Appendix N

LNAPL Recoverablity

Data Input

Thickness, Elevations, Vertical gradient

Maximum Monitoring Well LNAPL Thickness [ft] =	8.000
Depth of ground surface (Datum) =	0.000
Water table depth [ft] =	23.380
Depth of soil faces interface [ft] =	16.730
Water Vertical gradient (+ for upward) [Layer 1 Only] =	0.000

Fluid Characteristics

LNAPL density [gm/cc] =	0.772
LNAPL viscosity [cp] =	0.950
Air/Water surface tension [dyne/cm] =	62.100
Air/LNAPL surface tension [dyne/cm] =	22.600
LNAPL/Water interfacial tension [dyne/cm] =	24.100

Relative Permeability Model (Burdine is default)

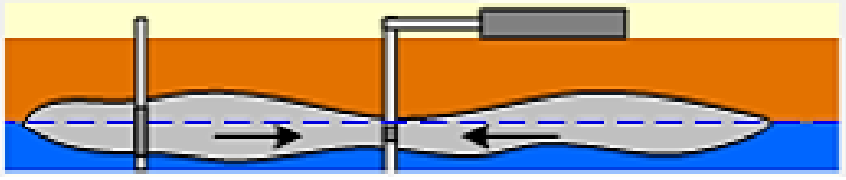
Use Mualem Model for Layer ☑ Layer 1 ☐ Layer 2

Soil 1

Porosity =	0.433
Hydraulic conductivity [ft/d] =	0.011
Van Genuchten "N" =	1.946
Van Genuchten "a" [ft-1] =	0.006
Irreducible water saturation =	0.570
Residual LNAPL saturation =	Variable
Residual LNAPL f-factor =	0.400

Soil 2

Porosity =	0.378
Hydraulic conductivity [ft/d] =	3.660
Van Genuchten "N" =	3.005
Van Genuchten "a" [ft-1] =	0.125
Irreducible water saturation =	0.046
Residual LNAPL saturation =	Variable
Residual LNAPL f-factor =	0.250



Input Data
TPH-07 @ Terminal

OK Cancel

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 * Saved time =  10 : 32,   2014 . 3 .  4
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 1. OPTIONS.

 * Units              =   1              (1: English Units, 2: SI Units)

 * Soil Heterogeneity =   2              ( Number of Layers: 1, 2 or 3)

 * Elevation          =   2              (1: Elevation above datum, 2: depth BGS)

 * FPR System Used    =   1              (1: well,  2: trench,  0: Not used)

 * Smear Correction   =   0              (0: no adjustment, 1: smear correction)

 * LNAPL Residual     =   3              (1: const (user), 2: const (f), 3:
variable)


 2. INPUT PARAMETERS.

 2.1 BASIC INPUT PARAMETERS.
 Monitor. Well LNAPL thickness[ft]=          8.000
 Ground Surface Depth [ft]        =          0.000
 Groundwater Table Depth [ft]     =         23.380
 Soil Layers Interface (z12) [ft] =         16.730
 Water Vertical Gradient(+up)     =          0.000
 LNAPL Density [g/cm3]            =          0.772
 LNAPL Viscosity [cp]             =          0.950
 Water Surface Tension [dyne/cm]  =         62.100
 LNAPL Surface Tension [dyne/cm]  =         22.600
 LNAPL/Water Interfacial Tension  =         24.100

 2.1.1 SOIL PROPERTIES OF LAYER 1
 Relative permeability model      =              1     (Mualem)
 Soil porosity                    =          0.433
 Hydraulic conductivity [ft/d]    =          0.011
 van Genuchten "N"                =          1.946
 van Genuchten "Alpha" [ft-1]     =          0.006
 Swr1                             =          0.570
 Snr1                             =       Variable
 LNAPL residual f-factor          =          0.400

 2.1.2 SOIL PROPERTIES OF LAYER 2
 Relative permeability model      =              0     (Burdine)
 Soil porosity                    =          0.378
 Hydraulic conductivity [ft/d]    =          3.660
 van Genuchten "N"                =          3.005
 van Genuchten "alpha"  [ft-1]    =          0.125
 Swr2                             =          0.046
 Snr2                             =       Variable
 LNAPL residual f-factor          =          0.250

 2.2 INPUT DATA FOR THE RECOVERY WELL.
 Design Recovery time [yr]        =          5.000
 Radius of pumping well [ft]      =          0.250
 Radius of capture [ft]           =         30.000
```

Radius of influence [ft]	=	30.000
Water production rate [gpm]	=	2.000
Groundwater thickness [ft]	=	15.000
Suction pressure [atm]	=	0.000
Screen length for air flow [ft]	=	5.000

3. FIELD DATA

1 (7) Depth [ft]	Sn
18.500	0.012
19.500	0.048
20.500	0.117
21.500	0.073
22.500	0.021
23.500	0.042
24.500	0.047

4. Calculated Parameters

Air-LNAPL interface [ft]	=	21.556
LNAPL-Water interface [ft]	=	29.556
Max. Free-Product elevation [ft]	=	18.492

Parameter		Soil 1	Soil 2
van Genuchten "M"	:	0.486	0.334
Air/LNAPL "alpha" [ft-1]	:	0.013	0.265
LNAPL/water "alpha" [ft-1]	:	0.004	0.073

5. LNAPL and Water saturation data.

BGS Depth [ft]	Sn	Snr	Sw	krn
18.492	0.000	0.000	0.872	0.0000
18.645	0.014	0.003	0.873	0.0000
18.798	0.026	0.007	0.875	0.0000
18.951	0.038	0.010	0.876	0.0001
19.105	0.049	0.012	0.877	0.0002
19.258	0.059	0.015	0.879	0.0004
19.411	0.068	0.017	0.881	0.0006
19.564	0.075	0.019	0.883	0.0009
19.717	0.082	0.020	0.885	0.0012
19.871	0.086	0.022	0.887	0.0016
20.024	0.090	0.022	0.890	0.0019
20.177	0.092	0.023	0.893	0.0023
20.330	0.093	0.023	0.896	0.0026
20.483	0.093	0.023	0.900	0.0029
20.637	0.093	0.023	0.903	0.0031
20.790	0.091	0.023	0.907	0.0032
20.943	0.088	0.022	0.910	0.0033
21.096	0.085	0.021	0.914	0.0033
21.250	0.082	0.020	0.918	0.0033
21.403	0.078	0.020	0.922	0.0032

21.556	0.075	0.019	0.925	0.0031
21.956	0.065	0.016	0.935	0.0022
22.356	0.056	0.014	0.944	0.0016
22.756	0.048	0.012	0.952	0.0011
23.156	0.041	0.010	0.959	0.0008
23.556	0.034	0.009	0.966	0.0005
23.956	0.028	0.007	0.972	0.0003
24.356	0.023	0.006	0.977	0.0002
24.756	0.018	0.004	0.982	0.0001
25.156	0.014	0.003	0.986	0.0001
25.556	0.011	0.003	0.989	0.0000
25.956	0.008	0.002	0.992	0.0000
26.356	0.005	0.001	0.995	0.0000
26.756	0.004	0.001	0.996	0.0000
27.156	0.002	0.001	0.998	0.0000
27.556	0.001	0.000	0.999	0.0000
27.956	0.001	0.000	0.999	0.0000
28.356	0.000	0.000	1.000	0.0000
28.756	0.000	0.000	1.000	0.0000
29.156	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000

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6. LNAPL specific volume and hydraulic conductivity

bn [ft]	Dn [ft]	Rn [ft]	Tn [ft2/d]
0.000	0.000	0.000	0.000
0.320	0.002	0.000	0.000
0.640	0.003	0.000	0.000
0.960	0.005	0.000	0.000
1.280	0.006	0.000	0.000
1.600	0.008	0.000	0.000
1.920	0.009	0.000	0.000
2.240	0.011	0.001	0.000
2.560	0.013	0.001	0.000
2.880	0.016	0.002	0.000
3.200	0.018	0.003	0.000
3.520	0.021	0.005	0.000
3.840	0.025	0.007	0.001
4.160	0.029	0.009	0.001
4.480	0.034	0.012	0.001
4.800	0.040	0.016	0.002
5.120	0.046	0.020	0.002
5.440	0.053	0.025	0.003
5.760	0.061	0.032	0.004
6.080	0.069	0.039	0.006
6.400	0.079	0.047	0.008
6.720	0.090	0.057	0.010
7.040	0.101	0.067	0.013
7.360	0.114	0.079	0.016
7.680	0.128	0.092	0.021
8.000	0.142	0.107	0.026

7. Data for curve-fitting segments

bn[ft]	Rn[ft]	Tn[ft2/d]	chi[ft]	beta	xi[ft]	eta
0.00000	0.00000	0.00000				
5.44000	0.02549	0.00311	0.00000	0.00469	0.00000	0.00057
6.72000	0.05656	0.00984	4.38967	0.02427	4.84774	0.00525
8.00000	0.10667	0.02623	5.27538	0.03915	5.95170	0.01281

8. Free product recovery system Analysis

8.1 Calculated parameters for the recovery system

Vacuum-enhanced air discharge [scfm]	=	0.000
Average drawdown(+)\buildup(-) [ft]	=	0.558
New water table depth [ft]	=	23.380
New monitoring well LNPAL thickness [ft]	=	8.000
Final monitoring well LNAPL thickness [ft]	=	5.854
a_skimmer [ft-2]	=	0.00005
a_water [ft-1]	=	0.00321
a_air [ft-1]	=	0.00000
Recovery time for segment 1 [yr]	=	2.556
Recovery time for segment 2 [yr]	=	7.089

8.2 Predicted Performances of the system

```
-----------------------------------------------------------------
                Time             bn             Vn             Qn
                [yr]           [ft]          [gal]          [gpd]
-----------------------------------------------------------------
               0.000          8.000          0.000          1.782
               0.128          7.902         81.151          1.697
               0.256          7.809        158.418          1.616
               0.383          7.720        231.989          1.539
               0.511          7.635        302.039          1.465
               0.639          7.555        368.738          1.395
               0.767          7.478        432.246          1.328
               0.895          7.405        492.714          1.265
               1.023          7.335        550.290          1.204
               1.150          7.269        605.111          1.146
               1.278          7.206        657.308          1.092
               1.406          7.146        707.009          1.039
               1.534          7.089        754.331          0.990
               1.662          7.035        799.389          0.942
               1.790          6.983        842.291          0.897
               1.917          6.933        883.141          0.854
               2.045          6.886        922.035          0.813
               2.173          6.842        959.069          0.774
               2.301          6.799        994.331          0.737
               2.429          6.759       1027.906          0.702
               2.556          6.720       1059.874          0.669
               2.679          6.663       1089.230          0.648
               2.801          6.607       1117.690          0.628
               2.923          6.554       1145.280          0.609
               3.045          6.502       1172.028          0.591
               3.167          6.451       1197.958          0.572
               3.290          6.402       1223.096          0.555
               3.412          6.355       1247.467          0.538
               3.534          6.309       1271.093          0.522
               3.656          6.264       1293.997          0.506
               3.778          6.221       1316.202          0.490
               3.900          6.179       1337.729          0.475
               4.023          6.138       1358.597          0.461
               4.145          6.099       1378.829          0.447
               4.267          6.060       1398.443          0.433
               4.389          6.023       1417.457          0.420
               4.511          5.987       1435.891          0.407
               4.633          5.953       1453.761          0.395
               4.756          5.919       1471.085          0.382
               4.878          5.886       1487.881          0.371
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
               5.000          5.854       1504.163          0.359
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5.000	5.854	1504.163	0.359
5.000	5.854	1504.163	0.359
5.000	5.854	1504.163	0.359

8.3 Water table drawdown / buildup

Radius [ft]	Drawdown [ft]	Buildup [ft]	Net [ft]
0.250	5.344	0.000	5.344
0.258	5.307	0.000	5.307
0.283	5.205	0.000	5.205
0.324	5.053	0.000	5.053
0.382	4.870	0.000	4.870
0.457	4.671	0.000	4.671
0.548	4.469	0.000	4.469
0.655	4.269	0.000	4.269
0.779	4.075	0.000	4.075
0.919	3.890	0.000	3.890
1.076	3.714	0.000	3.714
1.250	3.547	0.000	3.547
1.440	3.389	0.000	3.389
1.647	3.240	0.000	3.240
1.870	3.098	0.000	3.098
2.109	2.963	0.000	2.963
2.366	2.835	0.000	2.835
2.638	2.714	0.000	2.714
2.928	2.597	0.000	2.597
3.233	2.487	0.000	2.487
3.556	2.380	0.000	2.380
3.894	2.279	0.000	2.279
4.250	2.181	0.000	2.181
4.622	2.088	0.000	2.088
5.010	1.998	0.000	1.998
5.415	1.911	0.000	1.911
5.836	1.827	0.000	1.827
6.274	1.747	0.000	1.747
6.729	1.668	0.000	1.668
7.200	1.593	0.000	1.593
7.688	1.520	0.000	1.520
8.192	1.449	0.000	1.449
8.712	1.380	0.000	1.380
9.249	1.313	0.000	1.313
9.803	1.248	0.000	1.248
10.373	1.185	0.000	1.185
10.960	1.124	0.000	1.124
11.563	1.064	0.000	1.064
12.183	1.006	0.000	1.006
12.819	0.949	0.000	0.949
13.472	0.894	0.000	0.894
14.142	0.839	0.000	0.839
14.828	0.787	0.000	0.787
15.530	0.735	0.000	0.735
16.249	0.684	0.000	0.684
16.984	0.635	0.000	0.635
17.736	0.587	0.000	0.587
18.505	0.539	0.000	0.539
19.290	0.493	0.000	0.493
20.092	0.447	0.000	0.447
20.910	0.403	0.000	0.403
21.744	0.359	0.000	0.359
22.596	0.316	0.000	0.316

23.463	0.274	0.000	0.274
24.348	0.233	0.000	0.233
25.248	0.192	0.000	0.192
26.166	0.153	0.000	0.153
27.099	0.114	0.000	0.114
28.050	0.075	0.000	0.075
29.017	0.037	0.000	0.037
30.000	0.000	0.000	0.000

LNAPL Distribution and Recovery Model (LDRM)

File Data Recovery Graphs Options Help Exit

LNAPL Specific Volume, Dn (ft) =	0.1422
LNAPL Recoverable Volume, Rn (ft) =	0.1067
Drawdown (ft) =	0.558
New Water-table Depth (ft) =	23.380
New LNAPL Thickness, bn (ft) =	8.000
New LNAPL Specific Volume, Dn (ft) =	0.1422
New LNAPL Recoverable Volume, Rn (ft) =	0.1067
Initial Recovery Rate, Qn (gpd) =	1.782
Final LNAPL Thickness, bn (ft) =	5.854
Final Recovery Rate, Qn (gpd) =	0.359
Final Recovery Volume, Vn (gal) =	1504.2
Percent Recovery =	50.004

Recovery Results
GW-enhanced Skimmer
TPH-07 @ Terminal

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 * Saved time =  10 : 31,   2014 . 3 .  4
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 1. OPTIONS.

