TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

CAP WORKSHEET	SOIL VAPOR EXTRACTION (SVE)

Site Name: _____ TCEQ LPST #: _____
Address: _____ Prepared By: _____
_____ CAS Name: _____
_____ CAS #: _____
Date Prepared: _____

Please refer to the appropriate section in the EPA CAP Manual for definitions, equations and tables to assist you when completing this worksheet. When supplying the information requested below, please make certain that any calculations and methodology used to arrive at the value or conclusion you have entered is included in the CAP. A value entered without justification or support documentation may result in delayed review or rejection of the CAP. This document must not be altered in any manner.

SOIL CHARACTERISTICS

Intrinsic permeability k (cm^2): _____
Check one of the following:
☐ $k \geq 10^{-8}$ cm^2 (SVE generally effective)
☐ $10^{-8} \geq k$ 10^{-10} cm^2 (SVE may be effective; needs further evaluation)
☐ $k < 10^{-10}$ cm^2 (SVE has marginal to no effectiveness)
How was k obtained? ☐ pilot study ☐ field testing ☐ lab analysis of core samples
☐ calculated ☐ other _____

Hydraulic conductivity K (cm/sec): _____
How was K obtained? ☐ slug test ☐ pumping test ☐ other _____

Predominant types of soil present. (Check all that apply.) ☐ gravels ☐ sands ☐ silts
☐ clays ☐ other _____

Average depth to groundwater in area to be treated (ft): _____
Check one of the following:
☐ depth > 10 ft (SVE effective)
☐ 3 ft < depth < 10 ft (SVE needs special controls, i.e. groundwater pumping)
☐ depth < 3 ft (SVE not generally effective)

Thickness of capillary fringe (estimated from boring logs, ft): _____
Are the soils to be treated generally dry? ☐ yes ☐ no

CONSTITUENT CHARACTERISTICS

Product type released. (Check all that apply.) ☐ gasoline ☐ diesel ☐ waste oil ☐ kerosene
☐ heating oil ☐ lubricating oil ☐ other _____

Do any of the COCs[1] present have a vapor pressure <0.5 mm Hg? ☐ yes ☐ no
Do any of the COCs present have a Henry's Law constant <100 atm? ☐ yes ☐ no

[1]COCs - Constituents of Concern

SYSTEM DESIGN

Estimated of influence (ROI) (ft): _____
How was ROI determined? ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____

Design vacuum (inches of water): _____
How was wellhead vacuum determined: ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____

Design flow rate (cfm): _____
How was extraction flow rate determined: ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____

Are the risk-based target cleanup goals for all COCs achievable with this system? ☐ yes ☐ no

Proposed remedial cleanup time (months and/or years): _____

Soil volume to be treated with this system (ft^3): _____

Pore volume exchange time (hr): _____

Will extracted vapors be in excess of state or local air emission limits? ☐ yes ☐ no

Are there any site construction limitations, such as buildings, utilities, buried objects, and residences which must be included in the design process? ☐ yes ☐ no

SYSTEM COMPONENTS

How are the extraction wells oriented? ☐ vertically ☐ horizontally
Number of extraction wells needed: _____
Diameter of extraction wells (inches): _____ Length of screen (ft): _____

Zone of contaminated soils to be treated (ft below ground surface): _____

If vertical extraction wells are used, are they screened as follows? (Check all that apply.) ☐ N/A
Within the contaminated zone? ☐ yes ☐ no
Within the zone of lowest permeability? ☐ yes ☐ no
Above the static water table? ☐ yes ☐ no

If horizontal extraction wells are used, are the following conditions met? (Check all that apply.) ☐ N/A
Is zone of contamination <25 ft bgs? ☐ yes ☐ no
Is depth of groundwater <10 ft? ☐ yes ☐ no
Is zone of contamination confined to a specific stratigraphic unit? ☐ yes ☐ no

Diameter of the manifold piping (in): _____ Depth of burial (ft): _____
Is the piping to extraction well locations sloped back toward the well? ☐ yes ☐ no

Is vapor pretreatment necessary? ☐ yes ☐ no
If so, which of the following will be installed: ☐ moisture separator ☐ particulate filter
☐ other _____

Are any of the following included in the system design? (Check all that apply.) ☐ air injection wells
☐ passive inlet wells ☐ surface seals ☐ groundwater depression pumps (other than existing pump and treat)

SYSTEM COMPONENTS (Cont'd)			
Is the subject site paved?		☐ yes	☐ no
If no, what is the ground cover? _____			
Will a groundwater extraction system be operating concurrently with the SVE system?		☐ yes	☐ no
If yes, is the system currently operating?		☐ yes	☐ no
Will vapor treatment be necessary?		☐ yes	☐ no
If yes, what type will be used?	☐ granular activated carbon (GAC)		☐ catalytic oxidation
☐ thermal oxidation	☐ other _____		
Will a telemeter or remote monitoring system be installed?		☐ yes	☐ no
OPERATION, MONITORING AND PERFORMANCE (OMP) PLAN			
Does the OMP Plan include daily monitoring for the start-up phase (up to 10 days)?		☐ yes	☐ no
Does the OMP Plan include regulatory scheduled long-term monitoring?		☐ yes	☐ no
What is the scheduled frequency of long-term monitoring?	☐ biweekly ☐ monthly		☐ other _____
Does the OMP Plan include the following performance monitoring:			
Calculation of cumulative mass removed?		☐ yes	☐ no
A graph of cumulative mass removed and concentrations vs. operation time?		☐ yes	☐ no
Does the OMP Plan include a comparison of the proposed remedial cleanup time and the actual cleanup rate currently being achieved?		☐ yes	☐ no
CLOSURE PLAN			
Does the closure plan include the following:			
Confirmation of cleanup levels?		☐ yes	☐ no
Removal of the equipment?		☐ yes	☐ no
Plugging of wells?		☐ yes	☐ no
Submission of site closure request?		☐ yes	☐ no
Waste disposal?		☐ yes	☐ no ☐ N/A
Paving, resurfacing?		☐ yes	☐ no ☐ N/A

CAP WORKSHEET	BIOVENTING

Site Name: _____ TCEQ LPST #: _____
Address: _____ Prepared By: _____
_____ CAS Name: _____
_____ CAS #: _____
Date Prepared: _____

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SITE CHARACTERISTICS

Intrinsic permeability k (cm^2): _____ (Note: k should be $\geq 10^{-8}$ to be effective.)
How was k obtained? ☐ pilot study ☐ field testing ☐ lab analysis of core samples
☐ calculated ☐ other _____

Hydraulic conductivity K (cm/sec): _____
How was K obtained? ☐ slug test ☐ pumping test ☐ other _____

Plate count for total heterotrophic bacteria (CFU/gram dry soil): _____ (Note: plate count should be 1000 CFU/gram dry soil to be effective.)
Soil pH prior to bioventing: _____ (Note: acceptable range is $6 \leq pH \leq 8$.)
Thickness of the capillary fringe from boring logs (ft): _____
Will depression of the water table by groundwater pumping be necessary to biovent soils within the capillary fringe? ☐ yes ☐ no

