROUNDWATER FLOW PATTERNS, AND DIMINISH THE BENEFICIAL ASPECTS OF THE WETLANDS. FINALLY, THE CAP WOULD BE CONSTRUCTED IN THE 100-YEAR FLOOD ZONE AND WOULD BE PARTIALLY SUBMERGED. IN SUCH A SITUATION, WHERE THE CAP IS SUBJECT TO CONSTANTLY CHANGING CONDITIONS AND EROSION, THIS ALTERNATIVE PRESENTS LONG-TERM MANAGEMENT PROBLEMS TO MONITOR THE CAP AS NECESSARY TO AVOID FAILURE OF THE CONTAINMENT AND THE RELEASE OF CONTAMINANTS. SINCE OTHER PRACTICABLE AND MORE PROTECTIVE ALTERNATIVES EXIST WHICH WOULD RESULT IN LESS HARMFUL IMPACTS TO THE WETLANDS AND FLOODPLAIN, THIS ALTERNATIVE DOES NOT MEET THE WETLAND AND FLOODPLAIN ARARS.

ESTIMATED PERIOD OF OPERATION: 30 YEARS  
ESTIMATED CAPITAL COST: \$323,923  
ESTIMATED OPERATION AND MAINTENANCE COSTS (NET PRESENT WORTH): \$207,736  
ESTIMATED TOTAL COST (NET PRESENT WORTH): \$531,659

**SD #4**  
**CONTAINMENT OF SEDIMENTS WITH A PERMEABLE CAP**

THIS ALTERNATIVE, AS WITH SD #3, WOULD COVER APPROXIMATELY 15,800 SQUARE FEET OF CONTAMINATED SEDIMENTS, EXCEPT THAT THIS ALTERNATIVE WOULD UTILIZE A PERMEABLE CAP. THUS, IT WOULD NOT ELIMINATE INFILTRATION OF RAINWATER THROUGH CONTAMINATED SEDIMENTS BENEATH THE CAP.

CAPPING WOULD BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, BUT ITS EFFECTIVENESS OVER BOTH THE SHORT- AND LONG-TERMS IS UNCERTAIN. WHILE CAPPING WOULD ISOLATE CONTAMINANTS, CONSTRUCTION OF THE CAP COULD ADVERSELY AFFECT THE ENVIRONMENT IN THE SHORT-TERM BY RE-SUSPENDING CONTAMINATED SEDIMENTS AND PERMITTING MIGRATION OF SITE CONTAMINANTS. IT MAY BE POSSIBLE, HOWEVER, TO MINIMIZE RE-SUSPENSION OF CONTAMINATED SEDIMENTS IF CAP CONSTRUCTION IS TIMED TO TAKE PLACE DURING A PERIOD WHEN THE WATER TABLE IS LOW. IN ADDITION, A CAP WOULD EFFECTIVELY ELIMINATE PORTIONS OF THE WETLANDS, CHANGE SURFACE WATER FLOW PATTERNS, AND



DIMINISH THE BENEFICIAL ASPECTS OF THE WETLANDS. HOWEVER, SINCE THE CAP IS PERMEABLE, THE IMPACT ON GROUNDWATER FLOW PATTERNS WILL BE MUCH LESS THAN THAT OF SD #3. FINALLY, THE CAP WOULD BE CONSTRUCTED IN THE 100-YEAR FLOOD ZONE AND WOULD BE PARTIALLY SUBMERGED. IN SUCH A SITUATION, WHERE THE CAP IS SUBJECT TO CONSTANTLY CHANGING CONDITIONS AND EROSION, THIS ALTERNATIVE PRESENTS LONG-TERM MANAGEMENT PROBLEMS TO MONITOR THE CAP AS NECESSARY TO AVOID FAILURE OF THE CONTAINMENT AND THE RELEASE OF CONTAMINANTS. SINCE OTHER PRACTICABLE AND MORE PROTECTIVE ALTERNATIVES EXIST WHICH WOULD RESULT IN LESS HARMFUL IMPACTS TO THE WETLANDS AND FLOODPLAIN, THIS ALTERNATIVE DOES NOT MEET THE WETLAND AND FLOODPLAIN ARARS.

ESTIMATED PERIOD OF OPERATION: 30 YEARS  
ESTIMATED CAPITAL COST: \$153,241  
ESTIMATED OPERATION AND MAINTENANCE COSTS (NET PRESENT WORTH): \$236,790  
ESTIMATED TOTAL COST (NET PRESENT WORTH): \$390,031

**SD #5  
DISPOSAL OF CONTAMINATED SEDIMENTS AT AN OFF-SITE LANDFILL**

THIS IS THE PREFERRED ALTERNATIVE FOR SEDIMENT REMEDIATION AND IS DESCRIBED IN SECTION X., THE SELECTED REMEDY.

**SD #7  
ON-SITE INCINERATION**

ON-SITE INCINERATION WOULD INVOLVE DREDGING OR EXCAVATING (OVER THE SAME AREA, 15,800 SQUARE FEET, THAT WOULD BE REMEDIATED IN SD #3, #4, AND #5) AN ESTIMATED 1170 CUBIC YARDS OF SEDIMENTS CONTAMINATED ABOVE THE SEDIMENT TARGET CLEANUP LEVELS FROM THE WETLANDS. THE SEDIMENTS WOULD BE INCINERATED TO REMOVE HAZARDOUS PCB AND PAH CONTAMINANTS. THE TREATED MATERIALS WOULD BE MIXED WITH CLEAN FILL, AND REPLACED IN EXCAVATED AREAS OF THE WETLANDS.

THIS ALTERNATIVE WOULD BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT AND REDUCE THE TOXICITY, MOBILITY, AND VOLUME OF ORGANIC CONTAMINANTS BY PERMANENTLY DESTROYING THEM. INCINERATION TECHNOLOGY IS TECHNICALLY FEASIBLE AND IMPLEMENTABLE. HOWEVER, GIVEN THE SMALL VOLUME OF SEDIMENTS, THE LIMITED AVAILABILITY OF MOBILE INCINERATORS AND THEIR EXTENDED START-UP TIME, THE ON-SITE INCINERATION ALTERNATIVE WOULD BE PRACTICABLY IMPLEMENTABLE ONLY IF THE SELECTED SOIL REMEDIAL ACTION HAD BEEN ON-SITE INCINERATION. ITS IMPLEMENTATION COULD PRESENT POTENTIAL ADVERSE HUMAN HEALTH AND ECOLOGICAL IMPACTS FROM EXCAVATING AND/OR DREDGING SEDIMENTS FROM THE WETLANDS BY CREATING THE POTENTIAL FOR RE-SUSPENDING CONTAMINATED SEDIMENTS AND PERMITTING MIGRATION OF SITE CONTAMINANTS. IT MAY BE POSSIBLE, HOWEVER, TO MINIMIZE RE-SUSPENSION OF CONTAMINATED SEDIMENTS IF CAP CONSTRUCTION IS TIMED TO TAKE PLACE DURING A PERIOD WHEN THE WATER TABLE IS LOW. IN ADDITION, EXCAVATION OF THE SEDIMENTS WOULD DESTROY PORTIONS OF THE WETLANDS. HOWEVER, THE EXCAVATION COULD BE PERFORMED IN A MANNER THAT MINIMIZES, TO THE EXTENT FEASIBLE, IMPACTS ON AND DISTURBANCE OF THE WETLANDS. FINALLY, THE REMEDY WOULD REQUIRE RESTORATION OF THE AFFECTED WETLANDS, TO THE EXTENT PRACTICABLE.

ESTIMATED PERIOD OF OPERATION: 2 MONTHS  
ESTIMATED CAPITAL COST: \$730,339  
ESTIMATED TOTAL COST (NET PRESENT WORTH): \$730,339

**SD #8  
ON-SITE SEDIMENT WASHING**

THIS ALTERNATIVE WOULD INVOLVE DREDGING OR EXCAVATING (OVER THE SAME AREA, 15,800 SQUARE FEET, THAT WOULD BE REMEDIATED IN SD #3, #4, #5 AND #7) AN ESTIMATED 1170 CUBIC YARDS OF SEDIMENTS CONTAMINATED ABOVE THE SEDIMENT TARGET CLEANUP LEVELS FROM THE WETLANDS, AS DESCRIBED ABOVE IN SD #7. THE ONLY DIFFERENCE IS THAT THIS ALTERNATIVE WOULD TREAT THE SEDIMENTS WITH A WASHING SOLUTION.

SEDIMENTS WOULD BE PASSED THROUGH A GRINDER TO ACHIEVE A UNIFORM GRAIN SIZE PRIOR TO TREATMENT. FROM THE GRINDER, SEDIMENTS WOULD ENTER A TREATMENT TANK WHERE THEY WOULD BE AGITATED IN A SOLUTION OF SURFACTANTS TO REMOVE ORGANIC CONTAMINANTS. FOLLOWING AGITATION, LIQUIDS WOULD BE SEPARATED FROM SOLIDS IN A CENTRIFUGAL FILTER; CLEAN SOLIDS WOULD BE REMOVED FROM THE FILTER, AND LIQUIDS WOULD BE PLACED IN A DISTILLATION COLUMN TO SEPARATE THE ORGANIC CONTAMINANTS FROM THE WATER. TREATED MATERIALS WOULD THEN BE REPLACED IN THE EXCAVATED AREAS OF THE WETLANDS, COVERED WITH CLEAN FILL, AND REVEGETATED TO COMPLETE RESTORATION OF THE WETLANDS.

THIS ALTERNATIVE WOULD PROTECT HUMAN HEALTH AND THE ENVIRONMENT FROM RISKS CURRENTLY ASSOCIATED WITH CONTAMINATED SITE SEDIMENTS. THIS ALTERNATIVE IS A RELATIVELY NEW TECHNOLOGY, AND TESTING WILL BE REQUIRED TO DETERMINE THE EFFECTIVENESS OF THIS TECHNIQUE ON NHBB SEDIMENTS AND CONTAMINANTS. IF THE TECHNOLOGY WERE IMPLEMENTABLE, THE REMEDY WOULD OFFER BOTH SHORT- AND LONG-TERM EFFECTIVENESS AND WOULD BE A PERMANENT SOLUTION TO THE CONTAMINATION PROBLEM. IN ADDITION, ALL ARARS WOULD BE MET AND REMEDIATION WOULD RESULT IN

SIGNIFICANT REDUCTION IN THE TOXICITY AND VOLUME OF CONTAMINATED SEDIMENTS.

AS WITH SD #7, THE IMPLEMENTATION OF THIS REMEDY, HOWEVER, COULD PRESENT POTENTIAL ADVERSE HUMAN HEALTH AND ECOLOGICAL IMPACTS FROM EXCAVATING AND/OR DREDGING SEDIMENTS FROM THE WETLANDS, AS DISCUSSED IN SD #7, BY CREATING THE POTENTIAL FOR RE-SUSPENDING CONTAMINATED SEDIMENTS AND PERMITTING MIGRATION OF SITE CONTAMINANTS. IT MAY BE POSSIBLE, HOWEVER, TO MINIMIZE RE-SUSPENSION OF CONTAMINATED SEDIMENTS IF CAP CONSTRUCTION IS TIMED TO TAKE PLACE DURING A PERIOD WHEN THE WATER TABLE IS LOW. IN ADDITION, EXCAVATION OF THE SEDIMENTS WOULD DESTROY PORTIONS OF THE WETLANDS. HOWEVER, THE EXCAVATION COULD BE PERFORMED IN A MANNER THAT MINIMIZES, TO THE EXTENT FEASIBLE, IMPACTS ON AND DISTURBANCE OF THE WETLANDS. FINALLY, THE REMEDY WOULD REQUIRE RESTORATION OF THE AFFECTED WETLANDS, TO THE EXTENT PRACTICABLE.

ESTIMATED PERIOD OF OPERATION: 8 MONTHS

ESTIMATED CAPITAL COST: \$750,290

ESTIMATED OPERATION AND MAINTENANCE COSTS (NET PRESENT WORTH): \$377,031

ESTIMATED TOTAL COST (NET PRESENT WORTH): \$1,127,321

#### B. MANAGEMENT OF MIGRATION (GW) ALTERNATIVES ANALYZED

MANAGEMENT OF MIGRATION ALTERNATIVES ADDRESS CONTAMINANTS IN GROUNDWATER THAT HAVE MIGRATED FROM THE ORIGINAL SOURCE OF CONTAMINATION. AT THE SOUTH MUNICIPAL WATER SUPPLY WELL SITE, CONTAMINANTS HAVE MIGRATED FROM THE VICINITY OF THE NEW HAMPSHIRE BALL BEARINGS FACILITY NORTHEASTERLY TOWARDS NOONE POND. EXPERIENCE AT THE SITE HAS SHOWN THAT PUMPING OF THE SOUTH WELL CAN DRAW GROUNDWATER WITH THESE CONTAMINANTS INTO THE WELL. THE MANAGEMENT OF MIGRATION ALTERNATIVES EVALUATED FOR THE SITE INCLUDE A MINIMAL NO ACTION WITH MONITORING ALTERNATIVE (GW #1); GROUNDWATER EXTRACTION WITH ON-SITE AIR-STRIPPING (GW #3); GROUNDWATER EXTRACTION WITH GAC (GW #4); WELL-HEAD TREATMENT (SOUTH WELL) WITH AIR STRIPPING (GW #6); DEVELOPMENT OF AN ALTERNATE WATER SUPPLY (GW #7); GROUNDWATER EXTRACTION WITH A RADIAL COLLECTOR WELL WITH ON-SITE AIR STRIPPING (GW #8); AND GROUNDWATER EXTRACTION (ACCELERATED) WITH ON-SITE AIR STRIPPING (GW #9).

##### **GW #1**

##### **NO ACTION**

ANALYSIS OF THE NO ACTION ALTERNATIVE IS REQUIRED BY THE NCP AND IS INCLUDED IN THE FS FOR COMPARISON WITH OTHER REMEDIAL ALTERNATIVES. A NO ACTION ALTERNATIVE WOULD BE SELECTED ONLY IF THE SITE POSED LITTLE OR NO RISK TO PUBLIC HEALTH AND THE ENVIRONMENT. UNDER THIS ALTERNATIVE FOR THE SOUTH MUNICIPAL WELL SITE, NO ACTION WOULD BE TAKEN TO REMEDIATE CONTAMINATED GROUNDWATER AT THE SITE. THE CONTAMINANT PLUME WOULD EVENTUALLY ATTENUATE AND CONTAMINANT CONCENTRATIONS WOULD DECREASE, BUT GROUNDWATER CONTAMINANT LEVELS WOULD NOT FALL TO WITHIN THE TARGET CLEANUP LEVELS FOR DRINKING WATER FOR MORE THAN 100 YEARS.

THE NO ACTION ALTERNATIVE DOES NOT PROVIDE OVERALL PROTECTION OF PUBLIC HEALTH AND THE ENVIRONMENT. GROUNDWATER WOULD NOT REACH DRINKING WATER QUALITY ARARS IN THE FORESEEABLE FUTURE. IT DOES NOT REDUCE THE TOXICITY, MOBILITY, OR VOLUME OF CONTAMINANTS IN A REASONABLE AMOUNT OF TIME AND WOULD PERMIT THE CONTAMINATION TO SPREAD FURTHER IN THE REGIONAL GROUNDWATER AQUIFER. NO ACTION WOULD NOT PROVIDE A PERMANENT SOLUTION TO GROUNDWATER CONTAMINATION IN THE SHORT-TERM, AND WOULD BE INEFFECTIVE IN ATTAINING REMEDIAL OBJECTIVES IN THE LONG-TERM.

##### **GW #3**

##### **GROUNDWATER EXTRACTION WITH ON-SITE AIR STRIPPING**

THIS ALTERNATIVE WOULD INVOLVE THE EXTRACTION AND TREATMENT OF GROUNDWATER FROM BOTH NEAR THE NHBB BUILDING AND THE DILUTE PLUME, AND SUBSEQUENT DISCHARGE OF THE TREATED WATER. GROUNDWATER FROM THE NORTHEAST CORNER OF THE NHBB FACILITY (INCLUDING THE HIGHLY CONTAMINATED GZ-4 AREA), WHERE GROUNDWATER CONTAMINANT CONCENTRATIONS ARE HIGHEST, WOULD BE EXTRACTED AT A RATE OF APPROXIMATELY 200 GALLONS PER MINUTE (GPM). AN ADDITIONAL GROUNDWATER EXTRACTION SYSTEM, ALSO CAPABLE OF EXTRACTING APPROXIMATELY 200 GPM, WOULD BE INSTALLED TO DRAW GROUNDWATER FROM THE AREA OF THE DILUTE PLUME. THIS DILUTE PLUME SYSTEM WOULD EXTRACT CONTAMINANTS THAT HAVE ALREADY MIGRATED BEYOND THE NHBB PROPERTY, AND WOULD PROVIDE HYDRAULIC CONTROL OF THE DILUTE PORTION OF THE PLUME.

EXTRACTED GROUNDWATER FROM THE AREA NEAR THE NHBB BUILDING WOULD BE TREATED IN PACKED COLUMN AIR STRIPPERS, WITH THE ADDITION OF PHASE SEPARATION PRIOR TO AIR STRIPPING FOR THE MORE CONTAMINATED GZ-4 AREA GROUNDWATER. UNDER THIS ALTERNATIVE, THE TREATED WATER FROM THE AIR STRIPPERS WOULD BE DISCHARGED TO AN INFILTRATION TRENCH UPGRADIENT OF THE CONTAMINATED NHBB PLUME IN ORDER TO ENHANCE REMOVAL EFFICIENCIES.

A SECOND AIR STRIPPING SYSTEM WOULD BE INSTALLED NEAR THE EXTRACTION WELLS LOCATED IN THE DILUTE PORTION OF THE PLUME. DUE TO THE LOW CONTAMINANT CONCENTRATIONS IN THE GROUNDWATER IN THIS AREA, PHASE SEPARATION AND PRETREATMENT WOULD NOT BE REQUIRED PRIOR TO AIR STRIPPING. WATER EFFLUENT WOULD BE DISCHARGED TO AN INFILTRATION TRENCH INSTALLED BETWEEN THE SECOND AIR STRIPPING TREATMENT SYSTEM AND THE SOUTH WELL. THIS

SECOND INFILTRATION TRENCH WOULD PROVIDE EXTRA PROTECTION FOR THE SOUTH WELL BY CREATING A MORE POSITIVE HYDRAULIC BARRIER BETWEEN THE CONTAMINANT PLUME AND THE WELL.

