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April 25, 2002

Steven M. Scharf, P.E.
Bureau of Eastern Remedial Action
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233-7015

Re: Off-site Groundwater Monitoring Program Reports
Naval Weapons Industrial Reserve Plant/
Northrop Grumman Corporation Facilities
Bethpage, New York
Site Nos. 1-30-003A and 1-30-003B
D&B 1883

Dear Mr. Scharf:

On behalf of the Massapequa Water District, enclosed please find a memorandum prepared for the District summarizing and providing comments on the reports entitled Southern Area Vertical Profile Boring Installation Summary Report and GM-38 Area Vertical Profile Boring Installation Summary Report, both dated February 2002. These reports describe the results of the groundwater sampling activities conducted by Tetra Tech NUS, Inc. on behalf of the United States Navy Naval Facilities Engineering Command to evaluate groundwater quality off-site and downgradient of the Naval Weapons Industrial Reserve Plant property and the Northrop Grumman Corporation facility in Bethpage, New York.

In summary, based on the information in these reports, the downgradient and lateral extent of the plume has not been defined by the groundwater sampling activities conducted to date. It is, therefore, recommended that additional vertical profile borings (VPBs) be constructed south and east of the previous VPB locations to determine the extent of the plume prior to selection of locations and depths for outpost monitoring wells. This will allow the appropriate placement of the outpost monitoring wells for protection of the downgradient public water supply wells.

It is my understanding that it is intended to utilize the groundwater model being developed by Arcadis Geraghty and Miller, to determine the extent of the plume and placement of the outpost wells. However, to my knowledge, previous modeling results did not accurately define the plume. We previously provided comments on the earlier modeling efforts in our letter dated February 15, 2001. As a result, it is our and the District's preference to rely on actual groundwater results, rather than the model to locate the outpost wells and screen depths.

If you have any questions or need any additional information, please do not hesitate to call me at (516) 364-9890.

Very truly yours,

Thomas F. Maher, P.E.
Vice President

TRM/KPW(t)/jmy
Enclosure
cc: Board of Commissioners, Massapequa Water District
♦1883\TFM02LTR-03.DOC(R02)

MEMORANDUM

TO: Board of Commissioners
Massapequa Water District

FROM: Thomas F. Maher
Dvirka and Bartilucci Consulting Engineers

DATE: April 9, 2002

SUBJECT: Off-site Groundwater Monitoring Program
Naval Weapons Industrial Reserve Plant, Bethpage, New York
D&B No. 1883

This memorandum summarizes the activities conducted by Tetra Tech NUS, Inc. on behalf of the United States Navy Naval Facilities Engineering Command to evaluate groundwater quality off-site and downgradient of the Naval Weapons Industrial Reserve Plant (NWIRP) property and the Northrop Grumman Corporation (NGC) facility in Bethpage, New York. This summary is based on review of reports entitled Southern Area Vertical Profile Boring Installation Summary Report and GM-38 Area Vertical Profile Boring Installation Summary Report, both dated February 2002, and discussions held at the Technical Advisory Committee (TAC) meeting on February 21, 2002. Since the emphasis of this evaluation is to identify potential impacts to downgradient public water supply wells of the Massapequa Water District, the focus of the results discussion presented below is the Southern Area which includes the area south of Hempstead Turnpike (see Figure 1).

Procedures

The off-site groundwater investigation was conducted to evaluate groundwater quality in two areas, the GM-38 Area and the Southern Area (south of Hempstead Turnpike), using vertical profile borings (VPBs). Four VPBs (VPB-40, VPB-47, VPB-48 and VPB-51) were constructed to delineate the extent of groundwater contaminated by volatile organic compounds (VOCs) in the GM-38 Area, an area of significantly elevated concentrations of VOCs (maximum total VOCs of 3,144 micrograms per liter (ug/l) in VPB-51) located north of Hempstead Turnpike and west of the Seaford-Oyster Bay Expressway. Five VPBs (VPB-43, VPB-44, VPB-45, VPB-46 and VPB-50) were constructed in the Southern Area (south of Hempstead Turnpike) to establish the southern/downgradient extent of VOC contamination between Hempstead Turnpike and downgradient public water supply wells. The locations of public water supply well fields, the vertical profile borings and GM-38 are shown on Figure 1.

All VPBs were constructed to the top of the Raritan Confining Unit, at depths ranging from 760 to 850 feet below ground surface. Split spoon soil samples for geologic characterization and Hydropunch groundwater samples for chemical/water quality characterization were collected

from each VPB at 50-foot intervals to 200 feet below ground surface and thereafter at approximate 20-foot intervals to the bottom of the boring. Each boring was geophysically logged (gamma, single point resistivity and standard potential logs). Groundwater samples were analyzed for VOCs. Analysis for total organic carbon (TOC) was performed on two soil samples from each boring to provide data regarding VOC migration rates for groundwater modeling purposes. The samples analyzed for TOC were selected from highly permeable zones, typically between 200 and 500 feet below ground surface.

The results of both the GM-38 Area and Southern Area investigations have been used to develop an estimation of the extent of the plume originating from the NWIRP and NGC properties, in conjunction with preliminary results from the groundwater flow and transport model currently being prepared by ARCADIS Geraghty and Miller under contract to NGC. As reported by ARCADIS Geraghty and Miller, the southern extent of detectable concentrations of VOCs that have migrated from the NWIRP/NGC site is just north of the intersection of Hicksville Road (Route 107) and the Seaford-Oyster Bay Expressway, and the western edge of the plume is approximately defined by Wantagh Avenue. In addition, according to ARCADIS Geraghty and Miller, the eastern edge of the plume is not currently defined and this will be addressed by construction of two additional VPBs. To date, only one of these (VPB-49C) has been completed (see Figure 1). The second, VPB-42 (location also shown on Figure 1), will be constructed in the near future.