Do the areas to be treated have surface cover, such as asphalt or concrete? ☐ yes ☐ no
If no, what measures will be taken to prevent excessively moist soils due to surface infiltration? _____
_____

Soil temperature (°C): _____ (Note: acceptable range is 10°C and 45°C.)
Stoichiometric ratio of carbon:nitrogen:phosphorus (C:N:P): _____ (Note: ratio should range from 100:10:1 to 100:1:0.5 to be effective.)
Average depth to groundwater (ft bgs): _____ If groundwater depth is less than 3 ft bgs, what measures will be taken to prevent upwelling? _____
_____

CONSTITUENT CHARACTERISTICS

Do any of the constituents present have a vapor pressure < 0.5 mm Hg? ☐ yes ☐ no
Do any of the constituents present have a Henry's law constant < 100 atm? ☐ yes ☐ no
Is the TPH concentration of soils to be treated > 50,000 ppm? ☐ yes ☐ no
Is the heavy metal concentration of soils to be treated > 2,500 ppm? ☐ yes ☐ no

PILOT SCALE STUDIES

Have laboratory or pilot scale studies been conducted? ☐ yes ☐ no

If yes, check which type: ☐ soil vapor extraction and injection treatability tests

☐ respirometry studies ☐ slurry studies ☐ column studies

☐ laboratory microbial screening tests ☐ other: _____

SYSTEM DESIGN

Radius of influence (ROI) (ft): _____

How was ROI determined? ☐ pilot testing ☐ estimated ☐ modeling

Wellhead pressure (psig): _____

How was wellhead pressure determined? ☐ pilot testing ☐ estimated ☐ modeling

Induced vapor flow rate (CFM): _____

How was flow rate determined? ☐ pilot testing ☐ estimated ☐ modeling

Proposed remedial cleanup time (months and/or years): _____

Soil volume to be treated with this system (f^3.): _____

Pore volume exchange time (hr): _____

Will extracted vapors be in excess of state or local air emission limits? ☐ yes ☐ no

Are there any site construction limitations, such as buildings, utilities, buried objects, and residences which must be included in the design process? ☐ yes ☐ no

SYSTEM COMPONENTS

How are extraction wells oriented? ☐ vertically ☐ horizontally

Number of extraction wells needed: _____

Diameter of extraction wells (inches): _____ Length of screen (ft): _____

If vertical extraction wells are used, are they screened as follows? (Check all that apply.) ☐ N/A

Within the contaminated zone? ☐ yes ☐ no

Within the zone of lowest permeability? ☐ yes ☐ no

Above the seasonal low water table? ☐ yes ☐ no

If horizontal extraction wells are used, are the following conditions met? (Check all that apply.) ☐ N/A

Is zone of contamination < 25 ft bgs? ☐ yes ☐ no

Is depth to groundwater < 10 ft? ☐ yes ☐ no

Is zone of contamination confined to a specific stratigraphic unit? ☐ yes ☐ no

Is screen high enough above the water table so that normal fluctuations do not submerge the screen? ☐ yes ☐ no

Are air injection wells included in the design? ☐ yes ☐ no

If yes, answer the following:

Which types are proposed? ☐ active injection wells ☐ passive injection wells

How are injection wells oriented? ☐ vertically ☐ horizontally

Number of injection wells needed: _____ Diameter of injection wells (inches): _____

Length of screen (ft): _____

SYSTEM COMPONENTS (CONT.)

Diameter of the manifold piping (in): _____ Depth of burial: _____

Is the piping to extraction well locations sloped back toward the well? ☐ yes ☐ no

Is vapor pretreatment necessary? ☐ yes ☐ no

If yes, which of the following will be installed: ☐ moisture separator ☐ particulate filter

☐ other _____

Is a nutrient delivery system proposed? ☐ yes ☐ no

If yes, how will nutrients be supplied? (Check all that apply.)

☐ hand-spraying ☐ topical irrigation (sprinklers) ☐ trenches or wells

What is the proposed frequency of nutrient addition? _____

Will vapor treatment be necessary? ☐ yes ☐ no

If yes, what type will be used? ☐ granular activated carbon (GAC) ☐ catalytic oxidation

☐ thermal oxidation ☐ other _____

Will a telemeter or remote monitoring system be installed? ☐ yes ☐ no

OPERATION, MONITORING AND PERFORMANCE (OMP) PLAN

Does the OMP Plan include daily monitoring for the start-up phase (up to 10 days)? ☐ yes ☐ no

Does the OMP Plan include regularly scheduled long-term monitoring after start-up? ☐ yes ☐ no

What is the scheduled frequency of long-term monitoring? ☐ biweekly ☐ monthly ☐ other _____

Does the OMP Plan include the following performance monitoring and calculations:

- Calculation of cumulative VOC mass removed? ☐ yes ☐ no
- Carbon dioxide concentrations in extracted soil vapor? ☐ yes ☐ no
- VOC concentrations in extracted soil vapor? ☐ yes ☐ no
- A graph of cumulative mass removed and concentrations vs. operation time? ☐ yes ☐ no
- Does the OMP Plan include a comparison of the proposed remedial cleanup time and the actual cleanup rate currently being achieved? ☐ yes ☐ no

CLOSURE PLAN

Does the closure plan include the following:

- Confirmation of cleanup levels? ☐ yes ☐ no
- Removal of the equipment? ☐ yes ☐ no
- Plugging of wells? ☐ yes ☐ no
- Submission of site closure request? ☐ yes ☐ no
- Waste disposal? ☐ yes ☐ no ☐ N/A
- Paving, resurfacing? ☐ yes ☐ no ☐ N/A

CAP WORKSHEET	BIOPILES

Site Name: _____ TCEQ LPST #: _____
Address: _____ Prepared By: _____
_____ CAS Name: _____
_____ CAS #: _____
Date Prepared: _____

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SOIL/GW CHARACTERISTICS

Background plate count for total heterotrophic bacteria (CFU/gram dry soil): _____
Check one: ☐ Plate count is > 1,000 CFU/gram (generally effective)
☐ Plate count is < 1,000 CFU/gram (may be effective; needs further evaluation)

Soil pH: _____ Check one: ☐ 6 ≤ ph ≥ 8 (generally effective)
☐ 6 > ph > 8 (biopile soils will require adjustments)
Moisture content of the soils to be biopiled (% of field capacity): _____
Check one: ☐ 40% ≤ field capacity ≤ 85% (effective)
☐ field capacity < 40% (periodic moisture addition is needed to maintain proper bacterial growth)
☐ field capacity > 80% (biopile design should include special drainage considerations or impervious cover)
Is the average soil temperature between 10°C and 45°C? ☐ yes ☐ no
Concentration of naturally occurring nitrogen (expressed as ammonia) in soil: _____
Concentration of naturally occurring phosphate in soil: _____
Stoichiometric ratio of carbon:nitrogen:phosphorus (C:N:P): _____
Is the stoichiometric ratio C:N:P between 100:10:1 to 100:1:0.5? ☐ yes ☐ no
Volume of contaminated soil to be treated: (ft^3): _____
Soil bulk density (kg/ft^3): _____
Mass of contaminated soil (kg): _____
Predominant types of soil to be treated. (Check all that apply.) ☐ gavels ☐ sands ☐ silts ☐ clays
(Please note: clayey soils may require pretreatment prior to biopile construction, i.e. shredding, adding gypsum)