 * Units              =   1              (1: English Units, 2: SI Units)

 * Soil Heterogeneity =   2              ( Number of Layers: 1, 2 or 3)

 * Elevation          =   2              (1: Elevation above datum, 2: depth BGS)

 * FPR System Used    =   1              (1: well,  2: trench,  0: Not used)

 * Smear Correction   =   0              (0: no adjustment, 1: smear correction)

 * LNAPL Residual     =   3              (1: const (user), 2: const (f), 3:
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 LNAPL/Water Interfacial Tension  =         24.100

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 Soil porosity                    =          0.433
 Hydraulic conductivity [ft/d]    =          0.011
 van Genuchten "N"                =          1.946
 van Genuchten "Alpha" [ft-1]     =          0.006
 Swr1                             =          0.570
 Snr1                             =       Variable
 LNAPL residual f-factor          =          0.400

 2.1.2 SOIL PROPERTIES OF LAYER 2
 Relative permeability model      =              0     (Burdine)
 Soil porosity                    =          0.378
 Hydraulic conductivity [ft/d]    =          3.660
 van Genuchten "N"                =          3.005
 van Genuchten "alpha"  [ft-1]    =          0.125
 Swr2                             =          0.046
 Snr2                             =       Variable
 LNAPL residual f-factor          =          0.250

 2.2 INPUT DATA FOR THE RECOVERY WELL.
 Design Recovery time [yr]        =          5.000
 Radius of pumping well [ft]      =          0.250
 Radius of capture [ft]           =         30.000
```

Radius of influence [ft]	=	30.000
Water production rate [gpm]	=	2.000
Groundwater thickness [ft]	=	15.000
Suction pressure [atm]	=	0.200
Screen length for air flow [ft]	=	5.000

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1 (7) Depth [ft]	Sn
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LNAPL-Water interface [ft]	=	29.556
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18.645	0.014	0.003	0.873	0.0000
18.798	0.026	0.007	0.875	0.0000
18.951	0.038	0.010	0.876	0.0001
19.105	0.049	0.012	0.877	0.0002
19.258	0.059	0.015	0.879	0.0004
19.411	0.068	0.017	0.881	0.0006
19.564	0.075	0.019	0.883	0.0009
19.717	0.082	0.020	0.885	0.0012
19.871	0.086	0.022	0.887	0.0016
20.024	0.090	0.022	0.890	0.0019
20.177	0.092	0.023	0.893	0.0023
20.330	0.093	0.023	0.896	0.0026
20.483	0.093	0.023	0.900	0.0029
20.637	0.093	0.023	0.903	0.0031
20.790	0.091	0.023	0.907	0.0032
20.943	0.088	0.022	0.910	0.0033
21.096	0.085	0.021	0.914	0.0033
21.250	0.082	0.020	0.918	0.0033
21.403	0.078	0.020	0.922	0.0032

21.556	0.075	0.019	0.925	0.0031
21.956	0.065	0.016	0.935	0.0022
22.356	0.056	0.014	0.944	0.0016
22.756	0.048	0.012	0.952	0.0011
23.156	0.041	0.010	0.959	0.0008
23.556	0.034	0.009	0.966	0.0005
23.956	0.028	0.007	0.972	0.0003
24.356	0.023	0.006	0.977	0.0002
24.756	0.018	0.004	0.982	0.0001
25.156	0.014	0.003	0.986	0.0001
25.556	0.011	0.003	0.989	0.0000
25.956	0.008	0.002	0.992	0.0000
26.356	0.005	0.001	0.995	0.0000
26.756	0.004	0.001	0.996	0.0000
27.156	0.002	0.001	0.998	0.0000
27.556	0.001	0.000	0.999	0.0000
27.956	0.001	0.000	0.999	0.0000
28.356	0.000	0.000	1.000	0.0000
28.756	0.000	0.000	1.000	0.0000
29.156	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000

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6. LNAPL specific volume and hydraulic conductivity

bn [ft]	Dn [ft]	Rn [ft]	Tn [ft2/d]
0.000	0.000	0.000	0.000
0.320	0.002	0.000	0.000
0.640	0.003	0.000	0.000
0.960	0.005	0.000	0.000
1.280	0.006	0.000	0.000
1.600	0.008	0.000	0.000
1.920	0.009	0.000	0.000
2.240	0.011	0.001	0.000
2.560	0.013	0.001	0.000
2.880	0.016	0.002	0.000
3.200	0.018	0.003	0.000
3.520	0.021	0.005	0.000
3.840	0.025	0.007	0.001
4.160	0.029	0.009	0.001
4.480	0.034	0.012	0.001
4.800	0.040	0.016	0.002
5.120	0.046	0.020	0.002
5.440	0.053	0.025	0.003
5.760	0.061	0.032	0.004
6.080	0.069	0.039	0.006
6.400	0.079	0.047	0.008
6.720	0.090	0.057	0.010
7.040	0.101	0.067	0.013
7.360	0.114	0.079	0.016
7.680	0.128	0.092	0.021
8.000	0.142	0.107	0.026

7. Data for curve-fitting segments

bn[ft]	Rn[ft]	Tn[ft2/d]	chi[ft]	beta	xi[ft]	eta
0.00000	0.00000	0.00000				
3.84000	0.00658	0.00059	0.00000	0.00469	0.00000	0.00057
6.72000	0.05656	0.00984	4.38967	0.02427	4.84774	0.00525
8.00000	0.10667	0.02623	5.27538	0.03915	5.95170	0.01281

8. Free product recovery system Analysis

8.1 Calculated parameters for the recovery system

Vacuum-enhanced air discharge [scfm]	=	0.017
Average drawdown(+)\buildup(-) [ft]	=	-0.306
New water table depth [ft]	=	23.380
New monitoring well LNPAL thickness [ft]	=	8.000
Final monitoring well LNAPL thickness [ft]	=	5.850
a_skimmer [ft-2]	=	0.00005
a_water [ft-1]	=	0.00321
a_air [ft-1]	=	0.00001
Recovery time for segment 1 [yr]	=	2.547
Recovery time for segment 2 [yr]	=	7.063

8.2 Predicted Performances of the system

Time [yr]	bn [ft]	Vn [gal]	Qn [gpd]
0.000	8.000	0.000	1.789
0.127	7.902	81.151	1.703
0.255	7.809	158.418	1.622
0.382	7.720	231.989	1.544
0.509	7.635	302.039	1.470
0.637	7.555	368.738	1.400
0.764	7.478	432.246	1.333
0.891	7.405	492.714	1.269
1.019	7.335	550.290	1.209
1.146	7.269	605.111	1.151
1.273	7.206	657.308	1.096
1.401	7.146	707.009	1.043
1.528	7.089	754.331	0.993
1.656	7.035	799.389	0.946
1.783	6.983	842.291	0.901
1.910	6.933	883.141	0.857
2.038	6.886	922.035	0.816
2.165	6.842	959.069	0.777
2.292	6.799	994.331	0.740
2.420	6.759	1027.906	0.705
2.547	6.720	1059.874	0.671
2.670	6.662	1089.450	0.650
2.792	6.607	1118.116	0.630
2.915	6.552	1145.899	0.611
3.038	6.500	1172.828	0.592
3.160	6.449	1198.928	0.574
3.283	6.400	1224.224	0.556
3.406	6.352	1248.742	0.539
3.528	6.306	1272.506	0.523
3.651	6.261	1295.538	0.506
3.773	6.217	1317.861	0.491
3.896	6.175	1339.498	0.476
4.019	6.134	1360.469	0.461
4.141	6.095	1380.794	0.447
4.264	6.056	1400.494	0.433
4.387	6.019	1419.587	0.420
4.509	5.983	1438.093	0.407
4.632	5.948	1456.029	0.394
4.755	5.914	1473.414	0.382
4.877	5.882	1490.263	0.371
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359

5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359
5.000	5.850	1506.594	0.359

8.3 Water table drawdown / buildup

Radius [ft]	Drawdown [ft]	Buildup [ft]	Net [ft]
0.250	5.344	-6.778	-1.434
0.258	5.307	-6.733	-1.426
0.283	5.205	-6.607	-1.402
0.324	5.053	-6.419	-1.366
0.382	4.870	-6.192	-1.323
0.457	4.671	-5.947	-1.276
0.548	4.469	-5.697	-1.228
0.655	4.269	-5.450	-1.181
0.779	4.075	-5.211	-1.135
0.919	3.890	-4.982	-1.092
1.076	3.714	-4.764	-1.050
1.250	3.547	-4.558	-1.011
1.440	3.389	-4.363	-0.973
1.647	3.240	-4.178	-0.938
1.870	3.098	-4.003	-0.905
2.109	2.963	-3.836	-0.873
2.366	2.835	-3.678	-0.843
2.638	2.714	-3.528	-0.814
2.928	2.597	-3.384	-0.787
3.233	2.487	-3.247	-0.761
3.556	2.380	-3.116	-0.736
3.894	2.279	-2.991	-0.712
4.250	2.181	-2.870	-0.689
4.622	2.088	-2.754	-0.667
5.010	1.998	-2.643	-0.645
5.415	1.911	-2.536	-0.625
5.836	1.827	-2.433	-0.605
6.274	1.747	-2.333	-0.586
6.729	1.668	-2.236	-0.568
7.200	1.593	-2.143	-0.550
7.688	1.520	-2.053	-0.533
8.192	1.449	-1.965	-0.516
8.712	1.380	-1.880	-0.500
9.249	1.313	-1.797	-0.484
9.803	1.248	-1.717	-0.469
10.373	1.185	-1.639	-0.454
10.960	1.124	-1.563	-0.439
11.563	1.064	-1.489	-0.425
12.183	1.006	-1.417	-0.412
12.819	0.949	-1.347	-0.398
13.472	0.894	-1.279	-0.385
14.142	0.839	-1.212	-0.372
14.828	0.787	-1.146	-0.360
15.530	0.735	-1.083	-0.348
16.249	0.684	-1.020	-0.336
16.984	0.635	-0.959	-0.324
17.736	0.587	-0.899	-0.313
18.505	0.539	-0.841	-0.302
19.290	0.493	-0.784	-0.291
20.092	0.447	-0.727	-0.280
20.910	0.403	-0.672	-0.269
21.744	0.359	-0.618	-0.259
22.596	0.316	-0.565	-0.249

23.463	0.274	-0.513	-0.239
24.348	0.233	-0.462	-0.229
25.248	0.192	-0.412	-0.220
26.166	0.153	-0.363	-0.210
27.099	0.114	-0.315	-0.201
28.050	0.075	-0.267	-0.192
29.017	0.037	-0.220	-0.183
30.000	0.000	-0.174	-0.174

LNAPL Distribution and Recovery Model (LDRM)

File Data Recovery Graphs Options Help Exit

LNAPL Specific Volume, Dn (ft) =	0.1422
LNAPL Recoverable Volume, Rn (ft) =	0.1067
Drawdown (ft) =	-0.306
New Water-table Depth (ft) =	23.380
New LNAPL Thickness, bn (ft) =	8.000
New LNAPL Specific Volume, Dn (ft) =	0.1422
New LNAPL Recoverable Volume, Rn (ft) =	0.1067
Initial Recovery Rate, Qn (gpd) =	1.789
Final LNAPL Thickness, bn (ft) =	5.850
Final Recovery Rate, Qn (gpd) =	0.359
Final Recovery Volume, Vn (gal) =	1506.6
Percent Recovery =	50.085

Recovery Results
GW- and Vacuum-enhanced Skimmer
TPH-07 @ Terminal

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 *
 * File Name  = E:\Wayne's Projects\Wisconsin\Superior (00406)\General\Data\LDRM\406
 * Saved time =  11 :  6,   2014 . 3 .  4
 *
*****************************************************************************

 1. OPTIONS.

 * Units              =   1              (1: English Units, 2: SI Units)

 * Soil Heterogeneity =   2              ( Number of Layers: 1, 2 or 3)

 * Elevation          =   2              (1: Elevation above datum, 2: depth BGS)

 * FPR System Used    =   1              (1: well,  2: trench,  0: Not used)

 * Smear Correction   =   0              (0: no adjustment, 1: smear correction)

 * LNAPL Residual     =   3              (1: const (user), 2: const (f), 3:
variable)


 2. INPUT PARAMETERS.

 2.1 BASIC INPUT PARAMETERS.
 Monitor. Well LNAPL thickness[ft]=          8.000
 Ground Surface Depth [ft]        =          0.000
 Groundwater Table Depth [ft]     =         23.380
 Soil Layers Interface (z12) [ft] =         16.730
 Water Vertical Gradient(+up)     =          0.000
 LNAPL Density [g/cm3]            =          0.772
 LNAPL Viscosity [cp]             =          0.950
 Water Surface Tension [dyne/cm]  =         62.100
 LNAPL Surface Tension [dyne/cm]  =         22.600
 LNAPL/Water Interfacial Tension  =         24.100

 2.1.1 SOIL PROPERTIES OF LAYER 1
 Relative permeability model      =              1     (Mualem)
 Soil porosity                    =          0.433
 Hydraulic conductivity [ft/d]    =          0.011
 van Genuchten "N"                =          1.946
 van Genuchten "Alpha" [ft-1]     =          0.006
 Swr1                             =          0.570
 Snr1                             =       Variable
 LNAPL residual f-factor          =          0.400

 2.1.2 SOIL PROPERTIES OF LAYER 2
 Relative permeability model      =              0     (Burdine)
 Soil porosity                    =          0.378
 Hydraulic conductivity [ft/d]    =          3.660
 van Genuchten "N"                =          3.005
 van Genuchten "alpha"  [ft-1]    =          0.125
 Swr2                             =          0.046
 Snr2                             =       Variable
 LNAPL residual f-factor          =          0.250

 2.2 INPUT DATA FOR THE RECOVERY WELL.
 Design Recovery time [yr]        =          5.000
 Radius of pumping well [ft]      =          0.250
 Radius of capture [ft]           =         10.000
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Radius of influence [ft]	=	30.000
Water production rate [gpm]	=	0.000
Groundwater thickness [ft]	=	15.000
Suction pressure [atm]	=	0.000
Screen length for air flow [ft]	=	5.000

3. FIELD DATA

1 (7) Depth [ft]	Sn
18.500	0.012
19.500	0.048
20.500	0.117
21.500	0.073
22.500	0.021
23.500	0.042
24.500	0.047

4. Calculated Parameters

Air-LNAPL interface [ft]	=	21.556
LNAPL-Water interface [ft]	=	29.556
Max. Free-Product elevation [ft]	=	18.492

Parameter		Soil 1	Soil 2
van Genuchten "M"	:	0.486	0.334
Air/LNAPL "alpha" [ft-1]	:	0.013	0.265
LNAPL/water "alpha" [ft-1]	:	0.004	0.073

5. LNAPL and Water saturation data.

BGS Depth [ft]	Sn	Snr	Sw	krn
18.492	0.000	0.000	0.872	0.0000
18.645	0.014	0.003	0.873	0.0000
18.798	0.026	0.007	0.875	0.0000
18.951	0.038	0.010	0.876	0.0001
19.105	0.049	0.012	0.877	0.0002
19.258	0.059	0.015	0.879	0.0004
19.411	0.068	0.017	0.881	0.0006
19.564	0.075	0.019	0.883	0.0009
19.717	0.082	0.020	0.885	0.0012
19.871	0.086	0.022	0.887	0.0016
20.024	0.090	0.022	0.890	0.0019
20.177	0.092	0.023	0.893	0.0023
20.330	0.093	0.023	0.896	0.0026
20.483	0.093	0.023	0.900	0.0029
20.637	0.093	0.023	0.903	0.0031
20.790	0.091	0.023	0.907	0.0032
20.943	0.088	0.022	0.910	0.0033
21.096	0.085	0.021	0.914	0.0033
21.250	0.082	0.020	0.918	0.0033
21.403	0.078	0.020	0.922	0.0032

21.556	0.075	0.019	0.925	0.0031
21.956	0.065	0.016	0.935	0.0022
22.356	0.056	0.014	0.944	0.0016
22.756	0.048	0.012	0.952	0.0011
23.156	0.041	0.010	0.959	0.0008
23.556	0.034	0.009	0.966	0.0005
23.956	0.028	0.007	0.972	0.0003
24.356	0.023	0.006	0.977	0.0002
24.756	0.018	0.004	0.982	0.0001
25.156	0.014	0.003	0.986	0.0001
25.556	0.011	0.003	0.989	0.0000
25.956	0.008	0.002	0.992	0.0000
26.356	0.005	0.001	0.995	0.0000
26.756	0.004	0.001	0.996	0.0000
27.156	0.002	0.001	0.998	0.0000
27.556	0.001	0.000	0.999	0.0000
27.956	0.001	0.000	0.999	0.0000
28.356	0.000	0.000	1.000	0.0000
28.756	0.000	0.000	1.000	0.0000
29.156	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000

6. LNAPL specific volume and hydraulic conductivity

bn [ft]	Dn [ft]	Rn [ft]	Tn [ft2/d]
0.000	0.000	0.000	0.000
0.320	0.002	0.000	0.000
0.640	0.003	0.000	0.000
0.960	0.005	0.000	0.000
1.280	0.006	0.000	0.000
1.600	0.008	0.000	0.000
1.920	0.009	0.000	0.000
2.240	0.011	0.001	0.000
2.560	0.013	0.001	0.000
2.880	0.016	0.002	0.000
3.200	0.018	0.003	0.000
3.520	0.021	0.005	0.000
3.840	0.025	0.007	0.001
4.160	0.029	0.009	0.001
4.480	0.034	0.012	0.001
4.800	0.040	0.016	0.002
5.120	0.046	0.020	0.002
5.440	0.053	0.025	0.003
5.760	0.061	0.032	0.004
6.080	0.069	0.039	0.006
6.400	0.079	0.047	0.008
6.720	0.090	0.057	0.010
7.040	0.101	0.067	0.013
7.360	0.114	0.079	0.016
7.680	0.128	0.092	0.021
8.000	0.142	0.107	0.026

7. Data for curve-fitting segments

bn[ft]	Rn[ft]	Tn[ft2/d]	chi[ft]	beta	xi[ft]	eta
0.00000	0.00000	0.00000				
5.44000	0.02549	0.00311	0.00000	0.00469	0.00000	0.00057
6.72000	0.05656	0.00984	4.38967	0.02427	4.84774	0.00525
8.00000	0.10667	0.02623	5.27538	0.03915	5.95170	0.01281

8. Free product recovery system Analysis

8.1 Calculated parameters for the recovery system

Vacuum-enhanced air discharge [scfm]	=	0.000
Average drawdown(+)\buildup(-) [ft]	=	0.000
New water table depth [ft]	=	23.380
New monitoring well LNPAL thickness [ft]	=	8.000
Final monitoring well LNAPL thickness [ft]	=	5.583
a_skimmer [ft-2]	=	0.00062
a_water [ft-1]	=	0.00000
a_air [ft-1]	=	0.00000
Recovery time for segment 1 [yr]	=	1.836
Recovery time for segment 2 [yr]	=	5.804

8.2 Predicted Performances of the system

Time [yr]	bn [ft]	Vn [gal]	Qn [gpd]
0.000	8.000	0.000	0.305
0.092	7.890	10.120	0.284
0.184	7.790	19.321	0.266
0.275	7.700	27.601	0.250
0.367	7.610	35.881	0.235
0.459	7.525	43.701	0.220
0.551	7.450	50.602	0.208
0.643	7.375	57.502	0.195
0.734	7.305	63.942	0.184
0.826	7.240	69.922	0.173
0.918	7.180	75.442	0.164
1.010	7.122	80.733	0.155
1.102	7.067	85.793	0.147
1.193	7.015	90.623	0.139
1.285	6.965	95.223	0.131
1.377	6.920	99.363	0.125
1.469	6.875	103.503	0.118
1.560	6.832	107.413	0.112
1.652	6.793	111.094	0.106
1.744	6.755	114.544	0.101
1.836	6.720	117.764	0.096
1.994	6.625	123.182	0.090
2.152	6.537	128.173	0.084
2.310	6.455	132.878	0.079
2.469	6.378	137.298	0.074
2.627	6.305	141.433	0.070
2.785	6.235	145.426	0.066
2.943	6.170	149.133	0.062
3.102	6.110	152.555	0.059
3.260	6.051	155.906	0.056
3.418	5.996	159.043	0.053
3.576	5.945	161.966	0.050
3.734	5.895	164.817	0.047
3.893	5.849	167.455	0.045
4.051	5.805	169.951	0.042
4.209	5.762	172.374	0.040
4.367	5.724	174.585	0.038
4.525	5.686	176.723	0.036
4.684	5.650	178.791	0.035
4.842	5.616	180.751	0.033
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031

5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031
5.000	5.583	182.605	0.031

8.3 Water table drawdown / buildup

Radius [ft]	Drawdown [ft]	Buildup [ft]	Net [ft]
0.250	0.000	0.000	0.000
0.253	0.000	0.000	0.000
0.261	0.000	0.000	0.000
0.274	0.000	0.000	0.000
0.293	0.000	0.000	0.000
0.318	0.000	0.000	0.000
0.347	0.000	0.000	0.000
0.383	0.000	0.000	0.000
0.423	0.000	0.000	0.000
0.469	0.000	0.000	0.000
0.521	0.000	0.000	0.000
0.578	0.000	0.000	0.000
0.640	0.000	0.000	0.000
0.708	0.000	0.000	0.000
0.781	0.000	0.000	0.000
0.859	0.000	0.000	0.000
0.943	0.000	0.000	0.000
1.033	0.000	0.000	0.000
1.128	0.000	0.000	0.000
1.228	0.000	0.000	0.000
1.333	0.000	0.000	0.000
1.444	0.000	0.000	0.000
1.561	0.000	0.000	0.000
1.683	0.000	0.000	0.000
1.810	0.000	0.000	0.000
1.943	0.000	0.000	0.000
2.081	0.000	0.000	0.000
2.224	0.000	0.000	0.000
2.373	0.000	0.000	0.000
2.528	0.000	0.000	0.000
2.688	0.000	0.000	0.000
2.853	0.000	0.000	0.000
3.023	0.000	0.000	0.000
3.199	0.000	0.000	0.000
3.381	0.000	0.000	0.000
3.568	0.000	0.000	0.000
3.760	0.000	0.000	0.000
3.958	0.000	0.000	0.000
4.161	0.000	0.000	0.000
4.369	0.000	0.000	0.000
4.583	0.000	0.000	0.000
4.803	0.000	0.000	0.000
5.028	0.000	0.000	0.000
5.258	0.000	0.000	0.000
5.493	0.000	0.000	0.000
5.734	0.000	0.000	0.000
5.981	0.000	0.000	0.000
6.233	0.000	0.000	0.000
6.490	0.000	0.000	0.000
6.753	0.000	0.000	0.000
7.021	0.000	0.000	0.000
7.294	0.000	0.000	0.000
7.573	0.000	0.000	0.000

7.858	0.000	0.000	0.000
8.148	0.000	0.000	0.000
8.443	0.000	0.000	0.000
8.743	0.000	0.000	0.000
9.049	0.000	0.000	0.000
9.361	0.000	0.000	0.000
9.678	0.000	0.000	0.000
10.000	0.000	0.000	0.000

LNAPL Distribution and Recovery Model (LDRM)

File Data Recovery Graphs Options Help Exit

LNAPL Specific Volume, Dn (ft) =	0.1422
LNAPL Recoverable Volume, Rn (ft) =	0.1067
Drawdown (ft) =	0.000
New Water-table Depth (ft) =	23.380
New LNAPL Thickness, bn (ft) =	8.000
New LNAPL Specific Volume, Dn (ft) =	0.1422
New LNAPL Recoverable Volume, Rn (ft) =	0.1067
Initial Recovery Rate, Qn (gpd) =	0.305
Final LNAPL Thickness, bn (ft) =	5.583
Final Recovery Rate, Qn (gpd) =	0.031
Final Recovery Volume, Vn (gal) =	182.6
Percent Recovery =	54.634

Recovery Results
Passive Skimmer
TPH-07 @ Terminal