Results

The five VPBs in the Southern Area were drilled upgradient of the public water supply wells for the South Farmingdale Water District, Town of Hempstead Levittown Water District, New York Water Service and Massapequa Water District (MWD) (see Figure 1) . Note that the following discussion of results excludes the common laboratory contaminants methylene chloride and acetone, which were detected in individual samples from the Southern Area VPBs at concentrations up to 11 ug/l and 78 ug/l, respectively. Graphs showing the total VOC concentrations versus depth for these VPBs are attached. The maximum total VOC concentration for each VPB and the associated sample depth, as well as the maximum sample depth at which VOCs were detected at concentrations above New York State Department of Environmental Conservation (NYSDEC) Class GA groundwater standards, are shown on Figure 1.

The MWD well field nearest to the identified contamination is the Northwest Well Field (Well No. 4 and Well No. 5), located approximately 9,000 feet south-southeast (downgradient) of VPB-50 and approximately 9,500 feet south of VPB-44 (at least 8,000 feet south of the presently modeled plume limit). The maximum total VOC concentrations (excluding acetone and methylene chloride) detected in VPB-44 and VPB-50 were 54 micrograms per liter (ug/l)

and 13 ug/l, respectively. Chlorinated VOCs, including 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), 1,1,1-trichloroethane (1,1,1-TCA) and/or trichloroethene (TCE), were detected at concentrations exceeding NYSDEC Class GA groundwater standards at depths to 283 feet below ground surface in VPB-44. In VPB-50, 1,1-DCA, 1,1-DCE, 1,1,1-TCA and toluene were detected at concentrations at or below NYSDEC Class GA groundwater standards at depths to 151 feet below ground surface. VOCs were not detected in samples collected between 300 feet and 700 feet below ground surface in VPB-44 and between 200 feet and 800 feet in VPB-50. Below these depths, the detected contamination in both VPBs was MTBE and/or toluene at concentrations up to 3 ug/l each (total VOC concentrations were up to 3 ug/l). Based on these results, the groundwater sampling activities conducted to date in the area north of the Northwest Well Field have not defined the downgradient extent of the VOC contamination. Since, according to the MWD, no VOCs have been detected in either of the Northwest Well Field wells during the past two years, the plume has not yet reached this well field.

The gamma logs for VPB-44 and VPB-50 indicate clay or silty clay layers at depths of 298 to 310 feet, 438 to 442 feet and 590 to 605 feet below ground surface in VPB-44 and at depths of 320 to 327 feet, 415 to 435 feet and 455 to 461 feet below ground surface in VPB-50. While the continuity of the clay layers is unknown, they may serve to at least locally impede the vertical migration of contaminants.

Since the southern extent of the contamination is currently unknown, the horizontal and vertical distance between the plume and the Northwest Well Field cannot be determined. As a result, the potential threat to Well No. 4 (screened from 531 to 618 feet below ground surface) and Well No. 5 (screened from 740 to 820 feet below ground surface) currently cannot be evaluated.

The MWD Brooklyn Avenue Well Field (Well No. 6 and Well No. 7, screened from 565 to 625 feet below ground surface and 405 to 482 feet below ground surface, respectively) is located approximately 5,000 feet south-southeast (downgradient) of the Northwest Well Field. Although shallower than the Northwest Well Field wells, the Brooklyn Avenue wells are further downgradient and are therefore less likely to be threatened in the near future by the NWIRP/ NGC plume as compared to the Northwest Well Field.

VPB-43 and VPB-45 were constructed east of the Seaford-Oyster Bay Expressway, upgradient of South Farmingdale Water District (SFWD) well field containing wells N-4042, N-4043, N-5148 and N-7377 and the MWD Northeast Well Field (see Figure 1). Similar to VPB-44 and VPB-50, the sample results from VPB-43 and VPB-45 show chlorinated solvents (1,1-DCA, chloroform, 1,1-DCE, 1,1,1-TCA, TCE and/or tetrachloroethene (PCE)) at concentrations up to 10 ug/l each (total VOCs up to 23 ug/l) in samples collected from depths up to approximately 300 feet below ground surface. The only VOC detected in samples collected from deeper than 300 feet below ground surface in either boring was toluene, except for one detection of TCE in

VPB-43 (2 ug/l at 801 to 802 feet). According to the report for the Southern Area, the significant concentrations of toluene (23 ug/l to 170 ug/l) detected in the three samples collected between 460 feet and 500 feet below ground surface in VPB-45 were attributed (by Tetra Tech NUS) to contamination of the sampling equipment. However, other toluene detections in deeper samples from these borings (1 ug/l to 32 ug/l in VPB-45 at 53 to 54 feet and various depths between 580 feet and 801 feet, and five detections of 1 ug/l to 4 ug/l at depths of 281 feet to 662 feet VPB-43) are reported as environmental contamination, which suggests the possibility of regional toluene contamination.

As reported by ARCADIS Geraghty and Miller, groundwater modeling results to date show that the detectable concentrations of VOCs migrating from the NWIRP/NGC facility have reached the SFWD well field containing wells N-4042, N-4043, N-5148 and N-7377 (see Figure 1), although the depth of contamination is reported as above the screen zones of these wells. The MWD Northeast Well Field is located approximately 9,500 feet southeast of the SFWD wells. As shown on Figure 1, the easternmost VPBs constructed to date (VPB-49C, VPB-51, VPB-47 and VPB-43) all contained VOCs at concentrations exceeding NYSDEC Class GA groundwater standards, in some cases by orders of magnitude. This indicates that the eastern extent of the contamination has not been delineated. As a result, the potential threat to the Northeast Well Field cannot be evaluated at this time.

As shown on Figure 1, the westernmost VPB constructed as part of the Southern Area investigation was VPB-46. Chlorinated VOCs (1,1-DCA, 1,2-dichloroethane, 1,1-DCE, 1,2-dichloroethene, 1,1,1-TCA, TCE and/or PCE) were detected at individual concentrations up to 32 ug/l and total VOC concentrations up to 106 ug/l in samples collected from depths up to 300 feet. No VOCs were detected in any sample collected from deeper than 300 feet. These results show that the western and southern extent of contamination has not been determined in this area. Since the regional groundwater flow direction is toward the south-southeast, the detected VOCs could migrate toward the MWD Northwest Well Field.