AS AN ELEMENT OF EXTRACTING CONTAMINANTS NEAR THE NORTHEAST CORNER OF THE NHBB BUILDING, IT MAY BE NECESSARY TO IMPLEMENT TECHNOLOGIES TO ENHANCE CONTAMINANT REMOVAL AND TO ADDRESS THE PRESENCE OF FREE PHASE SOLVENTS IN THE SATURATED ZONE OF THIS AREA. TWO POTENTIALLY APPLICABLE TECHNIQUES ARE CYCLIC PUMPING AND STEAM INJECTION. EITHER OR BOTH OF THESE TECHNOLOGIES COULD BE USED IN CONJUNCTION WITH THE TREATMENT SYSTEM DESCRIBED ABOVE, AND ARE DETAILED IN THE FS.

THE TIME ESTIMATE FOR ACCOMPLISHING GROUNDWATER REMEDIATION WOULD BE APPROXIMATELY 19 TO 32 YEARS FOR THE NHBB AREA GROUNDWATER AND APPROXIMATELY 15 TO 30 YEARS FOR THE DILUTE PLUME. THE RESTORATION TIME IS CONTINGENT UPON TREATMENT OF CONTAMINATED SOILS TO ELIMINATE FURTHER MIGRATION OF VOCs INTO THE GROUNDWATER. THE RANGES PRESENTED REFLECT THE UNCERTAINTIES INHERENT IN ESTIMATING VARIOUS AQUIFER PARAMETERS. THESE UNCERTAINTIES WOULD BE CLARIFIED DURING DESIGN STUDIES. PERIODIC SYSTEM AND GROUNDWATER SAMPLING WOULD BE CONDUCTED TO MONITOR CONTAMINANT CONCENTRATIONS AND TO ASSESS THE EFFECTIVENESS OF SITE REMEDIATION.

THE IMPLEMENTATION OF THIS REMEDIAL ALTERNATIVE WOULD HAVE NO ADVERSE IMPACTS TO THE COMMUNITY. ADVERSE ENVIRONMENTAL IMPACTS AND RISKS TO SITE WORKERS COULD BE CONTROLLED BY IMPLEMENTATION OF APPROPRIATE SAFETY MEASURES AND CONTROL TECHNOLOGIES, AS DESCRIBED IN THE FS. THIS ALTERNATIVE WOULD PROVIDE PROTECTION OF PUBLIC HEALTH AND THE ENVIRONMENT, AND THE GROUNDWATER WOULD COMPLY WITH ALL DRINKING WATER ARARS UPON ATTAINMENT OF THE GROUNDWATER CLEANUP LEVELS. THE REMEDY WOULD PERMANENTLY REDUCE MOBILITY, TOXICITY, AND VOLUME OF GROUNDWATER CONTAMINANTS, AND THE SERVICES AND TECHNOLOGIES NECESSARY FOR ITS IMPLEMENTATION ARE READILY AVAILABLE. ONCE THE GROUNDWATER IS RESTORED, THIS ALTERNATIVE WOULD BE EFFECTIVE IN THE LONG-TERM AND WOULD BE A PERMANENT REMEDY. ITS IMPLEMENTATION WOULD, HOWEVER, INTRODUCE A POTENTIAL CHANGE TO THE GROUNDWATER/WETLANDS RELATIONSHIP, BUT ONLY CAUSING MINIMAL EFFECTS ON THE NEARBY WETLANDS AREAS.

THE PRIMARY PROBLEM WITH THIS ALTERNATIVE IS LENGTH OF TIME NECESSARY TO RESTORE THE GROUNDWATER TO DRINKING WATER QUALITY. THE SPEED OF RESTORATION IS DEPENDANT, IN PART, ON THE RATE AT WHICH CONTAMINATED GROUNDWATER IS PUMPED FROM THE AQUIFER FOR TREATMENT. THIS ALTERNATIVE WOULD NOT PERMIT USE OF THE UNTREATED GROUNDWATER FOR 15 TO 32 YEARS, WHICH COULD BE SHORTENED IF THE RATE OF EXTRACTION AND TREATMENT IS INCREASED. THEREFORE, THIS ALTERNATIVE WOULD NOT ACHIEVE THE REMEDIAL OBJECTIVE OF RESTORING THE GROUNDWATER IN THE SHORTEST PERIOD OF TIME PRACTICABLE.

ESTIMATED PERIOD OF OPERATION: 15 - 32 YEARS

ESTIMATED CAPITAL COST: \$2,067,039

ESTIMATED OPERATION AND MAINTENANCE COSTS (NET PRESENT WORTH): \$6,193,965

ESTIMATED TOTAL COST (NET PRESENT WORTH): \$8,261,004

#### **GW #4**

##### **GROUNDWATER EXTRACTION WITH GAC**

THIS ALTERNATIVE INVOLVES EXTRACTION OF CONTAMINATED GROUNDWATER AS DESCRIBED IN GW #3, WITH THE ONLY SIGNIFICANT DIFFERENCE BEING THE METHOD OF TREATMENT, CARBON ADSORPTION.

UNDER THIS ALTERNATIVE, THE WATER EXTRACTED FROM THE NHBB AREA AND THE DILUTE PORTION OF THE PLUME WOULD BE PUMPED TO SEPARATE ACTIVATED CARBON ADSORPTION TREATMENT SYSTEMS, LOCATED NEAR THE EXTRACTION WELLS. VOCs WOULD BIND TO THE CARBON AS THE WATER MOVES THROUGH THE SYSTEM. THE CONTAMINATED CARBON WOULD BE SENT TO A LICENSED OFF-SITE TREATMENT FACILITY FOR REGENERATION. SINCE THE CONTAMINANTS ARE PERMANENTLY REMOVED FROM GROUNDWATER DURING CARBON ADSORPTION, THE TREATMENT IS IRREVERSIBLE. THE TREATED WATER WOULD BE PIPED TO INFILTRATION TRENCHES FOR DISCHARGE AS IN GW #3.

AS WITH GW #3, THE IMPLEMENTATION OF THIS REMEDIAL ALTERNATIVE WOULD HAVE NO ADVERSE IMPACTS TO THE COMMUNITY. ADVERSE ENVIRONMENTAL EFFECTS AND RISKS TO WORKERS COULD BE CONTROLLED BY IMPLEMENTATION OF APPROPRIATE SAFETY MEASURES AND CONTROL TECHNOLOGIES, AS DETAILED IN THE FS. ITS IMPLEMENTATION WOULD, HOWEVER, INTRODUCE A POTENTIAL CHANGE TO THE GROUNDWATER/WETLANDS RELATIONSHIP, BUT ONLY CAUSING MINIMAL EFFECTS ON THE NEARBY WETLANDS AREAS. TREATMENT OF CONTAMINATED GROUNDWATER WITH CARBON ADSORPTION IS EFFECTIVE IN BOTH THE SHORT AND LONG TERMS, AND WOULD BE A PERMANENT REMEDY. THIS TREATMENT WOULD REDUCE CONTAMINANT CONCENTRATIONS IN THE DILUTE PLUME GROUNDWATER TO THE CLEANUP TARGET LEVELS. THE TIME ESTIMATE FOR ACCOMPLISHING THESE TARGET LEVELS IS THE SAME AS FOR GW #3, CONTINGENT UPON TREATMENT OF CONTAMINATED SOILS TO ELIMINATE FURTHER MIGRATION OF VOCs INTO THE GROUNDWATER.

THIS REMEDIAL ALTERNATIVE REDUCES THE TOXICITY, MOBILITY, AND VOLUME OF CONTAMINANTS AND OF CONTAMINATED MEDIA, AND COMPLIES WITH ALL ARARS. CARBON ADSORPTION HAS BEEN SHOWN TO BE AN EFFECTIVE TECHNOLOGY FOR REMOVING VOCs FROM GROUNDWATER, AND THE SERVICES AND TECHNOLOGIES NECESSARY FOR ITS IMPLEMENTATION ARE READILY AVAILABLE.

ONE DIFFERENCE BETWEEN THIS TREATMENT APPROACH AND THE AIR STRIPPING APPROACH OF GW #3 IS THAT THE CARBON WOULD HAVE TO BE MAINTAINED, PRESENTING THE NEED FOR LONG-TERM MANAGEMENT OF TREATMENT RESIDUALS. MAINTAINING THE ACTIVATED CARBON INCREASES THE COSTS OF THIS ALTERNATIVE BEYOND THE COSTS OF GW #3. HOWEVER, THE PRIMARY PROBLEM WITH THIS ALTERNATIVE, AS WITH GW #3, IS LENGTH OF TIME NECESSARY TO RESTORE THE GROUNDWATER TO DRINKING WATER QUALITY. THE SPEED OF RESTORATION IS DEPENDANT, IN PART, ON THE RATE AT WHICH CONTAMINATED GROUNDWATER IS PUMPED FROM THE AQUIFER FOR TREATMENT. THIS ALTERNATIVE WOULD NOT PERMIT USE OF THE UNTREATED GROUNDWATER FOR 15 TO 32 YEARS, WHICH COULD BE SHORTENED IF THE RATE OF EXTRACTION AND TREATMENT IS INCREASED. THEREFORE, THIS ALTERNATIVE WOULD NOT ACHIEVE THE REMEDIAL OBJECTIVE OF RESTORING THE GROUNDWATER IN THE SHORTEST PERIOD OF TIME PRACTICABLE.

ESTIMATED PERIOD OF OPERATION: 15 - 32 YEARS  
ESTIMATED CAPITAL COST: \$1,485,940  
ESTIMATED OPERATION AND MAINTENANCE COSTS (NET PRESENT WORTH): \$7,266,602  
ESTIMATED TOTAL COST (NET PRESENT WORTH): \$9,752,542

#### **GW #6**

##### **WELL-HEAD TREATMENT (SOUTH WELL) WITH AIR STRIPPING**

THIS ALTERNATIVE WOULD DIRECTLY TREAT GROUNDWATER FOR THE PETERBOROUGH PUBLIC WATER SUPPLY THROUGH WELL-HEAD TREATMENT OF WATER EXTRACTED BY THE SOUTH MUNICIPAL WELL. WATER WOULD BE EXTRACTED AT 450 GALLONS PER MINUTE (GPM), WHICH IS THE RATE AT WHICH WATER WAS PUMPED PRIOR TO DISCOVERY OF THE CONTAMINATION, AND TREATED WITH PACKED COLUMN AIR STRIPPING. PUMPING FROM THE SOUTH WELL AT 450 GPM, 24 HOURS PER DAY, IS EXPECTED TO DRAW THE CONTAMINANT PLUME INTO THE WELL. CONTAMINANT CONCENTRATIONS SHOULD NOT EXCEED 200 PARTS PER BILLION (PPB) INITIALLY, BUT CONTINUED PUMPING WITHOUT TREATMENT OR ISOLATION OF THE GZ-4 AREA SOILS AND GROUNDWATER WOULD DRAW INCREASINGLY HIGHER CONTAMINANT CONCENTRATIONS INTO THE WELL.

A SINGLE STRIPPING TOWER APPROXIMATELY FIVE FEET IN DIAMETER AND 20 FEET HIGH WOULD RECEIVE THE GROUNDWATER DIRECTLY FROM THE WELL. TREATED WATER FROM THE TOWER WOULD THEN ENTER A HOLDING TANK FROM WHICH IT WOULD BE PUMPED TO THE PUBLIC WATER DISTRIBUTION SYSTEM. PERIODIC MONITORING OF THE TREATED WATER WOULD BE PERFORMED TO VERIFY THE EFFICIENCY OF CONTAMINANT REMOVAL PRIOR TO PUBLIC DISTRIBUTION OF THE TREATED WATER. IN ADDITION, GROUNDWATER MONITORING BETWEEN THE CURRENT CONTAMINANT PLUME AND THE SOUTH WELL WOULD BE PERFORMED TO PROVIDE INFORMATION ON THE BEHAVIOR OF THE PLUME UNDER FULL SOUTH WELL PUMPING CONDITIONS.

WELL-HEAD TREATMENT, BY ITSELF, WOULD NOT REMEDIATE SITE GROUNDWATER CONTAMINATION AND WOULD NOT RESTORE THE AQUIFER TO DRINKING WATER QUALITY. ALTHOUGH IT WOULD ENSURE THAT THE PUBLIC WATER SUPPLY IS TREATED TO REMOVE ANY CONTAMINANTS PRIOR TO DISTRIBUTION, WELL-HEAD TREATMENT WOULD NOT TREAT THE HIGHLY CONTAMINATED GROUNDWATER IN THE AREA OF GZ-4 AND WOULD ALLOW CONTAMINANT MIGRATION TO CONTINUE. FOR THIS REASON, POTENTIAL RISKS TO HUMAN HEALTH AND THE ENVIRONMENT FOLLOWING ITS INSTALLATION AND OPERATION WOULD BE SUBSTANTIAL. WHILE THE EXCESSIVE RISKS TO HUMANS ASSOCIATED WITH INGESTION OF CONTAMINATED GROUNDWATER FROM THE SOUTH WELL WOULD BE SUBSTANTIALLY DECREASED DUE TO THE DIRECT TREATMENT OF THE WELL WATER, WELL-HEAD TREATMENT DOES NOT PROTECT AGAINST RISKS FROM THE DEVELOPMENT OF PRIVATE WELLS IN THE CONTAMINATED AQUIFER AND USE OF THE CONTAMINATED WATER.

THIS ALTERNATIVE WOULD BE EFFECTIVE IN THE SHORT-TERM FOR PROVIDING SAFE PUBLIC WATER SUPPLIES. IMPLEMENTATION WOULD PRESENT MINIMAL AND CONTROLLABLE ADVERSE ENVIRONMENTAL IMPACTS, AND NO ADVERSE IMPACTS TO THE COMMUNITY OR SITE WORKERS. ALTHOUGH THIS TREATMENT WOULD MEET ALL ARARS DIRECTLY PERTAINING TO THE TREATMENT OF SOUTH WELL WATER, IT WOULD NOT REDUCE THE LEVELS OF CONTAMINATION TO MEET DRINKING WATER STANDARDS THROUGHOUT THE AQUIFER. THE REMEDY WOULD NOT RESTORE WHAT HAD BEEN A SOURCE OF DRINKING WATER PRIOR TO THE CONTAMINATION. THIS ALTERNATIVE, THEREFORE, WOULD NOT RESULT IN SIGNIFICANT AND PERMANENT REDUCTION IN THE TOXICITY, MOBILITY, OR VOLUME OF CONTAMINANTS OR OF CONTAMINATED MEDIA. SINCE THE CONTAMINATED WATER WOULD CONTINUE TO BE DRAWN TO THE WELL FOR TREATMENT, THE WELL-HEAD TREATMENT WOULD BE REQUIRED FOR A LONG PERIOD OF TIME AND THE REMEDIAL ACTION WOULD INCUR SUBSTANTIAL COSTS TO OPERATE AND MAINTAIN.

ESTIMATED PERIOD OF REMEDIATION: 30 YEARS  
ESTIMATED CAPITAL COST: \$925,466  
ESTIMATED OPERATION AND MAINTENANCE COSTS (NET PRESENT WORTH): \$2,414,311  
ESTIMATED TOTAL COST (NET PRESENT WORTH): \$3,339,777

#### **GW #7**

##### **DEVELOPMENT OF AN ALTERNATE WATER SUPPLY**

UNDER THIS ALTERNATIVE, AN ALTERNATE WATER SUPPLY WOULD BE PROVIDED TO THE SOUTH MUNICIPAL WELL SITE COMMUNITY. THE EVALUATION OF THIS ALTERNATIVE WAS BASED ON THE WHITMAN AND HOWARD REPORT (1985) PREPARED FOR THE TOWN BY WHITMAN AND HOWARD ENGINEERING, INC. THE 1985 REPORT DETERMINED THAT THERE ARE SEVERAL POTENTIAL WELL SITES IN THE TOWN OF PETERBOROUGH, IN ADDITION TO THE WELLS CURRENTLY SUPPLYING THE TOWN WITH WATER.

AREAS DEFINED TO HAVE "MAJOR GROUNDWATER POTENTIAL" IN THIS REPORT, AND WHICH HAVE NOT YET BEEN DEVELOPED AS TOWN WATER SUPPLIES, INCLUDE THE GROVE STREET AQUIFER, THE NORTHERN SWAMP, AND THE BOGLE ROAD AREAS.

DEVELOPMENT OF AN ALTERNATE WATER SUPPLY WOULD REQUIRE TESTING OF THE POTENTIAL AQUIFER AREAS TO DETERMINE WHETHER WATER YIELDS ARE SUFFICIENT TO MEET THE TOWN'S NEEDS, AND TO VERIFY THAT GROUNDWATER FROM THESE AREAS IS POTABLE. FOLLOWING TESTING, A WELL WOULD BE INSTALLED WITH THE APPROPRIATE PIPING TO CONNECT THE NEW WATER SUPPLY TO THE EXISTING TOWN SYSTEM FOR DISTRIBUTION TO THE SOUTH END OF TOWN. BOTH THE TESTING AND THE WELL AND PIPING INSTALLATION WOULD BE IMPLEMENTED EASILY AND WOULD PRESENT NO TECHNICAL DIFFICULTIES.

WITH THIS ALTERNATIVE, SHORT-TERM EFFECTIVENESS WOULD BE ACHIEVED WITH MINIMAL AND CONTROLLABLE ADVERSE IMPACTS TO SITE WORKERS, THE COMMUNITY, AND THE ENVIRONMENT. THIS ALTERNATIVE WOULD BE EFFECTIVE IN THE SHORT-TERM FOR PROVIDING DRINKING WATER FROM THE AQUIFER AND PROVIDING SAFE PUBLIC WATER SUPPLIES. IMPLEMENTATION WOULD PRESENT MINIMAL AND CONTROLLABLE ADVERSE ENVIRONMENTAL IMPACTS, AND NO ADVERSE IMPACTS TO THE COMMUNITY OR SITE WORKERS. HOWEVER, THIS APPROACH DOES NOT PROTECT AGAINST RISKS FROM THE DEVELOPMENT OF PRIVATE WELLS IN THE CONTAMINATED AQUIFER AND USE OF THE CONTAMINATED WATER.