```
*****************************************************************************
 *
 * File Name  = E:\Wayne's Projects\Wisconsin\Superior (00406)\General\Data\LDRM\406
 * Saved time =  11 :  7,   2014 . 3 .  4
 *
*****************************************************************************

 1. OPTIONS.

 * Units              =   1              (1: English Units, 2: SI Units)

 * Soil Heterogeneity =   2              ( Number of Layers: 1, 2 or 3)

 * Elevation          =   2              (1: Elevation above datum, 2: depth BGS)

 * FPR System Used    =   1              (1: well,  2: trench,  0: Not used)

 * Smear Correction   =   0              (0: no adjustment, 1: smear correction)

 * LNAPL Residual     =   3              (1: const (user), 2: const (f), 3:
variable)


 2. INPUT PARAMETERS.

 2.1 BASIC INPUT PARAMETERS.
 Monitor. Well LNAPL thickness[ft]=          8.000
 Ground Surface Depth [ft]        =          0.000
 Groundwater Table Depth [ft]     =         23.380
 Soil Layers Interface (z12) [ft] =         16.730
 Water Vertical Gradient(+up)     =          0.000
 LNAPL Density [g/cm3]            =          0.772
 LNAPL Viscosity [cp]             =          0.950
 Water Surface Tension [dyne/cm]  =         62.100
 LNAPL Surface Tension [dyne/cm]  =         22.600
 LNAPL/Water Interfacial Tension  =         24.100

 2.1.1 SOIL PROPERTIES OF LAYER 1
 Relative permeability model      =              1     (Mualem)
 Soil porosity                    =          0.433
 Hydraulic conductivity [ft/d]    =          0.011
 van Genuchten "N"                =          1.946
 van Genuchten "Alpha" [ft-1]     =          0.006
 Swr1                             =          0.570
 Snr1                             =       Variable
 LNAPL residual f-factor          =          0.400

 2.1.2 SOIL PROPERTIES OF LAYER 2
 Relative permeability model      =              0     (Burdine)
 Soil porosity                    =          0.378
 Hydraulic conductivity [ft/d]    =          3.660
 van Genuchten "N"                =          3.005
 van Genuchten "alpha"  [ft-1]    =          0.125
 Swr2                             =          0.046
 Snr2                             =       Variable
 LNAPL residual f-factor          =          0.250