CONSTITUENT CHARACTERISTICS

Product type released. (Check all that apply.) ☐ gasoline ☐ diesel ☐ waste oil ☐ kerosene
☐ heating oil ☐ lubricating oil ☐ other _____

Is the TPH concentration of soils to be treated > 50,000 ppm? ☐ yes ☐ no
Is the heavy metal concentration of soils to be treated > 2,500 ppm? ☐ yes ☐ no
Is a reduction in TPH levels greater than 95% required? ☐ yes ☐ no
If yes, either a pilot study is required to demonstrate the ability of the biopile system to achieve these reductions or another technology should be considered.
Is a cleanup level lower than 0.1 ppm required for any individual constituent? ☐ yes ☐ no

CLIMATIC CONDITIONS

Is the ambient air temperature between 10°C and 45°C year round? ☐ yes ☐ no
Is annual rainfall greater than 30 inches in the area? ☐ yes ☐ no
Are high winds likely? ☐ yes ☐ no

BIOTREATABILITY

Has a biotreatability study been conducted? ☐ yes ☐ no (If no, skip to Biopile Design Section.)
If yes, answer the following questions.
Type of study: ☐ flask study ☐ pan study
Analyses performed: (Check all that apply.) ☐ soil toxicity ☐ soil texture ☐ nutrients
☐ contaminant biodegradability
Type of degradation study performed: (Check all that apply.) ☐ no treatment control ☐ nutrient adjusted
☐ inoculated ☐ sterile control
Does the biotreatability study demonstrate effectiveness? ☐ yes ☐ no
If no, is a field trial or pilot study proposed? ☐ yes ☐ no

BIOPILE DESIGN

Height of biopiles (ft): _____ Width of biopiles (ft): _____ Length of biopiles (ft): _____
Total square area of biopiles including berms, sloping sides, etc. (ft^2): _____

Is site preparation necessary, i.e. clearing, grading, etc.? ☐ yes ☐ no
Is air injection or extraction piping included in the design? ☐ yes ☐ no
Is a leachate collection and treatment system included in the design? ☐ yes ☐ no
Is soil pretreatment necessary, i.e. shredding, blending, pH control, etc.? ☐ yes ☐ no
Is vapor treatment necessary? ☐ yes ☐ no
Aeration will be done by: ☐ manual turning ☐ aeration system ☐ other _____

Is management of runon and runoff included in the design? ☐ yes ☐ no
How will runoff be disposed of? _____
Are soil erosion controls from wind and water included in the design? ☐ yes ☐ no
Will the biopiles be covered? ☐ yes ☐ no
Are pH adjustment, moisture addition, and nutrient supply methods and frequencies specified? ☐ yes ☐ no
Is the biopile site secured to deter public contact? ☐ yes ☐ no

Have air emissions been estimated based on initial soil concentrations? ☐ yes ☐ no
Is vapor monitoring proposed during initial biopile operation? ☐ yes ☐ no
Are provisions included for vapor treatment, if needed? ☐ yes ☐ no
Will soils from more than one LPST site be treated at this biopile site? ☐ yes ☐ no

OPERATION, MONITORING AND PERFORMANCE (OMP) PLAN

Are the anticipated frequencies of aeration, nutrient addition, and moisture addition provided in the OMP Plan? ☐ yes ☐ no
Are seasonal variations in temperature and rainfall taken into account? ☐ yes ☐ no
If the biopiles are covered, is periodic monitoring of cover condition and provisions for cover replacement included? ☐ yes ☐ no ☐ N/A

OPERATION, MONITORING AND PERFORMANCE (OMP) PLAN (Cont'd)

Is monitoring for constituent reduction and biodegradation conditions proposed?	☐ yes	☐ no
Is air monitoring proposed?	☐ yes	☐ no
Is surface runoff water sampling proposed?	☐ yes	☐ no
Is quarterly monitoring of biopile soils proposed?	☐ yes	☐ no
If no, what is the proposed monitoring frequency? _____		
Quarterly monitoring of soils will include: (Check all that apply.)	☐ pH	☐ moisture content
☐ bacterial population ☐ nutrient content ☐ constituent concentrations		☐ other _____
If air extraction or injection is used, is the monitoring of oxygen and carbon dioxide concentrations in the extracted vapor proposed?	☐ yes	☐ no ☐ N/A
If yes, will this vapor monitoring be conducted weekly for thefirst three months then quarterly during treatment?	☐ yes	☐ no
Will soil beneath the biopile be monitored?	☐ yes	☐ no
Will groundwater downgradient of the biopiles be monitored?	☐ yes	☐ no

CLOSURE PLAN

Proposed final disposition of the treated soil:	☐ incorporated into asphalt	☐ returned to the excavation
☐ landfill ☐ landfill cover	☐ other _____	
Will the treated material be used in an engineering application such as road bed, building foundation, grading and filling:	☐ yes	☐ no

CAP WORKSHEET	THERMAL DESORPTION

Site Name: _____ TCEQ LPST #: _____
Address: _____ Prepared By: _____
_____ CAS Name: _____
CAS #: _____
Date Prepared: _____

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SOIL CHARACTERISTICS

Do the soils have high plasticity? ☐ yes ☐ no
If yes, how was this determined? ☐ estimated ☐ measured Atterberg Limits
☐ other _____

Do the soils contain material larger than 2 inches in diameter? ☐ yes ☐ no
If yes, will this material be crushed or removed? ☐ yes ☐ no
Predominant types of soil to be treated. (Check all that apply.) ☐ gravels ☐ sands ☐ silts
☐ clays ☐ other _____
Moisture content of soil to be treated: _____
If moisture content > 35%, will soils be dewatered? ☐ yes ☐ no ☐ N/A

Are soils below the water table proposed for treatment? ☐ yes ☐ no
If yes, how will these soils be dewatered? (Check all that apply.) ☐ air drying
☐ mixing with drier soils ☐ mechanical dewatering ☐ other _____
Does the soil contain high concentrations of humic material? ☐ yes ☐ no
Does the soil contain concentrations of heavy metals? ☐ yes ☐ no
Soil bulk density (lb/ft^3): _____ Is this value? ☐ in situ ☐ ex situ

Product type released. (Check all that apply.) ☐ gasoline ☐ diesel ☐ waste oil ☐ kerosene
☐ heating oil ☐ lubricating oil ☐ other _____

Is the soil heating value >2,000 Btu/lb? ☐ yes ☐ no
Is the concentration of TPH in the soil > 3%? ☐ yes ☐ no
Will soils be blended with cleaner soils to dilute high concentrations of hydrocarbons? ☐ yes ☐ no
Will the concentration of organic compounds be limited to <25 % LEL? ☐ yes ☐ no
If soils to be treated are contaminated with waste oil, has the soil been sampled for PCBs and other chlorinated compounds which are potential precursors of dioxins? ☐ yes ☐ no ☐ N/A

PROCESS OPERATING CONDITIONS

Type of system that will be used: ☐ rotary dryer ☐ asphalt plant aggregate dryer
☐ thermal screws ☐ conveyor furnace ☐ other _____
System capacity (tons/hour): _____
Is the system? ☐ mobile ☐ stationary
Is the system registered with the PST Division under 30 TAC 334 Subchapter K? ☐ yes ☐ no
If yes, PST treatment facility registration number: _____

PROCESS OPERATING CONDITIONS (CONT.)