THIS ALTERNATIVE WOULD NOT ATTAIN ALL ARARS DIRECTLY PERTAINING TO DRINKING WATER IN THE AQUIFER AND THE REMEDY WOULD NOT RESTORE WHAT HAD BEEN A SOURCE OF DRINKING WATER PRIOR TO THE CONTAMINATION. THIS ALTERNATIVE, THEREFORE, WOULD NOT RESULT IN SIGNIFICANT AND PERMANENT REDUCTION IN THE TOXICITY, MOBILITY, OR VOLUME OF CONTAMINANTS OR OF CONTAMINATED MEDIA. ALTHOUGH THIS ALTERNATIVE WOULD SIGNIFICANTLY REDUCE RISKS TO HUMAN HEALTH AND THE ENVIRONMENT BY PROVIDING A NEW, CLEAN WATER SUPPLY, IT WOULD NOT ADDRESS THE CONTAMINANT MIGRATION THAT WILL CONTINUE FROM THE GZ-4 AREA.

ESTIMATED CAPITAL COST (NET PRESENT WORTH): \$641,118

ESTIMATED TOTAL COST (NET PRESENT WORTH): \$641,118

#### **GW #8**

##### **GROUNDWATER EXTRACTION WITH A RADIAL COLLECTOR WELL WITH AIR STRIPPING**

THIS ALTERNATIVE IS SIMILAR TO GW #3, THE ONLY DIFFERENCE BEING THE METHOD OF GROUNDWATER EXTRACTION NEAR THE NORTHEAST CORNER OF THE NHBB BUILDING. AT THAT LOCATION, A SINGLE CONCRETE CAISSON WOULD BE INSTALLED. FROM THE CAISSON, SCREENED WELLS WOULD BE EXTENDED RADIALLY AT A CHOSEN DEPTH. THESE RADIAL WELLS WOULD BE CAPABLE OF EXTRACTING GROUNDWATER FROM THE MOST CONTAMINATED PORTION OF THE AQUIFER AT A RATE OF 200-300 GALLONS PER MINUTE. THIS METHOD OF EXTRACTION IS THEORETICALLY MORE EFFICIENT THAN EXTRACTION FROM CONVENTIONAL WELLS SINCE THE HORIZONTAL SCREENING ALLOWS GROUNDWATER TO BE REMOVED FROM A PARTICULAR DEPTH AT HIGH VOLUME. THE ABILITY TO EXTRACT HIGH VOLUMES OF GROUNDWATER FROM A SINGLE DEPTH ALLOWS PLACEMENT OF HORIZONTAL WELLS AT SEVERAL POINTS WITHIN THE MOST HIGHLY CONTAMINATED "LAYER" OF THE AQUIFER, INCREASING THE EFFICIENCY OF CONTAMINANT REMOVAL. IN ADDITION, HIGH VOLUME EXTRACTION FROM A SINGLE DEPTH WOULD INCREASE THE GROUNDWATER FLOW RATE THROUGH THE EXTRACTION LAYER, PRESUMABLY ENHANCING CONTAMINANT REMOVAL. INSTALLATION OF FOUR RADIAL WELLS, EXTENDING FROM THE CAISSON AT A DEPTH OF 55 FEET, IS EXPECTED TO BE SUFFICIENT TO TREAT THE CONTAMINATION. DILUTE PLUME EXTRACTION AND TREATMENT WILL STILL BE NECESSARY. THE TIME ESTIMATE FOR ACCOMPLISHING GROUNDWATER REMEDIATION WOULD BE THE SAME AS FOR GW #3. THE RATE OF RESTORATION WOULD BE CONTINGENT UPON TREATMENT OF CONTAMINATED SOILS TO ELIMINATE FURTHER MIGRATION OF VOCS INTO THE GROUNDWATER. PERIODIC SYSTEM AND GROUNDWATER SAMPLING WOULD BE CONDUCTED TO MONITOR CONTAMINANT CONCENTRATIONS AND TO ASSESS THE EFFECTIVENESS OF SITE REMEDIATION.

THE IMPLEMENTATION OF THIS REMEDIAL ALTERNATIVE WOULD HAVE NO ADVERSE IMPACTS TO THE COMMUNITY. ADVERSE ENVIRONMENTAL IMPACTS AND RISKS TO SITE WORKERS COULD BE CONTROLLED BY IMPLEMENTATION OF APPROPRIATE SAFETY MEASURES AND CONTROL TECHNOLOGIES, AS DESCRIBED IN THE FS. THIS ALTERNATIVE WOULD PROVIDE GOOD OVERALL PROTECTION OF PUBLIC HEALTH AND THE ENVIRONMENT, AND THE GROUNDWATER WOULD COMPLY WITH ALL DRINKING WATER ARARS UPON ATTAINMENT OF THE GROUNDWATER CLEANUP LEVELS. THE REMEDY WOULD PERMANENTLY REDUCE MOBILITY, TOXICITY AND VOLUME OF GROUNDWATER CONTAMINANTS, AND THE SERVICES AND TECHNOLOGIES NECESSARY FOR ITS IMPLEMENTATION ARE READILY AVAILABLE. ONCE THE GROUNDWATER IS RESTORED, THIS ALTERNATIVE WOULD BE EFFECTIVE IN THE LONG-TERM AND WOULD BE A PERMANENT REMEDY. THE RATE OF GROUNDWATER REMEDIATION WOULD BE CONTINGENT UPON THE ELIMINATION OF CONTAMINANT MIGRATION FROM THE SOILS IN THE GZ-4 AREA. THE REMEDY WOULD BE PERMANENT UPON COMPLETION OF GROUNDWATER REMEDIATION.

ESTIMATED PERIOD OF OPERATION: 15 - 32 YEARS

ESTIMATED CAPITAL COST: \$2,909,827

ESTIMATED OPERATION AND MAINTENANCE COSTS (NET PRESENT WORTH): \$6,193,965

ESTIMATED TOTAL COST (NET PRESENT WORTH): \$9,103,792

**GROUNDWATER EXTRACTION (ACCELERATED) WITH ON-SITE AIR STRIPPING**

THIS IS THE PREFERRED ALTERNATIVE FOR GROUNDWATER REMEDIATION AND IS DESCRIBED IN SECTION X., THE SELECTED REMEDY.

**#TSR****X. THE SELECTED REMEDY**

THE SELECTED REMEDIAL ACTION IS A COMPREHENSIVE APPROACH CONSISTING OF SOURCE CONTROL COMPONENTS FOR SOILS AND SEDIMENTS, AND A MANAGEMENT OF MIGRATION COMPONENT LISTED IN SECTION VII.

**A. DESCRIPTION OF THE SELECTED REMEDY****1. REMEDIAL ACTION OBJECTIVES/CLEANUP GOALS**

THE SELECTED REMEDY WAS DEVELOPED TO SATISFY THE FOLLOWING REMEDIAL OBJECTIVES WHICH WILL GUIDE THE DESIGN OF THE REMEDY AND BE USED TO MEASURE THE SUCCESS OF THE REMEDY.

- A. SOIL. SPECIFIC SOIL TARGET CLEANUP LEVELS WILL BE MET IN THE REMEDIAL ACTION IN ORDER TO REDUCE CONTAMINANT LEVELS TO ELIMINATE THE POTENTIAL MIGRATION OF CONTAMINANTS FROM THE SOILS INTO THE GROUNDWATER AT LEVELS EXCEEDING GROUNDWATER CLEANUP TARGET LEVELS.

THE TARGET SOIL CLEANUP LEVELS ARE LISTED BELOW FOR EACH OF THE GROUNDWATER INDICATOR CHEMICALS. THOSE CONTAMINANTS WHICH ARE ALSO INDICATOR CHEMICALS FOR SOILS ARE SHOWN IN BOLD.

CONTAMINANT	TARGET LEVEL (PPB)
TETRACHLOROETHYLENE	4.5
1,1,1-TRICHLOROETHANE	76
TRICHLOROETHYLENE	1.5
1,1-DICHLOROETHYLENE	1.1
TOLUENE	1500
1,1-DICHLOROETHANE	60
VINYL CHLORIDE <sup>0</sup> .	28

THE EXCESS CANCER RISK ASSOCIATED WITH DIRECT CONTACT AND INGESTION OF SOILS CONTAINING THESE TARGET LEVELS IS EXPECTED TO BE  $2.92 \times 10^{-10}$ , A LEVEL WHICH IS MORE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT THAN THE RISK RANGE GENERALLY CONSIDERED BY EPA TO BE PROTECTIVE.

THE SOIL TARGET CLEANUP LEVELS SET FORTH IN THIS DOCUMENT ARE, IN PART, BASED ON ESTIMATES OF SOIL CHARACTERISTICS DEVELOPED DURING THE RI/FS. DURING THE DESIGN OF THE REMEDY, ADDITIONAL SOIL CHARACTERIZATION WILL TAKE PLACE THAT COULD PROVIDE BETTER INFORMATION FROM ACTUAL FIELD DATA. WHERE APPROPRIATE, IF ANALYSIS OF NEW DATA INDICATES THAT THE PARAMETERS USED IN THE MODEL SHOULD BE ADJUSTED TO REFLECT ACTUAL FIELD CONDITIONS, THE SOIL TARGET CLEANUP LEVELS MAY BE ADJUSTED, AND AN EXPLANATION OF SIGNIFICANT DIFFERENCES ISSUED, IF APPROPRIATE.

**B. SEDIMENTS. SPECIFIC SEDIMENT TARGET CLEANUP LEVELS WILL BE MET IN THE REMEDIAL ACTION IN ORDER TO:**

- ELIMINATE, TO THE MAXIMUM EXTENT PRACTICABLE, THE POTENTIAL EXPOSURE OF HUMANS OR ENVIRONMENTAL RECEPTORS TO SITE RELATED CONTAMINANTS;
- PREVENT THE POTENTIAL MIGRATION OF CONTAMINANTS FROM THE SEDIMENTS, INCLUDING MIGRATION DURING IMPLEMENTATION OF THE REMEDY; AND
- IMPLEMENT THE REMEDY IN A MANNER THAT MINIMIZES DISTURBANCE OF THE WETLANDS AND RESTORES THE WETLANDS, TO THE EXTENT PRACTICABLE.

TO MEET THESE OBJECTIVES, SEDIMENTS IN THE WETLANDS CONTAMINATED WITH PCBS AT LEVELS GREATER THAN 1 PPM OR WITH PAHS AT LEVELS GREATER THAN 1.1 PPM WILL BE EXCAVATED AND DISPOSED OFF-SITE. FURTHER, THE REMEDY SELECTED WILL INCLUDE MEASURES TO PREVENT THE POTENTIAL MIGRATION OF CONTAMINATED SEDIMENTS DURING IMPLEMENTATION. THE REMEDY WILL ALSO INCLUDE PROVISIONS TO MINIMIZE DESTRUCTION OF THE WETLANDS AREA AND TO ENSURE THAT DAMAGED AREAS IN THE WETLANDS WILL BE RESTORED TO THE MAXIMUM EXTENT PRACTICABLE.

THE EXCESS CANCER RISK RESULTING FROM THE TARGET SEDIMENT CLEANUP LEVELS WOULD BE  $2.9 \times 10^{-7}$  FOR PCBS AND  $1 \times 10^{-6}$  FOR PAHS, FOR A TOTAL RISK OF APPROXIMATELY  $1.3 \times 10^{-6}$ , WHICH IS PROTECTIVE OF HUMAN HEALTH.

C. GROUNDWATER. SPECIFIC GROUNDWATER TARGET CLEANUP LEVELS WILL BE MET IN THE REMEDIAL ACTION IN ORDER TO:

- RESTORE THE CONTAMINATED PORTION OF THE AQUIFER, INCLUDING ALL OF THE "DILUTE PLUME" AREA, TO DRINKING WATER QUALITY (MCLS) IN AS SHORT A TIME AS PRACTICABLE;
- PREVENT THE MIGRATION OF CONTAMINATED GROUNDWATER INTO UNCONTAMINATED PORTIONS OF THE AQUIFER;
- IMPLEMENT A GROUNDWATER EXTRACTION SYSTEM WHICH CREATES A BARRIER BETWEEN HIGHLY CONTAMINATED GROUNDWATER IN THE NHBB AREA AND THE DILUTE PLUME AREA, SO THAT USE OF THE PORTION OF THE AQUIFER AFFECTED BY THE DILUTE PLUME COULD OCCUR INDEPENDENT OF THE RESTORATION OF THE NHBB AREA; AND
- IMPLEMENT A GROUNDWATER EXTRACTION SYSTEM WHICH CREATES A BARRIER BETWEEN THE DILUTE PLUME AREA AND THE SOUTH MUNICIPAL WELL, TO PERMIT RESTRICTED USE OF THE SOUTH WELL IN THE EVENT OF WATER SUPPLY EMERGENCIES PRIOR TO FULL ATTAINMENT OF GROUNDWATER CLEANUP TARGET LEVELS IN THE DILUTE PLUME.

THE TARGET GROUND WATER CLEANUP LEVELS ARE LISTED BELOW FOR EACH OF THE GROUNDWATER INDICATOR CHEMICALS.

CONTAMINANT	TARGET LEVEL PC
TETRACHLOROETHYLENE	5
1,1,1-TRICHLOROETHANE	200
TRICHLOROETHYLENE	5
1,1-DICHLOROETHYLENE	7
TOLUENE	2000
1,1-DICHLOROETHANE	810
VINYL CHLORIDE	2

OF THE INDICATOR CHEMICALS, TETRACHLOROETHYLENE IS THE MOST RESISTANT TO TREATMENT BASED ON RELATIVE WATER SOLUBILITIES AND SOIL ADSORPTION COEFFICIENTS. THEREFORE, IT IS EXPECTED THAT CONCENTRATIONS OF ALL OTHER INDICATOR CHEMICALS WILL DECREASE PROPORTIONALLY TO, OR MORE QUICKLY THAN CONCENTRATIONS OF TETRACHLOROETHYLENE. THUS, AT THE CONCLUSION OF THE GROUNDWATER REMEDIATION, CONCENTRATIONS OF EACH GROUNDWATER INDICATOR CHEMICAL WILL BE AT OR BELOW ITS TARGET LEVEL. THE CARCINOGENIC RISKS ASSOCIATED WITH POST-REMEDICATION INDICATOR CHEMICAL CONCENTRATIONS ARE EXPECTED TO RANGE FROM  $7.7 \times 10^{-6}$  TO  $1.0 \times 10^{-5}$ . THE TARGET LEVELS WERE ESTABLISHED IN ORDER TO REMEDIATE THE GROUNDWATER SO THE AQUIFER MAY ONCE AGAIN BE A SOURCE OF DRINKING WATER FOR THE TOWN OF PETERBOROUGH. THE TARGET LEVELS FOR GROUNDWATER ARE BASED ON MAXIMUM CONTAMINANT LEVELS (MCLS) ESTABLISHED UNDER THE FEDERAL SAFE DRINKING WATER ACT AND THE CORRESPONDING STANDARDS OF THE STATE OF NEW HAMPSHIRE, EXCEPT FOR TETRACHLOROETHYLENE AND 1,1-DICHLOROETHANE. THE TARGET LEVEL FOR TETRACHLOROETHYLENE IS BASED UPON A PROPOSED MCL WHILE THE TARGET LEVEL FOR L,L-DICHLOROTHANE IS BASED UPON THE NEW HAMPSHIRE DEPARTMENT OF PUBLIC HEALTH SERVICE CONSUMPTION ADVISORY FOR WATER SUPPLIES, SINCE NO MCL HAS BEEN PROMULGATED.

IT IS ESTIMATED THAT THE GROUNDWATER TARGET CLEANUP LEVELS UNDER THE REMEDY SHOULD BE ATTAINED IN THE DILUTE PLUME IN 7.5 YEARS AT A GROUNDWATER EXTRACTION RATE OF 400 GPM. TARGET LEVELS FOR THE GROUNDWATER IN THE NHBB AREA, NEAR THE GZ-4 WELL, SHOULD BE ATTAINED IN 19 TO 32 YEARS AT A GROUNDWATER EXTRACTION RATE OF 200 GPM. HOWEVER, GROUNDWATER IN THAT AREA MAY NOT ACHIEVE TARGET LEVELS WITHIN 19 TO 32 YEARS DUE TO THE DIFFICULTIES IN EXTRACTING SUCH HIGHLY CONTAMINATED GROUNDWATER. THE RATE OF RESTORATION OF THIS REMEDY, AS SET FORTH IN THIS DOCUMENT, IS CALCULATED, IN PART, BASED ON ESTIMATES OF AQUIFER AND SOIL CHARACTERISTICS DEVELOPED DURING THE RI/FS. IF DURING THE PRELIMINARY DESIGN, IT IS DETERMINED THAT THE EXTRACTION RATE EVALUATED IN THE FS (400 GPM IN THE DILUTE PLUME AND 200 GPM IN THE NHBB AREA) AND THE NUMBER AND CONFIGURATION OF EXTRACTION WELLS SPECIFIED FOR EACH AREA WILL NOT RESULT IN A RESTORATION TIME SIMILAR TO THAT SPECIFIED ABOVE, THE EXTRACTION RATES, AND NUMBER AND CONFIGURATION OF WELLS MAY BE ADJUSTED.

## 2. DESCRIPTION OF REMEDIAL COMPONENTS

AFTER EVALUATING ALL OF THE FEASIBLE ALTERNATIVES, EPA IS SELECTING A REMEDY WITH SIX COMPONENTS TO ADDRESS SOIL, SEDIMENT, AND GROUNDWATER CONTAMINATION AT THE SITE:

### A. SL #7 IN-SITU VACUUM EXTRACTION OF CONTAMINATED SOILS

AN IN-SITU VACUUM EXTRACTION SYSTEM (VES) WILL BE INSTALLED TO REDUCE CONTAMINANT LEVELS IN THE 7500 CUBIC YARDS OF ON-SITE SOILS THAT ARE ABOVE TARGET CLEANUP LEVELS. SINCE THE TREATMENT IS PERFORMED IN-SITU (I.E., IN PLACE), NO EXCAVATION AND SUBSEQUENT BACKFILLING OF TREATED SOILS WILL BE NECESSARY. THE IN-SITU VACUUM EXTRACTION WILL BE USED TO REMOVE VOCs FROM CONTAMINATED SOILS ABOVE THE WATER TABLE. VES IS A RELATIVELY NEW TECHNOLOGY THAT HAS BEEN DEMONSTRATED AT THE GROVELAND WELLS SUPERFUND SITE IN GROVELAND, MASSACHUSETTS. IT IS DESCRIBED BRIEFLY, BELOW.