 2.2 INPUT DATA FOR THE RECOVERY WELL.
 Design Recovery time [yr]        =          5.000
 Radius of pumping well [ft]      =          0.250
 Radius of capture [ft]           =         30.000
```

Radius of influence [ft]	=	30.000
Water production rate [gpm]	=	0.000
Groundwater thickness [ft]	=	15.000
Suction pressure [atm]	=	0.200
Screen length for air flow [ft]	=	5.000

3. FIELD DATA

1 (7) Depth [ft]	Sn
18.500	0.012
19.500	0.048
20.500	0.117
21.500	0.073
22.500	0.021
23.500	0.042
24.500	0.047

4. Calculated Parameters

Air-LNAPL interface [ft]	=	21.556
LNAPL-Water interface [ft]	=	29.556
Max. Free-Product elevation [ft]	=	18.492

Parameter		Soil 1	Soil 2
van Genuchten "M"	:	0.486	0.334
Air/LNAPL "alpha" [ft-1]	:	0.013	0.265
LNAPL/water "alpha" [ft-1]	:	0.004	0.073

5. LNAPL and Water saturation data.

BGS Depth [ft]	Sn	Snr	Sw	krn
18.492	0.000	0.000	0.872	0.0000
18.645	0.014	0.003	0.873	0.0000
18.798	0.026	0.007	0.875	0.0000
18.951	0.038	0.010	0.876	0.0001
19.105	0.049	0.012	0.877	0.0002
19.258	0.059	0.015	0.879	0.0004
19.411	0.068	0.017	0.881	0.0006
19.564	0.075	0.019	0.883	0.0009
19.717	0.082	0.020	0.885	0.0012
19.871	0.086	0.022	0.887	0.0016
20.024	0.090	0.022	0.890	0.0019
20.177	0.092	0.023	0.893	0.0023
20.330	0.093	0.023	0.896	0.0026
20.483	0.093	0.023	0.900	0.0029
20.637	0.093	0.023	0.903	0.0031
20.790	0.091	0.023	0.907	0.0032
20.943	0.088	0.022	0.910	0.0033
21.096	0.085	0.021	0.914	0.0033
21.250	0.082	0.020	0.918	0.0033
21.403	0.078	0.020	0.922	0.0032

21.556	0.075	0.019	0.925	0.0031
21.956	0.065	0.016	0.935	0.0022
22.356	0.056	0.014	0.944	0.0016
22.756	0.048	0.012	0.952	0.0011
23.156	0.041	0.010	0.959	0.0008
23.556	0.034	0.009	0.966	0.0005
23.956	0.028	0.007	0.972	0.0003
24.356	0.023	0.006	0.977	0.0002
24.756	0.018	0.004	0.982	0.0001
25.156	0.014	0.003	0.986	0.0001
25.556	0.011	0.003	0.989	0.0000
25.956	0.008	0.002	0.992	0.0000
26.356	0.005	0.001	0.995	0.0000
26.756	0.004	0.001	0.996	0.0000
27.156	0.002	0.001	0.998	0.0000
27.556	0.001	0.000	0.999	0.0000
27.956	0.001	0.000	0.999	0.0000
28.356	0.000	0.000	1.000	0.0000
28.756	0.000	0.000	1.000	0.0000
29.156	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000
29.556	0.000	0.000	1.000	0.0000

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6. LNAPL specific volume and hydraulic conductivity

bn [ft]	Dn [ft]	Rn [ft]	Tn [ft2/d]
0.000	0.000	0.000	0.000
0.320	0.002	0.000	0.000
0.640	0.003	0.000	0.000
0.960	0.005	0.000	0.000
1.280	0.006	0.000	0.000
1.600	0.008	0.000	0.000
1.920	0.009	0.000	0.000
2.240	0.011	0.001	0.000
2.560	0.013	0.001	0.000
2.880	0.016	0.002	0.000
3.200	0.018	0.003	0.000
3.520	0.021	0.005	0.000
3.840	0.025	0.007	0.001
4.160	0.029	0.009	0.001
4.480	0.034	0.012	0.001
4.800	0.040	0.016	0.002
5.120	0.046	0.020	0.002
5.440	0.053	0.025	0.003
5.760	0.061	0.032	0.004
6.080	0.069	0.039	0.006
6.400	0.079	0.047	0.008
6.720	0.090	0.057	0.010
7.040	0.101	0.067	0.013
7.360	0.114	0.079	0.016
7.680	0.128	0.092	0.021
8.000	0.142	0.107	0.026

7. Data for curve-fitting segments

bn[ft]	Rn[ft]	Tn[ft2/d]	chi[ft]	beta	xi[ft]	eta
0.00000	0.00000	0.00000				
5.44000	0.02549	0.00311	0.00000	0.00469	0.00000	0.00057
6.72000	0.05656	0.00984	4.38967	0.02427	4.84774	0.00525
8.00000	0.10667	0.02623	5.27538	0.03915	5.95170	0.01281

8. Free product recovery system Analysis

8.1 Calculated parameters for the recovery system

Vacuum-enhanced air discharge [scfm]	=	0.017
Average drawdown(+)\buildup(-) [ft]	=	-0.863
New water table depth [ft]	=	23.380
New monitoring well LNPAL thickness [ft]	=	8.000
Final monitoring well LNAPL thickness [ft]	=	7.985
a_skimmer [ft-2]	=	0.00005
a_water [ft-1]	=	0.00000
a_air [ft-1]	=	0.00001
Recovery time for segment 1 [yr]	=	688.320
Recovery time for segment 2 [yr]	=	1908.818

8.2 Predicted Performances of the system

Time [yr]	bn [ft]	Vn [gal]	Qn [gpd]
0.000	8.000	0.000	0.007
0.250	7.999	0.604	0.007
0.500	7.999	1.208	0.007
0.750	7.998	1.811	0.007
1.000	7.997	2.414	0.007
1.250	7.996	3.018	0.007
1.500	7.996	3.620	0.007
1.750	7.995	4.223	0.007
2.000	7.994	4.826	0.007
2.250	7.993	5.428	0.007
2.500	7.993	6.030	0.007
2.750	7.992	6.632	0.007
3.000	7.991	7.233	0.007
3.250	7.991	7.835	0.007
3.500	7.990	8.436	0.007
3.750	7.989	9.037	0.007
4.000	7.988	9.637	0.007
4.250	7.988	10.238	0.007
4.500	7.987	10.838	0.007
4.750	7.986	11.438	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007

5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007
5.000	7.985	12.038	0.007

8.3 Water table drawdown / buildup

Radius [ft]	Drawdown [ft]	Buildup [ft]	Net [ft]
0.250	0.000	-6.778	-6.778
0.258	0.000	-6.733	-6.733
0.283	0.000	-6.607	-6.607
0.324	0.000	-6.419	-6.419
0.382	0.000	-6.192	-6.192
0.457	0.000	-5.947	-5.947
0.548	0.000	-5.697	-5.697
0.655	0.000	-5.450	-5.450
0.779	0.000	-5.211	-5.211
0.919	0.000	-4.982	-4.982
1.076	0.000	-4.764	-4.764
1.250	0.000	-4.558	-4.558
1.440	0.000	-4.363	-4.363
1.647	0.000	-4.178	-4.178
1.870	0.000	-4.003	-4.003
2.109	0.000	-3.836	-3.836
2.366	0.000	-3.678	-3.678
2.638	0.000	-3.528	-3.528
2.928	0.000	-3.384	-3.384
3.233	0.000	-3.247	-3.247
3.556	0.000	-3.116	-3.116
3.894	0.000	-2.991	-2.991
4.250	0.000	-2.870	-2.870
4.622	0.000	-2.754	-2.754
5.010	0.000	-2.643	-2.643
5.415	0.000	-2.536	-2.536
5.836	0.000	-2.433	-2.433
6.274	0.000	-2.333	-2.333
6.729	0.000	-2.236	-2.236
7.200	0.000	-2.143	-2.143
7.688	0.000	-2.053	-2.053
8.192	0.000	-1.965	-1.965
8.712	0.000	-1.880	-1.880
9.249	0.000	-1.797	-1.797
9.803	0.000	-1.717	-1.717
10.373	0.000	-1.639	-1.639
10.960	0.000	-1.563	-1.563
11.563	0.000	-1.489	-1.489
12.183	0.000	-1.417	-1.417
12.819	0.000	-1.347	-1.347
13.472	0.000	-1.279	-1.279
14.142	0.000	-1.212	-1.212
14.828	0.000	-1.146	-1.146
15.530	0.000	-1.083	-1.083
16.249	0.000	-1.020	-1.020
16.984	0.000	-0.959	-0.959
17.736	0.000	-0.899	-0.899
18.505	0.000	-0.841	-0.841
19.290	0.000	-0.784	-0.784
20.092	0.000	-0.727	-0.727
20.910	0.000	-0.672	-0.672
21.744	0.000	-0.618	-0.618
22.596	0.000	-0.565	-0.565

23.463	0.000	-0.513	-0.513
24.348	0.000	-0.462	-0.462
25.248	0.000	-0.412	-0.412
26.166	0.000	-0.363	-0.363
27.099	0.000	-0.315	-0.315
28.050	0.000	-0.267	-0.267
29.017	0.000	-0.220	-0.220
30.000	0.000	-0.174	-0.174

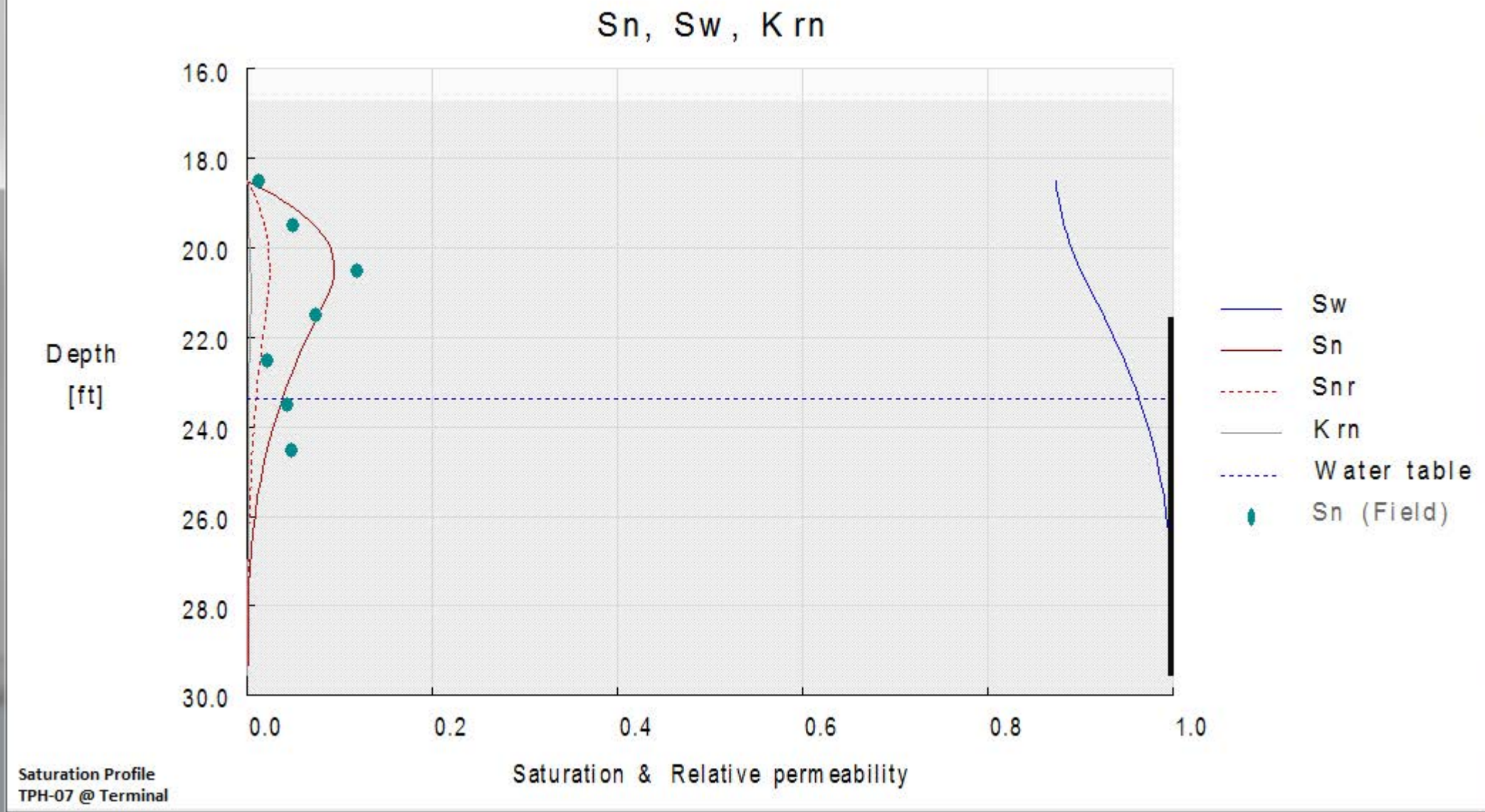
LNAPL Distribution and Recovery Model (LDRM)

File Data Recovery Graphs Options Help Exit

LNAPL Specific Volume, Dn (ft) =	0.1422
LNAPL Recoverable Volume, Rn (ft) =	0.1067
Drawdown (ft) =	-0.863
New Water-table Depth (ft) =	23.380
New LNAPL Thickness, bn (ft) =	8.000
New LNAPL Specific Volume, Dn (ft) =	0.1422
New LNAPL Recoverable Volume, Rn (ft) =	0.1067
Initial Recovery Rate, Qn (gpd) =	0.007
Final LNAPL Thickness, bn (ft) =	7.985
Final Recovery Rate, Qn (gpd) =	0.007
Final Recovery Volume, Vn (gal) =	12.0
Percent Recovery =	0.400

Recovery Results
Vacuum-enhanced Skimmer
TPH-07 @ Terminal

Saturation Profiles



Data Input

Thickness, Elevations, Vertical gradient

Maximum Monitoring Well LNAPL Thickness [ft] =	8.000
Depth of ground surface (Datum) =	0.000
Water table depth [ft] =	16.500
Depth of soil faces interface [ft] =	18.000
Water Vertical gradient (+ for upward) = [Layer 1 Only]	0.400

Fluid Characteristics

LNAPL density [gm/cc] =	0.770
LNAPL viscosity [cp] =	0.990
Air/Water surface tension [dyne/cm] =	62.440
Air/LNAPL surface tension [dyne/cm] =	21.820
LNAPL/Water interfacial tension [dyne/cm] =	17.890

Relative Permeability Model (Burdine is default)

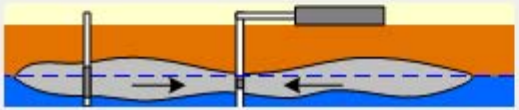
Use Mualem Model for Layer ☑ Layer 1 ☐ Layer 2

Soil 1

Porosity =	0.433
Hydraulic conductivity [ft/d] =	0.011
Van Genuchten "N" =	1.946
Van Genuchten "a" [ft-1] =	0.006
Irreducible water saturation =	0.570
Residual LNAPL saturation =	Variable
Residual LNAPL f-factor =	0.250

Soil 2

Porosity =	0.403
Hydraulic conductivity [ft/d] =	2.740
Van Genuchten "N" =	2.100
Van Genuchten "a" [ft-1] =	0.312
Irreducible water saturation =	0.046
Residual LNAPL saturation =	Variable
Residual LNAPL f-factor =	0.500



Input Data
TPH-09 @ Manifold

OK Cancel

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 * File Name  = E:\Wayne's Projects\Wisconsin\Superior (00406)\General\Data\Superior
 * Saved time =  14 : 27,   2014 .12 . 23
 *
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 1. OPTIONS.

 * Units              =   1              (1: English Units, 2: SI Units)

 * Soil Heterogeneity =   2              ( Number of Layers: 1, 2 or 3)

 * Elevation          =   2              (1: Elevation above datum, 2: depth BGS)

 * FPR System Used    =   1              (1: well,  2: trench,  0: Not used)

 * Smear Correction   =   0              (0: no adjustment, 1: smear correction)

 * LNAPL Residual     =   3              (1: const (user), 2: const (f), 3:
variable)


 2. INPUT PARAMETERS.

 2.1 BASIC INPUT PARAMETERS.
 Monitor. Well LNAPL thickness[ft]=          8.000
 Ground Surface Depth [ft]        =          0.000
 Groundwater Table Depth [ft]     =         16.500
 Soil Layers Interface (z12) [ft] =         18.000
 Water Vertical Gradient(+up)     =          0.400
 LNAPL Density [g/cm3]            =          0.770
 LNAPL Viscosity [cp]             =          0.990
 Water Surface Tension [dyne/cm]  =         62.440
 LNAPL Surface Tension [dyne/cm]  =         21.820
 LNAPL/Water Interfacial Tension  =         17.890

 2.1.1 SOIL PROPERTIES OF LAYER 1
 Relative permeability model      =              1     (Mualem)
 Soil porosity                    =          0.433
 Hydraulic conductivity [ft/d]    =          0.011
 van Genuchten "N"                =          1.946
 van Genuchten "Alpha" [ft-1]     =          0.006
 Swr1                             =          0.570
 Snr1                             =       Variable
 LNAPL residual f-factor          =          0.250

 2.1.2 SOIL PROPERTIES OF LAYER 2
 Relative permeability model      =              0     (Burdine)
 Soil porosity                    =          0.403
 Hydraulic conductivity [ft/d]    =          2.740
 van Genuchten "N"                =          2.100
 van Genuchten "alpha"  [ft-1]    =          0.312
 Swr2                             =          0.046
 Snr2                             =       Variable
 LNAPL residual f-factor          =          0.500

 2.2 INPUT DATA FOR THE RECOVERY WELL.
 Design Recovery time [yr]        =          5.000
 Radius of pumping well [ft]      =          0.250
 Radius of capture [ft]           =         70.000
```