Estimated soil feed rate (tons/hour): _____
How was this rate determined? ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____

Type of treatment system that will be used to control particulates: ☐ venturi scrubber ☐ cyclone
☐ baghouse ☐ other _____
Type of treatment system that will be used to control organic vapors: ☐ afterburner ☐ condenser
☐ activated carbon ☐ other _____

Soil discharge temperature range (°F): Does this temperature range meet or exceed the treatment temperature range for the products of concern? ☐ yes ☐ no
What is the design residence time? _____ Is a test burn recommended or proposed? ☐ yes ☐ no

PRACTICALITY OF USING THERMAL DESORPTION

Volume of soil to be treated (ft^3): _____ Do soils to be treated need to be excavated? ☐ yes ☐ no

Are the contaminated soils > 25 feet below land surface? ☐ yes ☐ no
Are the contaminated soils below the water table? ☐ yes ☐ no
Are the contaminated soils beneath or near buildings or other structures? ☐ yes ☐ no
Are the contaminated soils located within the site boundaries? ☐ yes ☐ no

If a mobile or stationary system will be used on site, please answer the following questions. If soils will be treated off-site, please check here. ☐ N/A (Skip next five questions.)
Is a sufficient amount of space available for stockpiling treated and untreated soils and operating process equipment? ☐ yes ☐ no
Will daily site operations continue during treatment? ☐ yes ☐ no
Can the minimum distances required by fire and safety codes for operating thermal desorption equipment in the vicinity of petroleum storage facilities be maintained? ☐ yes ☐ no
Is any land adjacent to the site being used for schools, parks, health care facilities or dense residential development? ☐ yes ☐ no
Will the LTTD system be operated 24 hours a day? ☐ yes ☐ no

Proposed final disposition of the treated soil: ☐ incorporated into asphalt ☐ returned to the excavation
☐ landfill ☐ landfill cover ☐ other _____
Will the treated material be used in an engineering application such as road bed, building foundation, grading and filling? ☐ yes ☐ no

EFFECTIVENESS OF THERMAL DESORPTION

Rate feed soil will be analyzed (per cubic yard): _____ Rate treated soil will be analyzed (per cubic yard): _____

Are the target concentrations above achievable with the system proposed? ☐ yes ☐ no
What course of action will be taken if target concentrations are not achieved following initial treatment? _____
If soils are to be excavated, will excavation wall and floor samples be collected? ☐ yes ☐ no ☐ N/A
Other than PST treatment facility registration, are any other permits required for the operation of the system? ☐ yes ☐ no
If yes, what type? _____

CAP WORKSHEET	AIR SPARGING

Site Name: _____ TCEQ LPST #: _____
Address: _____ Prepared By: _____
_____ CAS Name: _____
_____ CAS #: _____
Date Prepared: _____

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SOIL/GW CHARACTERISTICS

Intrinsic permeability k (cm^2): _____
Check one of the following: ☐ $k \geq 10^{-9}$ cm^2 (generally effective)
☐ $10^{-9} \geq k \geq 10^{-10}$ cm^2 (may be effective; needs further evaluation)
☐ $k < 10^{-10}$ cm^2 (has marginal to no effectiveness)
How was k obtained? ☐ pilot study ☐ field testing ☐ lab analysis of core samples
☐ calculated ☐ other _____

Hydraulic conductivity K (cm/sec): _____
How was K obtained? ☐ slug test ☐ pumping test ☐ calculated ☐ other _____

Predominant types of soil present. (Check all that apply.) ☐ gravels ☐ sands ☐ silts
☐ clays ☐ other _____

Total dissolved iron concentration at the site (ppm): _____

CONSTITUENT CHARACTERISTICS

Product type released. (Check all that apply.) ☐ gasoline ☐ diesel ☐ waste oil ☐ kerosene
☐ heating oil ☐ lubricating oil ☐ other _____
Do any of the COCs[2] present have a vapor pressure <0.5 mm Hg? ☐ yes ☐ no
Do any of the COCs present have a Henry's Law constant <100 atm? ☐ yes ☐ no

SYSTEM DESIGN

Will a SVE system be used in conjunction with the air sparging system? ☐ yes ☐ no
If no, how will potential vapor migration be monitored and controlled? _____
_____

Radius of influence (ROI) (ft): _____
How was ROI determined? ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____

[2]COCs - Constituents of Concern

SYSTEM DESIGN (Cont'd)
Sparging air flow rate (scfm): _____ How was extraction flow rate determined? ☐ pilot testing ☐ estimated ☐ modeling ☐ other _____
Sparging air pressure (psig): _____ How was sparging air pressure determined? ☐ pilot testing ☐ estimated ☐ modeling ☐ other _____
Are the risk-based target cleanup goals for all COCs achievable with this system? ☐ yes ☐ no
Proposed remedial cleanup time (months and/or years): _____
Saturated zone volume to be treated with this system (ft^3): _____
Pore volume exchange time (hr): _____
Will extracted vapors be in excess of state or local air emission limits? ☐ yes ☐ no
Are there any site construction limitations, such as buildings, utilities, buried objects, and residences which must be included in the design process? ☐ yes ☐ no
SYSTEM COMPONENTS
How are the sparging wells oriented? ☐ vertically ☐ horizontally Number of sparging wells needed: _____ Diameter of sparging wells (inches): _____ Length of typical sparging well screen (ft):
Number of extraction wells needed: _____ Diameter of extraction wells (inches): _____ Length of typical well screen (ft): _____
If vertical extraction wells are used, are they screened as follows? (Check all that apply.) ☐ N/A Within the contaminated zone? ☐ yes ☐ no Within the zone of lowest permeability? ☐ yes ☐ no Above the static water table? ☐ yes ☐ no
If horizontal extraction wells are used, are the following conditions met? (Check all that apply.) ☐ N/A Is zone of contamination < 25 ft bgs? ☐ yes ☐ no Is depth to groundwater < 10 ft? ☐ yes ☐ no Is zone of contamination confined to a specific stratigraphic unit? ☐ yes ☐ no
Diameter of the manifold piping (in): _____ Depth of burial: _____ Is the piping to extraction well locations sloped back toward the well? ☐ yes ☐ no
Is vapor pretreatment necessary? If so, which of the following will be installed: ☐ moisture separator ☐ particulate filter ☐ other _____ Is the air compressor equipped with downstream coalescing and particulate filters? ☐ yes ☐ no
Is the site paved? ☐ yes ☐ no If no, what is the ground cover? _____