A VACUUM PUMP EXTRACTS SUBSURFACE ORGANIC CONTAMINANTS AS VAPORS THROUGH PERFORATED PIPES BURIED JUST ABOVE THE WATER TABLE. A VACUUM IS DEVELOPED WITHIN THE SOIL MATRIX IN ORDER TO INDUCE AIR AND CONTAMINANT FLOW THROUGH THE PORE STRUCTURE. AS SOIL GAS MIGRATES THROUGH THE PORE SPACES, MASS TRANSFER BETWEEN THE TRAPPED RESIDUAL UNSATURATED CONTAMINATION AND THE AIR OCCURS, RELEASING THE CONTAMINATION. THIS FACILITATES CONTAMINANT REMOVAL WITHOUT SOIL EXCAVATION. REPORTS INDICATE SIGNIFICANT QUANTITIES OF CONTAMINATION CAN BE REMOVED IN THIS MANNER IN A RELATIVELY SHORT TIME FRAME.

VACUUM EXTRACTION IS CLASSIFIED AS AN ACTIVE VAPOR COLLECTION SYSTEM. IT CONSISTS OF VAPOR EXTRACTION WELLS, VAPOR COLLECTION HEADERS, VACUUM BLOWERS OR PUMPS, AND VAPOR COLLECTION (CONDENSERS) AND/OR VAPOR TREATMENT (CARBON ADSORPTION) EQUIPMENT.

TWO AREAS AT THE SITE WILL BE SUBJECT TO THE VACUUM EXTRACTION SYSTEM. THE DEPTH TO GROUND WATER IN THESE AREAS VARIES FROM 15 FEET AT THE NORTHEAST CORNER OF THE NHBB FACILITY TO 7 FEET IN THE AREA NEAR WELL GZ-105. A MAXIMUM AREA OF 7500 SQUARE FEET IS ESTIMATED FOR VACUUM EXTRACTION. THIS AREA WILL BE CONFIRMED THROUGH ADDITIONAL SOIL SAMPLING DURING A PILOT PLANT STUDY STAGE OF REMEDIAL DESIGN. AS GROUND WATER EXTRACTION AND TREATMENT SYSTEMS ARE INSTALLED, THE GROUND WATER DEPTH WILL DROP, ALLOWING FOR IMPROVED EFFICIENCIES. ALTHOUGH THE LENGTH OF TIME FOR TREATMENT IS DEPENDENT UPON EXTRACTION EFFICIENCY AND ACTUAL SOIL AREAS TO BE TREATED (BOTH OF WHICH WILL BE FURTHER DEFINED DURING THE PILOT PLANT STUDY STAGE), THE FS ESTIMATED THAT THE VES COULD ATTAIN TARGET LEVELS AFTER TWO YEARS OF OPERATION. CONTINUOUS MONITORING OF THE OFF-GASES WILL OCCUR TO EVALUATE THE EFFECTIVENESS OF THE TECHNOLOGY.

THIS ALTERNATIVE IS EXPECTED TO REQUIRE RELATIVELY LITTLE TIME TO IMPLEMENT. SEVERAL VACUUM WELLS CAN BE COMPLETED BY A SINGLE CREW IN A DAY AND COLLECTION PIPING AND MECHANICAL EQUIPMENT CAN BE INSTALLED CONCURRENTLY. NO SOIL EXCAVATION IS REQUIRED. VAPOR EXTRACTION CAN BE STARTED UPON COMPLETION OF THE SYSTEM AND IMMEDIATE REMOVAL OF CONTAMINANTS REALIZED.

THE EXTRACTED GAS WILL CONTAIN HIGH LEVELS OF VOLATILE ORGANIC COMPOUNDS (VOCs) AND MOISTURE. MOISTURE WILL BE REMOVED BY A SLOPING HEADER FOLLOWED BY A WATER COOLED CONDENSER TO REMOVE ANY REMAINING MOISTURE AND SOME VOCs. WATER FOR THE CONDENSER WILL BE SUPPLIED BY THE GROUND WATER TREATMENT SYSTEM RECOMMENDED FOR THE MANAGEMENT OF MIGRATION ALTERNATIVE. MOISTURE COLLECTED IN THE CONDENSER WILL BE RETURNED TO THE GROUND WATER TREATMENT SYSTEM FOR TREATMENT. THE SYSTEM PROVIDES A HIGH DEGREE OF FLEXIBILITY. VALVE ADJUSTMENTS ENABLE THE OPERATOR TO MAXIMIZE (OR MINIMIZE) FLOW FROM AN AREA. FLOW ADJUSTMENTS ARE MADE INITIALLY SO THAT MOST OF THE EXTRACTED FLOW IS FROM THE AREA OF HIGHEST CONTAMINATION. AS CONCENTRATIONS ARE FOUND TO DECREASE, ADJUSTMENTS CAN BE MADE SO THAT MOST OF THE FLOW IS DIRECTED TOWARD AREAS HAVING THE HIGHEST CONTAMINANT LEVELS. AN ACTIVATED CARBON CANISTER OR OTHER POLLUTION CONTROL DEVICE WILL BE USED TO CLEAN THE AIR STREAM BEFORE IT IS DISCHARGED TO THE ATMOSPHERE.

### B. SD #5 EXCAVATION AND/OR DREDGING WITH DEWATERING OF SEDIMENTS AND OFF-SITE DISPOSAL

THIS REMEDY WILL REMOVE SEDIMENTS IN THE WETLANDS CONTAMINATED WITH PCBs AT LEVELS GREATER THAN 1 PPM OR WITH PAHS AT LEVELS GREATER THAN 1.1 PPM, ESTIMATED TO TOTAL 1170 CUBIC YARDS. THE EXCAVATED SEDIMENTS WILL BE DEWATERED, PLACED IN CONTAINERS, AND TRANSPORTED TO AN OFF-SITE, LICENSED RCRA LANDFILL FOR DISPOSAL.

WHILE PCBs AND PAHS HAVE BEEN FOUND IN THE TOP SIX TO TWELVE INCHES OF SEDIMENT IN THIS AREA, APPROXIMATELY 15,800 SQUARE FEET AREA OF SEDIMENTS WOULD BE DREDGED/EXCAVATED TO A DEPTH OF TWO FEET TO ENSURE COMPLETE REMOVAL OF CONTAMINATION. CONTAMINATED SEDIMENTS ARE LOCATED IN AN AREA OF WATER TABLE FLUCTUATION, SO THAT THEY ARE AT TIMES SATURATED WHILE, AT OTHER TIMES, ABOVE THE WATER LINE. FOR THIS REASON, SEDIMENT REMOVAL MAY TAKE THE FORM OF EITHER EXCAVATION OR DREDGING.

SINCE IT WAS DETERMINED THAT WETLAND SEDIMENT CONTAMINATION WAS AT A LEVEL WHICH POSED AN UNACCEPTABLE RISK TO HUMAN HEALTH AND THE ENVIRONMENT, ALTERNATIVES WERE EVALUATED TO ADDRESS THAT RISK. NO PRACTICABLE REMEDIATION ALTERNATIVE EXISTS WHICH WOULD NOT INCLUDE CONSTRUCTION IN THE WETLANDS, HOWEVER. THEREFORE, THE



REMEDY IN THE WETLANDS WILL BE UNDERTAKEN IN SUCH A MANNER TO AVOID OR MINIMIZE THE DESTRUCTION, LOSS AND DEGRADATION OF SITE WETLANDS AND TO PRESERVE AND ENHANCE THE NATURAL AND BENEFICIAL USE OF WETLANDS. THE WORK WILL BE PERFORMED DURING LOW WATER PERIODS TO MINIMIZE THE NEED FOR DREDGING AND THE ASSOCIATED POTENTIAL SPREAD OF CONTAMINANTS TO OTHER PORTIONS OF THE WETLANDS. CONTROLS WILL BE USED TO ISOLATE THE CONTAMINATED WETLANDS AND TO MINIMIZE RESUSPENSION AND DOWNSTREAM TRANSPORT OF THE CONTAMINATED SEDIMENTS. DURING EXCAVATION, MONITORING WILL BE CONDUCTED IN THE AREA AND DOWNSTREAM TO DETERMINE WHETHER UNACCEPTABLE CONTAMINANT TRANSPORT IS OCCURRING.

### C. WETLANDS RESTORATION

FOLLOWING THE COMPLETION OF REMEDIAL ACTIVITIES IN THE WETLANDS TO EXCAVATE CONTAMINATED SEDIMENTS, A WETLANDS RESTORATION PROGRAM WILL BE IMPLEMENTED. THE WETLANDS RESTORATION PROGRAM WILL BE DESIGNED TO RETURN THE AFFECTED WETLAND AREAS TO THEIR ORIGINAL CONDITIONS, TO THE MAXIMUM EXTENT PRACTICABLE. CLEAN FILL MATERIAL WILL REPLACE THE CONTAMINATED SEDIMENTS REMOVED IN THIS COMPONENT OF THE REMEDIAL ACTION. THE FILL WILL BE PLACED SUCH THAT GROUND SURFACE CONTOURS ARE RETURNED TO THOSE WHICH EXISTED PRIOR TO THE EXCAVATION/DREDGING SO AS TO MAINTAIN THE ORIGINAL HYDROLOGIC FLOW PATTERNS. THE WETLANDS WILL BE REVEGETATED WITH APPROPRIATE WETLAND PLANTS IN ORDER TO MINIMIZE EROSION AND TO PROVIDE HABITAT FOR INDIGENOUS WILDLIFE WITH A PROGRAM OF TRANSPLANTING, SEEDING OR SOME COMBINATION THEREOF. THE REMEDY INCLUDES MONITORING OF THE WETLANDS, AND CONTINUED RESTORATION ACTIVITIES UNTIL THE OBJECTIVES OF THE WETLANDS RESTORATION PROGRAM HAVE BEEN ACHIEVED.

### D. GW #9 GROUNDWATER EXTRACTION AND TREATMENT WITH AIR STRIPPING AND CARBON COLUMNS FOR AIR EMISSION CONTROL

THIS COMPONENT OF THE REMEDY WILL EXTRACT GROUNDWATER FROM THE NHBB AREA PLUME (INCLUDING THE GZ-4 AREA PLUME) AND THE DILUTE PLUME. THE EXTRACTED WATER WILL BE TREATED ON-SITE WITH AIR STRIPPING TO REDUCE CONTAMINANT LEVELS TO DRINKING WATER STANDARDS, AND THE TREATED WATER WILL BE DISCHARGED TO GROUNDWATER ON-SITE. THE GROUNDWATER EXTRACTION/DISCHARGE SYSTEM FOR THE NHBB AREA WILL BE DESIGNED SO AS TO PROVIDE A HYDROLOGIC BARRIER BETWEEN GROUNDWATER IN THE NHBB AREA AND GROUNDWATER IN THE REST OF THE AQUIFER; THE GROUNDWATER EXTRACTION SYSTEM FOR THE DILUTE PLUME AREA WILL BE DESIGNED SO AS TO PROVIDE A HYDROLOGIC BARRIER BETWEEN GROUNDWATER IN THE DILUTE PLUME AND THE SOUTH MUNICIPAL WELL.

THE NHBB AREA GROUNDWATER EXTRACTION SYSTEM WILL CONSIST OF CONVENTIONAL EXTRACTION WELLS, LOCATED IN THE VICINITY OF THE NORTHEAST CORNER OF THE NHBB BUILDING AND PUMPING AT A TOTAL RATE OF APPROXIMATELY 200 GPM. THE EXTRACTION SYSTEM FOR GROUNDWATER IN THE DILUTE PLUME AREA WOULD CONSIST OF GROUNDWATER EXTRACTION WELLS, PUMPING AT A RATE OF APPROXIMATELY 400 GPM. THE DILUTE PLUME EXTRACTION WELLS WILL BE PLACED SO AS TO WITHDRAW CONTAMINATED GROUNDWATER THAT HAS MIGRATED FROM THE NHBB AREA.

CONTAMINATED GROUNDWATER EXTRACTED BY THESE TWO EXTRACTION SYSTEMS WILL BE TREATED ON-SITE BY AIR STRIPPING TO REDUCE CONTAMINANT LEVELS IN THE TREATED WATER TO THE GROUNDWATER TARGET CLEANUP LEVELS. GROUNDWATER FROM THE NHBB AREA WILL FIRST PASS THROUGH A PHASE SEPARATION SETTLEMENT TANK/PRETREATMENT SYSTEM WHERE DENSE NONAQUEOUS PHASE LIQUID (DNAPL) COULD SEPARATE FROM SOLUTION PRIOR TO AIR STRIPPING. DNAPLS IN THIS TANK WOULD BE DRAINED OFF PERIODICALLY FOR RECYCLING OR DISPOSAL. WATER WHICH HAS PASSED THROUGH THE PHASE SEPARATION OR WHICH IS DRAWN FROM THE DILUTE PLUME AREA WILL BE TREATED BY ONE OR MORE AIR STRIPPING SYSTEMS CAPABLE OF DISCHARGING EFFLUENT WHICH WILL MEET STATE OF NEW HAMPSHIRE GROUNDWATER DISCHARGE LIMITS. THE TREATMENT SYSTEM OR SYSTEMS WILL CONSIST OF STRIPPING TOWERS, HOLDING TANKS, AND TRANSFER PUMPS TO CYCLE WATER THROUGH THE SYSTEM. WATER TREATED BY THE AIR STRIPPING SYSTEM WILL BE MONITORED DURING THE GROUNDWATER TREATMENT OPERATION TO ENSURE THAT THE TREATMENT SYSTEM IS EFFECTIVE. TREATED EFFLUENT WILL THEN BE PUMPED TO TWO INFILTRATION TRENCHES. THE FIRST INFILTRATION TRENCH WILL BE LOCATED UPGRADIENT OF THE EXTRACTION WELLS FOR THE NHBB AREA TO ENHANCE CONTAMINANT REMOVALS IN THAT AREA. A SECOND INFILTRATION TRENCH COULD BE INSTALLED BETWEEN THE DILUTE PLUME AND THE SOUTH WELL TO PROVIDE A MORE POSITIVE HYDRAULIC BARRIER. IT IS LIKELY THAT A PORTION OF THE TREATED FLOW WILL BE DISCHARGED TO THE CONTOOCOOK RIVER. THE DISCHARGE POINT OR POINTS WILL BE DETERMINED IN THE DESIGN PHASE.

EPA ESTIMATES THAT THE EXTRACTION AND TREATMENT SYSTEMS WILL NEED TO OPERATE FOR 13, 19, AND 7.5 YEARS FOR THE NHBB AREA, GZ-4 AREA, AND DILUTE PLUMES, RESPECTIVELY, IN ORDER TO ACHIEVE THE GROUNDWATER TARGET CLEANUP LEVELS IN ALL PARTS OF THE AQUIFER. THEREFORE, THE POINT OF COMPLIANCE FOR DETERMINING WHETHER THE GROUNDWATER TARGET CLEANUP LEVELS HAVE BEEN ACHIEVED IS ANYWHERE IN THE AQUIFER.

AS DISCUSSED ABOVE IN SECTION X.A.1.C, THE EXTRACTION RATES AND THE AQUIFER RESTORATION TIMES DESCRIBED HERE ARE ESTIMATES CALCULATED WITH MODELS. DURING THE DESIGN OF THE GROUNDWATER EXTRACTION/TREATMENT SYSTEM, ACTUAL FIELD DATA WILL BE DEVELOPED AND USED TO REFINE THE MODELLING RESULTS AND TO DETERMINE THE OPTIMAL RATE FOR EXTRACTING AND TREATING GROUNDWATER.

ALSO AS NOTED, THE PRESENCE OF DNAPLS IN THE NHBB AREA MAY LENGTHEN THE TIME NECESSARY TO MEET TARGET CLEANUP LEVELS FOR GROUNDWATER LOCATED NEAR THE NHBB AREA. AS THE TIME ESTIMATES FOR AQUIFER RESTORATION INDICATE, THE REMEDY IS EXPECTED TO REACH TARGET CLEANUP LEVELS IN THE DILUTE PLUME AREA BEFORE GROUNDWATER IN THE NHBB AREA IS REMEDIATED. THIS REMEDY WILL CONTINUE TO EXTRACT AND TREAT GROUNDWATER IN THE NHBB AREA UNTIL THE

CLEANUP TARGETS ARE ACHIEVED IN ALL LOCATIONS. TO ACCOUNT FOR THE DIFFERENT TREATMENT PERIODS, THE EXTRACTION SYSTEMS WILL BE DESIGNED SO AS TO CREATE A HYDROLOGIC CONTAMINANTS AWAY FROM THE NHBB AREA. THE HYDROLOGIC BARRIER WILL PERMIT THE USE OF GROUNDWATER IN THE AQUIFER WHILE THE REMEDY CONTINUES TO PUMP AND TREAT CONTAMINATED GROUNDWATER IN THE NHBB AREA.

#### E. LONG-TERM ENVIRONMENTAL MONITORING

A GROUNDWATER MONITORING PROGRAM WILL BE DEVELOPED FOR THE FOLLOWING PURPOSES:

- TO DETERMINE THE REDUCTION OF CONTAMINANT CONCENTRATIONS OVER TIME;
- TO EVALUATE THE EFFECTIVENESS OF THE REMEDIAL ACTION AND ATTAINMENT OF THE GROUNDWATER TARGET CLEANUP LEVELS; AND TO ENSURE THAT THE GROUNDWATER CONTAMINANT LEVELS IN TREATED EFFLUENT DO NOT EXCEED TARGET CLEANUP LEVELS.