Radius of influence [ft]	=	120.000
Water production rate [gpm]	=	2.000
Groundwater thickness [ft]	=	15.000
Suction pressure [atm]	=	0.000
Screen length for air flow [ft]	=	5.000

3. FIELD DATA

1 (4) Depth [ft]	Sn
17.500	0.001
18.500	0.076
19.500	0.038
20.500	0.000

4. Calculated Parameters

Air-LNAPL interface [ft]	=	14.660
LNAPL-Water interface [ft]	=	22.660
Max. Free-Product elevation [ft]	=	0.000

Parameter		Soil 1	Soil 2
van Genuchten "M"	:	0.486	0.048
Air/LNAPL "alpha" [ft-1]	:	0.013	0.687
LNAPL/water "alpha" [ft-1]	:	0.013	0.250

5. LNAPL and Water saturation data.

BGS Depth [ft]	Sn	Snr	Sw	krn
0.000	0.014	0.003	0.978	0.0011
0.733	0.013	0.003	0.979	0.0011
1.466	0.013	0.003	0.980	0.0011
2.199	0.012	0.003	0.982	0.0011
2.932	0.012	0.003	0.983	0.0011
3.665	0.011	0.003	0.984	0.0011
4.398	0.011	0.003	0.985	0.0011
5.131	0.011	0.003	0.986	0.0011
5.864	0.010	0.003	0.987	0.0011
6.597	0.010	0.002	0.988	0.0011
7.330	0.009	0.002	0.989	0.0011
8.063	0.009	0.002	0.990	0.0011
8.796	0.008	0.002	0.991	0.0010
9.529	0.007	0.002	0.991	0.0010
10.262	0.007	0.002	0.992	0.0010
10.995	0.006	0.002	0.993	0.0010
11.728	0.006	0.001	0.994	0.0010
12.461	0.005	0.001	0.995	0.0009
13.194	0.005	0.001	0.995	0.0009
13.927	0.004	0.001	0.996	0.0009
14.660	0.003	0.001	0.997	0.0008
14.827	0.003	0.001	0.997	0.0008
14.994	0.003	0.001	0.997	0.0007

```
              15.161          0.003          0.001          0.997         0.0007
              15.328          0.003          0.001          0.997         0.0006
              15.495          0.003          0.001          0.997         0.0006
              15.662          0.003          0.001          0.997         0.0006
              15.829          0.003          0.001          0.997         0.0005
              15.996          0.002          0.001          0.998         0.0005
              16.163          0.002          0.001          0.998         0.0005
              16.330          0.002          0.001          0.998         0.0004
              16.497          0.002          0.001          0.998         0.0004
              16.664          0.002          0.000          0.998         0.0004
              16.831          0.002          0.000          0.998         0.0003
              16.998          0.002          0.000          0.998         0.0003
              17.165          0.002          0.000          0.998         0.0003
              17.332          0.002          0.000          0.998         0.0003
              17.499          0.001          0.000          0.999         0.0002
              17.666          0.001          0.000          0.999         0.0002
              17.833          0.001          0.000          0.999         0.0002
              18.000          0.001          0.000          0.999         0.0002
              18.233          0.069          0.035          0.931         0.0047
              18.466          0.064          0.032          0.936         0.0040
              18.699          0.059          0.030          0.941         0.0034
              18.932          0.054          0.027          0.946         0.0028
              19.165          0.049          0.025          0.951         0.0023
              19.398          0.044          0.022          0.956         0.0019
              19.631          0.039          0.020          0.961         0.0015
              19.864          0.034          0.017          0.966         0.0011
              20.097          0.029          0.015          0.971         0.0008
              20.330          0.025          0.012          0.975         0.0006
              20.563          0.021          0.010          0.979         0.0004
              20.796          0.016          0.008          0.984         0.0002
              21.029          0.013          0.006          0.987         0.0001
              21.262          0.009          0.005          0.991         0.0001
              21.495          0.007          0.003          0.993         0.0000
              21.728          0.004          0.002          0.996         0.0000
              21.961          0.002          0.001          0.998         0.0000
              22.194          0.001          0.000          0.999         0.0000
              22.427          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
-----------------------------------------------------------------


 6. LNAPL specific volume and hydraulic conductivity
-----------------------------------------------------------------
```

bn [ft]	Dn [ft]	Rn [ft]	Tn [ft2/d]
0.000	0.000	0.000	0.000
0.320	0.016	0.001	0.000
0.640	0.018	0.003	0.000
0.960	0.019	0.004	0.000
1.280	0.021	0.006	0.000
1.600	0.022	0.007	0.000
1.920	0.024	0.009	0.000
2.240	0.027	0.011	0.000
2.560	0.032	0.012	0.001
2.880	0.037	0.014	0.001
3.200	0.041	0.016	0.001
3.520	0.046	0.018	0.002
3.840	0.050	0.020	0.002
4.160	0.055	0.022	0.003
4.480	0.059	0.025	0.003
4.800	0.063	0.028	0.003
5.120	0.068	0.031	0.004
5.440	0.072	0.034	0.004
5.760	0.076	0.037	0.005
6.080	0.080	0.041	0.006
6.400	0.085	0.045	0.006
6.720	0.090	0.050	0.007
7.040	0.094	0.054	0.008
7.360	0.100	0.059	0.009
7.680	0.105	0.065	0.011
8.000	0.111	0.070	0.012

7. Data for curve-fitting segments

bn[ft]	Rn[ft]	Tn[ft2/d]	chi[ft]	beta	xi[ft]	eta
0.00000	0.00000	0.00000				
2.24000	0.01061	0.00012	0.00000	0.00474	0.00000	0.00005
6.72000	0.04976	0.00735	1.02611	0.00874	2.16863	0.00161
8.00000	0.07018	0.01211	3.60034	0.01595	4.74804	0.00373

8. Free product recovery system Analysis

8.1 Calculated parameters for the recovery system

Vacuum-enhanced air discharge [scfm]	=	0.000
Average drawdown(+)\buildup(-) [ft]	=	1.720
New water table depth [ft]	=	16.500
New monitoring well LNPAL thickness [ft]	=	8.000
Final monitoring well LNAPL thickness [ft]	=	6.985
a_skimmer [ft-2]	=	0.00001
a_water [ft-1]	=	0.00088
a_air [ft-1]	=	0.00000
Recovery time for segment 1 [yr]	=	6.686
Recovery time for segment 2 [yr]	=	76.916

8.2 Predicted Performances of the system

Time	bn	Vn	Qn

[yr]	[ft]	[gal]	[gpd]
0.000	8.000	0.000	1.224
0.250	7.940	110.688	1.202
0.500	7.881	219.325	1.179
0.750	7.823	325.949	1.158
1.000	7.766	430.596	1.136
1.250	7.710	533.305	1.115
1.500	7.655	634.110	1.094
1.750	7.601	733.048	1.074
2.000	7.548	830.152	1.054
2.250	7.496	925.456	1.035
2.500	7.445	1018.995	1.016
2.750	7.395	1110.800	0.997
3.000	7.346	1200.903	0.978
3.250	7.298	1289.337	0.960
3.500	7.251	1376.133	0.942
3.750	7.204	1461.320	0.925
4.000	7.159	1544.927	0.908
4.250	7.114	1626.986	0.891
4.500	7.070	1707.525	0.874
4.750	7.027	1786.570	0.858
5.000	6.985	1864.152	0.842
5.000	6.985	1864.152	0.842
5.000	6.985	1864.152	0.842
5.000	6.985	1864.152	0.842
5.000	6.985	1864.152	0.842
5.000	6.985	1864.152	0.842
5.000	6.985	1864.152	0.842
5.000	6.985	1864.152	0.842
5.000	6.985	1864.152	0.842
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5.000	6.985	1864.152	0.842
5.000	6.985	1864.152	0.842
5.000	6.985	1864.152	0.842
5.000	6.985	1864.152	0.842
5.000	6.985	1864.152	0.842

8.3 Water table drawdown / buildup

Radius [ft]	Drawdown [ft]	Buildup [ft]	Net [ft]
0.250	10.223	0.000	10.223
0.269	10.100	0.000	10.100
0.328	9.776	0.000	9.776
0.424	9.347	0.000	9.347
0.560	8.888	0.000	8.888
0.734	8.439	0.000	8.439
0.948	8.017	0.000	8.017
1.199	7.627	0.000	7.627
1.490	7.267	0.000	7.267
1.819	6.937	0.000	6.937
2.188	6.631	0.000	6.631
2.594	6.349	0.000	6.349
3.040	6.086	0.000	6.086
3.524	5.842	0.000	5.842
4.048	5.612	0.000	5.612
4.609	5.397	0.000	5.397
5.210	5.194	0.000	5.194
5.849	5.003	0.000	5.003
6.528	4.821	0.000	4.821
7.244	4.649	0.000	4.649
8.000	4.484	0.000	4.484
8.794	4.327	0.000	4.327
9.628	4.178	0.000	4.178
10.499	4.034	0.000	4.034
11.410	3.896	0.000	3.896
12.359	3.764	0.000	3.764
13.348	3.637	0.000	3.637
14.374	3.514	0.000	3.514
15.440	3.395	0.000	3.395
16.544	3.281	0.000	3.281
17.688	3.170	0.000	3.170
18.869	3.063	0.000	3.063
20.090	2.960	0.000	2.960
21.349	2.859	0.000	2.859
22.648	2.761	0.000	2.761
23.984	2.666	0.000	2.666
25.360	2.574	0.000	2.574
26.774	2.484	0.000	2.484
28.228	2.396	0.000	2.396
29.719	2.311	0.000	2.311
31.250	2.228	0.000	2.228
32.819	2.147	0.000	2.147
34.428	2.068	0.000	2.068
36.074	1.990	0.000	1.990
37.760	1.915	0.000	1.915
39.484	1.841	0.000	1.841
41.248	1.768	0.000	1.768
43.049	1.698	0.000	1.698
44.890	1.628	0.000	1.628
46.769	1.560	0.000	1.560
48.688	1.494	0.000	1.494
50.644	1.428	0.000	1.428
52.640	1.364	0.000	1.364
54.674	1.302	0.000	1.302
56.748	1.240	0.000	1.240
58.859	1.180	0.000	1.180

61.010	1.120	0.000	1.120
63.199	1.062	0.000	1.062
65.428	1.004	0.000	1.004
67.694	0.948	0.000	0.948
70.000	0.893	0.000	0.893

Well Recovery Systems

Recovery time [yr] =	5.000
Radius of Pumping Well [ft] =	0.250
Radius of Recovery [ft] =	70.000
Radius of Influence [ft] =	120.000

Input Parameters
GW-enhanced Skimmer
TPH-09 @ Manifold

Water Enhanced system

Water production rate [gpm] =	2000
Water Saturated thickness [ft] =	15.000

Air Enhanced system

(-)Suction Pressure [atm] =	0.000
Screen Length [ft] =	5.000
Air Radius of Capture [ft] =	26.929

OK Cancel

LNAPL Distribution and Recovery Model (LDRM)

File Data Recovery Graphs Options Help Exit

LNAPL Specific Volume, Dn (ft) =	0.1105
LNAPL Recoverable Volume, Rn (ft) =	0.0702
Drawdown (ft) =	1.720
New Water-table Depth (ft) =	16.500
New LNAPL Thickness, bn (ft) =	8.000
New LNAPL Specific Volume, Dn (ft) =	0.1105
New LNAPL Recoverable Volume, Rn (ft) =	0.0702
Initial Recovery Rate, Qn (gpd) =	1.224
Final LNAPL Thickness, bn (ft) =	6.985
Final Recovery Rate, Qn (gpd) =	0.842
Final Recovery Volume, Vn (gal) =	1864.2
Results Percent Recovery =	14.646

GW-enhanced Skimmer
TPH-09 @ Manifold

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 * Saved time =  14 : 48,   2014 .12 . 23
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 1. OPTIONS.