SYSTEM COMPONENTS (Cont'd)		
Will a groundwater extraction system be operating concurrently with this system?	☐ yes	☐ no
If yes, is the pump and treat system currently operating?	☐ yes	☐ no
Will vapor treatment be necessary?	☐ yes	☐ no
If yes, what type will be used? ☐ granular activated carbon (GAC) ☐ catalytic oxidation ☐ thermal oxidation ☐ other _____		
Will a telemeter or remote monitoring system be installed?	☐ yes	☐ no
OPERATION, MONITORING AND PERFORMANCE (OMP) PLAN		
Does the OMP Plan de daily monitoring for the start-up phase (up to 10 days)?	☐ yes	☐ no
Does the OMP Plan de regularly scheduled long-term monitoring?	☐ yes	☐ no
What is the scheduled frequency of long-term monitoring?	☐ biweekly ☐ monthly	☐ other _____
Does the OMP Plan include the following performance monitoring:		
Calculation of cumulative VOC mass removed?	☐ yes	☐ no
Does the OMP Plan include a comparison of the proposed remedial cleanup time and the actual cleanup rate currently being achieved?	☐ yes	☐ no
CLOSURE PLAN		
Does the closure plan include the following:		
Confirmation of cleanup levels?	☐ yes	☐ no
Removal of the equipment?	☐ yes	☐ no
Plugging of wells?	☐ yes	☐ no
Submission of site closure request?	☐ yes	☐ no
Waste disposal?	☐ yes	☐ no ☐ N/A
Paving, resurfacing?	☐ yes	☐ no ☐ N/A

CAP WORKSHEET	BIOSPARGING

Site Name: _____ TCEQ LPST #: _____
Address: _____ Prepared By: _____
_____ CAS Name: _____
CAS #: _____
Date Prepared: _____

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SITE CHARACTERISTICS

Intrinsic permeability k (cm^2): _____ (Note: K should be $>10^{-9}$ to be effective.)
How was k obtained? ☐ pilot study ☐ field testing ☐ lab analysis of core samples
☐ calculated ☐ other _____

Hydraulic conductivity K (cm/sec): _____
How was K obtained? ☐ slug test ☐ pumping test ☐ other _____

Predominant types of soil present. (Check all that apply.) ☐ gravels ☐ sands ☐ silts
☐ clays ☐ other _____

Groundwater temperature (°C): _____ (Note: groundwater temperature should be between 10°C and 45°C)
Groundwater pH prior to bioventing: _____ (Note: acceptable range is $6 \leq pH \leq 8$)

Plate count for total heterotrophic bacteria (CFU/gram of soil): _____
(Note: plate count should be >1000 CFU/gram dry soil.)
Stoichiometric ratio of carbon:nitrogen:phosphorus (C:N:P): _____
(Note: ratio should be between 100:10:01 to 100:1:0.5.)
Total dissolved iron (Fe^{+2}) concentration in groundwater (mg/L): _____

CONSTITUENT CHARACTERISTICS

Product type released. (Check all that apply.) ☐ gasoline ☐ diesel ☐ waste oil ☐ kerosene
☐ heating oil ☐ lubricating oil ☐ other _____

Is the TPH concentration of soils to be treated > 50,000 ppm? ☐ yes ☐ no
Is the heavy metal concentration of soils to be treated > 2,500 ppm? ☐ yes ☐ no

Is a cleanup less than or equal to 0.1 ppm required for any COC? ☐ yes ☐ no

Do any of the constituents present have a vapor pressure < 0.5 mm Hg? ☐ yes ☐ no
Do any of the constituents present have a Henry's law constant < 100 atm? ☐ yes ☐ no

TREATABILITY AND PILOT SCALE STUDIES

Have laboratory or pilot scale studies been conducted? ☐ yes ☐ no
If yes, check which type: ☐ laboratory microbial screening tests ☐ laboratory biodegradation studies
☐ field biosparging treatability tests ☐ other: _____

SYSTEM DESIGN

Radius of influence (ROI) (ft): _____

How was ROI determined? ☐ pilot testing ☐ estimated ☐ modeling

☐ other _____

Sparging air flow rate (CFM): _____

How was flow rate determined? ☐ pilot testing ☐ estimated ☐ modeling

☐ other _____

Sparging air pressure (psig): _____

How was wellhead pressure determined? ☐ pilot testing ☐ estimated ☐ modeling

☐ other _____

Initial oxygen concentration in saturated zone (ppm): _____

Initial CO_2 concentration in saturated zone (ppm): _____

How were oxygen and CO_2 concentrations determined? ☐ pilot testing ☐ estimated ☐ modeling

☐ other _____

Proposed remedial cleanup time (months and/or years): _____

Saturated zone volume to be treated with this system (ft^3): _____

Will extracted vapors be in excess of state or local air emission limits? ☐ yes ☐ no

Are there any site construction limitations, such as buildings, utilities, buried objects, and residences which must be included in the design process? ☐ yes ☐ no

SYSTEM COMPONENTS

How are the biosparging wells oriented? ☐ vertically ☐ horizontally

Number of biosparging wells needed: _____ Diameter of biosparging wells (inches): _____

Length of typical biosparging well screen (ft): _____

Depth below ground surface screened interval will be set (ft): _____

How are extraction wells oriented? ☐ vertically ☐ horizontally ☐ N/A

Number of extraction wells needed: _____ Diameter of extraction wells (inches): _____

Length of typical extraction well screen: _____

Depth below ground surface screened interval will be set (ft): _____

If horizontal biosparging/extraction wells are used, are the following conditions met? (Check all that apply.) ☐ N/A

Is depth to groundwater < 25 ft? ☐ yes ☐ no

Is zone of contamination confined to a specific stratigraphic unit? ☐ yes ☐ no

Is the system under an operational facility? ☐ yes ☐ no

Is the thickness of the saturated zone < 10 ft? ☐ yes ☐ no

Diameter of the manifold piping (in): _____ Depth of burial (ft): _____

Is the piping to extraction well locations sloped back toward the well? ☐ yes ☐ no

Is vapor pretreatment necessary? ☐ yes ☐ no

If yes, which of the following will be installed: ☐ moisture separator ☐ particulate filter