Future Activities

As described above, VPB-42 is to be constructed in the near future. The sample results from VPB-42 and VPB-49C will be incorporated into the groundwater model and simulations will be performed to determine the current extent of the plume and to project future plume migration. Based on these results, the model also will be used to determine optimal locations for extraction wells and recharge structures (wells or basins) for remediation of the GM-38 Area, as well as the locations and depths for outpost monitoring wells to be constructed upgradient of public water supply wells to the south. Since the exact locations and specifications for the outpost wells have not yet been established, the effectiveness of the outpost well network cannot be evaluated at this

time. As currently scheduled, construction of the outpost monitoring wells will begin in June 2002.

The next TAC meeting tentatively has been scheduled for Thursday, June 20, 2002. At that meeting, it is planned that the results of the two new VPBs and the extended groundwater modeling effort will be presented, including the time of travel estimates for impacts to the downgradient public water supply wells and the proposed locations and depths for the outpost monitoring wells. In addition, the conceptual design and proposed locations for the remediation system in the GM-38 Area will be presented. As shown on the attached schedule prepared by the Navy, the final design for the GM-38 system is scheduled to be completed by the end of calendar year 2002, and construction of the system is scheduled to begin in April 2003.

Conclusions and Recommendations

Concentrations of VOCs exceeding Class GA groundwater standards were detected in all VPBs constructed in the Southern Area except one (VPB-50). Based on these results, the extent of VOC contamination in groundwater and threat to the MWD wells have not been defined. It is therefore recommended that additional VPBs be constructed so that potential impacts to downgradient public water supply wells can be evaluated. Additional VPBs should be constructed east of the Bethpage State Parkway to delineate the plume to the east and upgradient of the MWD Northeast Well Field. Also, additional VPBs should be constructed south of VPB-44, VPB-45 and VPB-46 to delineate the contamination to the south of these locations and upgradient of the MWD Northwest and Brooklyn Avenue Well Fields. These activities should be conducted prior to selection of locations and depths of outpost monitoring wells.