 * Units              =   1              (1: English Units, 2: SI Units)

 * Soil Heterogeneity =   2              ( Number of Layers: 1, 2 or 3)

 * Elevation          =   2              (1: Elevation above datum, 2: depth BGS)

 * FPR System Used    =   1              (1: well,  2: trench,  0: Not used)

 * Smear Correction   =   0              (0: no adjustment, 1: smear correction)

 * LNAPL Residual     =   3              (1: const (user), 2: const (f), 3:
variable)


 2. INPUT PARAMETERS.

 2.1 BASIC INPUT PARAMETERS.
 Monitor. Well LNAPL thickness[ft]=          8.000
 Ground Surface Depth [ft]        =          0.000
 Groundwater Table Depth [ft]     =         16.500
 Soil Layers Interface (z12) [ft] =         18.000
 Water Vertical Gradient(+up)     =          0.400
 LNAPL Density [g/cm3]            =          0.770
 LNAPL Viscosity [cp]             =          0.990
 Water Surface Tension [dyne/cm]  =         62.440
 LNAPL Surface Tension [dyne/cm]  =         21.820
 LNAPL/Water Interfacial Tension  =         17.890

 2.1.1 SOIL PROPERTIES OF LAYER 1
 Relative permeability model      =              1     (Mualem)
 Soil porosity                    =          0.433
 Hydraulic conductivity [ft/d]    =          0.011
 van Genuchten "N"                =          1.946
 van Genuchten "Alpha" [ft-1]     =          0.006
 Swr1                             =          0.570
 Snr1                             =       Variable
 LNAPL residual f-factor          =          0.250

 2.1.2 SOIL PROPERTIES OF LAYER 2
 Relative permeability model      =              0     (Burdine)
 Soil porosity                    =          0.403
 Hydraulic conductivity [ft/d]    =          2.740
 van Genuchten "N"                =          2.100
 van Genuchten "alpha"  [ft-1]    =          0.312
 Swr2                             =          0.046
 Snr2                             =       Variable
 LNAPL residual f-factor          =          0.500

 2.2 INPUT DATA FOR THE RECOVERY WELL.
 Design Recovery time [yr]        =          5.000
 Radius of pumping well [ft]      =          0.250
 Radius of capture [ft]           =         70.000
```

Radius of influence [ft]	=	120.000
Water production rate [gpm]	=	2.000
Groundwater thickness [ft]	=	15.000
Suction pressure [atm]	=	0.200
Screen length for air flow [ft]	=	5.000

3. FIELD DATA

1 (4) Depth [ft]	Sn
17.500	0.001
18.500	0.076
19.500	0.038
20.500	0.000

4. Calculated Parameters

Air-LNAPL interface [ft]	=	14.660
LNAPL-Water interface [ft]	=	22.660
Max. Free-Product elevation [ft]	=	0.000

Parameter		Soil 1	Soil 2
van Genuchten "M"	:	0.486	0.048
Air/LNAPL "alpha" [ft-1]	:	0.013	0.687
LNAPL/water "alpha" [ft-1]	:	0.013	0.250

5. LNAPL and Water saturation data.

BGS Depth [ft]	Sn	Snr	Sw	krn
0.000	0.014	0.003	0.978	0.0011
0.733	0.013	0.003	0.979	0.0011
1.466	0.013	0.003	0.980	0.0011
2.199	0.012	0.003	0.982	0.0011
2.932	0.012	0.003	0.983	0.0011
3.665	0.011	0.003	0.984	0.0011
4.398	0.011	0.003	0.985	0.0011
5.131	0.011	0.003	0.986	0.0011
5.864	0.010	0.003	0.987	0.0011
6.597	0.010	0.002	0.988	0.0011
7.330	0.009	0.002	0.989	0.0011
8.063	0.009	0.002	0.990	0.0011
8.796	0.008	0.002	0.991	0.0010
9.529	0.007	0.002	0.991	0.0010
10.262	0.007	0.002	0.992	0.0010
10.995	0.006	0.002	0.993	0.0010
11.728	0.006	0.001	0.994	0.0010
12.461	0.005	0.001	0.995	0.0009
13.194	0.005	0.001	0.995	0.0009
13.927	0.004	0.001	0.996	0.0009
14.660	0.003	0.001	0.997	0.0008
14.827	0.003	0.001	0.997	0.0008
14.994	0.003	0.001	0.997	0.0007

```
              15.161          0.003          0.001          0.997         0.0007
              15.328          0.003          0.001          0.997         0.0006
              15.495          0.003          0.001          0.997         0.0006
              15.662          0.003          0.001          0.997         0.0006
              15.829          0.003          0.001          0.997         0.0005
              15.996          0.002          0.001          0.998         0.0005
              16.163          0.002          0.001          0.998         0.0005
              16.330          0.002          0.001          0.998         0.0004
              16.497          0.002          0.001          0.998         0.0004
              16.664          0.002          0.000          0.998         0.0004
              16.831          0.002          0.000          0.998         0.0003
              16.998          0.002          0.000          0.998         0.0003
              17.165          0.002          0.000          0.998         0.0003
              17.332          0.002          0.000          0.998         0.0003
              17.499          0.001          0.000          0.999         0.0002
              17.666          0.001          0.000          0.999         0.0002
              17.833          0.001          0.000          0.999         0.0002
              18.000          0.001          0.000          0.999         0.0002
              18.233          0.069          0.035          0.931         0.0047
              18.466          0.064          0.032          0.936         0.0040
              18.699          0.059          0.030          0.941         0.0034
              18.932          0.054          0.027          0.946         0.0028
              19.165          0.049          0.025          0.951         0.0023
              19.398          0.044          0.022          0.956         0.0019
              19.631          0.039          0.020          0.961         0.0015
              19.864          0.034          0.017          0.966         0.0011
              20.097          0.029          0.015          0.971         0.0008
              20.330          0.025          0.012          0.975         0.0006
              20.563          0.021          0.010          0.979         0.0004
              20.796          0.016          0.008          0.984         0.0002
              21.029          0.013          0.006          0.987         0.0001
              21.262          0.009          0.005          0.991         0.0001
              21.495          0.007          0.003          0.993         0.0000
              21.728          0.004          0.002          0.996         0.0000
              21.961          0.002          0.001          0.998         0.0000
              22.194          0.001          0.000          0.999         0.0000
              22.427          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
-----------------------------------------------------------------


 6. LNAPL specific volume and hydraulic conductivity
-----------------------------------------------------------------
```

bn [ft]	Dn [ft]	Rn [ft]	Tn [ft2/d]
0.000	0.000	0.000	0.000
0.320	0.016	0.001	0.000
0.640	0.018	0.003	0.000
0.960	0.019	0.004	0.000
1.280	0.021	0.006	0.000
1.600	0.022	0.007	0.000
1.920	0.024	0.009	0.000
2.240	0.027	0.011	0.000
2.560	0.032	0.012	0.001
2.880	0.037	0.014	0.001
3.200	0.041	0.016	0.001
3.520	0.046	0.018	0.002
3.840	0.050	0.020	0.002
4.160	0.055	0.022	0.003
4.480	0.059	0.025	0.003
4.800	0.063	0.028	0.003
5.120	0.068	0.031	0.004
5.440	0.072	0.034	0.004
5.760	0.076	0.037	0.005
6.080	0.080	0.041	0.006
6.400	0.085	0.045	0.006
6.720	0.090	0.050	0.007
7.040	0.094	0.054	0.008
7.360	0.100	0.059	0.009
7.680	0.105	0.065	0.011
8.000	0.111	0.070	0.012

7. Data for curve-fitting segments

bn[ft]	Rn[ft]	Tn[ft2/d]	chi[ft]	beta	xi[ft]	eta
0.00000	0.00000	0.00000				
2.24000	0.01061	0.00012	0.00000	0.00474	0.00000	0.00005
6.72000	0.04976	0.00735	1.02611	0.00874	2.16863	0.00161
8.00000	0.07018	0.01211	3.60034	0.01595	4.74804	0.00373

8. Free product recovery system Analysis

8.1 Calculated parameters for the recovery system

Vacuum-enhanced air discharge [scfm]	=	0.017
Average drawdown(+)\buildup(-) [ft]	=	1.613
New water table depth [ft]	=	16.500
New monitoring well LNPAL thickness [ft]	=	8.000
Final monitoring well LNAPL thickness [ft]	=	6.051
a_skimmer [ft-2]	=	0.00001
a_water [ft-1]	=	0.00088
a_air [ft-1]	=	0.00077
Recovery time for segment 1 [yr]	=	3.566
Recovery time for segment 2 [yr]	=	41.028

8.2 Predicted Performances of the system

Time	bn	Vn	Qn

[yr]	[ft]	[gal]	[gpd]
0.000	8.000	0.000	2.295
0.178	7.920	147.543	2.239
0.357	7.841	291.441	2.183
0.535	7.765	431.786	2.129
0.713	7.690	568.663	2.077
0.892	7.618	702.160	2.026
1.070	7.547	832.358	1.976
1.248	7.478	959.341	1.927
1.427	7.410	1083.187	1.879
1.605	7.345	1203.974	1.833
1.783	7.280	1321.778	1.787
1.961	7.218	1436.671	1.743
2.140	7.157	1548.727	1.700
2.318	7.097	1658.014	1.658
2.496	7.039	1764.602	1.617
2.675	6.983	1868.557	1.577
2.853	6.927	1969.944	1.538
3.031	6.874	2068.827	1.500
3.210	6.821	2165.268	1.463
3.388	6.770	2259.326	1.427
3.566	6.720	2351.061	1.392
3.638	6.684	2387.337	1.381
3.710	6.648	2423.325	1.370
3.781	6.613	2459.028	1.359
3.853	6.578	2494.448	1.348
3.925	6.543	2529.588	1.338
3.996	6.508	2564.450	1.327
4.068	6.474	2599.035	1.317
4.140	6.439	2633.347	1.306
4.211	6.406	2667.387	1.296
4.283	6.372	2701.157	1.286
4.355	6.339	2734.660	1.275
4.427	6.306	2767.897	1.265
4.498	6.273	2800.871	1.255
4.570	6.241	2833.584	1.245
4.642	6.208	2866.038	1.235
4.713	6.176	2898.236	1.226
4.785	6.145	2930.177	1.216
4.857	6.113	2961.866	1.206
4.928	6.082	2993.305	1.197
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187
5.000	6.051	3024.493	1.187

8.3 Water table drawdown / buildup

Radius [ft]	Drawdown [ft]	Buildup [ft]	Net [ft]
0.250	10.223	-6.778	3.445
0.269	10.100	-6.670	3.430
0.328	9.776	-6.387	3.389
0.424	9.347	-6.012	3.335
0.560	8.888	-5.610	3.278
0.734	8.439	-5.217	3.222
0.948	8.017	-4.848	3.169
1.199	7.627	-4.507	3.120
1.490	7.267	-4.192	3.075
1.819	6.937	-3.903	3.033
2.188	6.631	-3.636	2.995
2.594	6.349	-3.389	2.960
3.040	6.086	-3.160	2.927
3.524	5.842	-2.945	2.896
4.048	5.612	-2.745	2.868
4.609	5.397	-2.557	2.841
5.210	5.194	-2.379	2.815
5.849	5.003	-2.212	2.791
6.528	4.821	-2.053	2.768
7.244	4.649	-1.902	2.747
8.000	4.484	-1.758	2.726
8.794	4.327	-1.621	2.707
9.628	4.178	-1.490	2.688
10.499	4.034	-1.364	2.670
11.410	3.896	-1.244	2.653
12.359	3.764	-1.128	2.636
13.348	3.637	-1.017	2.620
14.374	3.514	-0.909	2.605
15.440	3.395	-0.806	2.590
16.544	3.281	-0.706	2.575
17.688	3.170	-0.609	2.562
18.869	3.063	-0.515	2.548
20.090	2.960	-0.424	2.535
21.349	2.859	-0.336	2.523
22.648	2.761	-0.251	2.510
23.984	2.666	-0.168	2.498
25.360	2.574	-0.087	2.487
26.774	2.484	-0.008	2.476
28.228	2.396	0.000	2.396
29.719	2.311	0.000	2.311
31.250	2.228	0.000	2.228
32.819	2.147	0.000	2.147
34.428	2.068	0.000	2.068
36.074	1.990	0.000	1.990
37.760	1.915	0.000	1.915
39.484	1.841	0.000	1.841
41.248	1.768	0.000	1.768
43.049	1.698	0.000	1.698
44.890	1.628	0.000	1.628
46.769	1.560	0.000	1.560
48.688	1.494	0.000	1.494
50.644	1.428	0.000	1.428
52.640	1.364	0.000	1.364
54.674	1.302	0.000	1.302
56.748	1.240	0.000	1.240
58.859	1.180	0.000	1.180

61.010	1.120	0.000	1.120
63.199	1.062	0.000	1.062
65.428	1.004	0.000	1.004
67.694	0.948	0.000	0.948
70.000	0.893	0.000	0.893

Well Recovery Systems

Recovery time [yr] =	5.000
Radius of Pumping Well [ft] =	0.250
Radius of Recovery [ft] =	70.000
Radius of Influence [ft] =	120.000

Input Parameters
GW and Vacuum Enhanced Skimmer
TPH-09 @ Manifold

Water Enhanced system

Water production rate [gpm] =	2.000
Water Saturated thickness [ft] =	15.000

Air Enhanced system

(-)Suction Pressure [atm] =	0.200
Screen Length [ft] =	5.000
Air Radius of Capture [ft] =	26.929

OK Cancel

LNAPL Distribution and Recovery Model (LDRM)

File Data Recovery Graphs Options Help Exit

LNAPL Specific Volume, Dn (ft) =	0.1105
LNAPL Recoverable Volume, Rn (ft) =	0.0702
Drawdown (ft) =	1.613
New Water-table Depth (ft) =	16.500
New LNAPL Thickness, bn (ft) =	8.000
New LNAPL Specific Volume, Dn (ft) =	0.1105
New LNAPL Recoverable Volume, Rn (ft) =	0.0702
Initial Recovery Rate, Qn (gpd) =	2.295
Final LNAPL Thickness, bn (ft) =	6.051
Final Recovery Rate, Qn (gpd) =	1.187
Final Recovery Volume, Vn (gal) =	3024.5
Results Percent Recovery =	23.763

GW and Vacuum Enhanced Skimmer
TPH--09 @ Manifold