☐ other _____

SYSTEM COMPONENTS (Cont'd)			
Will vapor treatment be necessary?	☐ yes	☐ no	
If yes, what type will be used? ☐ granular activated carbon (GAC) ☐ catalytic oxidation ☐ thermal oxidation ☐ other _____			
Will a telemeter or remote monitoring system be installed?	☐ yes	☐ no	
OPERATION, MONITORING AND PERFORMANCE (OMP) PLAN			
Does the OMP Plan include daily monitoring for the start-up phase (up to 7 days)?	☐ yes	☐ no	
Does the OMP Plan include long-term monitoring?	☐ yes	☐ no	
Does the OMP include the following performance monitoring and calculations:			
Calculation of cumulative VOC mass removed?	☐ yes	☐ no	
Carbon dioxide concentrations in extracted soil vapor?	☐ yes	☐ no	
VOC concentrations in extracted soil vapor?	☐ yes	☐ no	
A graph of cumulative mass removed and concentrations vs. operation time?	☐ yes	☐ no	
Does the OMP Plan include a comparison of the proposed remedial cleanup time and the actual cleanup rate currently being achieved?	☐ yes	☐ no	
CLOSURE PLAN			
Does the closure plan include the following:			
Confirmation of cleanup levels?	☐ yes	☐ no	
Removal of the equipment?	☐ yes	☐ no	
Plugging of wells?	☐ yes	☐ no	
Submission of site closure request?	☐ yes	☐ no	
Waste disposal?	☐ yes	☐ no	☐ N/A
Paving, resurfacing?	☐ yes	☐ no	☐ N/A

CAP WORKSHEET	NATURAL ATTENUATION

Site Name: _____ TCEQ LPST #: _____
Address: _____ Prepared By: _____
_____ CAS Name: _____
CAS #: _____
Date Prepared: _____

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SITE CHARACTERISTICS

Is free product present at the site in thickness greater than 0.01 foot?
☐ yes (natural attenuation should not be used) ☐ no

Are TPH concentrations < 25,000 in the soil? ☐ yes ☐ no (natural attenuation should not be used)

Product type released. (Check all that apply.) ☐ gasoline ☐ diesel ☐ waste oil ☐ kerosene
☐ heating oil ☐ lubricating oil ☐ other _____

RECEPTORS/LAND USE

Surrounding land use is predominantly (check all that apply): ☐ residential ☐ commercial/industrial
☐ recreational ☐ other _____
Is there a current or projected receptor that may be affected at any time by contamination at this site? ☐ yes ☐ no
If yes, what is the receptor? _____
What is the distance to the nearest current or projected receptor? _____
What is the travel time from the source to the nearest current or projected receptor? _____
Is the travel time < 2 years? ☐ yes (active remediation generally required) ☐ no

SITE FACTORS AFFECTING CONSTITUENT MIGRATION

Predominant types of soil present. (Check all that apply.) ☐ gravels ☐ sands ☐ silts
☐ clays ☐ other _____
Is the intrinsic permeability $\geq 10^{-8}$ cm^2? ☐ yes ☐ no

Is the soil oxygen levels ≥ 2%? ☐ yes ☐ no
Is the dissolved oxygen concentration > 1 mg/L in groundwater? ☐ yes ☐ no
Does the soil have a pH of 6 - 8? ☐ yes ☐ no
What is the fraction organic carbon (f_{oc}) in the soil? _____

Does the soil have a moisture content of 40 - 85%? ☐ yes ☐ no
Does the soil have a C:N:P ratio of 100:1:.5 to 100:10:1? ☐ yes ☐ no

Is the average annual rainfall > 10 inches? ☐ yes ☐ no
Does the soil have a temperature of 5°C to 45°C? ☐ yes ☐ no
Are concentrations of heavy metals and other toxic compounds
below levels that could inhibit microbial activity? ☐ yes ☐ no

OPERATION, MONITORING AND PERFORMANCE (OMP) PLAN

Which of the following will be included in remedial progress soil monitoring? (Check all that apply.)

☐ TPH ☐ BTEX ☐ O_2 ☐ CO_2 ☐ other _____

Which of the following will be included in remedial progress groundwater monitoring? (Check all that apply.)

☐ TPH ☐ BTEX ☐ D.O. ☐ pH ☐ oxidation/reduction potential

☐ Fe^{2+} ☐ hardness ☐ other _____

Does the monitoring plan include regularly scheduled monitoring? ☐ yes ☐ no

What is the scheduled frequency? ☐ quarterly ☐ bi-annually ☐ annually ☐ other _____

Does the monitoring plan include:

An upgradient well?	☐ yes	☐ no
A well close to the original source?	☐ yes	☐ no
Wells along the centerline of the dissolved plume?	☐ yes	☐ no
wells along the outer boundary of the dissolved plume?	☐ yes	☐ no
Wells outside of the dissolved plume?	☐ yes	☐ no
Sentinel wells?	☐ yes	☐ no
Surface water bodies?	☐ yes	☐ no

Proposed remedial cleanup time (months and/or years): _____

Does the OMP Plan include a comparison of the proposed remedial cleanup time and the actual cleanup rate currently being achieved? ☐ yes ☐ no

CAP WORKSHEET	IN-SITU BIOREMEDIATION

Site Name: _____ TCEQ LPST #: _____
Address: _____ Prepared By: _____
_____ Cas Name: _____
_____ CAS #: _____
Date Prepared: _____

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SOIL/GW CHARACTERISTICS

What are the predominant types of soil present? (Check all that apply.) ☐ gravels ☐ sands ☐ silts
☐ clays ☐ other _____

Is the aquifer is homogeneous? ☐ yes ☐ no
Is clayey medium targeted for remediation? ☐ yes ☐ no
Are there any subsurface structures near the site? ☐ yes ☐ no
If yes, indicate which type of structure(s) and approximate distance to source area: _____

Is free product present? ☐ yes ☐ no
Is contaminated groundwater under confined conditions? ☐ yes ☐ no
Are the COCs[3] potentially biodegradable? ☐ yes ☐ no
What is the average depth to groundwater in area to be treated (ft)? _____
Does the groundwater generally fluctuate between seasons? ☐ yes ☐ no

Intrinsic permeability k (cm^2): _____
How was k obtained? ☐ pilot study ☐ field testing ☐ calculated
☐ lab analysis of core samples ☐ other _____
Hydraulic conductivity K (cm/sec): _____
How was K obtained? ☐ slug test ☐ pumping test ☐ other _____

CONSTITUENT CHARACTERISTICS

Product type(s) released. (Check all that apply.) ☐ gasoline ☐ diesel ☐ waste oil ☐ kerosene
☐ heating oil ☐ lubricating oil ☐ other _____

For compounds other than BTEX, has a treatability pilot test been performed? ☐ yes ☐ no
If no, please explain: _____
If yes, what is the temperature of the aquifer: _____

[31]COCs - Constituents of Concern

SITE CHARACTERISTICS

What is the pH of the aquifer? _____

What is the total bacteria count (CFU/gram dry soil) of the aquifer? _____
How was this count obtained? _____