KPW(t)/ld
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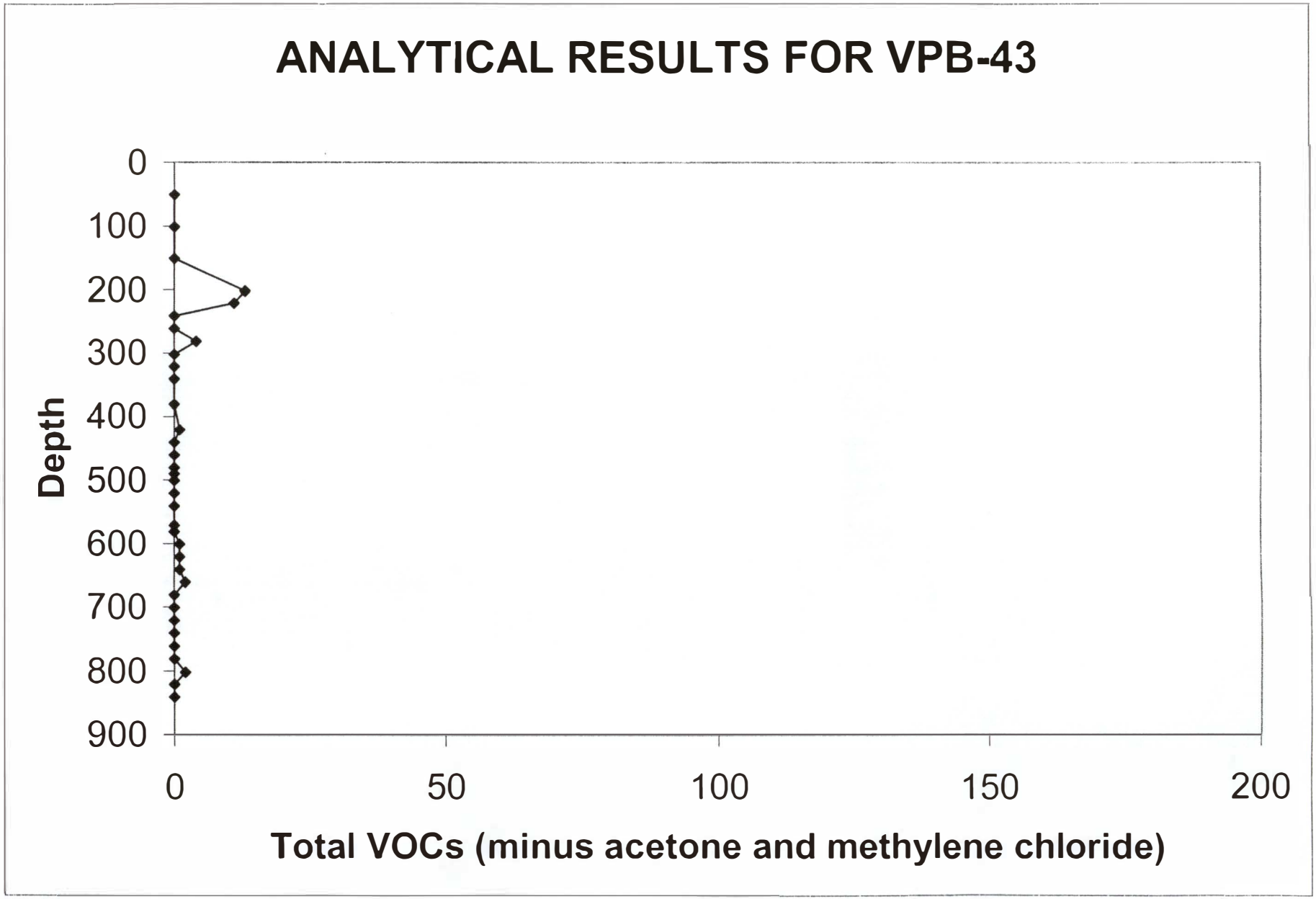