THE DETAILS OF THE GROUNDWATER MONITORING PROGRAM WILL BE DEVELOPED DURING REMEDIAL DESIGN AND TAILORED TO THE SPECIFICS OF THE DESIGN. PERFORMANCE MONITORING WILL BE IMPLEMENTED CONSISTENT WITH 40 CFR SS 264.100(D), WHICH REQUIRES IMPLEMENTATION OF A MONITORING PROGRAM TO ASSESS THE EFFECTIVENESS OF A CORRECTIVE ACTION PROGRAM. GROUNDWATER MONITORING WELLS MAY NEED TO BE INSTALLED IN ORDER TO ENSURE THAT THE OBJECTIVES OF THE MONITORING PROGRAM ARE ACHIEVED. SELECTED WELLS WILL BE MONITORED ON A PERIODIC BASIS THROUGHOUT THE IMPLEMENTATION OF THE REMEDY. GROUNDWATER WILL BE MONITORED QUARTERLY IN BOTH THE NHBB AREA AND THE DILUTE PLUME AREA. ALL SAMPLES WILL BE ANALYZED FOR VOCs. SPECIFIC ANALYSIS PARAMETERS MAY BE ADDED OR DELETED DEPENDING ON SAMPLING RESULTS AND OBSERVED TRENDS.

ALL MONITORING DATA WILL BE REVIEWED AND EVALUATED DURING THE IMPLEMENTATION OF THE REMEDIAL ACTION TO ENSURE THAT RESPONSE OBJECTIVES ARE ACHIEVED. ADJUSTMENTS TO THE EXTRACTION AND TREATMENT SYSTEMS WILL BE IMPLEMENTED TO OPTIMIZE TREATMENT AND RESTORATION. MODIFICATIONS TO THE REMEDIAL ACTION WILL BE CONSIDERED IF THE MONITORING PROGRAM SHOWS THAT THE GROUNDWATER WILL NOT ATTAIN THE TARGET LEVELS WITHIN THE PERIOD OF TIME SPECIFIED IN THIS REMEDY OR THAT REMEDY IS NOT ADEQUATELY REDUCING RISKS TO HUMAN HEALTH AND/OR THE ENVIRONMENT THAT ARE POSED BY EXPOSURE TO SITE CONTAMINANTS.

TO THE EXTENT REQUIRED BY LAW, EPA WILL REVIEW THE SITE AT LEAST ONCE EVERY FIVE YEARS AFTER THE INITIATION OF THE REMEDIAL ACTION AT THE SITE IF ANY HAZARDOUS SUBSTANCES, POLLUTANTS, OR CONTAMINANTS REMAIN AT THE SITE, TO ASSURE THAT THE REMEDIAL ACTION CONTINUES TO PROTECT THE HUMAN HEALTH AND THE ENVIRONMENT. EPA WILL ALSO EVALUATE RISK POSED BY THE SITE AT THE COMPLETION OF THE REMEDIAL ACTION (I.E., BEFORE THE SITE IS PROPOSED FOR DELETION FROM THE NPL).

#### F. INSTITUTIONAL CONTROLS, INCLUDING RESTRICTIONS ON USE OF THE SOUTH MUNICIPAL WATER SUPPLY WELL

SINCE REMEDIATION OF CONTAMINATED GROUNDWATER WILL REQUIRE SEVERAL YEARS FOR COMPLETION, THIS REMEDY INCLUDES INSTITUTIONAL CONTROLS DESIGNED TO ENSURE THAT GROUNDWATER IN THE ZONE OF CONTAMINATION WILL NOT BE USED AS A DRINKING WATER SOURCE UNTIL MCLS ARE MET. EPA WILL WORK WITH THE STATE AND THE TOWN OF PETERBOROUGH TO RESTRICT THE USE OF THE SOUTH WELL AND PREVENT INSTALLATION OF PRIVATE WELLS WHICH MIGHT DRAW IN CONTAMINATED GROUNDWATER. THE EXTENT OF RESTRICTIONS (UP TO AND INCLUDING PROHIBITION OF USE) PLACED ON THE USE OF THE SOUTH WELL IS DEPENDENT UPON THE FINAL DESIGN OF THE DILUTE PLUME EXTRACTION SYSTEM AND THEREFORE MUST BE DEVELOPED IN CLOSE COORDINATION WITH THE REMEDIAL DESIGN.

#### B. RATIONALE FOR SELECTION

THE RATIONALE FOR CHOOSING EACH SELECTED ALTERNATIVE WHICH IS A PART .OF THE SELECTED REMEDY IS BASED ON AN ASSESSMENT OF EACH CRITERION LISTED IN THE EVALUATION OF ALTERNATIVES SECTION OF THIS DOCUMENT. IN ACCORDANCE WITH SECTION 121 OF CERCLA, TO BE CONSIDERED AS A CANDIDATE FOR SELECTION IN THE ROD, THE ALTERNATIVE MUST HAVE BEEN FOUND TO BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT AND ABLE TO ATTAIN ARARS UNLESS A WAIVER IS INVOKED. IN ASSESSING THE ALTERNATIVES THAT MET THESE STATUTORY REQUIREMENTS, EPA FOCUSED ON THE OTHER EVALUATION CRITERIA, INCLUDING: SHORT TERM EFFECTIVENESS; LONG TERM EFFECTIVENESS; IMPLEMENTABILITY; USE OF TREATMENT TO PERMANENTLY REDUCE THE MOBILITY, TOXICITY, AND VOLUME; AND COST. EPA ALSO CONSIDERED NON-TECHNICAL FACTORS THAT AFFECT THE IMPLEMENTABILITY OF A REMEDY, SUCH AS STATE AND COMMUNITY ACCEPTANCE. BASED UPON THIS ASSESSMENT, TAKING INTO ACCOUNT THE STATUTORY PREFERENCES OF CERCLA, EPA SELECTED THE REMEDIAL APPROACH FOR THE SITE.

##### 1. SOIL

IN-SITU VACUUM EXTRACTION, WHICH WAS ALTERNATIVE SL #7 IN THE FS AND THE PROPOSED PLAN, REPRESENTS THE BEST SOIL REMEDIATION ALTERNATIVE WHEN EVALUATED AGAINST THE CRITERIA AND COMPARED TO THE OTHER SOIL REMEDIATION ALTERNATIVES EVALUATED. THIS ALTERNATIVE IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT AND MEETS ARARS; REDUCES THE TOXICITY, MOBILITY AND VOLUME OF THE CONTAMINANTS; IS IMPLEMENTABLE; HAS COMMUNITY AND STATE ACCEPTANCE; AND IS COST-EFFECTIVE.

OTHER ALTERNATIVES WERE CONSIDERED LESS ACCEPTABLE FOR THE FOLLOWING REASONS. ALTERNATIVE SL #1, NO ACTION, DOES NOT ADDRESS RISKS ASSOCIATED WITH DIRECT CONTACT OR FROM CONTINUED MIGRATION OF VOCs INTO THE GROUNDWATER. ALL OF THE OTHER ALTERNATIVES WOULD ACHIEVE THOSE REMEDIAL ACTION OBJECTIVES. IT IS NOT PROTECTIVE AND DOES NOT ACHIEVE ARARS.

THE SELECTED REMEDY WILL BE MORE IMPLEMENTABLE THAN THE ALTERNATIVES WHICH REQUIRED EXCAVATION OF THE SOILS, FOLLOWED BY ON- OR OFF-SITE TREATMENT OR DISPOSAL. REMEDIATION OF CONTAMINATED SOILS UNDER AND IN CLOSE PROXIMITY TO AN OPERATING INDUSTRIAL FACILITY PRESENTS SPECIAL IMPLEMENTATION PROBLEMS RELATED TO MAINTAINING THE STRUCTURAL INTEGRITY OF THE BUILDING. IN ADDITION, THE COSTS OF THE REMEDIAL ALTERNATIVES INVOLVING EXCAVATION WERE HIGHER THAN THE SELECTED REMEDY, BUT WOULD PROVIDE NO GREATER DEGREE OF PROTECTION OR PERMANENCE.

THE SINGLE ADVANTAGE PRESENTED BY THE EXCAVATION ALTERNATIVES IS THE GREATER CERTAINTY OF LONG- AND SHORT-TERM EFFECTIVENESS IN MEETING SOIL TARGET CLEANUP LEVELS AT THE SITE THAT LANDFILLING, INCINERATION, AND MECHANICAL AERATION AFFORD. HOWEVER, EPA BELIEVES THAT VACUUM EXTRACTION CAN ATTAIN THE TARGET LEVELS IN SOIL AND, THEREFORE IS EFFECTIVE IN THE LONG- AND SHORT-TERM. YET, THERE IS SOME DEGREE OF UNCERTAINTY THAT THIS INNOVATIVE TECHNOLOGY CAN ACHIEVE SITE-WIDE REDUCTIONS TO THE VERY LOW LEVELS ESTABLISHED IN THIS REMEDY. THEREFORE, THIS REMEDY INCLUDES CONTINUED EVALUATION OF THE EFFECTIVENESS OF VACUUM EXTRACTION IN MEETING THE TARGET LEVELS, AND PROVIDES THAT ADDITIONAL REMEDIAL APPROACHES WILL BE EVALUATED IF EXPERIENCE DURING THE REMEDIAL ACTION INDICATES THAT THE REMEDY IS NOT PROTECTIVE. HOWEVER, THIS REMEDY PROVIDES THAT THE VACUUM EXTRACTION SYSTEM WILL CONTINUE TO OPERATE, EVEN IF THE TARGET LEVELS ARE NOT ATTAINED IN TWO YEARS, UNTIL ANOTHER REMEDY IS SELECTED. ANOTHER FACTOR THAT MAY AFFECT CONSIDERATIONS ON THE EFFECTIVENESS OF VACUUM EXTRACTION IS THAT DURING THE DESIGN OF THIS COMPONENT OF THE REMEDY, ADDITIONAL SOIL AND AQUIFER CHARACTERIZATION MAY SUPPORT A RECALCULATION OF THE MODEL THAT WAS USED TO ESTABLISH THE SOIL TARGET CLEANUP LEVELS. AN INCREASE OR DECREASE IN TARGET LEVELS, AS WELL AS EXPERIENCE GAINED DURING DESIGN OF THE REMEDY, MAY AFFECT CONSIDERATIONS WHETHER VACUUM EXTRACTION CONTINUES AS AN ELEMENT OF THE REMEDY. AFTER CONSIDERING THE TECHNICAL COMPLICATIONS FROM IMPLEMENTING SOILS EXCAVATION, AND THE RELATED INCREASE IN REMEDIAL COSTS, WITH NO INCREASE IN PROTECTIVENESS, SL #7 IS PREFERRED OVER ALTERNATIVES WHICH WOULD REQUIRE SOIL EXCAVATION (ALTERNATIVES SL #3, SL #5, AND SL #6).

THE OTHER ALTERNATIVE EVALUATED WHICH WOULD NOT REQUIRE EXCAVATION, SL #8, IN-SITU SOIL FLUSHING, WOULD REQUIRE APPROXIMATELY THIRTY YEARS TO REACH THE TARGET CLEANUP LEVELS, WHILE THE SELECTED ALTERNATIVE IS EXPECTED TO TAKE APPROXIMATELY TWO YEARS. THE SELECTED REMEDY WILL REDUCE CONTAMINANT LEVELS SOONER, SO THAT THE SOILS WILL NOT CONTINUE TO BE A SOURCE OF GROUNDWATER CONTAMINATION, AND THEREFORE HAS GREATER SHORT-TERM EFFECTIVENESS. IN ADDITION, SL #8 IS ESTIMATED TO COST MORE THAN THE VACUUM EXTRACTION SYSTEM, WHICH IS RELATED IN PART TO THE EXTENDED REMEDIATION TIME, BUT THE ALTERNATIVE DOES NOT PROVIDE A MORE PROTECTIVE OR PERMANENT REMEDY.

## 2. SEDIMENTS

DISPOSAL OF CONTAMINATED SEDIMENTS AT AN OFF-SITE LANDFILL, THE SELECTED REMEDY FOR REMEDIATING CONTAMINATED SEDIMENTS (ALTERNATIVE SD #5 IN THE FS AND THE PROPOSED PLAN) REPRESENTS THE BEST WETLANDS REMEDIATION ALTERNATIVE WHEN EVALUATED AGAINST THE CRITERIA AND COMPARED TO THE OTHER OPTIONS WHICH WERE EVALUATED. THE SELECTED ALTERNATIVE IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT AND MEETS ARARS; IS EFFECTIVE IN THE LONG AND SHORT TERMS; IS IMPLEMENTABLE; AND HAS STATE AND COMMUNITY ACCEPTANCE. WHILE THIS ALTERNATIVE DOES NOT REDUCE THE TOXICITY OR VOLUME OF CONTAMINANTS, CONTAINMENT OF THE EXCAVATED SEDIMENTS WILL REDUCE THE MOBILITY OF THE CONTAMINANTS. ALTHOUGH THE SELECTED REMEDY IS NOT THE LEAST COSTLY ALTERNATIVE EVALUATED, THE EXCAVATION AND OFF-SITE DISPOSAL IS THE MOST COST EFFECTIVE APPROACH BECAUSE IT IS A PROTECTIVE REMEDY FOR WHICH THE COSTS ARE PROPORTIONATE TO ITS EFFECTIVENESS.

OTHER ALTERNATIVES WERE CONSIDERED LESS ACCEPTABLE FOR THE FOLLOWING REASONS. SINCE ALTERNATIVE SD #1, NO ACTION, DOES NOT ADDRESS RISKS TO HUMANS NOR ENVIRONMENTAL RECEPTORS, IT IS NOT PROTECTIVE AND WOULD NOT ATTAIN THE REMEDIAL OBJECTIVES. ALTERNATIVES SD #3 AND SD #4 BOTH INVOLVE CAPPING THE CONTAMINATED SEDIMENTS, EFFECTIVELY DESTROYING THE WETLAND AREAS THAT ARE CAPPED AND THUS, RESULT IN NON-COMPLIANCE WITH ARARS FOR WETLAND PROTECTION AND FLOODPLAIN MANAGEMENT. IN ADDITION, THE CONTAMINANTS WOULD REMAIN IN PLACE, THEREBY LEAVING A POTENTIAL EXPOSURE POINT FOR THE LONG TERM SHOULD THE CAPPING SYSTEMS FAIL AND REQUIRE LONG-TERM MANAGEMENT. ALTERNATIVE SD #7, ON-SITE INCINERATION, WHILE PROVIDING FOR THE TREATMENT OF THE CONTAMINANTS, THE SMALL AMOUNT OF SEDIMENTS NEEDING TREATMENT IS LIKELY TO LIMIT THE AVAILABILITY OF THE TECHNOLOGY AND AFFECT THE SHORT-TERM EFFECTIVENESS OF THE ALTERNATIVE. WHILE THE FS AND PROPOSED PLAN INDICATE THAT ON-SITE INCINERATION IS SOMEWHAT LESS EXPENSIVE THAN THE PREFERRED SEDIMENT ALTERNATIVE, ITS COST WAS BASED UPON INCINERATION IN CONJUNCTION WITH SOIL INCINERATION, AN ALTERNATIVE REJECTED BECAUSE OF COST AND IMPLEMENTABILITY CONSIDERATIONS PREVIOUSLY DESCRIBED. ON-SITE SEDIMENT WASHING, SD #8, WAS REJECTED BECAUSE THE HIGHER COSTS WOULD NOT PRODUCE A PROPORTIONATE DEGREE OF EFFECTIVENESS DUE TO THE UNCERTAINTIES OF THE EFFECTIVENESS OF THIS TECHNOLOGY TO TREAT SITE CONTAMINANTS.

### 3. GROUNDWATER

ALTERNATIVE GW #9 FROM THE FS AND THE PROPOSED PLAN, GROUNDWATER EXTRACTION AND TREATMENT WITH AIR STRIPPING AND CARBON COLUMNS FOR AIR EMISSION CONTROL, REPRESENTS THE BEST GROUNDWATER REMEDIATION ALTERNATIVE WHEN EVALUATED AGAINST THE CRITERIA AND COMPARED TO THE OTHER ALTERNATIVES. THE SELECTED ALTERNATIVE IS PROTECTIVE; IS EFFECTIVE IN THE LONG AND SHORT TERMS; REDUCES THE TOXICITY, MOBILITY, AND VOLUME OF CONTAMINANTS; IS IMPLEMENTABLE; HAS COMMUNITY AND STATE ACCEPTANCE; AND IS COST-EFFECTIVE. FINALLY, THE SELECTED REMEDY WILL ACHIEVE RESTORATION OF THE AQUIFER TO DRINKING WATER QUALITY IN THE SHORTEST PERIOD OF TIME. OTHER ALTERNATIVES WERE CONSIDERED LESS ACCEPTABLE FOR THE FOLLOWING REASONS. ALTERNATIVE GW #1, NO ACTION, DOES NOT ADDRESS RISKS TO HUMANS NOR ENVIRONMENTAL RECEPTORS AND WAS REJECTED FROM FURTHER CONSIDERATION. GW #3 AND GW #4 ARE ESSENTIALLY THE SAME AS THE PREFERRED ALTERNATIVE BUT WITH A LONGER CLEANUP TIME FOR THE DILUTE PLUME PORTION OF THE CONTAMINATION. THE ESTIMATED COSTS OF IMPLEMENTING GW #3 AND GW #4 ARE HIGHER THAN THE COSTS OF THE SELECTED REMEDY, PRIMARILY BECAUSE OPERATING THE PUMP AND TREAT SYSTEMS FOR A LONGER PERIOD WILL RESULT IN INCREASED COSTS.

ALTERNATIVES GW #6 AND GW #7 DO NOT ADDRESS THE ENVIRONMENTAL RISKS POSED BY THE CONTAMINATION IN THE AQUIFER AND DO NOT RESTORE THE AQUIFER TO DRINKING WATER QUALITY, THUS FAILING TO ATTAIN ARARS OR THE REMEDIAL OBJECTIVES. WHILE EACH WOULD PROVIDE A SAFE WATER SUPPLY, NEITHER PROVIDES FOR LONG TERM PROTECTIVENESS TO PUBLIC HEALTH OR THE ENVIRONMENT. GW #8 IS SIMILAR TO GW #3 AND GW #4 IN TERMS OF ENVIRONMENTAL IMPACTS AND THE RATE OF AQUIFER RESTORATION BUT USES A DIFFERENT GROUNDWATER EXTRACTION SYSTEM, A RADIAL WELL COLLECTOR SYSTEM. HOWEVER, THE COST OF THIS SYSTEM IS GREATER THAN THE SELECTED REMEDY WITHOUT PROVIDING A FASTER RATE OF RESTORATION OR A MORE PROTECTIVE REMEDY. IN ADDITION, APPLICATION OF THIS TECHNOLOGY IN REMEDIATING HAZARDOUS WASTE IN GROUNDWATER IS UNTESTED AND MAY NOT BE IMPLEMENTABLE.