Will commercially produced microorganism be required to augment indigenous bacteria? ☐ yes ☐ no
If yes, indicate brand/manufacturer's name: _____
Will additional nutrients (carbon, nitrogen and phosphorous) be required? ☐ yes ☐ no
If yes, what is the required carbon: nitrogen: phosphorous (C:N:P) ratio: _____
How was the C:N:P ratio obtained? _____

What is the background oxygen concentration? _____
What is the background carbon dioxide concentration? _____

Which of the following minerals is present in groundwater at concentrations that may affect the effectiveness of the proposed treatment system. (Check all that apply.) ☐ Iron ☐ Calcium ☐ Magnesium
☐ other _____
If any mineral is present, will chemical sequestration be required? ☐ yes ☐ no ☐ N/A
If yes, how will the chemical sequestration be accomplished? _____

SYSTEM DESIGN

Radius of influence (ROI) (ft): _____
How was ROI determined? ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____

What is the groundwater flow rate (gpm)? _____
How was groundwater flow rate determined? ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____
Is aboveground water treatment required? ☐ yes ☐ no
If yes, what is the method of groundwater treatment? _____

What is the method of air/oxygen delivery to the contaminated zone? _____
If nutrient addition is required, how was the appropriate delivery rate determined? (Check all that apply.) ☐ N/A
☐ laboratory studies ☐ field studies ☐ other _____
How will the additional microorganisms and/or nutrients be introduced to the zone of contamination? (Check all that apply.)
☐ N/A ☐ injection well ☐ infiltration trench ☐ infiltration gallery

Will any treated groundwater disposal be required? ☐ yes ☐ no
If yes, indicate method of treated groundwater disposal: _____

What is the volume of the affected aquifer (ft^3 or m^3)? _____
Total estimated mass of hydrocarbons at the site (lb or kg): _____
Estimated hydrocarbon mass removal rate (lb/hr or kg/hr): _____
Proposed remedial cleanup time (months and/or years): _____

SYSTEM COMPONENTS

How are injection/extraction wells oriented? ☐ vertically ☐ horizontally
Number of injection wells needed: _____
Number of extraction wells needed: _____
Diameter of injection/extraction wells (inches): _____

Depth to groundwater table (ft below ground surface): _____
Depth to zone of contaminated soils to be treated (ft below ground surface): _____
Is the zone of contamination < 25 ft bgs? ☐ yes ☐ no
Is the zone of contamination confined to a specific stratigraphic unit? ☐ yes ☐ no

What is the diameter of the manifold piping? _____
If the manifold is buried, what is the depth of burial? _____

Which of the following systems will be operated concurrently with the in-situ groundwater bioremediation?
☐ vapor extraction wells ☐ sparging wells ☐ other _____

Which of the following are included in the system design? (Check all that apply.) ☐ vapor extraction wells
☐ surface seals ☐ groundwater depression pumps (beside existing pump and treat) ☐ N/A

Is the subject site paved? ☐ yes ☐ no
If no, what is the ground cover? _____

Is vapor pretreatment necessary? ☐ yes ☐ no
If yes, which of the following will be installed: ☐ moisture separator ☐ particulate filter
☐ other _____

Will vapor treatment be required? ☐ yes ☐ no
If yes, what vapor treatment method will be used? _____

Will a telemeter or remote monitoring system be installed? ☐ yes ☐ no

OPERATION, MONITORING AND PERFORMANCE (OMP) PLAN

Does the OMP Plan include daily monitoring for the start-up phase (up to 10 days)? ☐ yes ☐ no
Does the OMP Plan include long-term monitoring? ☐ yes ☐ no

What is the long term scheduled monitoring frequency? ☐ biweekly ☐ monthly ☐ other _____
What is the scheduled soil sampling frequency? _____

Does the OMP Plan include a comparison of the proposed remedial cleanup time and the actual cleanup rate currently being achieved? ☐ yes ☐ no

CLOSURE PLAN

Does the closure plan include the following:

Confirmation of cleanup levels?	☐ yes	☐ no	
Removal of the equipment?	☐ yes	☐ no	
Plugging of wells?	☐ yes	☐ no	
Submission of site closure request?	☐ yes	☐ no	
Waste disposal?	☐ yes	☐ no	☐ N/A
Paving, resurfacing	☐ yes	☐ no	☐ N/A

CAP WORKSHEET	DUAL-PHASE EXTRACTION (DPE)

Site Name: _____ TCEQ LPST #: _____
Address: _____ Prepared By: _____
_____ CAS Name: _____
_____ CAS #: _____
Date Prepared: _____

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SOIL/GW CHARACTERISTICS

Intrinsic permeability k (cm^2): _____ (Note: k should be between 10^{-9} and 10^{-12} to be effective.)
How was k obtained? ☐ pilot study ☐ field testing ☐ lab analysis of core samples
☐ other _____

Hydraulic conductivity K (cm/sec): _____
How was K obtained? ☐ slug test ☐ pumping test ☐ other _____

Predominant types of soil present. (Check all that apply.) ☐ gravels ☐ sands
☐ silts ☐ clays ☐ other _____
Fractional content of soil organic carbon, f_{oc}: _____

Is free product present at the site? ☐ yes ☐ no
If yes, what is the maximum thickness remaining at the site? _____

Average depth to groundwater in area to be treated (ft): _____ (Note: depth should be >3 ft. to be effective.)
Thickness of capillary fringe (estimated from boring logs, ft): _____
Are the soils to be treated generally dry? ☐ yes ☐ no
Soil moisture content in the unsaturated zone: ☐ ≤ 85% of field capacity ☐ ≥85% of field capacity

CONSTITUENT CHARACTERISTICS

Product type released. (Check all that apply.) ☐ gasoline ☐ diesel ☐ waste oil ☐ kerosene
☐ heating oil ☐ lubricating oil ☐ other _____

Do any of the COCs[4] have a vapor pressure <0.5 mm Hg? ☐ yes ☐ no
Do any of the COCs have a Henry's law constant < 100 atm? ☐ yes ☐ no

PILOT STUDIES

Has an aquifer pumping test been performed? ☐ yes ☐ no
Has a SVE test been performed? ☐ yes ☐ no
Have any other laboratory or pilot studies been performed? (Check all that apply.) ☐ respirometry studies
☐ slurry studies ☐ column studies ☐ laboratory microbial screening tests ☐ other _____

[4]COCs - Constituents of Concern

EVALUATION OF DPE SYSTEM DESIGN

Has a tank tightness test been performed on the associated tanks and piping? ☐ yes ☐ no
(Because of the high vacuum pressures associated with DPE, the tank system should be tight to avoid influence by the DPE system.)