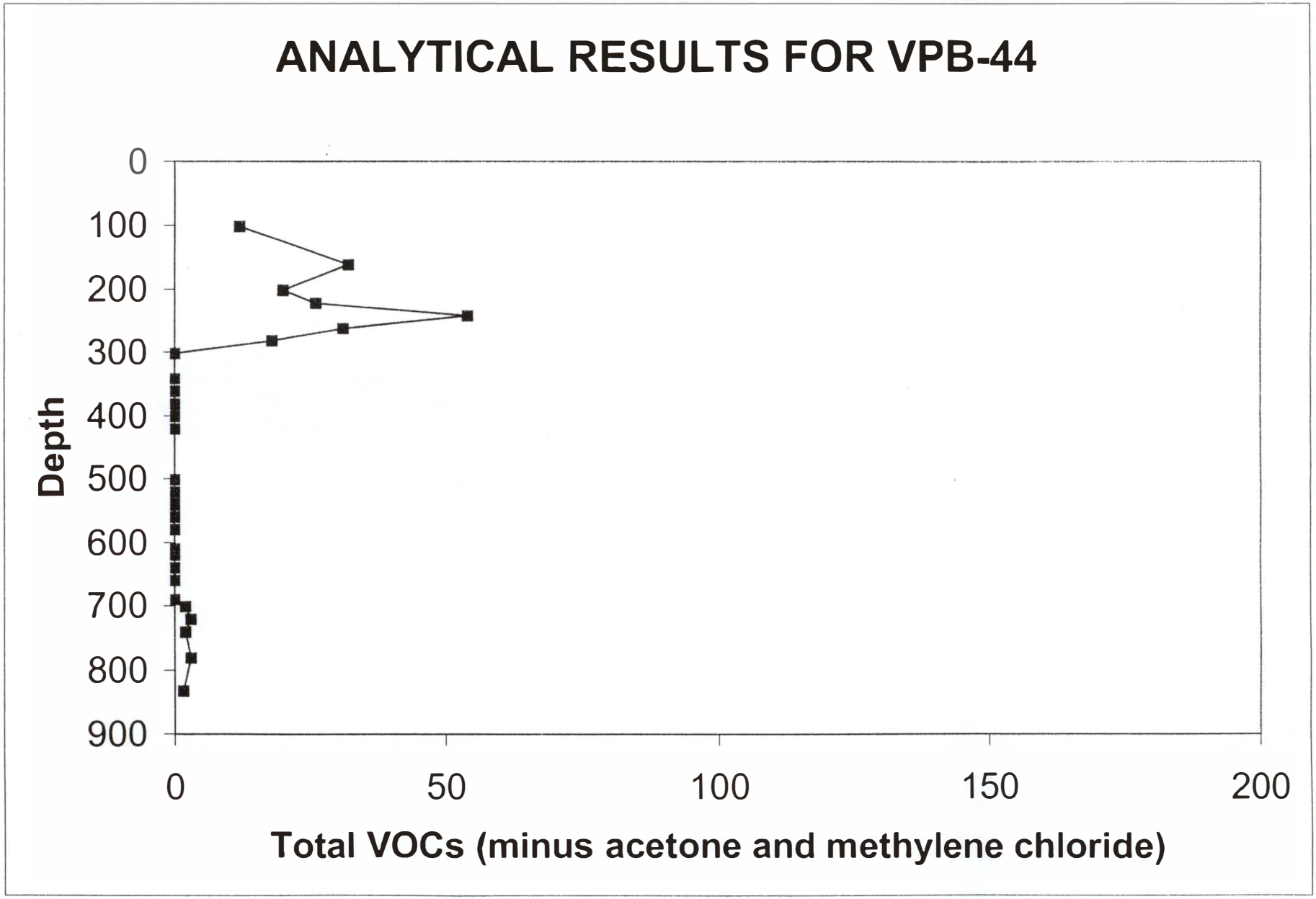
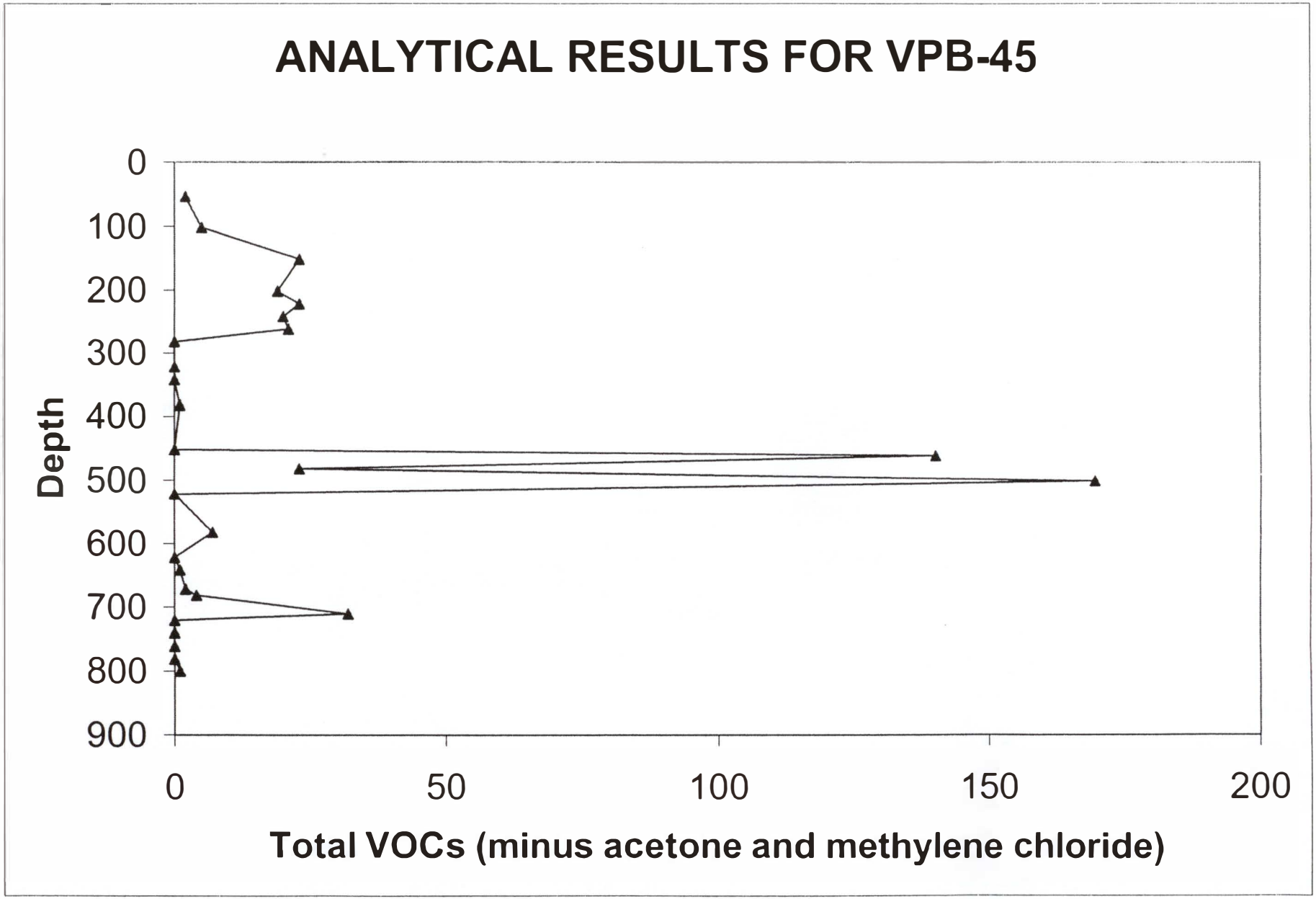
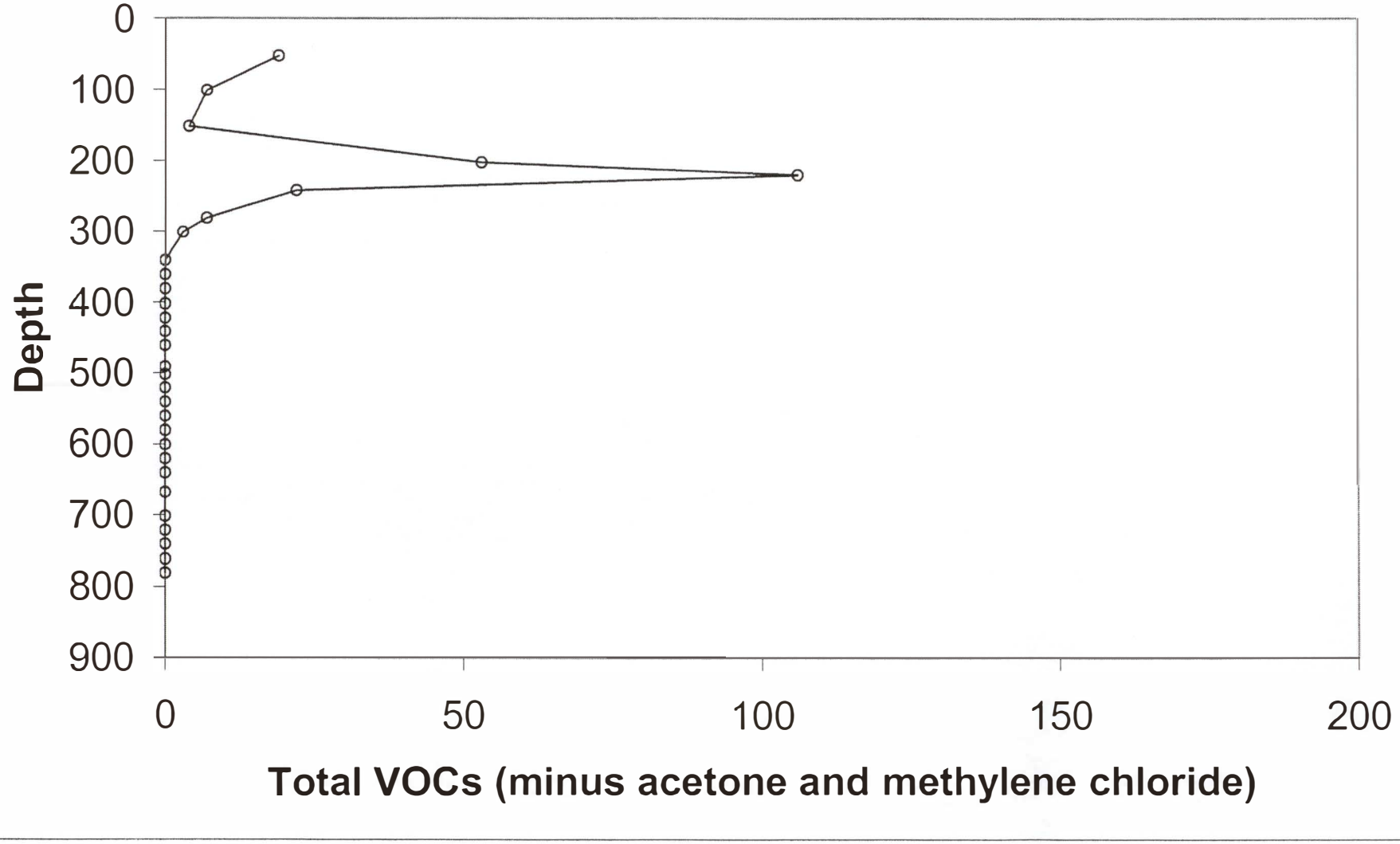