```
*************************************************************************
 *
 * File Name  = E:\Wayne's Projects\Wisconsin\Superior (00406)\General\Data\Superior
 * Saved time =  14 : 23,   2014 .12 . 23
 *
*************************************************************************

 1. OPTIONS.

 * Units              =   1              (1: English Units, 2: SI Units)

 * Soil Heterogeneity =   2              ( Number of Layers: 1, 2 or 3)

 * Elevation          =   2              (1: Elevation above datum, 2: depth BGS)

 * FPR System Used    =   1              (1: well,  2: trench,  0: Not used)

 * Smear Correction   =   0              (0: no adjustment, 1: smear correction)

 * LNAPL Residual     =   3              (1: const (user), 2: const (f), 3:
variable)


 2. INPUT PARAMETERS.

 2.1 BASIC INPUT PARAMETERS.
 Monitor. Well LNAPL thickness[ft]=          8.000
 Ground Surface Depth [ft]        =          0.000
 Groundwater Table Depth [ft]     =         16.500
 Soil Layers Interface (z12) [ft] =         18.000
 Water Vertical Gradient(+up)     =          0.400
 LNAPL Density [g/cm3]            =          0.770
 LNAPL Viscosity [cp]             =          0.990
 Water Surface Tension [dyne/cm]  =         62.440
 LNAPL Surface Tension [dyne/cm]  =         21.820
 LNAPL/Water Interfacial Tension  =         17.890

 2.1.1 SOIL PROPERTIES OF LAYER 1
 Relative permeability model      =              1     (Mualem)
 Soil porosity                    =          0.433
 Hydraulic conductivity [ft/d]    =          0.011
 van Genuchten "N"                =          1.946
 van Genuchten "Alpha" [ft-1]     =          0.006
 Swr1                             =          0.570
 Snr1                             =       Variable
 LNAPL residual f-factor          =          0.250

 2.1.2 SOIL PROPERTIES OF LAYER 2
 Relative permeability model      =              0     (Burdine)
 Soil porosity                    =          0.403
 Hydraulic conductivity [ft/d]    =          2.740
 van Genuchten "N"                =          2.100
 van Genuchten "alpha"  [ft-1]    =          0.312
 Swr2                             =          0.046
 Snr2                             =       Variable
 LNAPL residual f-factor          =          0.500

 2.2 INPUT DATA FOR THE RECOVERY WELL.
 Design Recovery time [yr]        =          5.000
 Radius of pumping well [ft]      =          0.250
 Radius of capture [ft]           =         50.000
```

Radius of influence [ft]	=	100.000
Water production rate [gpm]	=	0.000
Groundwater thickness [ft]	=	15.000
Suction pressure [atm]	=	0.000
Screen length for air flow [ft]	=	5.000

3. FIELD DATA

1 (4) Depth [ft]	Sn
17.500	0.001
18.500	0.076
19.500	0.038
20.500	0.000

4. Calculated Parameters

Air-LNAPL interface [ft]	=	14.660
LNAPL-Water interface [ft]	=	22.660
Max. Free-Product elevation [ft]	=	0.000

Parameter		Soil 1	Soil 2
van Genuchten "M"	:	0.486	0.048
Air/LNAPL "alpha" [ft-1]	:	0.013	0.687
LNAPL/water "alpha" [ft-1]	:	0.013	0.250

5. LNAPL and Water saturation data.

BGS Depth [ft]	Sn	Snr	Sw	krn
0.000	0.014	0.003	0.978	0.0011
0.733	0.013	0.003	0.979	0.0011
1.466	0.013	0.003	0.980	0.0011
2.199	0.012	0.003	0.982	0.0011
2.932	0.012	0.003	0.983	0.0011
3.665	0.011	0.003	0.984	0.0011
4.398	0.011	0.003	0.985	0.0011
5.131	0.011	0.003	0.986	0.0011
5.864	0.010	0.003	0.987	0.0011
6.597	0.010	0.002	0.988	0.0011
7.330	0.009	0.002	0.989	0.0011
8.063	0.009	0.002	0.990	0.0011
8.796	0.008	0.002	0.991	0.0010
9.529	0.007	0.002	0.991	0.0010
10.262	0.007	0.002	0.992	0.0010
10.995	0.006	0.002	0.993	0.0010
11.728	0.006	0.001	0.994	0.0010
12.461	0.005	0.001	0.995	0.0009
13.194	0.005	0.001	0.995	0.0009
13.927	0.004	0.001	0.996	0.0009
14.660	0.003	0.001	0.997	0.0008
14.827	0.003	0.001	0.997	0.0008
14.994	0.003	0.001	0.997	0.0007

```
              15.161          0.003          0.001          0.997          0.0007
              15.328          0.003          0.001          0.997          0.0006
              15.495          0.003          0.001          0.997          0.0006
              15.662          0.003          0.001          0.997          0.0006
              15.829          0.003          0.001          0.997          0.0005
              15.996          0.002          0.001          0.998          0.0005
              16.163          0.002          0.001          0.998          0.0005
              16.330          0.002          0.001          0.998          0.0004
              16.497          0.002          0.001          0.998          0.0004
              16.664          0.002          0.000          0.998          0.0004
              16.831          0.002          0.000          0.998          0.0003
              16.998          0.002          0.000          0.998          0.0003
              17.165          0.002          0.000          0.998          0.0003
              17.332          0.002          0.000          0.998          0.0003
              17.499          0.001          0.000          0.999          0.0002
              17.666          0.001          0.000          0.999          0.0002
              17.833          0.001          0.000          0.999          0.0002
              18.000          0.001          0.000          0.999          0.0002
              18.233          0.069          0.035          0.931          0.0047
              18.466          0.064          0.032          0.936          0.0040
              18.699          0.059          0.030          0.941          0.0034
              18.932          0.054          0.027          0.946          0.0028
              19.165          0.049          0.025          0.951          0.0023
              19.398          0.044          0.022          0.956          0.0019
              19.631          0.039          0.020          0.961          0.0015
              19.864          0.034          0.017          0.966          0.0011
              20.097          0.029          0.015          0.971          0.0008
              20.330          0.025          0.012          0.975          0.0006
              20.563          0.021          0.010          0.979          0.0004
              20.796          0.016          0.008          0.984          0.0002
              21.029          0.013          0.006          0.987          0.0001
              21.262          0.009          0.005          0.991          0.0001
              21.495          0.007          0.003          0.993          0.0000
              21.728          0.004          0.002          0.996          0.0000
              21.961          0.002          0.001          0.998          0.0000
              22.194          0.001          0.000          0.999          0.0000
              22.427          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
              22.660          0.000          0.000          1.000          0.0000
-----------------------------------------------------------------


 6. LNAPL specific volume and hydraulic conductivity
-----------------------------------------------------------------
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bn [ft]	Dn [ft]	Rn [ft]	Tn [ft2/d]
0.000	0.000	0.000	0.000
0.320	0.016	0.001	0.000
0.640	0.018	0.003	0.000
0.960	0.019	0.004	0.000
1.280	0.021	0.006	0.000
1.600	0.022	0.007	0.000
1.920	0.024	0.009	0.000
2.240	0.027	0.011	0.000
2.560	0.032	0.012	0.001
2.880	0.037	0.014	0.001
3.200	0.041	0.016	0.001
3.520	0.046	0.018	0.002
3.840	0.050	0.020	0.002
4.160	0.055	0.022	0.003
4.480	0.059	0.025	0.003
4.800	0.063	0.028	0.003
5.120	0.068	0.031	0.004
5.440	0.072	0.034	0.004
5.760	0.076	0.037	0.005
6.080	0.080	0.041	0.006
6.400	0.085	0.045	0.006
6.720	0.090	0.050	0.007
7.040	0.094	0.054	0.008
7.360	0.100	0.059	0.009
7.680	0.105	0.065	0.011
8.000	0.111	0.070	0.012

7. Data for curve-fitting segments

bn[ft]	Rn[ft]	Tn[ft2/d]	chi[ft]	beta	xi[ft]	eta
0.00000	0.00000	0.00000				
2.24000	0.01061	0.00012	0.00000	0.00474	0.00000	0.00005
6.72000	0.04976	0.00735	1.02611	0.00874	2.16863	0.00161
8.00000	0.07018	0.01211	3.60034	0.01595	4.74804	0.00373

8. Free product recovery system Analysis

8.1 Calculated parameters for the recovery system

Vacuum-enhanced air discharge [scfm]	=	0.000
Average drawdown(+)\buildup(-) [ft]	=	0.000
New water table depth [ft]	=	16.500
New monitoring well LNPAL thickness [ft]	=	8.000
Final monitoring well LNAPL thickness [ft]	=	7.815
a_skimmer [ft-2]	=	0.00002
a_water [ft-1]	=	0.00000
a_air [ft-1]	=	0.00000
Recovery time for segment 1 [yr]	=	46.371
Recovery time for segment 2 [yr]	=	1250.616

8.2 Predicted Performances of the system

Time	bn	Vn	Qn

[yr]	[ft]	[gal]	[gpd]
0.000	8.000	0.000	0.099
0.250	7.990	9.078	0.098
0.500	7.981	18.011	0.098
0.750	7.971	26.942	0.098
1.000	7.962	35.728	0.097
1.250	7.952	44.660	0.097
1.500	7.943	53.445	0.096
1.750	7.934	62.231	0.096
2.000	7.924	71.017	0.096
2.250	7.915	79.656	0.095
2.500	7.906	88.441	0.095
2.750	7.897	96.934	0.094
3.000	7.887	105.573	0.094
3.250	7.878	114.212	0.094
3.500	7.869	122.705	0.093
3.750	7.860	131.197	0.093
4.000	7.851	139.690	0.093
4.250	7.842	148.183	0.092
4.500	7.833	156.529	0.092
4.750	7.824	164.876	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091
5.000	7.815	173.222	0.091

8.3 Water table drawdown / buildup

Radius [ft]	Drawdown [ft]	Buildup [ft]	Net [ft]
0.250	0.000	0.000	0.000
0.264	0.000	0.000	0.000
0.305	0.000	0.000	0.000
0.374	0.000	0.000	0.000
0.471	0.000	0.000	0.000
0.595	0.000	0.000	0.000
0.748	0.000	0.000	0.000
0.927	0.000	0.000	0.000
1.134	0.000	0.000	0.000
1.369	0.000	0.000	0.000
1.632	0.000	0.000	0.000
1.922	0.000	0.000	0.000
2.240	0.000	0.000	0.000
2.585	0.000	0.000	0.000
2.959	0.000	0.000	0.000
3.359	0.000	0.000	0.000
3.788	0.000	0.000	0.000
4.244	0.000	0.000	0.000
4.728	0.000	0.000	0.000
5.239	0.000	0.000	0.000
5.778	0.000	0.000	0.000
6.344	0.000	0.000	0.000
6.939	0.000	0.000	0.000
7.560	0.000	0.000	0.000
8.210	0.000	0.000	0.000
8.887	0.000	0.000	0.000
9.592	0.000	0.000	0.000
10.324	0.000	0.000	0.000
11.084	0.000	0.000	0.000
11.872	0.000	0.000	0.000
12.688	0.000	0.000	0.000
13.530	0.000	0.000	0.000
14.401	0.000	0.000	0.000
15.299	0.000	0.000	0.000
16.225	0.000	0.000	0.000
17.179	0.000	0.000	0.000
18.160	0.000	0.000	0.000
19.169	0.000	0.000	0.000
20.205	0.000	0.000	0.000
21.269	0.000	0.000	0.000
22.361	0.000	0.000	0.000
23.480	0.000	0.000	0.000
24.628	0.000	0.000	0.000
25.802	0.000	0.000	0.000
27.004	0.000	0.000	0.000
28.234	0.000	0.000	0.000
29.492	0.000	0.000	0.000
30.777	0.000	0.000	0.000
32.090	0.000	0.000	0.000
33.430	0.000	0.000	0.000
34.799	0.000	0.000	0.000
36.194	0.000	0.000	0.000
37.618	0.000	0.000	0.000
39.069	0.000	0.000	0.000
40.548	0.000	0.000	0.000
42.054	0.000	0.000	0.000

43.588	0.000	0.000	0.000
45.149	0.000	0.000	0.000
46.739	0.000	0.000	0.000
48.355	0.000	0.000	0.000
50.000	0.000	0.000	0.000

LNAPL Distribution and Recovery Model (LDRM)

File Data Recovery Graphs Options Help Exit

LNAPL Specific Volume, Dn (ft) =	0.1105
LNAPL Recoverable Volume, Rn (ft) =	0.0702
Drawdown (ft) =	0.000
New Water-table Depth (ft) =	16.500
New LNAPL Thickness, bn (ft) =	8.000
New LNAPL Specific Volume, Dn (ft) =	0.1105
New LNAPL Recoverable Volume, Rn (ft) =	0.0702
Initial Recovery Rate, Qn (gpd) =	0.099
Final LNAPL Thickness, bn (ft) =	7.815
Final Recovery Rate, Qn (gpd) =	0.091
Final Recovery Volume, Vn (gal) =	173.2
Percent Recovery =	2.667