#SD

#### XI. STATUTORY DETERMINATIONS

THE REMEDIAL ACTION SELECTED FOR IMPLEMENTATION AT THE SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE IS CONSISTENT WITH CERCLA AND, TO THE EXTENT PRACTICABLE, THE NCP. THE SELECTED REMEDY IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, ATTAINS ARARS AND IS COST EFFECTIVE. THE SELECTED REMEDY ALSO SATISFIES THE STATUTORY PREFERENCE FOR TREATMENT WHICH PERMANENTLY AND SIGNIFICANTLY REDUCES THE MOBILITY, TOXICITY OR VOLUME OF HAZARDOUS SUBSTANCES AS A PRINCIPAL ELEMENT. ADDITIONALLY, THE SELECTED REMEDY UTILIZES ALTERNATE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE.

##### A. THE SELECTED REMEDY IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT

THE REMEDY AT THIS SITE WILL PERMANENTLY REDUCE THE RISKS PRESENTLY POSED TO HUMAN HEALTH AND THE ENVIRONMENT BY EXPOSURE TO CONTAMINATED SOILS, SEDIMENTS, AND GROUNDWATER.

THE SOIL CLEANUP LEVELS TO BE ATTAINED BY THIS REMEDY ARE DESIGNED TO PREVENT MIGRATION OF CONTAMINANTS INTO THE GROUNDWATER AT LEVELS WHICH EXCEED DRINKING WATER STANDARDS. PREVENTING FURTHER CONTAMINATION OF GROUNDWATER AT UNACCEPTABLE LEVELS WILL ALSO EXPEDITE RESTORATION OF THE AQUIFER. WHEN CONTAMINANT LEVELS REACH THE SOILS TARGET CLEANUP LEVELS, THE RISKS ASSOCIATED WITH DERMAL CONTACT AND ACCIDENTAL INGESTION ARE PROTECTIVE OF HUMAN HEALTH. REMOVAL OF THE PCB AND PAH CONTAMINATED SEDIMENTS WILL REDUCE THE RISKS TO THE WILDLIFE WHICH INHABIT THE AREA AS WELL AS REDUCING THE RISKS POSED TO HUMANS THROUGH DERMAL CONTACT AND ACCIDENTAL INGESTION. CONTAINMENT OF THE CONTAMINATED SEDIMENTS IN AN OFFSITE LANDFILL MEETING RCRA REQUIREMENTS WILL PROTECT HUMANS AND ENVIRONMENTAL RECEPTORS FROM THE THREAT OF CONTACT OR BIOACCULATION.

THE SELECTED GROUND WATER REMEDY WILL SIGNIFICANTLY REDUCE THE RISKS OF INGESTION OF CONTAMINATED GROUNDWATER BY TREATING GROUNDWATER THROUGHOUT THE AFFECTED PORTION OF THE AQUIFER TO DRINKING WATER STANDARDS, WHICH ARE ARARS AT THIS SITE. THIS REMEDY WILL ACHIEVE THESE PROTECTIVE DRINKING WATER STANDARDS IN THE SHORTEST PERIOD OF TIME OF ANY OF THE ALTERNATIVES THAT WERE EVALUATED. IN ADDITION, TREATMENT OF THE AIR STREAM WILL PREVENT EXPOSURE TO THE REMOVED CONTAMINANTS BY INHALATION. INSTITUTIONAL CONTROLS WILL ENSURE THAT NO EXPOSURE TO THE CONTAMINATED GROUNDWATER WILL OCCUR DURING THE IMPLEMENTATION OF THE SELECTED REMEDY. THIS COMBINATION OF ELEMENTS RESULTS IN A REMEDY WHICH IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT.

##### B. THE SELECTED REMEDY ATTAINS ARARS

THIS REMEDY WILL MEET OR ATTAIN ALL APPLICABLE OR RELEVANT AND APPROPRIATE FEDERAL AND STATE REQUIREMENTS THAT APPLY TO THE SITE. ENVIRONMENTAL LAWS FROM WHICH ARARS FOR THE SELECTED REMEDIAL ACTION AT THE SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE ARE DERIVED INCLUDE:

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA);  
CLEAN WATER ACT (CWA);  
SAFE DRINKING WATER ACT (SDWA);  
EXECUTIVE ORDER 11988 (FLOODPLAIN MANAGEMENT);

EXECUTIVE ORDER 11990 (PROTECTION OF WETLANDS);  
FISH AND WILDLIFE COORDINATION ACT;  
CLEAN AIR ACT (CAA);  
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA);  
STATE SUPERFUND LAWS; AND STATE HAZARDOUS WASTE FACILITY LAWS.

THE FOLLOWING POLICIES, CRITERIA, AND GUIDANCES HAVE ALSO BEEN CONSIDERED (TBCS) DURING THE SELECTION OF THE REMEDY:

SDWA MAXIMUM CONTAMINANT LEVEL GOALS (MCLGS);  
CWA AMBIENT WATER QUALITY CRITERIA;  
OSWER DIRECTIVE 9355.0-28, AIR STRIPPER CONTROL GUIDANCE; AND STATE DRINKING WATER CRITERIA AND CONSUMPTION ADVISORIES.

CHEMICAL- AND LOCATION-SPECIFIC ARARS ARE FOUND IN TABLES 3-1 AND 3-2 OF THE FEASIBILITY STUDY, RESPECTIVELY. ACTION-SPECIFIC ARARS ARE PRESENTED IN THE FEASIBILITY STUDY IN TABLES 5-1 AND 5-2. THESE TABLES (INCLUDED IN APPENDIX B) PROVIDE A BRIEF SYNOPSIS OF THE REQUIREMENTS AND INDICATE WHETHER THE ARAR IS APPLICABLE, RELEVANT AND APPROPRIATE, OR TO-BE-CONSIDERED. A BRIEF NARRATIVE SUMMARY OF THE ARARS AND TBCS FOLLOWS. THE PRINCIPAL CHEMICAL-SPECIFIC ARARS ARE THE MAXIMUM CONTAMINANT

LEVELS (MCLS) ESTABLISHED IN THE SAFE DRINKING WATER ACT (40 CFR 141.1 - 141.16) WHICH HAS BEEN DETERMINED TO BE RELEVANT AND APPROPRIATE TO THE SITE. MCLS WERE USED TO HELP SET THE GROUNDWATER CLEANUP LEVELS, AS WELL AS, THE SOIL CLEANUP LEVELS. THE SPECIFIC MCLS WHICH ARE ARARS TO BE MET INCLUDE: 1,1,1-TRICHLOROETHANE, 200 PPB; TRICHLOROETHYLENE, 5 PPB; 1,1-DICHLOROETHYLENE, 7 PPB; TOLUENE, 2000; AND VINYL CHLORIDE, 2 PPB. THE LEVEL SET FOR TETRACHLOROETHYLENE, 5 PPB, IS BASED UPON A PROPOSED MCL WHICH IS CONSIDERED A TBC. IN ADDITION, THE STATE OF NEW HAMPSHIRE DEPARTMENT OF PUBLIC HEALTH SERVICE CONSUMPTION ADVISORIES FOR WATER SUPPLIES, WHICH HAVE BEEN DETERMINED TO BE A TBC, WERE USED IN THE ABSENCE OF AN MCL FOR L,L-DICHLOROETHANE IN SETTING SITE CLEANUP LEVELS FOR GROUNDWATER AND SOIL. THE LEVEL TO BE MET IS 810 PPB. THE FISH AND WILDLIFE COORDINATION ACT HAS BEEN DETERMINED TO BE A TBC FOR THIS SITE AND COMMENTS SUBMITTED TO EPA BY THE FISH AND WILDLIFE SERVICE OF THE US DEPARTMENT OF THE INTERIOR WERE USED IN SETTING PCB CLEANUP LEVELS FOR SEDIMENTS.

WITH RESPECT TO LOCATION-SPECIFIC ARARS, THE EXECUTIVE ORDERS CONCERNING WETLANDS AND FLOODPLAINS ARE APPLICABLE TO THIS SITE. SINCE IT WAS DETERMINED THAT WETLAND SEDIMENT CONTAMINATION WAS AT A LEVEL WHICH POSED AN UNACCEPTABLE RISK TO HUMAN HEALTH AND THE ENVIRONMENT, ALTERNATIVES WERE EVALUATED TO ADDRESS THAT RISK. NO PRACTICABLE REMEDIATION ALTERNATIVE EXISTS WHICH WOULD NOT INCLUDE CONSTRUCTION IN THE WETLANDS, HOWEVER. THEREFORE, THE REMEDY IN THE WETLANDS WILL BE UNDERTAKEN IN SUCH A MANNER TO AVOID OR MINIMIZE THE DESTRUCTION, LOSS AND DEGRADATION OF SITE WETLANDS AND TO PRESERVE AND ENHANCE THE NATURAL AND BENEFICIAL USE OF WETLANDS. ALSO, THE REMEDY WILL BE IMPLEMENTED IN SUCH A MANNER AS TO MAINTAIN EXISTING FLOW PATTERNS SO AS NOT TO IMPACT THE FLOODPLAIN.

IN ADDITION, THIS REMEDY WAS SELECTED USING EPA GUIDANCE ON CONTROL OF AIR EMISSIONS (OSWER DIRECTIVE 9355.0-28, JUNE 15, 1989) AS A TBC FOR THE SITE, WHICH IS IN AN OZONE NON-ATTAINMENT AREA. FOR SUCH AN AREA, THE DIRECTIVE INDICATES THE NEED FOR CONTROL OF VOC EMISSIONS FROM SUPERFUND AIR STRIPPERS AND SOIL VAPOR EXTRACTION SYSTEMS BASED UPON ACTUAL EMISSION RATES OF VOCS.

THE PRINCIPAL ACTION-SPECIFIC ARARS INCLUDE RCRA STANDARDS FOR THE TREATMENT, STORAGE, AND DISPOSAL OF HAZARDOUS WASTES. THESE STANDARDS ARE APPLICABLE TO THE DESIGN, CONSTRUCTION AND OPERATION OF THE GROUNDWATER EXTRACTION AND TREATMENT SYSTEMS, SINCE THOSE SYSTEMS WILL BE HANDLING, TREATING AND DISPOSING OF HAZARDOUS WASTE AND HAZARDOUS WASTE CONSTITUENTS. RCRA WILL APPLY TO THE SOIL TREATMENT ALTERNATIVE TO THE EXTENT THIS COMPONENT OF THE REMEDY INVOLVES HANDLING, TREATMENT OR DISPOSAL OF HAZARDOUS WASTES.

ALL OSHA REQUIREMENTS FOR WORKER HEALTH AND SAFETY DURING HAZARDOUS WASTE OPERATIONS AND GENERAL INDUSTRY STANDARDS ARE APPLICABLE DURING IMPLEMENTATION OF THIS REMEDY. WITH RESPECT TO LONG-TERM GROUNDWATER MONITORING, THE RCRA GROUNDWATER PROTECTION REQUIREMENTS (40 CFR SS 264, SUBPART F) HAVE BEEN DETERMINED TO BE RELEVANT AND APPROPRIATE FOR THIS SITE. THE GROUNDWATER MONITORING PROGRAM IMPLEMENTED WILL BE CONSISTENT WITH 40 CFR SS 264.100(D) TO EVALUATE THE EFFECTIVENESS OF THE REMEDY.

#### C. THE SELECTED REMEDIAL ACTION IS COST-EFFECTIVE

OF THOSE ALTERNATIVES THAT ARE PROTECTIVE AND ATTAIN ARARS, EPA'S SELECTED REMEDY IS A COMBINATION OF THE MOST COST-EFFECTIVE REMEDIAL ALTERNATIVE COMPONENTS THAT WERE EVALUATED. THE REMEDY PROVIDES A DEGREE OF PROTECTIVENESS PROPORTIONATE TO ITS COSTS. THE SOIL TREATMENT COMPONENT WAS ESTIMATED TO BE SIGNIFICANTLY LESS COSTLY THAN THE FOUR OTHER PROTECTIVE ALTERNATIVES, COSTING APPROXIMATELY 20% OF THE NEXT CHEAPEST ALTERNATIVE. THE EXCAVATION OF SEDIMENTS FOR OFF-SITE DISPOSAL IS NOT THE LEAST COSTLY ALTERNATIVE THAT WAS EVALUATED. HOWEVER, BECAUSE THE SELECTED REMEDY IS MORE PROTECTIVE AND EFFECTIVE IN THE LONG- AND SHORT-TERMS IN PROVIDING A PERMANENT SOLUTION ON-SITE THAN THE CAPPING ALTERNATIVES, AND BECAUSE IT CAN BE

MORE READILY IMPLEMENTED THAN THE ON-SITE TREATMENT ALTERNATIVES, IT IS THE MOST COST-EFFECTIVE ALTERNATIVE. AS FOR GROUNDWATER, THE SELECTED REMEDY IS PROTECTIVE AND IS THE LEAST COSTLY ALTERNATIVE EVALUATED. THIS WAS DUE TO THE CHOICE OF TREATMENT AND GROUNDWATER EXTRACTION TECHNOLOGIES AND TO THE MORE RAPID RATE OF EXTRACTION WHICH RESULTED IN LOWER OPERATION AND MAINTENANCE COSTS.

A SUMMARY OF THE COSTS FOR EACH OF THE ELEMENTS OF THE SELECTED REMEDY ARE PRESENTED BELOW. ALL COSTS ARE NET PRESENT WORTH.

TOTAL COST OF SELECTED REMEDY

CONTAMINATED MEDIA	CAPITAL	O&M	TOTAL
SOIL	\$ 327,583	\$ 202,145	\$ 529,728
SEDIMENTS	782,189	-	782,189
GROUNDWATER	2,284,747	3,790,005	6,074,752
			\$7,387,769

D. THE SELECTED REMEDY UTILIZES PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

THE SELECTED REMEDY UTILIZES PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE. A BRIEF DESCRIPTION REGARDING HOW EACH COMPONENT OF THE REMEDY MEETS THIS DETERMINATION FOLLOWS.

1. SOIL. THE SOIL REMEDIATION COMPONENT OF THE SELECTED REMEDY UTILIZES AN INNOVATIVE TREATMENT TECHNOLOGY, IN-SITU VACUUM EXTRACTION, TO PERMANENTLY REDUCE CONTAMINANTS IN SOILS TO LEVELS THAT ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. THE SELECTED REMEDY WILL PROVIDE A PERMANENT SOLUTION FOR THE VOC CONTAMINATED SOIL BY SIGNIFICANTLY REDUCING THE TOXICITY, MOBILITY, AND VOLUME OF THE CONTAMINATION. THE VOCS REMOVED FROM THE EXTRACTED SOIL VAPOR WILL BE TREATED BY BEING ADSORBED ONTO ACTIVATED CARBON, WHICH WILL BE REGENERATED (AND THE VOCS DESTROYED) AT AN OFFSITE RESOURCE RECOVERY FACILITY OR ON-SITE AS PART OF THE TREATMENT PROCESS. WHILE THE ALTERNATIVES INVOLVING INCINERATION AND MECHANICAL AERATION WOULD ALSO ACHIEVE THE SAME DEGREE OF PERMANENCE USING A TREATMENT TECHNOLOGY, AS NOTED ABOVE, THESE ALTERNATIVES WOULD COST MORE WITHOUT PROVIDING A MORE PROTECTIVE SOLUTION.
2. SEDIMENTS. THE EXCAVATION AND CONTAINMENT OF CONTAMINATED SEDIMENTS WILL PROVIDE A PERMANENT SOLUTION AT THE SITE TO CONTAMINATION IN THE WETLANDS. IT PROVIDES FOR A PERMANENT SOLUTION AT THIS SITE BY REMOVING AND DISPOSING OF CONTAMINATED SEDIMENTS IN A RCRA LANDFILL CAPABLE OF INSURING LONGTERM SECURITY. WHILE LONGTERM UNCERTAINTIES EXIST WITH THE PERMANENCE OF ANY LANDFILLING ALTERNATIVE, THE USE OF A LICENSED RCRA MINIMIZES THESE UNCERTAINTIES. THE TWO CAPPING ALTERNATIVES, WHILE CONSIDERABLY LESS EXPENSIVE WOULD LEAVE THE CONTAMINATION IN PLACE, THUS REQUIRING PERPETUAL MAINTENANCE TO AVOID FAILURE OF THE CONTAINMENT SYSTEM, AND ALLOWING THE POTENTIAL FOR FUTURE EXPOSURES TO SITE CONTAMINANTS. GIVEN THE SMALL VOLUME OF SEDIMENTS, THE LIMITED AVAILABILITY OF MOBILE INCINERATORS AND THEIR EXTENDED START-UP TIME, THE ONSITE INCINERATION ALTERNATIVE WOULD BE PRACTICABLY IMPLEMENTABLE ONLY IF THE SELECTED SOIL REMEDIAL ACTION HAD BEEN ON-SITE INCINERATION.
3. GROUNDWATER. THE GROUNDWATER EXTRACTION AND TREATMENT COMPONENT OF THE REMEDY WILL PROVIDE A PERMANENT SOLUTION TO CONTAMINATION OF THE DRINKING WATER AQUIFER IN THE SHORTEST PERIOD OF TIME OF ANY ALTERNATIVE EVALUATED. OF THE SEVEN GROUNDWATER REMEDIATION ALTERNATIVES EVALUATED IN THE FS, THREE ALTERNATIVES WERE FOUND NOT TO BE PROTECTIVE NOR ABLE TO MEET ARARS. THESE INCLUDED THE NO ACTION ALTERNATIVE, WELL-HEAD TREATMENT, AND DEVELOPMENT OF AN ALTERNATIVE WATER SUPPLY. OF THE REMAINING ALTERNATIVES, ALL OF WHICH WERE FOUND TO BE PERMANENT, PROTECTIVE AND ABLE TO ATTAIN ARARS, THE SELECTED REMEDY ATTAINED THE REMEDIAL OBJECTIVES IN THE SHORTEST PERIOD OF TIME.

