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REVIEW COMMENTS TO FREE PHASE PRODUCT ASSESSMENT REPORT SITE 6 NCBC GULFPORT MS
4/15/1994
U S GEOLOGICAL SURVEY

United States Department of the Interior

GEOLOGICAL SURVEY

Water Resources Division
100 W. Capitol St., Suite 710
Jackson, Mississippi 39269

TAKE PRIDE IN AMERICA

NCBC Gulfport Administrative Record
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April 15, 1994

Ms. Penny M. Baxter
Senior Project Manager
ABB Environmental Services
1400 Centerpoint Blvd. Suite 158
Knoxville, TN 37932-1968

Dear Penny:

Enclosed are our review comments in relation to NCBC Site 6 Free Phase Product Assessment Report, former fire-fighting training area, NCBC Gulfport, Mississippi. Please contact me at (601) 965-5582, if you have questions about our review comments. Please see attachments also.

Sincerely,

John F. Harsh

John F. Harsh
Supervisory Hydrologist

Enclosures

#212

REVIEW COMMENTS TO NCBC SITE 6 FREE PHASE PRODUCT ASSESSMENT REPORT
4/15/94 NCBC FACILITY, GULFPORT, MS

- p.v-vi - clarify whether there are one or two plumes?

- p.2-3 - 2 plumes coalesce (one plume fig. 2-1).
  - size of each plume or size of both plumes.
  - dissolved phase and product areas.

- p.vi - gross contamination - dissolved or nonaqueous or both.
  - for what period or dates of water-level measurements - document flow direction and presence of ground-water mounding.

- p.vi - last paragraph talks about one plume. Is the recommendation one or two recovery well(s)?

- p. 3-2 - why is fig. 3-1 different from fig. 1-7? same date?
  - explain what is meant by "gross" ground-water contamination.

- p.v - paragraph 2, were the objectives accomplished? What approach was used to: delineate the extent of free-phase product? You say so on p.2-1.

- p.v - last paragraph, where in the body of the report is the extent of plume indicated?

- p.vi - last paragraph, based on the capture analysis presented in this report, one well may not hydraulically influence removal of the contaminant mass in the contaminated area to minimize the level of contaminants below agreed upon residual concentrations. Rate of contaminant mass removal by pumping wells (hydraulic manipulation) is very slow.

- fig. 1-5,1-6 - give the reader the impression the surficial aquifer is homogeneous and no clay intervals are present in the upper part of the aquifer.

- p. 1-12 - give date for 10 January measurements of WL.

- fig. 1-7 - are measurements for WP or MWs? Use shorter arrows. Explain symbols - I-12, O-16, etc. M-18 not shown.

- p. 2-3 - can't find where the extent of free-phase product plume is given - (170 ft N-S, 110 ft E-W) not in report content, summary only.
  2.5 ft well GPT-6-1 and L-14. How can points be grouted in place?

- p. 2-5 - interchange of terms--monitoring point, well point, drive point.

- p. 2-7 - Why not show sieve and hydrometer results? (curve?).

- p. 2-11 - Explain what is meant by the turbidity of ground water, was considered acceptable development based on removal of fines or stabilization of temp, pH, and spec. conductance?

- p. 2-20 - Headings not consistently stated: Phase II-Free-Phase Product and GW Depression (p.2-18) vs Free-Phase Product Removal/Pumping at 3.04 gpm (p.2-20); Phase III-Pumping at 7.1 gpm (p.2-26) vs Free-Phase Product and GW Depression (p.2-19)?

- p. 2-27 - What is meant by minimum large radius of influence?

  p. 3-1 - How do you explain the reliability of two different surveys to determine elevation? Are the data comparable and correct?

- p. 3-4 - fig. 3-3 explain i_1 and i_2 on figure, where is i_3?
  ref. p. 3-5.

- p. 3-5 - Boring log for GPT 6-4 does not indicate screen/completed well is in compacted fill.

- p. 3-7 - 978.7 --> 973.7
  flow rate not steady for use of Jacob straight line-assumptions/limitations(longer test 24 hours min. steady flow rate).