ANALYTICAL RESULTS FOR VPB-43
Depth
0
100
200
300
400
500
600
700
800
900
0
50
100
150
200
Total VOCs (minus acetone and methylene chloride)

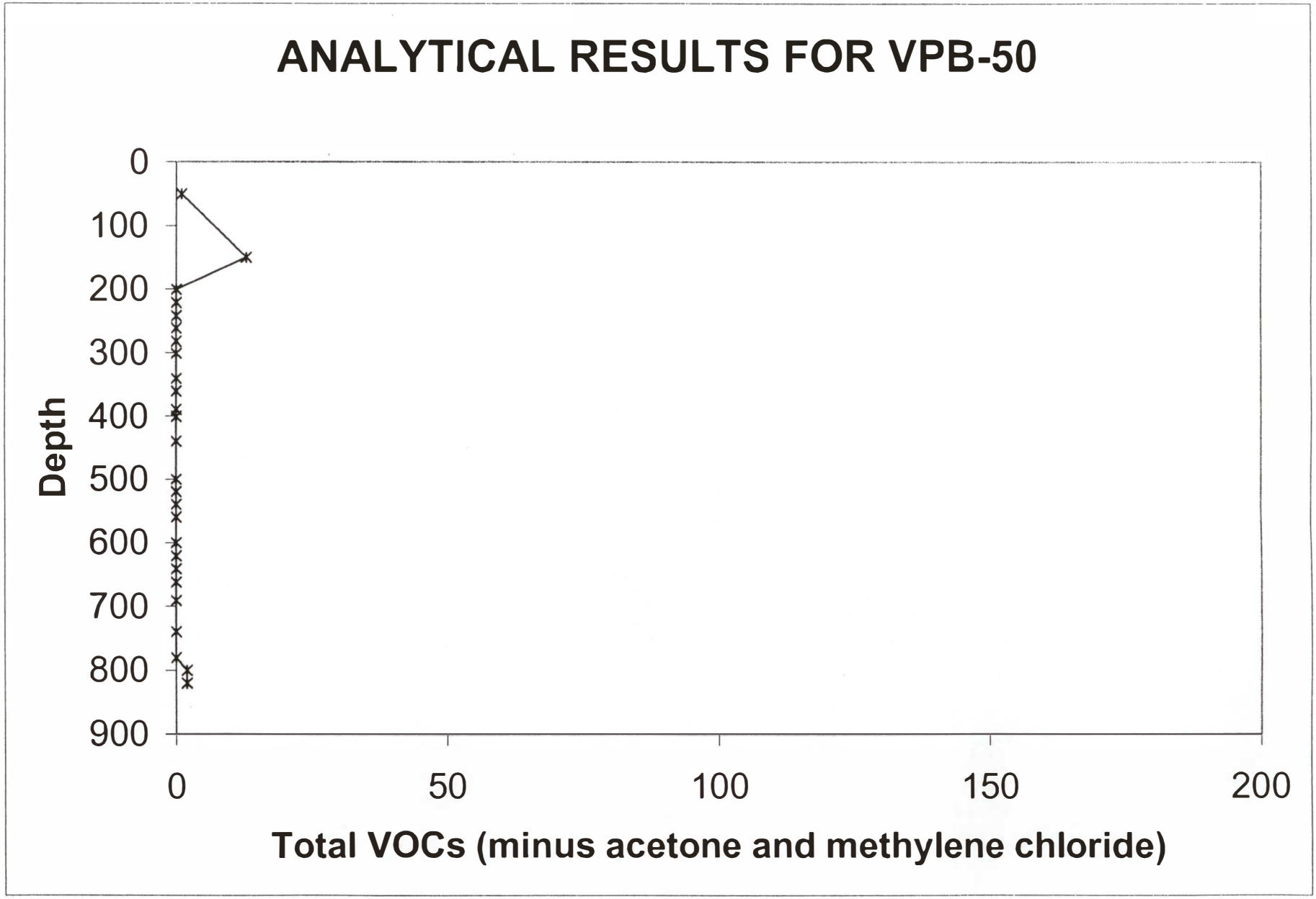
ANALYTICAL RESULTS FOR VPB-44




ANALYTICAL RESULTS FOR VPB-45
Depth
0
100
200
300
400
500
600
700
800
900
0
50
100
150
200
Total VOCs (minus acetone and methylene chloride)

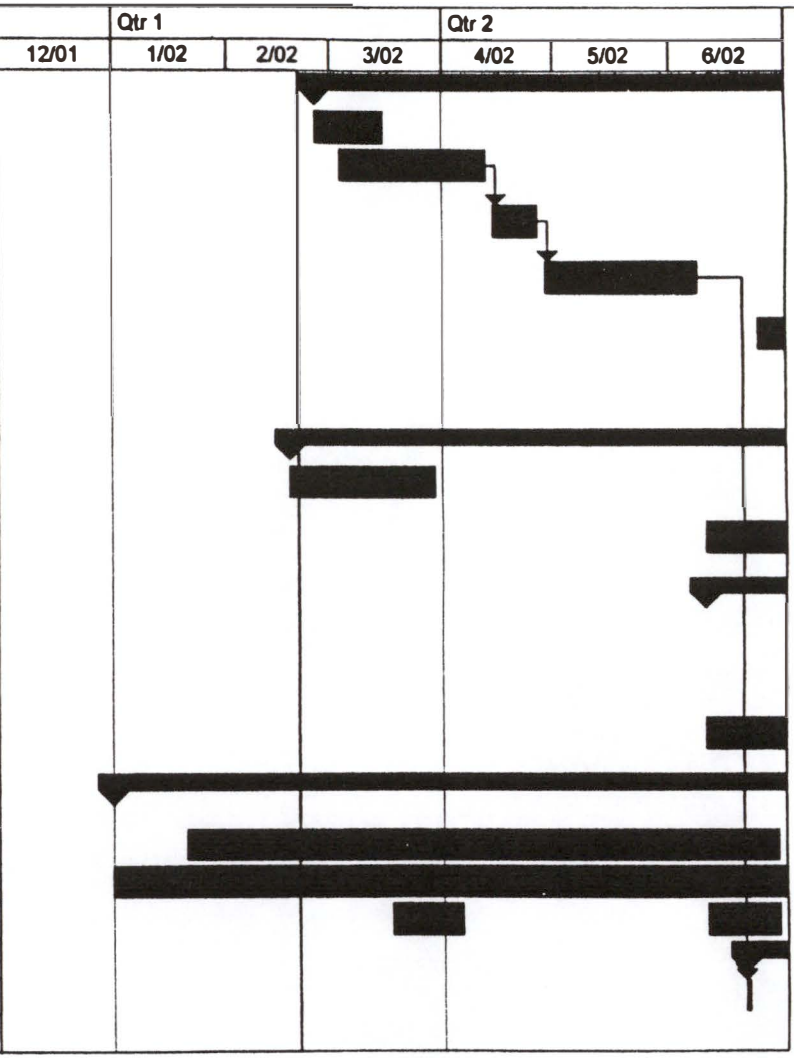
ANALYTICAL RESULTS FOR VPB-46




ANALYTICAL RESULTS FOR VPB-50
Depth
0
100
200
300
400
500
600
700
800
900
0
50
100
150
200
Total VOCs (minus acetone and methylene chloride)