Radius of influence (ROI) (ft): _____
How was ROI determined? ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____

Wellhead vacuum (inches of water): _____
How was wellhead vacuum determined? ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____

Vapor extraction rate (cfm): _____
How was the extraction rate determined? ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____

Groundwater extraction rate (gpm): _____
How was the extraction rate determined? ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____

Proposed remedial cleanup time (months and/or years): _____
Soil volume to be treated with this system (ft^3): _____
Pore volume exchange time (hr): _____
Will extracted vapors be in excess of state or local air emission limits? ☐ yes ☐ no

SYSTEM COMPONENTS

How are wells oriented? ☐ vertically ☐ horizontally
Number of extraction wells needed: _____
Diameter of extraction wells (inches): _____

Zone of contaminated soils to be treated (ft below ground surface): _____

If vertical extraction wells are used, are they screened as follows? (Check all that apply.) ☐ N/A
Within the contaminated zone? ☐ yes ☐ no
Within the zone of lowest permeability? ☐ yes ☐ no
Above the static water table? ☐ yes ☐ no

If horizontal extraction wells are used, are the following conditions met? (Check all that apply.) ☐ N/A
Is zone of contamination <25 ft bgs? ☐ yes ☐ no
Is depth to groundwater <10 ft? ☐ yes ☐ no
Is zone of contamination confined to a specific stratigraphic unit? ☐ yes ☐ no

Diameter of the manifold piping (in): _____
Is the piping to extraction well locations sloped back toward the well? ☐ yes ☐ no
Depth of burial: _____

SYSTEM COMPONENTS (Cont'd)

Is vapor pretreatment necessary? ☐ yes ☐ no
If so, which of the following will be installed: ☐ moisture separator ☐ particulate filter
☐ other _____

Are any of the following included in the system design? (Check all that apply.) ☐ air injection wells
☐ passive inlet wells ☐ surface seals
Is the subject site paved? ☐ yes ☐ no
If no, what is the ground cover? _____

Will vapor treatment be necessary? ☐ yes ☐ no
If yes, what type will be used? ☐ granular activated carbon (GAC) ☐ catalytic oxidation
☐ thermal oxidation ☐ other _____
Will a telemeter or remote monitoring system be installed? ☐ yes ☐ no

OPERATION, MONITORING AND PERFORMANCE (OMP) PLAN

Does the OMP Plan include daily monitoring for the start-up phase (up to 10 days)? ☐ yes ☐ no
Does the OMP Plan include regularly scheduled long-term monitoring? ☐ yes ☐ no
What is the scheduled frequency for long-term monitoring? ☐ biweekly ☐ monthly ☐ other _____

Does the OMP Plan include the following performance monitoring: (Check all that apply.)
Calculation of cumulative mass removed? ☐ yes ☐ no
A graph of cumulative mass removed vs. operation time? ☐ yes ☐ no
A graph of vapor concentration vs. operation time? ☐ yes ☐ no
Does the OMP Plan include a comparison of the proposed remedial cleanup time and the actual cleanup rate currently being achieved? ☐ yes ☐ no

CLOSURE PLAN

Does the closure plan include the following:
Confirmation of cleanup levels? ☐ yes ☐ no
Removal of the equipment? ☐ yes ☐ no
Plugging of wells? ☐ yes ☐ no
Submission of site closure request? ☐ yes ☐ no
Waste disposal? ☐ yes ☐ no ☐ N/A
Paving, resurfacing ☐ yes ☐ no ☐ N/A

CAP WORKSHEET	GROUNDWATER EXTRACTION

Site Name: _____ TCEQ LPST #: _____
Address: _____ Prepared By: _____
_____ CAS Name: _____
_____ CAS #: _____
Date Prepared: _____

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SITE CHARACTERISTICS

Intrinsic permeability k (cm^2): _____
How was k obtained? ☐ pilot study ☐ field testing ☐ lab analysis of core samples
☐ other _____

Hydraulic conductivity K (cm/sec): _____
How was K obtained? ☐ slug test ☐ pumping test ☐ other _____

Predominant types of soil present. (Check all that apply.) ☐ gravels ☐ sands
☐ silts ☐ clays ☐ other _____
Fractional content of soil organic carbon, f_{oc}: _____

Is free product present at the site? ☐ yes ☐ no
If yes, what is the maximum thickness remaining at the site? _____

Product type released. (Check all that apply.) ☐ gasoline ☐ diesel ☐ waste oil
☐ kerosene ☐ heating oil ☐ lubricating oil ☐ other _____

Has an aquifer pumping test been performed? ☐ yes ☐ no

SYSTEM DESIGN

Primary purpose of groundwater extraction? (Check all that apply.) ☐ groundwater depression
☐ groundwater treatment ☐ plume contaminant ☐ other _____

Has groundwater capture zone been determined? ☐ yes* ☐ no
How was capture zone determined? ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____

Drawdown (inches of water): _____
How was drawdown determined? ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____

Groundwater extraction rate (gpm): _____
How was the extraction rate determined? ☐ pilot testing ☐ estimated ☐ modeling
☐ other _____

SYSTEM COMPONENTS

How are wells oriented? ☐ vertically ☐ horizontally
Number of extraction wells needed: _____
Diameter of extraction wells (inches): _____ Length of screen (ft.): _____

Depth below ground surface screened interval will be set (ft.): _____

If horizontal extraction wells are used, are the following conditions met? (Check all that apply.) ☐ N/A
- Is zone of contamination <25 ft bgs? ☐ yes ☐ no
- Is depth to groundwater <10 ft? ☐ yes ☐ no
- Is zone of contamination confined to a specific stratigraphic unit? ☐ yes ☐ no

Diameter of the manifold piping (in): _____
Is the piping to extraction well locations sloped back toward the well? ☐ yes ☐ no
Depth of burial: _____

Will groundwater treatment be necessary? ☐ yes ☐ no
- If yes, what type will be used? ☐ granular activated carbon (GAC) ☐ air stripping
- ☐ biological reactor ☐ other _____

Will a telemeter or remote monitoring system be installed? ☐ yes ☐ no

OPERATION, MONITORING AND PERFORMANCE (OMP) PLAN

Does the OMP Plan include daily monitoring for the start-up phase (up to 10 days)? ☐ yes ☐ no
Does the OMP Plan include regularly scheduled long-term monitoring? ☐ yes ☐ no
What is the scheduled frequency for long-term monitoring? ☐ biweekly ☐ monthly ☐ other _____

Does the OMP Plan include the following performance monitoring: (Check all that apply.)
- Calculation of cumulative mass removed? ☐ yes ☐ no
- A graph of cumulative mass removed vs. operation time? ☐ yes ☐ no

Does the OMP Plan include a comparison of the proposed remedial cleanup time and the actual cleanup rate currently being achieved? ☐ yes ☐ no

CLOSURE PLAN

Does the closure plan include the following:
- Confirmation of cleanup levels? ☐ yes ☐ no
- Removal of the equipment? ☐ yes ☐ no
- Plugging of wells? ☐ yes ☐ no
- Submission of site closure request? ☐ yes ☐ no
- Waste disposal? ☐ yes ☐ no ☐ N/A
- Paving, resurfacing ☐ yes ☐ no ☐ N/A

* Please ensure that the CAP includes a site map drawn to scale which includes the capture zone(s) and stagnation point(s) for each groundwater extraction well, in addition to any other supporting documentation identified in CAP RG-41.