Recovery Results
Passive Skimmer
TPH-09 @ Manifold

```
*****************************************************************************
 *
 * File Name  = E:\Wayne's Projects\Wisconsin\Superior (00406)\General\Data\Superior
 * Saved time =  14 : 42,   2014 .12 . 23
 *
*****************************************************************************

 1. OPTIONS.

 * Units              =   1              (1: English Units, 2: SI Units)

 * Soil Heterogeneity =   2              ( Number of Layers: 1, 2 or 3)

 * Elevation          =   2              (1: Elevation above datum, 2: depth BGS)

 * FPR System Used    =   1              (1: well,  2: trench,  0: Not used)

 * Smear Correction   =   0              (0: no adjustment, 1: smear correction)

 * LNAPL Residual     =   3              (1: const (user), 2: const (f), 3:
variable)


 2. INPUT PARAMETERS.

 2.1 BASIC INPUT PARAMETERS.
 Monitor. Well LNAPL thickness[ft]=          8.000
 Ground Surface Depth [ft]        =          0.000
 Groundwater Table Depth [ft]     =         16.500
 Soil Layers Interface (z12) [ft] =         18.000
 Water Vertical Gradient(+up)     =          0.400
 LNAPL Density [g/cm3]            =          0.770
 LNAPL Viscosity [cp]             =          0.990
 Water Surface Tension [dyne/cm]  =         62.440
 LNAPL Surface Tension [dyne/cm]  =         21.820
 LNAPL/Water Interfacial Tension  =         17.890

 2.1.1 SOIL PROPERTIES OF LAYER 1
 Relative permeability model      =              1     (Mualem)
 Soil porosity                    =          0.433
 Hydraulic conductivity [ft/d]    =          0.011
 van Genuchten "N"                =          1.946
 van Genuchten "Alpha" [ft-1]     =          0.006
 Swr1                             =          0.570
 Snr1                             =       Variable
 LNAPL residual f-factor          =          0.250

 2.1.2 SOIL PROPERTIES OF LAYER 2
 Relative permeability model      =              0     (Burdine)
 Soil porosity                    =          0.403
 Hydraulic conductivity [ft/d]    =          2.740
 van Genuchten "N"                =          2.100
 van Genuchten "alpha"  [ft-1]    =          0.312
 Swr2                             =          0.046
 Snr2                             =       Variable
 LNAPL residual f-factor          =          0.500

 2.2 INPUT DATA FOR THE RECOVERY WELL.
 Design Recovery time [yr]        =          5.000
 Radius of pumping well [ft]      =          0.250
 Radius of capture [ft]           =         70.000
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Radius of influence [ft]	=	120.000
Water production rate [gpm]	=	0.000
Groundwater thickness [ft]	=	15.000
Suction pressure [atm]	=	0.200
Screen length for air flow [ft]	=	5.000

3. FIELD DATA

1 (4) Depth [ft]	Sn
17.500	0.001
18.500	0.076
19.500	0.038
20.500	0.000

4. Calculated Parameters

Air-LNAPL interface [ft]	=	14.660
LNAPL-Water interface [ft]	=	22.660
Max. Free-Product elevation [ft]	=	0.000

Parameter		Soil 1	Soil 2
van Genuchten "M"	:	0.486	0.048
Air/LNAPL "alpha" [ft-1]	:	0.013	0.687
LNAPL/water "alpha" [ft-1]	:	0.013	0.250

5. LNAPL and Water saturation data.

BGS Depth [ft]	Sn	Snr	Sw	krn
0.000	0.014	0.003	0.978	0.0011
0.733	0.013	0.003	0.979	0.0011
1.466	0.013	0.003	0.980	0.0011
2.199	0.012	0.003	0.982	0.0011
2.932	0.012	0.003	0.983	0.0011
3.665	0.011	0.003	0.984	0.0011
4.398	0.011	0.003	0.985	0.0011
5.131	0.011	0.003	0.986	0.0011
5.864	0.010	0.003	0.987	0.0011
6.597	0.010	0.002	0.988	0.0011
7.330	0.009	0.002	0.989	0.0011
8.063	0.009	0.002	0.990	0.0011
8.796	0.008	0.002	0.991	0.0010
9.529	0.007	0.002	0.991	0.0010
10.262	0.007	0.002	0.992	0.0010
10.995	0.006	0.002	0.993	0.0010
11.728	0.006	0.001	0.994	0.0010
12.461	0.005	0.001	0.995	0.0009
13.194	0.005	0.001	0.995	0.0009
13.927	0.004	0.001	0.996	0.0009
14.660	0.003	0.001	0.997	0.0008
14.827	0.003	0.001	0.997	0.0008
14.994	0.003	0.001	0.997	0.0007

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              15.161          0.003          0.001          0.997         0.0007
              15.328          0.003          0.001          0.997         0.0006
              15.495          0.003          0.001          0.997         0.0006
              15.662          0.003          0.001          0.997         0.0006
              15.829          0.003          0.001          0.997         0.0005
              15.996          0.002          0.001          0.998         0.0005
              16.163          0.002          0.001          0.998         0.0005
              16.330          0.002          0.001          0.998         0.0004
              16.497          0.002          0.001          0.998         0.0004
              16.664          0.002          0.000          0.998         0.0004
              16.831          0.002          0.000          0.998         0.0003
              16.998          0.002          0.000          0.998         0.0003
              17.165          0.002          0.000          0.998         0.0003
              17.332          0.002          0.000          0.998         0.0003
              17.499          0.001          0.000          0.999         0.0002
              17.666          0.001          0.000          0.999         0.0002
              17.833          0.001          0.000          0.999         0.0002
              18.000          0.001          0.000          0.999         0.0002
              18.233          0.069          0.035          0.931         0.0047
              18.466          0.064          0.032          0.936         0.0040
              18.699          0.059          0.030          0.941         0.0034
              18.932          0.054          0.027          0.946         0.0028
              19.165          0.049          0.025          0.951         0.0023
              19.398          0.044          0.022          0.956         0.0019
              19.631          0.039          0.020          0.961         0.0015
              19.864          0.034          0.017          0.966         0.0011
              20.097          0.029          0.015          0.971         0.0008
              20.330          0.025          0.012          0.975         0.0006
              20.563          0.021          0.010          0.979         0.0004
              20.796          0.016          0.008          0.984         0.0002
              21.029          0.013          0.006          0.987         0.0001
              21.262          0.009          0.005          0.991         0.0001
              21.495          0.007          0.003          0.993         0.0000
              21.728          0.004          0.002          0.996         0.0000
              21.961          0.002          0.001          0.998         0.0000
              22.194          0.001          0.000          0.999         0.0000
              22.427          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
              22.660          0.000          0.000          1.000         0.0000
-----------------------------------------------------------------


 6. LNAPL specific volume and hydraulic conductivity
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bn [ft]	Dn [ft]	Rn [ft]	Tn [ft2/d]
0.000	0.000	0.000	0.000
0.320	0.016	0.001	0.000
0.640	0.018	0.003	0.000
0.960	0.019	0.004	0.000
1.280	0.021	0.006	0.000
1.600	0.022	0.007	0.000
1.920	0.024	0.009	0.000
2.240	0.027	0.011	0.000
2.560	0.032	0.012	0.001
2.880	0.037	0.014	0.001
3.200	0.041	0.016	0.001
3.520	0.046	0.018	0.002
3.840	0.050	0.020	0.002
4.160	0.055	0.022	0.003
4.480	0.059	0.025	0.003
4.800	0.063	0.028	0.003
5.120	0.068	0.031	0.004
5.440	0.072	0.034	0.004
5.760	0.076	0.037	0.005
6.080	0.080	0.041	0.006
6.400	0.085	0.045	0.006
6.720	0.090	0.050	0.007
7.040	0.094	0.054	0.008
7.360	0.100	0.059	0.009
7.680	0.105	0.065	0.011
8.000	0.111	0.070	0.012

7. Data for curve-fitting segments

bn[ft]	Rn[ft]	Tn[ft2/d]	chi[ft]	beta	xi[ft]	eta
0.00000	0.00000	0.00000				
2.24000	0.01061	0.00012	0.00000	0.00474	0.00000	0.00005
6.72000	0.04976	0.00735	1.02611	0.00874	2.16863	0.00161
8.00000	0.07018	0.01211	3.60034	0.01595	4.74804	0.00373

8. Free product recovery system Analysis

8.1 Calculated parameters for the recovery system

Vacuum-enhanced air discharge [scfm]	=	0.017
Average drawdown(+)\buildup(-) [ft]	=	-0.107
New water table depth [ft]	=	16.500
New monitoring well LNPAL thickness [ft]	=	8.000
Final monitoring well LNAPL thickness [ft]	=	7.092
a_skimmer [ft-2]	=	0.00001
a_water [ft-1]	=	0.00000
a_air [ft-1]	=	0.00077
Recovery time for segment 1 [yr]	=	7.643
Recovery time for segment 2 [yr]	=	87.932

8.2 Predicted Performances of the system

Time	bn	Vn	Qn

[yr]	[ft]	[gal]	[gpd]
0.000	8.000	0.000	1.071
0.250	7.947	96.934	1.054
0.500	7.895	192.296	1.037
0.750	7.844	286.109	1.020
1.000	7.794	378.401	1.003
1.250	7.745	469.194	0.987
1.500	7.696	558.514	0.971
1.750	7.648	646.384	0.955
2.000	7.601	732.829	0.940
2.250	7.555	817.870	0.924
2.500	7.509	901.532	0.909
2.750	7.464	983.835	0.895
3.000	7.420	1064.804	0.880
3.250	7.377	1144.458	0.866
3.500	7.334	1222.819	0.852
3.750	7.292	1299.909	0.838
4.000	7.251	1375.748	0.824
4.250	7.210	1450.356	0.811
4.500	7.170	1523.753	0.798
4.750	7.131	1595.959	0.785
5.000	7.092	1666.994	0.772
5.000	7.092	1666.994	0.772
5.000	7.092	1666.994	0.772
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5.000	7.092	1666.994	0.772
5.000	7.092	1666.994	0.772
5.000	7.092	1666.994	0.772

8.3 Water table drawdown / buildup

Radius [ft]	Drawdown [ft]	Buildup [ft]	Net [ft]
0.250	0.000	-6.778	-6.778
0.269	0.000	-6.670	-6.670
0.328	0.000	-6.387	-6.387
0.424	0.000	-6.012	-6.012
0.560	0.000	-5.610	-5.610
0.734	0.000	-5.217	-5.217
0.948	0.000	-4.848	-4.848
1.199	0.000	-4.507	-4.507
1.490	0.000	-4.192	-4.192
1.819	0.000	-3.903	-3.903
2.188	0.000	-3.636	-3.636
2.594	0.000	-3.389	-3.389
3.040	0.000	-3.160	-3.160
3.524	0.000	-2.945	-2.945
4.048	0.000	-2.745	-2.745
4.609	0.000	-2.557	-2.557
5.210	0.000	-2.379	-2.379
5.849	0.000	-2.212	-2.212
6.528	0.000	-2.053	-2.053
7.244	0.000	-1.902	-1.902
8.000	0.000	-1.758	-1.758
8.794	0.000	-1.621	-1.621
9.628	0.000	-1.490	-1.490
10.499	0.000	-1.364	-1.364
11.410	0.000	-1.244	-1.244
12.359	0.000	-1.128	-1.128
13.348	0.000	-1.017	-1.017
14.374	0.000	-0.909	-0.909
15.440	0.000	-0.806	-0.806
16.544	0.000	-0.706	-0.706
17.688	0.000	-0.609	-0.609
18.869	0.000	-0.515	-0.515
20.090	0.000	-0.424	-0.424
21.349	0.000	-0.336	-0.336
22.648	0.000	-0.251	-0.251
23.984	0.000	-0.168	-0.168
25.360	0.000	-0.087	-0.087
26.774	0.000	-0.008	-0.008
28.228	0.000	0.000	0.000
29.719	0.000	0.000	0.000
31.250	0.000	0.000	0.000
32.819	0.000	0.000	0.000
34.428	0.000	0.000	0.000
36.074	0.000	0.000	0.000
37.760	0.000	0.000	0.000
39.484	0.000	0.000	0.000
41.248	0.000	0.000	0.000
43.049	0.000	0.000	0.000
44.890	0.000	0.000	0.000
46.769	0.000	0.000	0.000
48.688	0.000	0.000	0.000
50.644	0.000	0.000	0.000
52.640	0.000	0.000	0.000
54.674	0.000	0.000	0.000
56.748	0.000	0.000	0.000
58.859	0.000	0.000	0.000

61.010	0.000	0.000	0.000
63.199	0.000	0.000	0.000
65.428	0.000	0.000	0.000
67.694	0.000	0.000	0.000
70.000	0.000	0.000	0.000

Well Recovery Systems

Recovery time [yr] =	5.000
Radius of Pumping Well [ft] =	0.250
Radius of Recovery [ft] =	70.000
Radius of Influence [ft] =	120.000

Input Parameters
Vacuum-enhanced Skimmer
TPH-09 @ Manifold

Water Enhanced system

Water production rate [gpm] =	0.000
Water Saturated thickness [ft] =	15.000

Air Enhanced system

(-)Suction Pressure [atm] =	0.200
Screen Length [ft] =	5.000
Air Radius of Capture [ft] =	26.929

OK Cancel

LNAPL Distribution and Recovery Model (LDRM)

File Data Recovery Graphs Options Help Exit

LNAPL Specific Volume, Dn (ft) =	0.1105
LNAPL Recoverable Volume, Rn (ft) =	0.0702
Drawdown (ft) =	-0.107
New Water-table Depth (ft) =	16.500
New LNAPL Thickness, bn (ft) =	8.000
New LNAPL Specific Volume, Dn (ft) =	0.1105
New LNAPL Recoverable Volume, Rn (ft) =	0.0702
Initial Recovery Rate, Qn (gpd) =	1.071
Final LNAPL Thickness, bn (ft) =	7.092
Final Recovery Rate, Qn (gpd) =	0.772
Final Recovery Volume, Vn (gal) =	1667.0
Results Percent Recovery =	13.097

Vacuum-enhanced Skimmer

TPH-09 @ Manifold

Saturation Profiles