Draft 2002 Estimated OU-2 Project Schedule, Northrop Grumman & NWIRP facilities, Bethpage, New York

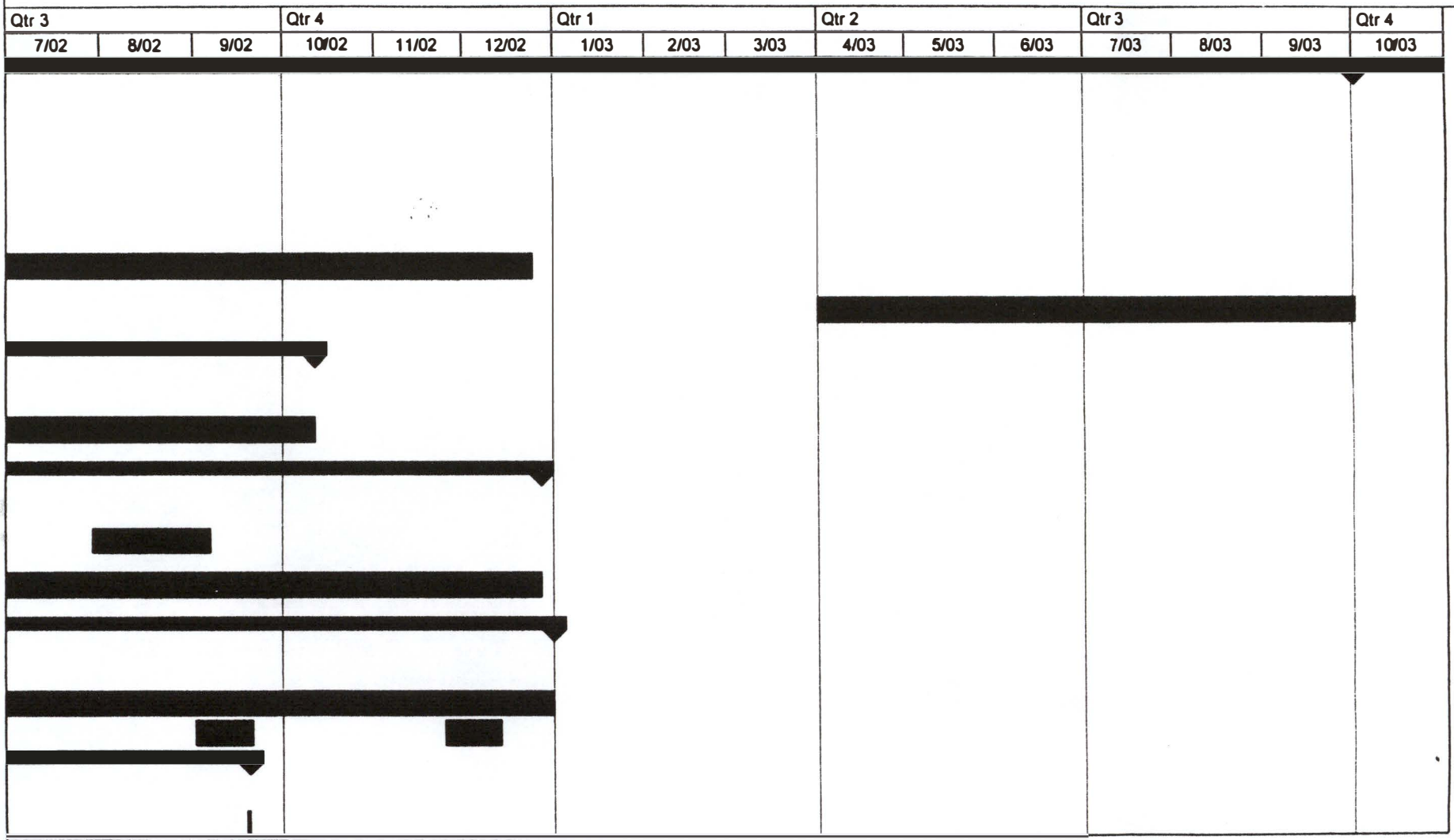
ID	Task Name	Duration	Start	Finish
1	**GM-38 Area RD/RA Activities**	**418 days?**	**Mon 2/25/02**	**Wed 10/1/03**
2	Model Calibration	15 days?	Mon 2/25/02	Fri 3/15/02
3	GM-38 Area VPB Drilling (Pre-Design Investigation	30 days?	Mon 3/4/02	Fri 4/12/02
4	GM-38 Area VPB Data Evaluation	10 days?	Mon 4/15/02	Fri 4/26/02
5	GM-38 Area Contaminant Transport Simulations	30 days?	Mon 4/29/02	Fri 6/7/02
6	GM-38 Area RD/RA Work Plan & Design	132 days?	Mon 6/24/02	Tue 12/24/02
7	GM-38 Area Remedy Construction	132 days?	Tue 4/1/03	Wed 10/1/03
8	**ONCT System Evaluations**	**170 days?**	**Mon 2/18/02**	**Fri 10/11/02**
9	ONCT System Hydraulic Evaluation Work Plan	30 days?	Mon 2/18/02	Fri 3/29/02
10	ONCT System Hydraulic Evaluation Investigation & Rpt.	90 days?	Mon 6/10/02	Fri 10/11/02
11	**Public Supply Well Contingency Plan & Outpost Monitoring Wells**	**145 days?**	**Mon 6/10/02**	**Fri 12/27/02**
12	Public Supply Well Contingency Plan	29 days?	Tue 7/30/02	Fri 9/6/02
13	Outpost Montoring Well Installation	145 days?	Mon 6/10/02	Fri 12/27/02
14	**On-Site Systems (GP-1 and ONCT) O&M**	**261 days?**	**Tue 1/1/02**	**Tue 12/31/02**
15	Preparation of OMM Plan	115 days?	Mon 1/21/02	Fri 6/28/02
16	Systems O&M	261 days?	Tue 1/1/02	Tue 12/31/02
17	Groundwater Monitoring	195 days	Mon 3/18/02	Fri 12/13/02
22	**TAC Meetings**	**66 days?**	**Thu 6/20/02**	**Thu 9/19/02**
23	TAC Meeting No. 2	1 day?	Thu 6/20/02	Thu 6/20/02
24	TAC Meeting No. 3	1 day?	Thu 9/19/02	Thu 9/19/02