E. THE SELECTED REMEDY SATISFIES THE PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

THE PRINCIPAL ELEMENT OF THE SELECTED REMEDY IS THE TREATMENT OF GROUNDWATER AND SOILS TO PERMANENTLY REDUCE CONTAMINANTS TO LEVELS WHICH ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. GROUNDWATER EXTRACTION AND TREATMENT, USED IN CONJUNCTION WITH THE IN-SITU VACUUM EXTRACTION SYSTEM FOR SOILS, ADDRESSES THE PRIMARY THREAT AT THE SITE, CONTAMINATION OF THE GROUNDWATER. THE SELECTED REMEDY SATISFIES THE STATUTORY PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT BY REMOVING VOCS FROM THE GROUNDWATER THROUGH THE USE OF AIR STRIPPING TOWERS FOLLOWED BY CARBON COLUMNS. UPON REGENERATION OF THE CARBON, THE CONTAMINATION WILL HAVE BEEN EFFECTIVELY DESTROYED. SIMILARLY, THE VOCS REMOVED FROM THE SOIL VAPOR BY THE VACUUM EXTRACTION PROCESS WILL EFFECTIVELY BE DESTROYED DURING THE REGENERATION OF THE CARBON.

#SR

**XII. STATE ROLE**

THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES HAS REVIEWED THE VARIOUS ALTERNATIVES AND HAS INDICATED ITS SUPPORT FOR THE SELECTED REMEDY. THE STATE HAS ALSO REVIEWED THE REMEDIAL INVESTIGATION, RISK ASSESSMENT AND THE FEASIBILITY STUDY TO DETERMINE IF THE SELECTED REMEDY IS IN COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE STATE ENVIRONMENTAL LAWS AND REGULATIONS. THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES CONCURS WITH THE SELECTED REMEDY FOR THE SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE. A COPY OF THE DECLARATION OF CONCURRENCE IS ATTACHED AS APPENDIX A.

#RS

**RESPONSIVENESS SUMMARY**

PREFACE

THE US ENVIRONMENTAL PROTECTION AGENCY (EPA) HELD A PUBLIC COMMENT PERIOD, FROM JULY 21, 1989 TO AUGUST 19, 1989, TO PROVIDE AN OPPORTUNITY FOR INTERESTED PARTIES TO COMMENT ON THE DRAFT FEASIBILITY STUDY (FS) AND THE JULY 1989 PROPOSED PLAN PREPARED FOR THE SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE (THE SITE) IN PETERBOROUGH, NEW HAMPSHIRE. THE DRAFT FS EXAMINES AND EVALUATES VARIOUS OPTIONS, CALLED REMEDIAL ALTERNATIVES, FOR ADDRESSING CONTAMINATION OF GROUNDWATER, SOIL AND SEDIMENT AT THE SITE. EPA IDENTIFIED ITS PREFERRED ALTERNATIVE FOR THE CLEANUP OF THE SITE IN THE PROPOSED PLAN BEFORE THE START OF THE PUBLIC COMMENT PERIOD.

THE PURPOSE OF THIS RESPONSIVENESS SUMMARY IS TO IDENTIFY MAJOR COMMENTS RAISED DURING THE PUBLIC COMMENT PERIOD AND TO PROVIDE EPA RESPONSE TO THE COMMENTS. EPA HAS CONSIDERED ALL OF THE COMMENTS SUMMARIZED IN THIS DOCUMENT BEFORE SELECTING A FINAL REMEDIAL ALTERNATIVE FOR THE CONTAMINATION AT THE SITE IN PETERBOROUGH, NEW HAMPSHIRE.

THIS RESPONSIVENESS SUMMARY IS DIVIDED INTO THE FOLLOWING SECTIONS:

- I OVERVIEW OF REMEDIAL ALTERNATIVES CONSIDERED IN THE DRAFT FEASIBILITY STUDY. INCLUDING# THE PREFERRED ALTERNATIVE THIS SECTION BRIEFLY OUTLINES THE REMEDIAL ALTERNATIVES EVALUATED IN THE DRAFT FS AND THE PROPOSED PLAN, INCLUDING EPA'S PREFERRED ALTERNATIVE.
- II BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS - THIS SECTION PROVIDES A BRIEF HISTORY OF COMMUNITY INTEREST AND CONCERNS REGARDING THE SITE.
- III SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND EPA RESPONSES - THIS SECTION SUMMARIZES AND PROVIDES EPA RESPONSES TO THE ORAL AND WRITTEN COMMENTS RECEIVED FROM THE PUBLIC DURING THE PUBLIC COMMENT PERIOD. IN PART I, THE COMMENTS RECEIVED FROM CITIZENS AND EPA'S RESPONSES ARE ORGANIZED BY SUBJECT. IN PART II, THE COMMENTS RECEIVED FROM THE PRP, INCLUDING THE PRP'S PREFERRED ALTERNATIVE, ARE PRESENTED FOLLOWED BY EPA'S RESPONSE.

EXHIBIT A - THIS EXHIBIT IS A LIST OF THE COMMUNITY RELATIONS ACTIVITIES THAT THE EPA HAS CONDUCTED AT THE SITE.

EXHIBIT B - THIS EXHIBIT IS A COPY OF THE TRANSCRIPT FROM THE INFORMAL PUBLIC HEARING THAT WAS HELD ON AUGUST 3, 1989.

**I. OVERVIEW OF REMEDIAL ALTERNATIVES CONSIDERED IN THE DRAFT FEASIBILITY STUDY, INCLUDING THE PREFERRED ALTERNATIVE**

USING THE INFORMATION GATHERED DURING THE REMEDIAL INVESTIGATION (RI) AND THE ENDANGERMENT ASSESSMENT (EA), EPA IDENTIFIED SEVERAL OBJECTIVES FOR THE CLEANUP OF THE SITE. THESE RESPONSE OBJECTIVES ARE:

- ELIMINATE OR MINIMIZE, TO THE MAXIMUM EXTENT PRACTICABLE, THE THREAT POSED TO THE PUBLIC HEALTH, WELFARE, AND ENVIRONMENT BY THE CURRENT EXTENT OF CONTAMINATION FOR GROUNDWATER, SOILS, AND SEDIMENTS;
- ELIMINATE OR MINIMIZE THE MIGRATION OF CONTAMINANTS FROM THE SOILS INTO THE GROUNDWATER; AND

MEET FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS).

NEW HAMPSHIRE BALL BEARINGS, INC. (NHBB), WITH EPA OVERSIGHT, SCREENED AND EVALUATED POTENTIAL CLEANUP ALTERNATIVES FOR THE SITE. THIS EVALUATION, CONTAINED IN THE FS, SPECIFICALLY DESCRIBES ALTERNATIVES FOR ADDRESSING CONTAMINATION OF GROUNDWATER AND CONTAMINATED SOIL AND SEDIMENTS, AS WELL AS THE CRITERIA USED TO

NARROW THE LIST TO SIX ALTERNATIVES FOR GROUNDWATER CONTAMINATION AND ELEVEN ALTERNATIVES FOR SOIL AND SEDIMENT CONTAMINATION. EACH OF THESE ALTERNATIVES IS BRIEFLY DESCRIBED BELOW.

**SL #1**

**NO ACTION**

ANALYSIS OF THE NO-ACTION ALTERNATIVE IS REQUIRED BY FEDERAL REGULATIONS AND IS INCLUDED FOR COMPARISON WITH OTHER REMEDIAL ALTERNATIVES. UNDER THIS ALTERNATIVE, NO ACTION WOULD BE TAKEN TO REMEDIATE CONTAMINATED SOILS AT THE SOUTH MUNICIPAL WELL SITE.

**SL #3**

**DISPOSAL OF CONTAMINATED SOILS AT AN OFF-SITE LANDFILL**

FOR THIS ALTERNATIVE, 7500 CUBIC YARDS OF CONTAMINATED SOILS WOULD BE DISPOSED IN AN OFF-SITE LANDFILL THAT COMPLIES WITH THE REQUIREMENTS OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA).

**SL #5**

**ON-SITE INCINERATION**

ON-SITE INCINERATION OF CONTAMINATED NHBB SOILS WOULD INVOLVE EXCAVATING APPROXIMATELY 7500 CUBIC YARDS OF SOIL, AS IN SL #3. THE SOILS WOULD BE TREATED ON-SITE WITH A MOBILE INCINERATOR, AND THE TREATED MATERIAL WOULD BE REPLACED IN EXCAVATED AREAS AND COVERED WITH CLEAN FILL.

**SL #6**

**ON-SITE MECHANICAL AERATION**

ON-SITE MECHANICAL AERATION INVOLVES EXCAVATING APPROXIMATELY 7500 CUBIC YARDS OF CONTAMINATED SOILS, AS IN SL #3 AND #5. THE EXCAVATED SOILS WOULD BE TREATED ON-SITE WITH MECHANICAL AERATION.

**SL #7**

**IN-SITU VACUUM EXTRACTION**

THIS ALTERNATIVE REMOVES THE CONTAMINATION FROM THE 7500 CUBIC YARDS OF SOIL BY EXTRACTING THE ORGANIC CONTAMINANTS AS VAPORS. THE PROCESS INVOLVES NO EXCAVATION AS IT IS DONE IN-PLACE.

IN THE PROPOSED PLAN ISSUED PRIOR TO THE PUBLIC COMMENT PERIOD, EPA PRESENTED THIS ALTERNATIVE AS THE PREFERRED ALTERNATIVE FOR ADDRESSING SOIL CONTAMINATION AT THE SITE.

**SL #8**

**IN-SITU SOIL FLUSHING**

SOIL FLUSHING WOULD INJECT WASHING AGENTS (WATER, STEAM, OR SURFACTANTS) INTO AREAS OF SOIL CONTAMINATION, AND THE INJECTED FLUIDS AND CONTAMINATION WOULD BE EXTRACTED FOR TREATMENT AND RECYCLING.

**SD #1**

**NO ACTION**

ANALYSIS OF THE NO-ACTION ALTERNATIVE IS REQUIRED BY FEDERAL REGULATION AND IS INCLUDED FOR COMPARISON WITH THE OTHER ALTERNATIVES. UNDER THIS ALTERNATIVE, NO SEDIMENT REMEDIATION WOULD BE PERFORMED. PCBs AND PAHS WOULD REMAIN IN THE WETLAND SEDIMENTS ABOVE TARGET CLEANUP LEVELS.

**SD #3**

**CONTAINMENT OF SEDIMENTS WITH AN IMPERMEABLE CAP**

THIS ALTERNATIVE WOULD COVER AN ESTIMATED 15,800 SQUARE FEET OF CONTAMINATED SEDIMENTS LOCATED IN ON-SITE WETLANDS WITH A MULTI-LAYERED IMPERMEABLE CAP.

**SD #4**

**CONTAINMENT OF SEDIMENTS WITH A PERMEABLE CAP**

THIS ALTERNATIVE, AS WITH SD #3, WOULD COVER APPROXIMATELY 15,800 SQUARE FEET OF CONTAMINATED SEDIMENTS, EXCEPT THAT THIS ALTERNATIVE WOULD UTILIZE A PERMEABLE CAP.



**SD #5****DISPOSAL OF CONTAMINATED SEDIMENTS AT A RCRA LANDFILL**

THIS ALTERNATIVE WOULD INVOLVE THE DREDGING OR EXCAVATING FROM THE WETLANDS APPROXIMATELY 1170 CUBIC YARDS OF SEDIMENTS (OVER THE SAME 15,800 SQUARE FOOT AREA REMEDIATED IN SD #3 AND #4) CONTAMINATED ABOVE THE SEDIMENT TARGET CLEANUP LEVELS. THE SEDIMENTS WOULD BE DEWATERED AS NEEDED AND TRANSPORTED TO AN OFFSITE LANDFILL LICENSED UNDER RCRA UNLESS SUFFICIENT LAND IS AVAILABLE ON-SITE TO ACCOMMODATE THE SEDIMENTS IN A LANDFILL THAT CAN MEET RCRA REQUIREMENTS.

IN THE PROPOSED PLAN ISSUED PRIOR TO THE PUBLIC COMMENT PERIOD, EPA RECOMMENDED OFF-SITE LANDFILLING AS THE RECOMMENDED DISPOSAL ELEMENT OF THE PREFERRED ALTERNATIVE FOR ADDRESSING THE SEDIMENT CONTAMINATION AT THE SITE. THIS WAS BASED UPON SCREENING CRITERIA WHICH ELIMINATED THE ON-SITE LANDFILL DUE TO INADEQUATE SPACE ON-SITE. THE FINAL DECISION WILL BE MADE AS TO THE ADEQUACY OF THE ON-SITE LANDFILL DURING DETAILED DESIGN INVESTIGATIONS.

**SD #7****ON-SITE INCINERATION**

ON-SITE INCINERATION WOULD INVOLVE DREDGING OR EXCAVATING FROM THE WETLANDS (OVER THE SAME 15,800 SQUARE FOOT AREA REMEDIATED IN SD #3, #4, AND #5) AN ESTIMATED 1170 CUBIC YARDS OF SEDIMENTS CONTAMINATED ABOVE THE SEDIMENT TARGET CLEANUP LEVELS. THE SEDIMENTS WOULD BE INCINERATED TO REMOVE HAZARDOUS PCB AND PAH CONTAMINANTS.

**SD #8****ON-SITE SEDIMENT WASHING**

THIS ALTERNATIVE WOULD INVOLVE DREDGING OR EXCAVATING FROM THE WETLANDS (OVER THE SAME 15,800 SQUARE FOOT AREA REMEDIATED IN SD #3, #4, #5 AND #7) AN ESTIMATED 1170 CUBIC YARDS OF SEDIMENTS CONTAMINATED ABOVE THE SEDIMENT TARGET CLEANUP LEVELS. THE ONLY DIFFERENCE IS THAT THIS ALTERNATIVE WOULD TREAT THE SEDIMENTS WITH A WASHING SOLUTION.

**GW #1****NO ACTION**

ANALYSIS OF THE NO ACTION ALTERNATIVE IS REQUIRED BY THE NCP AND IS INCLUDED IN THE FS FOR COMPARISON WITH OTHER REMEDIAL ALTERNATIVES. THE AQUIFER WOULD REMAIN UNSUITABLE FOR USE AS A DRINKING WATER SUPPLY FOR THE FORESEEABLE FUTURE.

**GW #3****GROUNDWATER EXTRACTION WITH ON-SITE AIR STRIPPING**

THIS ALTERNATIVE WOULD INVOLVE THE EXTRACTION AND TREATMENT OF GROUNDWATER BY AIR STRIPPER TECHNOLOGY FROM BOTH NEAR THE NHBB BUILDING AND THE DILUTE PLUME, AND SUBSEQUENT DISCHARGE OF THE TREATED WATER.

**GW #4****GROUNDWATER EXTRACTION WITH GAC**

THIS ALTERNATIVE INVOLVES EXTRACTION OF CONTAMINATED GROUNDWATER AS DESCRIBED IN GW #3. THE CONFIGURATION OF THE ENTIRE SYSTEM IS VERY SIMILAR TO THAT OF GW #3, WITH THE ONLY SIGNIFICANT DIFFERENCE BEING THE METHOD OF TREATMENT, CARBON ADSORPTION.

**GW #6****WELL-HEAD TREATMENT #SOUTH WELL) WITH AIR STRIPPING**

THIS ALTERNATIVE WOULD DIRECTLY TREAT GROUNDWATER FOR THE PETERBOROUGH PUBLIC WATER SUPPLY THROUGH WELL-HEAD TREATMENT OF WATER EXTRACTED BY THE SOUTH MUNICIPAL WELL USING AIR STRIPPERS.

**GW #7****DEVELOPMENT OF AN ALTERNATE WATER SUPPLY**

UNDER THIS ALTERNATIVE, AN ALTERNATE WATER SUPPLY WOULD BE PROVIDED TO THE SOUTH MUNICIPAL WELL SITE COMMUNITY.

## GW #8

### GROUNDWATER EXTRACTION WITH A RADIAL COLLECTOR WELL WITH AIR STRIPPING

THIS ALTERNATIVE IS SIMILAR TO GW #3, THE ONLY DIFFERENCE BEING THE METHOD OF GROUNDWATER EXTRACTION NEAR THE NORTHEAST CORNER OF THE NHBB BUILDING. AT THAT LOCATION, A SINGLE CONCRETE CAISSON WOULD BE INSTALLED. FROM THE CAISSON, SCREENED WELLS WOULD BE EXTENDED RADIALY AT A CHOSEN DEPTH IN AN ATTEMPT TO ENHANCE CONTAMINANT REMOVAL.

## GW #9

### GROUNDWATER EXTRACTION(ACCELERATED) WITH ON-SITE AIR STRIPPING

THIS IS SIMILAR TO GW #3 EXCEPT THAT A GREATER EXTRACTION RATE IS USED FOR THE DILUTE PLUME GROUNDWATER EXTRACTION SYSTEM, THUS RESULTING IN A FASTER CLEANUP TIME FOR THAT PORTION OF THE AQUIFER. IN THE PROPOSED PLAN ISSUED PRIOR TO THE PUBLIC COMMENT PERIOD, EPA RECOMMENDED THIS ALTERNATIVE AS THE PREFERRED ALTERNATIVE FOR ADDRESSING GROUNDWATER CONTAMINATION AT THE SITE.

## II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

THE SITE CONSISTS OF THAT AREA POTENTIALLY AFFECTED BY A CONTAMINATED PLUME OF GROUNDWATER WHOSE AREAL EXTENT IS APPROXIMATELY 250 ACRES. FROM 1952 UNTIL 1982, THE SOUTH MUNICIPAL WATER SUPPLY WELL DREW WATER FROM THE AQUIFER AFFECTED BY THE PLUME. THE PUMPING OF THE WELL CAUSED THE CONTAMINATION TO BE DRAWN INTO THE MUNICIPAL SUPPLY CAUSING USE OF THE WELL TO BE DISCONTINUED.