- p. 3-8 - 1.4 --> 1.3
  range in conductivities (k)?
  2,142 is not close to 1,026.

- p. 3-9 - no calculations shown in App C for dd-distance relation.

- p. 3-10 - baseline data for what date?
  section 3.3 - limits of influence were determined based on what reference? How were the capture zone and zone of influence determined? They are not the same. Capture zone of well is typically smaller in areal extent than its associated zone of influence.

- p. 4-28 - two shallow samples from which well GPT 6-4? Notation D 2,3 unclear).

- fig. 4-4, 4-5 - approx. extent of dissolved-phase plume?

- p. 5-1 - indicate which options are preferred, as stated in the conclusion.

- Section 6 - see penciled comments.

- p. 6-1 - Are you suggesting a longer pumping (at a constant rate) test?

DRAFT

EXECUTIVE SUMMARY

ABB Environmental Services, Inc. (ABB-ES), under contract to Southern Division Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), has prepared this Free-Phase Product Assessment (F-PPA) Report for Site 6, Fire-Fighting Training Area, located at Naval Construction Battalion Center (NCBC) Gulfport, Mississippi. This F-PPA Report was prepared under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract No. N62467-89-D-0317 and Contract Task Order No. 096.

The objective of the assessment is to delineate the vertical and horizontal extent of free-phase product, determine the source of contamination, characterize the contaminants, and determine aquifer properties. The assessment included three field efforts: the Hydropunch II investigation, monitoring and recovery well installation, and an aquifer pumping test.

The work was implemented in accordance with the requirements of the U.S. Environmental Protection Agency, Region IV, the Mississippi Department of Environmental Quality, and the provisions of SOUTHNAVFACENGCOM contract No. N62467-89-D-0317.

While delineating the vertical and horizontal extent of the free-phase product, a second plume was discovered to the north of the original plume. The plumes measure approximately 170 feet north to south and 110 feet east to west.

The free-phase product is mainly composed of diesel and heavier fuel oils. Groundwater and soil samples indicate high concentrations of fuel constituents and soluble metals in some samples. Gross groundwater contamination does not extend vertically to the clay layer.

Groundwater flow is generally to the west except along the western edge where the gradient is reversed which is probably the result of groundwater mounding. This groundwater mounding may explain why the free-phase product plume has not migrated further to the west.

Hydraulic conductivities, transmissivity, and storativity values were calculated from the aquifer slug and pumping tests and used to model the capture zone. The resulting capture zone is not large enough to adequately remediate the plume. With the data collected, a second recovery well may be needed ~~needs to be installed~~ north of the existing recovery well. However, the capture zone may represent a transient and not a steady state condition. If this is the case, one recovery well may be sufficient.