Project: Draft Project Schedule_v3
Date: Wed 2/20/02

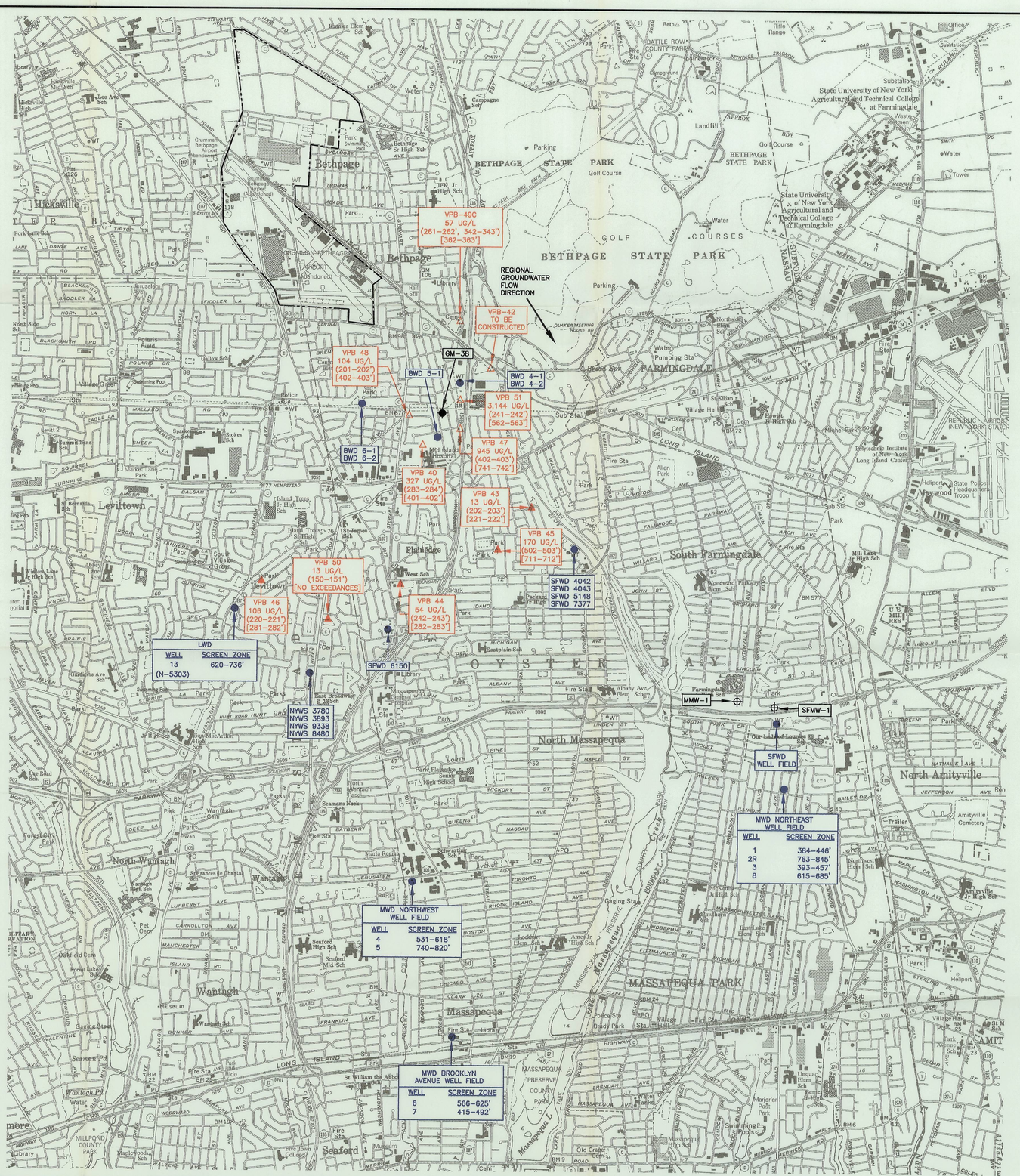
Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

Draft 2002 Estimated OU-2 Project Schedule, Northrop Grumman & NWIRP facilities, Bethpage, New York



Project: Draft Project Schedule_v3
Date: Wed 2/20/02

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline



LEGEND

VPB-40 △	GM-38 AREA VERTICAL PROFILE BORING LOCATION AND DESIGNATION
VPB-43 ▲	SOUTHERN AREA VERTICAL PROFILE BORING LOCATION AND DESIGNATION
327 UG/L (283-284')	MAXIMUM TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATION AND DEPTH
[ ]	MAXIMUM SAMPLE DEPTH WITH EXCEEDANCE OF CLASS GA GROUNDWATER STANDARDS
●	PUBLIC WATER SUPPLY WELL FIELD
✱	EXISTING NWIRP/NGC MONITORING WELL AND DESIGNATION
⊕	EXISTING OUTPOST MONITORING WELL (LIBERTY INDUSTRIAL FINISHING SITE) AND DESIGNATION

MWD MASSAPEQUA WATER DISTRICT
BWD BETHPAGE WATER DISTRICT
SFWD SOUTH FARMINGDALE WATER DISTRICT
NYWS NEW YORK WATER SERVICE
LWD TOWN OF HEMPSTEAD LEVITTOWN WATER DISTRICT

NWIRP/NGC SITE BOUNDARY

SCALE: 1"=2000'

PUBLIC WATER SUPPLY WELL LOCATIONS AND VERTICAL PROFILE BORING LOCATIONS AND RESULTS

DVIRKA AND BARTILUCCI
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

FIGURE 1