THE PRIMARY CONCERN OF THE COMMUNITY HAS BEEN THE ADEQUACY OF THE MUNICIPAL WATER SUPPLIES, ESPECIALLY DURING PERIODS OF HIGH DEMAND. TWICE DURING THE PERFORMANCE OF THE RI, THE WELL WAS USED FOR SHORT PERIODS OF TIME, COINCIDING WITH DRY SUMMER SEASONS AND HIGH DEMAND. FOR THE SECOND INCIDENT, RESIDENTS CONCERNED WITH THE QUALITY OF THE SOUTH WELL WATER PRESENTED A PETITION TO SELECTMEN WHICH RESULTED IN DISCONTINUANCE OF USE OF THE WELL.

PLANNED AND IMPLEMENTED MODIFICATIONS TO THE WATER SUPPLY DISTRIBUTION SYSTEM HAVE LESSENED CONCERN OVER THE SHORT TERM NEED FOR THE SOUTH WELL. HOWEVER, THERE IS STILL A RECOGNITION THAT THE SOUTH WELL AQUIFER WILL PLAY AN IMPORTANT ROLE IN SERVING THE FUTURE WATER SUPPLY NEEDS OF THE TOWN.

WITH EPA'S ISSUANCE OF THE PROPOSED PLAN IN JULY OF 1989, SOME PUBLIC CONCERN WAS EXPRESSED OVER THE FINANCIAL IMPACT THAT THE COST OF THE REMEDY MIGHT HAVE ON NHBB, A LARGE EMPLOYER IN THE TOWN.

## III. SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND EPA RESPONSES

THIS RESPONSIVENESS SUMMARY ADDRESSES THE COMMENTS RECEIVED BY EPA CONCERNING THE FS AND PROPOSED PLAN FOR THE SITE. SIX WRITTEN SETS OF COMMENTS WERE RECEIVED DURING THE PUBLIC COMMENT PERIOD (JULY 21 - AUGUST 19, 1989): TWO FROM RESIDENTS, TWO FROM TOWN OFFICIALS, ONE FROM THE PRP, AND ONE FROM THE SPEAKER OF THE NEW HAMPSHIRE HOUSE OF REPRESENTATIVES. SEVERAL ORAL COMMENTS WERE PRESENTED AT THE AUGUST 3, 1989 INFORMAL PUBLIC HEARING. THESE ORAL COMMENTS CLARIFIED AND/OR REITERATED THE WRITTEN COMMENTS. A COPY OF THE TRANSCRIPT OF THE HEARING IS INCLUDED AS EXHIBIT B. COPIES OF THE TRANSCRIPT AND ALL COMMENTS ARE ALSO AVAILABLE AT THE PETERBOROUGH PUBLIC LIBRARY AND AT THE EPA RECORDS CENTER AT 90 CANAL STREET, BOSTON, MASSACHUSETTS, AS PART OF THE ADMINISTRATIVE RECORD.

THE COMMENTS FROM THE PUBLIC AND EPA RESPONSES ARE PRESENTED BELOW, FOLLOWED BY COMMENTS FROM THE PRP AND EPA RESPONSES.

### PART I - CITIZEN COMMENTS

1. THREE COMMENTERS STATED SUPPORT OF EPA'S PROPOSED PLAN AND URGED THAT THE CLEANUP OF THE AQUIFER BE DONE AS QUICKLY AS POSSIBLE TO ENABLE THE TOWN TO ONCE AGAIN USE THE SOUTH WELL.

EPA RESPONSE: THE PRINCIPAL REMEDIAL ACTION OBJECTIVE FOR ADDRESSING GROUNDWATER CONTAMINATION STATED IN THIS RECORD OF DECISION IS TO RESTORE THE AQUIFER TO DRINKING WATER QUALITY IN AS SHORT A TIME AS PRACTICABLE. EPA BELIEVES THAT THE GROUNDWATER REMEDIATION ALTERNATIVE PROPOSED AS PART OF THE REMEDY WILL MEET THAT OBJECTIVE. IN ADDITION, BY PROVIDING SEPARATE EXTRACTION SYSTEMS, EPA BELIEVES THAT THE DILUTE PLUME CAN BE ISOLATED FROM BOTH THE NHBB AREA PLUME AND THE SOUTH WELL. THIS WILL RESULT IN A SHORTER CLEANUP TIME FOR THAT PORTION OF THE AQUIFER AFFECTED BY THE SOUTH WELL. ALSO, SHOULD A SITUATION ARISE THAT NECESSITATES USE OF THE SOUTH WELL DURING REMEDIATION, THE HYDRAULIC CONTROL PROVIDED BY THE DILUTE PLUME EXTRACTION SYSTEM WILL PROVIDE A DEGREE OF PROTECTION. THE EXACT REQUIREMENTS WHICH WOULD BE IMPOSED ON USE OF THE WELL, UP TO AND INCLUDING PROHIBITION OF USE, WILL BE DETAILED DURING REMEDIAL DESIGN.

2. ONE COMMENTER SUGGESTED AN APPROACH TO ENABLE EMERGENCY USE OF THE SOUTH WELL DURING REMEDIATION, DIVERTING SOUTH WELL WATER THROUGH THE GROUNDWATER REMEDIATION FACILITY FOR TREATMENT BEFORE THE GROUNDWATER ENTERED THE WATER DISTRIBUTION SYSTEM.

EPA RESPONSE: THE HYDRAULIC CONTROL PROVIDED BY THE DILUTE PLUME EXTRACTION SYSTEM COUPLED WITH INSTITUTIONAL CONTROLS RESTRICTING THE USE OF THE SOUTH WELL WOULD RESULT IN NO CONTAMINANTS BEING DRAWN INTO THE ZONE OF INFLUENCE OF THE WELL. EPA BELIEVES THAT APPROACH WOULD PROVIDE EFFECTIVE PROTECTION WITHOUT INCURRING THE ADDITIONAL COSTS ASSOCIATED WITH THE CITIZEN'S SUGGESTION. HOWEVER, AS MENTIONED IN THE FIRST RESPONSE, THE FINAL DECISION ON WHETHER TO RESTRICT OR SIMPLY PROHIBIT USE WILL BE DONE IN CONJUNCTION WITH THE REMEDIAL DESIGN.

3. THREE COMMENTERS URGED THAT FLEXIBILITY BE ALLOWED IN THE RECORD OF DECISION TO ENABLE THE USE OF NEW TECHNOLOGIES AS THEY BECOME AVAILABLE.

EPA RESPONSE: EPA AGREES THAT NEW TECHNOLOGIES THAT PROVIDE FOR A FASTER, MORE EFFECTIVE, OR LESS COSTLY CLEANUP ARE DESIRABLE. THEREFORE, A WIDE RANGE OF TECHNOLOGIES WAS SCREENED DURING THE FS. THE RECORD OF DECISION (ROD) HAS DETERMINED THAT AN INNOVATIVE TECHNOLOGY FOR SOIL REMEDIATION, IN-SITU VACUUM EXTRACTION, IS APPROPRIATE TO BE APPLIED AT THIS SITE. HOWEVER, AS DISCUSSED IN THE ROD, SINCE IT IS AN INNOVATIVE TECHNOLOGY, CAREFUL MONITORING AND CONTINUAL EVALUATION OF ITS EFFECTIVENESS IS REQUIRED. IF THIS EVALUATION RESULTS IN THE CONCLUSION THAT A MORE EFFECTIVE TECHNOLOGY SHOULD BE IMPLEMENTED, IT IS POSSIBLE TO AMEND THE ROD TO ENABLE USE OF THAT TECHNOLOGY.

4. ONE COMMENTER REQUESTED THAT FLEXIBILITY BE ALLOWED DURING THE REMEDIAL DESIGN SO THAT COSTS CAN BE KEPT TO A MINIMUM. THE CONCERN IS THAT CONSIDERATION BE GIVEN TO THE PRESERVATION OF JOBS.

EPA RESPONSE: EPA IS REQUIRED BY THE NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN (NCP) TO IMPLEMENT A REMEDY THAT IS COST-EFFECTIVE. THE ALTERNATIVES WHICH MAKE UP THE COMPREHENSIVE REMEDY FOR THIS SITE HAVE BEEN DETERMINED TO BE COST-EFFECTIVE. DURING THE DESIGN PHASE THERE ARE SEVERAL DECISIONS THAT STILL MUST BE MADE, BASED UPON MORE DETAILED DESIGN INVESTIGATIONS. THESE DECISIONS COULD HAVE SIGNIFICANT IMPACTS ON THE FINAL COSTS OF THE PROJECT. EPA WILL CONTINUE TO ENSURE THAT DESIGN DECISIONS WILL BE MADE WITH EFFECTIVENESS AND COSTS CONSIDERED.

5. ONE COMMENTER RECOMMENDED THAT MONITORING WELLS BE LOCATED NORTH OF THE NOONE FALLS AREA AND THAT THE COST OF ANY MONITORING REQUIRED IF THE SOUTH WELL WERE TO BE USED DURING REMEDIATION WOULD NOT BE BORNE BY THE TOWN.

EPA RESPONSE: THE DECISIONS ON THE PLACEMENT OF MONITORING WELLS WILL BE MADE AS PART OF THE FINAL DESIGN OF THE REMEDY. THE DECISION AS TO WHEN AND HOW THE SOUTH WELL WOULD BE USED WILL BE DEPENDENT ON THE FINAL CONFIGURATION OF THE DILUTE PLUME EXTRACTION SYSTEM. THE MONITORING ASSOCIATED WITH THAT SYSTEM WILL BE DETERMINED IN CONJUNCTION WITH THE DESIGN OF THE EXTRACTION SYSTEM. IT IS ANTICIPATED THAT ALL MONITORING COSTS WILL BE CONSIDERED AS OPERATIONAL COSTS OF THE REMEDY.

## PART II - PRP COMMENTS

THE PRP, NHBB, PRESENTED VARIATIONS ON THE PREFERRED ALTERNATIVES WHICH EPA PRESENTED IN THE PROPOSED PLAN. THESE VARIATIONS WERE DOCUMENTED IN A LETTER AND AMPLIFIED ON IN A MEETING, THE MINUTES OF WHICH HAVE BEEN MADE PART OF THE ADMINISTRATIVE RECORD.

6. THE PRP HAS SUGGESTED THAT EPA SELECT A MODIFICATION OF GW #3 AS THE MANAGEMENT OF MIGRATION COMPONENT OF THE REMEDY. THIS ALTERNATIVE WOULD EXPAND THE EXISTING GROUNDWATER TREATMENT FACILITY TO ACCOMMODATE FLOWS UP TO 400 GPM INITIALLY. DATA WOULD BE COLLECTED DURING A ONE YEAR TRIAL OF THE EXPANDED PLANT TO DETERMINE THE EFFECTIVENESS OF REMEDIATING THE DILUTE PORTION OF THE PLUME WITH THE GOAL OF APPROXIMATING THE CLEANUP SCHEDULE PRESENTED IN THE PROPOSED PLAN (ABOUT 7.5 YEARS). THE DATA WOULD BE EVALUATED TO ASSIST IN DESIGN OF A FULL-SCALE TREATMENT. AS PART OF THIS MODIFICATION AND CENTRAL TO IT FROM THE STANDPOINT OF NHBB, IS THAT THE EXTRACTED GROUNDWATER BE TREATED IN ONE TREATMENT FACILITY. NHBB ASSERTS THAT THIS ALTERNATIVE CAN MORE CHEAPLY HANDLE THE EXTRACTED GROUNDWATER FROM BOTH THE NHBB AND DILUTE PLUME AREAS WHILE ACHIEVING A CLEANUP TIMEFRAME COMPATIBLE WITH EPA'S GOAL OF 7.5 YEARS.

EPA RESPONSE: THE MAJOR OBJECTIVE OF THE REMEDY SELECTED BY EPA IS TO CLEAN THE AQUIFER AS SOON AS PRACTICABLE. THE PARAMETERS USED IN THE MODEL WHICH HELPED DETERMINE THE PROBABLE CLEANUP TIME WERE LITERATURE VALUES WHICH WERE DEEMED APPROPRIATE FOR THE TYPES OF COARSE SANDS AND GRAVELS FOUND AT THIS SITE. ANY PRELIMINARY DESIGN INFORMATION WHICH COULD BE GENERATED TO CONFIRM THOSE VALUES WOULD AID IN DESIGNING AN OPTIMAL SYSTEM. HOWEVER, IF THE RESULTS OF FURTHER INVESTIGATIONS INDICATE THAT THE AQUIFER PARAMETERS ASSUMED IN THE FS RESULTED IN TOO LOW A GROUNDWATER EXTRACTION RATE TO ACHIEVE EPA GOALS, THEN EPA WOULD EXPECT THAT THE RATE WOULD BE INCREASED (AND HENCE THE TREATMENT PLANT EXPANDED) IN ORDER TO APPROACH THE 7.5 YEAR CLEANUP OF THE DILUTE PLUME.

FURTHERMORE, A RIGOROUS COST-EFFECTIVE ANALYSIS OF ONE TREATMENT PLANT COMPARED TO TWO TREATMENT PLANTS NEEDS TO BE DONE USING CONSISTENT METHODOLOGIES AND PARAMETERS. COMPLICATING THE ANALYSIS IS THE SHORTER TIME IT WILL TAKE TO CLEAN THE DILUTE PLUME. WHILE THE EXTRACTION OF NHBB AREA GROUNDWATER CAN BE EXPECTED TO CONTINUE FOR AT LEAST 19 YEARS, THE DILUTE PLUME SYSTEM COULD BE SHUT DOWN MUCH SOONER. CARRYING THAT MUCH EXCESS CAPACITY IN A SINGLE PLANT MAY NOT PROVE COST-EFFECTIVE. THE ROD PROVIDES THAT IF IT CAN BE SHOWN THAT ONE, RATHER THAN TWO TREATMENT FACILITIES CAN MEET THE REMEDIAL ACTION OBJECTIVES AND THE STATUTORY REQUIREMENTS, AND PRESENT AN EQUIVALENT BALANCE OF THE EVALUATION CRITERIA, THEN ONE FACILITY MAY BE CONSTRUCTED.

IN SUMMARY, FINAL DETERMINATIONS RELATING TO THE NUMBER OF TREATMENT FACILITIES, NUMBER AND LOCATION OF EXTRACTION WELLS, GROUNDWATER EXTRACTION RATE, AND THE NUMBER AND LOCATION OF DISCHARGE POINTS WILL BE BASED ON SITE SPECIFIC DATA COLLECTED DURING THE REMEDIAL DESIGN. REMEDIAL ACTION OBJECTIVES WILL BE MET.

7. THE PRP SUPPORTED THE SELECTION OF THE SOIL REMEDIATION TECHNOLOGY, VACUUM EXTRACTION, BUT HAVE EXPRESSED CONCERN THAT THIS INNOVATIVE TECHNOLOGY MAY BE UNABLE TO REACH THE VERY LOW SOIL CLEANUP LEVELS. THE PRP REQUESTED THAT FLEXIBILITY BE ALLOWED DURING REMEDIAL DESIGN TO EVALUATE TECHNOLOGICAL ADVANCES BEING MADE IN THE TREATMENT OF CONTAMINATED SOILS.

EPA RESPONSE: EPA'S POSITION ON THE USE OF VACUUM EXTRACTION IS PRESENTED IN SECTION X.B.L. OF THE ROD. THE REMEDY SELECTED WAS THE BEST OF THOSE IDENTIFIED IN THE FS PREPARED BY THE PRP. IT IS NOT CLEAR WHAT OTHER TECHNOLOGICAL ADVANCES ARE REFERRED TO NOR IS IT CLEAR HOW THEY COULD BE EVALUATED DURING REMEDIAL DESIGN SO AS NOT TO DELAY IMPLEMENTATION OF THE REMEDY. EPA'S CONCERNS ARE STATED IN THE RESPONSE TO COMMENT #3.

8. THE PRP RECOMMENDED A MODIFIED SEDIMENT TREATMENT ALTERNATIVE BECAUSE IT BELIEVES THAT THE SELECTION OF THE EPA ALTERNATIVE IS PREMATURE. THE PRP HAS PROPOSED BURYING A PORTION OF THE PCB CONTAMINATED SEDIMENTS IN AN UNLINED, ON-SITE LANDFILL TO BE LOCATED UNDER THE NHBB PARKING LOT WITH A CAP WHICH WOULD MEET FEDERAL LANDFILL CLOSURE REQUIREMENTS. THE REMAINING PORTION OF THE PAH-CONTAMINATED SEDIMENTS WOULD BE SHIPPED OFF-SITE FOR DISPOSAL.

EPA RESPONSE: THERE ARE SEVERAL REASONS WHY EPA DOES NOT AGREE WITH NHBB'S REMEDIAL ALTERNATIVE. THE PRP'S PROPOSAL WOULD RESULT IN THE CREATION OF A NEW LANDFILL AT THE SITE WHICH WOULD REQUIRE LONG-TERM MONITORING AND MAINTENANCE. NOT ONLY WOULD FEDERAL LANDFILL CLOSURE REQUIREMENTS NEED TO BE MET, BUT FEDERAL REQUIREMENTS FOR NEW LANDFILLS RELATED TO A LINER SYSTEM WOULD ALSO NEED TO BE INCORPORATED INTO THE DESIGN. IN GENERAL, WHILE THERE IS A PREFERENCE FOR ON-SITE SOLUTIONS EXPRESSED IN FEDERAL LAW, IN THIS CASE EPA HAS SELECTED OFF-SITE DISPOSAL AND DOES NOT BELIEVE THAT THERE ARE PRACTICABLE ON-SITE TREATMENT ALTERNATIVES FOR THE SEDIMENTS. OFF-SITE DISPOSAL WILL PROVIDE A PROTECTIVE REMEDY THAT PERMANENTLY REMOVES CONTAMINANTS FROM THE SITE. IN THIS CASE, EPA BELIEVES THAT THE SHORT AND LONG TERM EFFECTIVENESS OF AN OFF-SITE, RCRA-LICENSED LANDFILL THAT HAS BEEN DESIGNED TO CONTAIN HAZARDOUS SUBSTANCES IS MORE PROTECTIVE THAN A NEW LANDFILL CONSTRUCTED ON-SITE.