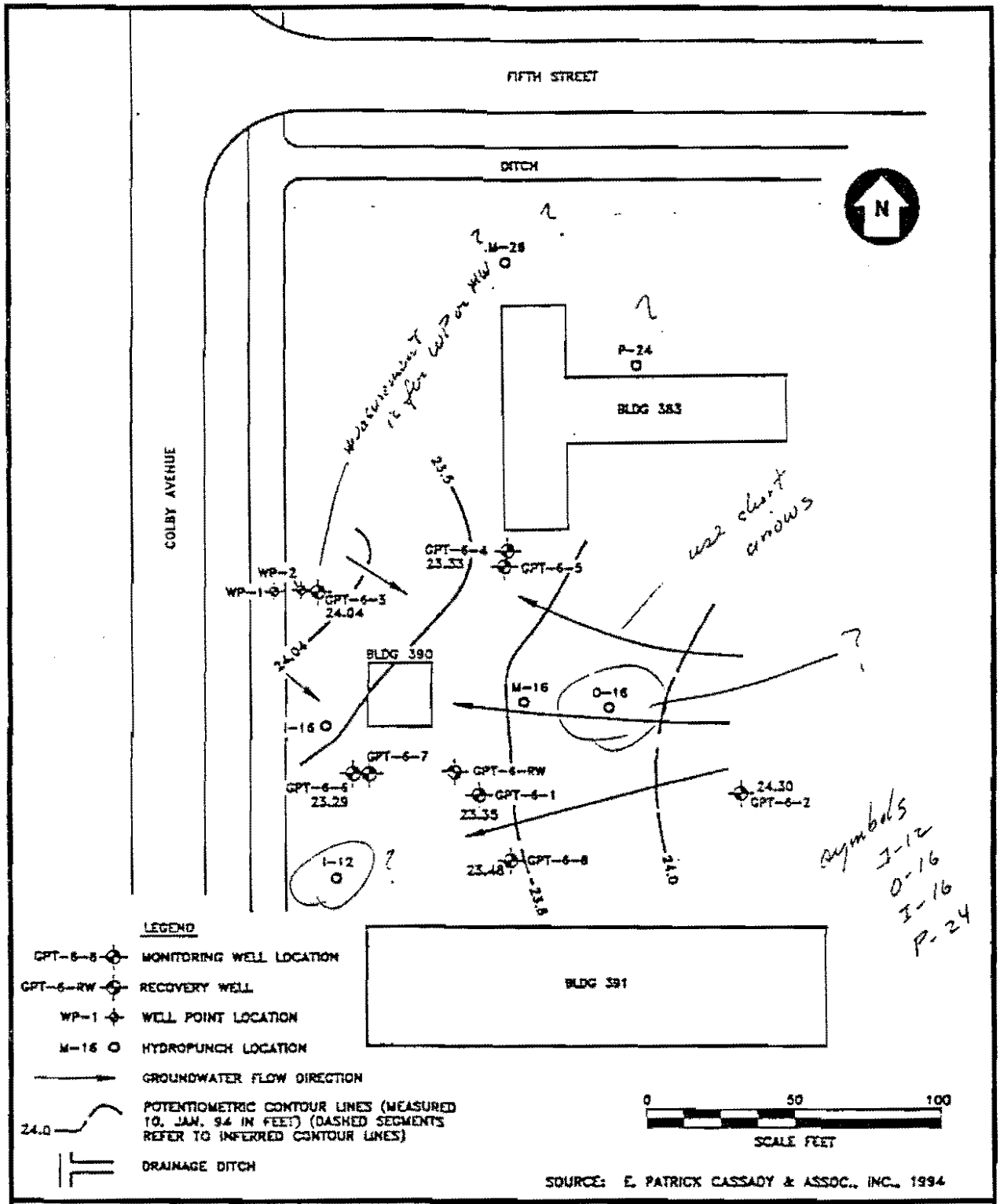

FIGURE 1-7

POTENTIOMETRIC SURFACE MAP, 10 JAN 94

F-PPA REPORT

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2.2.1 Free-Phase Product Plume Delineation Prior to installation of the Hydropunch II monitoring points, a grid was overlaid on the site. The array of the grid was established to encompass the former fire-fighting pits and the estimated extent of the plume. The north-south grid lines were designated D through T, with a 15-foot spacing between the lines. The east-west grid lines were designated 6 through 26 with a 15-foot spacing also. Each location was post-holed to 3.0 feet below land surface (bls) because of the presence of buried utilities on the site. The Hydropunch II tool (Figure 2-2) was then attached to the Mobile B-50 drill rig with standard AW drill rods and pushed or hammered 2 to 3 feet below the groundwater table. When the tool was withdrawn, the drive point remained in the soil with the well screen attached. This configuration (hydrocarbon mode) of the Hydropunch II allowed direct sampling and measurement of the floating product. When the points were no longer needed, they were grouted in place. ?

what is extent of free-phase plume?

Forty-one Hydropunch II drive points were used to assess the horizontal and vertical extent of the free-phase product. The original plume, first discovered in well GPT-6-1, appears to originate from the south fire-fighting training pit. While delineating the northern extent of the plume, a second plume was discovered. This plume is suspected to be the result of the former north fire-fighting training pit. The two plumes have coalesced and have migrated west of the former pits. The south free-phase plume had a maximum observed thickness of 2.5 feet in well GPT-6-1, and the north plume had a maximum observed thickness of 1.0 foot in Hydropunch well point M-19.

120 ft N-S
110 ft E-W

also well pt L-14

6.0 CONCLUSIONS AND RECOMMENDATIONS

The vertical and horizontal extent of the free-phase product plume was delineated using the Hydropunch II technology. The Hydropunch II allowed direct sampling and measurement of the floating product. While assessing the extent of contamination, an additional plume was discovered approximately 80 feet to the north of the original plume. This additional plume is suspected to be the result of the former north fire-fighting training pit.

The southern free-phase plume has a maximum observed thickness of 2.5 feet in well GPT-6-1 while the northern plume has a maximum observed thickness of 1.0 foot in ~~Hydropunch~~ well point M-19. The horizontal content of the plume measures 170 feet north to south compared to 110 feet east to west.

The lithology at the site consists of tan, gray, and brown fine to medium sand with little silt underlain by a saturated silty clay. The grain size analysis resulted in 60 percent fine sands, 21 percent medium sand, and 10 percent coarse silt. A silty clay layer was discovered while drilling wells GPT-6-5 and GPT-6-7 at depths of 35 and 47 feet, respectively.

Surface water generally flows west to a ditch located adjacent to the site and running parallel to Colby Avenue. Groundwater flow across Site 6 is also generally to the west except along the western edge where the gradient is reversed. The reversed gradient is probably the result of groundwater mounding as the ditch discharges surface water into the surficial aquifer. This

indicate for what time? date

extent of plume not indicated

groundwater mounding may explain why the free-phase product plumes have not migrated further to the west.

Five monitoring wells and one recovery well were installed to further characterize the free-phase product. The wells were located to characterize the extent and assess the amount of migration potential of the free-phase product plume. The two well pairs, GPT-6-4/GPT-6-5 and GPT-6-6/GPT-6-7, indicated a moderate downward vertical gradient. Gross groundwater contamination does not extend vertically to the clay layer. The free-phase product has migrated approximately 50 feet to the west of the former fire-fighting training pits.

give the gradient

?

unless stated otherwise

Free-phase product samples were collected in August by the USGS and in November during the Hydropunch field effort. Fingerprint analyses and dioxin/furan analyses were run on these samples. The free phase-product is composed mainly of diesel and heavier fuel oils. OCDD was detected in the sample collected in November at 235 pg/l which is equivalent to 0.235 2,3,7,8-TCDD.

Soil samples were collected during monitoring well installation from borings GPT-6-5 and GPT-6-7 at varying depths. Groundwater samples were collected from wells GPT-6-2, GPT-6-3, GPT-6-4, GPT-6-5, GPT-6-6, and GPT-6-7. All of these samples were analyzed following Level III DQOs and validated by Heartland Environmental Services. Analyses included TCL VOAs, TCL SVOAs, TCL pesticides and PCBs, TAL inorganics with cyanide, herbicides, dioxins and furans, TPH, and TOC. Results included some high concentrations of fuel constituents and metals. Soil sample SBG6508 had the largest concentrations with total xylenes of 19,000 µg/kg, 2-methylnaphthalene of 28,000 µg/kg, and aluminum of 1,460 mg/kg. Groundwater

hits? p. 4-23

sample GWG64D had the greatest concentrations for groundwater samples with 1,1,1-trichloroethane of 5,900 µg/l, 4-methylphenol of 1,100 µg/l, OCDD of 6,450 pg/l (TE = 6.45), and aluminum of 127,000 µg/l.

Samples were collected during the pumping test to aid in the remedial design phase. Physical parameters analyzed included alkalinity, color, hardness, TDS, TSS, chloride, sulfate, BOD^5, and Chemical Oxygen Demand. Also to aid with the remedial design, filtered inorganic analyses were run on unused material from groundwater samples GWG62, GWG63, and GWG64. GWG64 was reanalyzed as filtered and unfiltered. Significant reductions were noted in the concentrations of aluminum (83,100 to 111 µg/l) and lead (378 to 1.5 µg/l).

Aquifer properties were characterized by conducting aquifer slug tests on the monitoring wells and by running a stepped pumping test. The slug tests yielded hydraulic conductivity values of 2.0×10^{-4} to 2.4×10^{-3} cm/sec for the shallow wells, (2.2×10^{-3} to 5.6×10^{-3} cm/sec) for the deep wells, and 2.9×10^{-3} cm/sec as the geometric average.

The stepped pumping test consisted of four phases: free-phase product only, free-phase product removal/pumping at 3.04 gpm, pumping at 7.1 gpm, and the recovery phase. Using a modified Jacob straight-line method for a distance-drawdown solution, transmissivity and storativity values were calculated for Phases II and III. Transmissivity values for Phase II and III were 194 and 166 ft^2/day and storativity values were 0.012 and 0.0052, respectively. The radius of influence ranged from 120 feet during the 3.04 gpm pumping stage to 140 feet during the 7.1 gpm pumping stage.

With the data collected, a second recovery ~~needs to be installed~~ may be needed north of the ~~existing~~ recovery well. However, Phase III of the pumping test may not have been conducted over a sufficient period of time to reach a steady state condition. Under steady-state conditions, one recovery may effectively capture the entire plume.

Cleanup options for the recovery of free-phase product include recovery wells and trenches. Treatment methods being considered for the free-phase product and groundwater include biodegradation, air stripping, and carbon absorption.

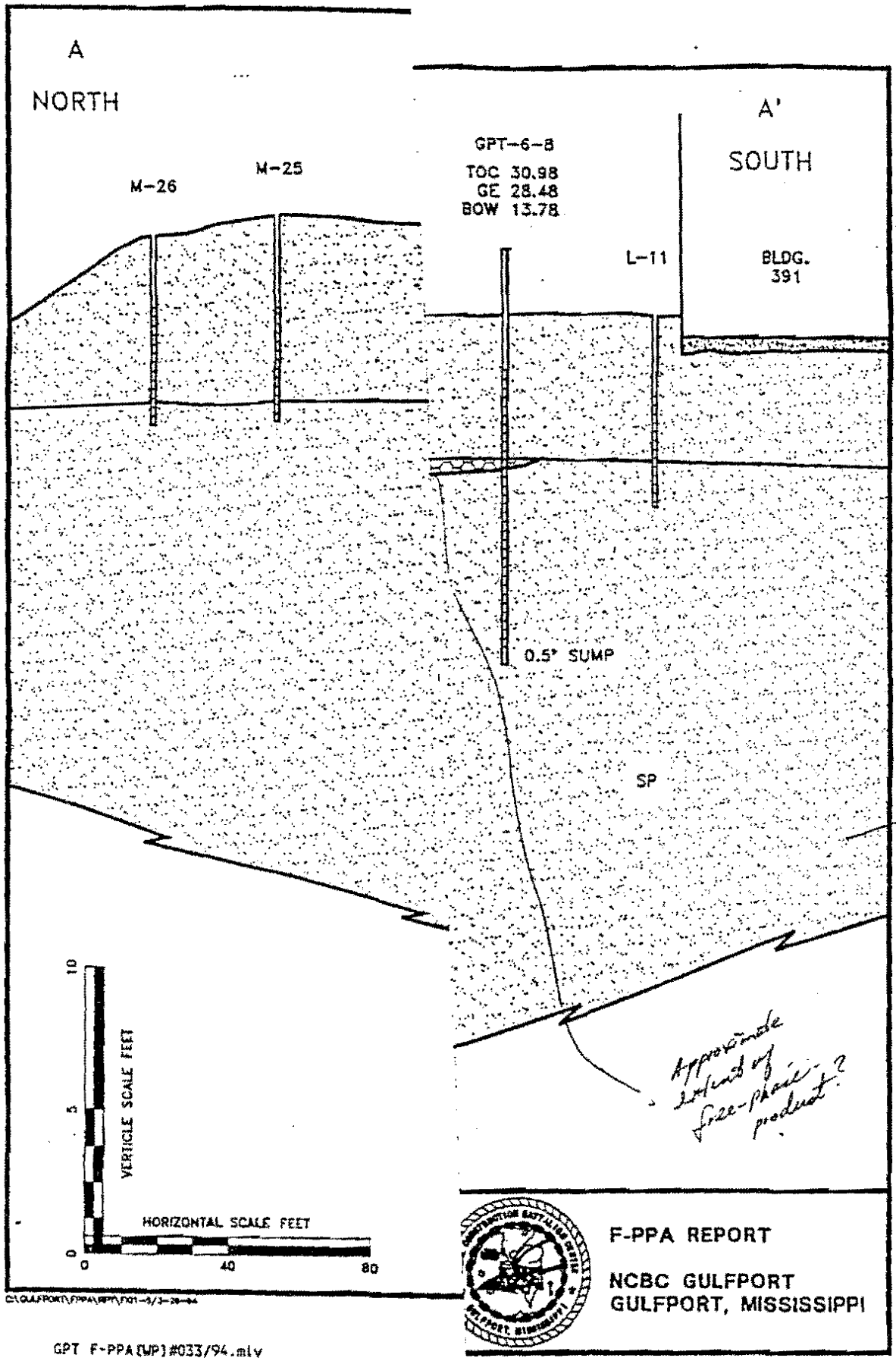
If biodiologic processes < Biodegrad? processes

Underlying ~~Beneath~~ the surficial aquifer are units that ~~what~~ are collectively called the Miocene aquifer System (Newcomb, 1975). The Miocene aquifer System includes the Citronelle Formation (Pliocene), the Graham Ferry Formation (Pliocene), and the Pascagoula, Hattiesburg, and Catahoula Formations (Miocene). These aquifers formations are composed of sands and discontinuous lenticular clays. The Miocene aquifers are a major source of potable water in the Gulfport area (Brown, et al, 1944; Newcome, 1975; Colson and Boswell, 1985).

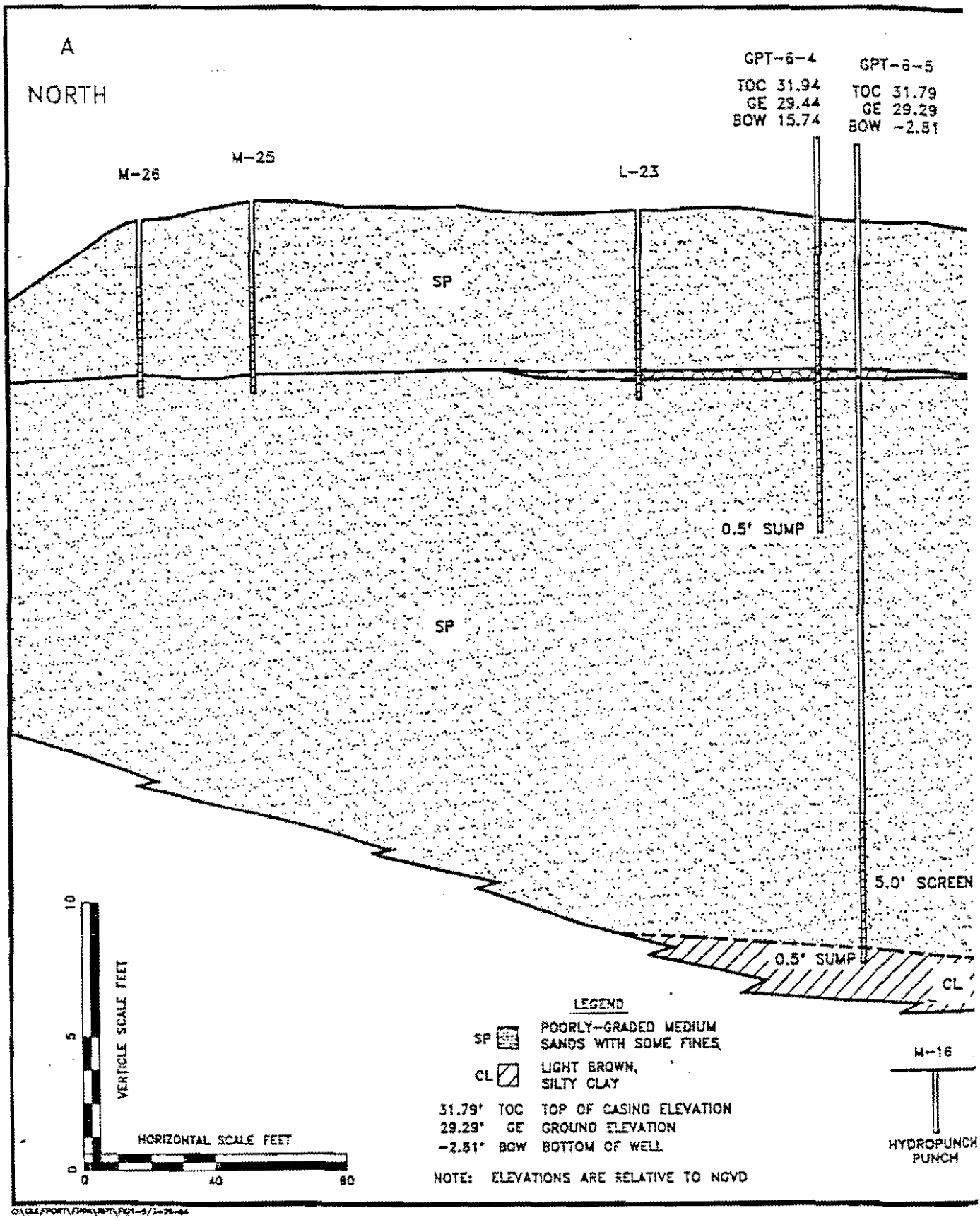
Boundaries between Miocene formations ~~aquifers~~ are vaguely defined, however the formation names are useful in designating the zone of interest, if at all. At the site, the first artesian aquifer underlying the younger deposits of the surficial aquifer is considered to be the uppermost unit ~~part~~ of the Miocene aquifer System.

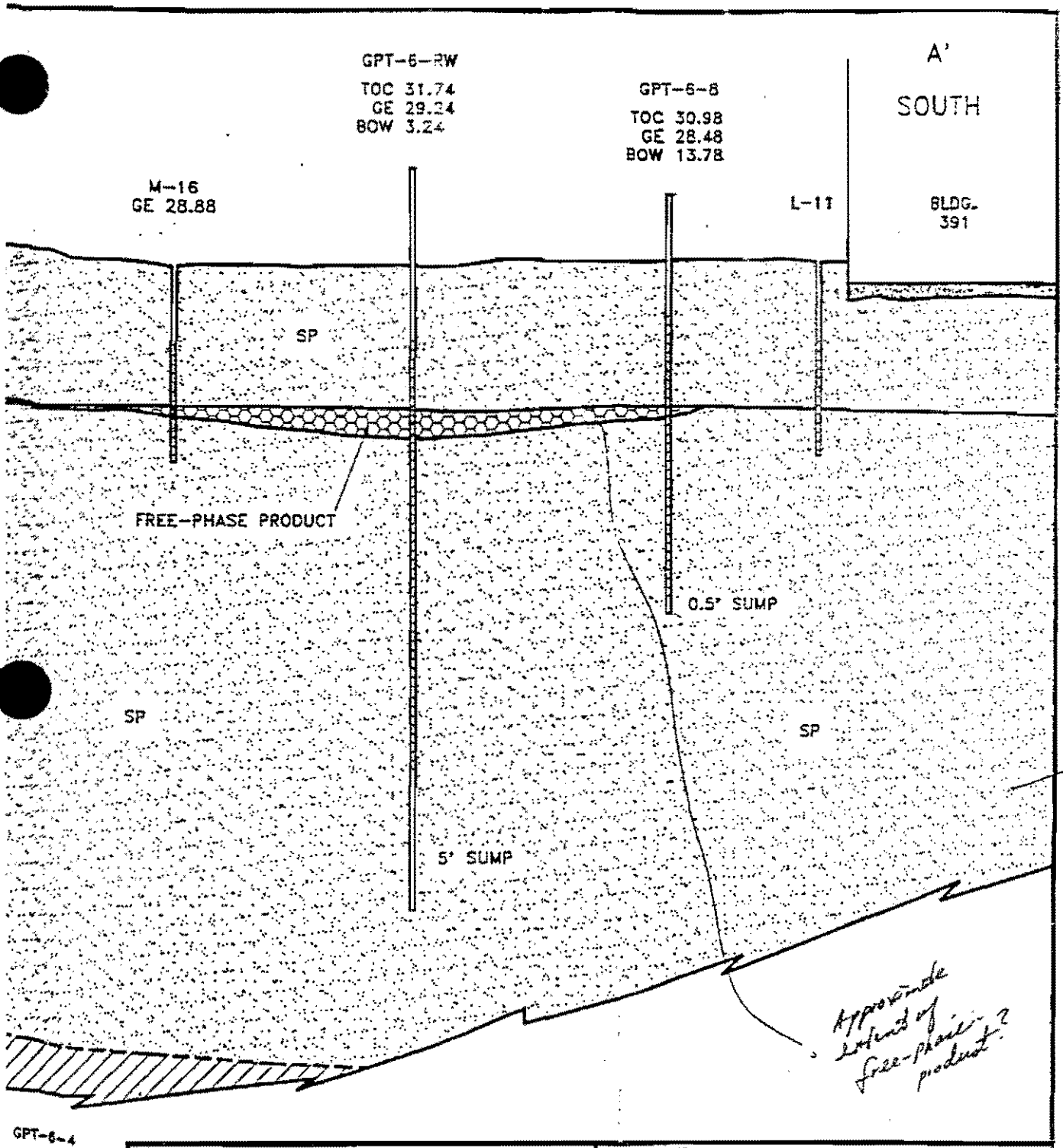
Regional groundwater flow in the Miocene aquifer system at NCBC has been interpreted to be to the south; however, the hydraulic gradient at Site 6 is generally to the west. The surficial aquifer consists of the Pamlico (Pleistocene to recent) sand and recent deposits with thicknesses of up to 100 feet in the region. At NCBC, the surficial aquifer is composed of sands and fine gravel ranging from 13 to 45 feet in thickness underlain by a clay layer ranging from 28 to 197 feet in thickness. Unconfined conditions exist in the surficial aquifer at Site 6 with groundwater elevations ranging from 23.34 to 24.24 feet above msl as measured on 11 January 1994. In March 1987, groundwater elevations ranged in elevation from 26.37 to 24.24 feet above msl. Groundwater flow across the site during January 1994 was dissected by a drainage divide (Figure 1-7) in the area near ~~GPT-~~6-2, GPT-6-3 and WP-1, but was generally flowing west.

Unconsolidated sediments encountered at Site 6 during drilling and soil sampling consisted of tan, gray, and brown fine to medium sand with little silt underlain



GPT F-PPA[WP]#033/94.mlv


A
NORTH
GPT-6-4
TOC 31.94
GE 29.44
BOW 15.74
GPT-6-5
TOC 31.79
GE 29.29
BOW -2.51
M-26
M-25
L-23
SP
0.5' SUMP
SP
5.0' SCREEN
0.5' SUMP
CL
LEGEND
SP POORLY-GRADED MEDIUM SANDS WITH SOME FINES
CL LIGHT BROWN, SILTY CLAY
31.79' TOC TOP OF CASING ELEVATION
29.29' GE GROUND ELEVATION
-2.51' BOW BOTTOM OF WELL
NOTE: ELEVATIONS ARE RELATIVE TO NGVD
M-16
HYDROPUNCH PUNCH
VERTICLE SCALE FEET
HORIZONTAL SCALE FEET
0
5
10
0
40
80



GPT-6-4

MONITORING WELL

FIGURE 1-5

GEOLOGIC CROSS SECTION A-A' CONCEPTUAL MODEL

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