Plan for Replacement of OU2 Remedial Well 3

Northrop Grumman Systems, Corporation, Bethpage, NY

NYSDEC Site ID # 1-30-003A

November 29, 2011

The specific capacity of Operable Unit 2 (OU2) Remedial Well 3 has declined by more than 50 percent since the most recent development efforts in 2010 (current specific capacity is approximately 5 gallons per minute(gpm)/foot of drawdown (ft), compared to other OU2 remedial wells, which are greater than 25 gpm/ft). Repeated re-development efforts since 2004 have yielded diminishing returns. Therefore, Northrop Grumman determined that replacement of Well 3 will be required. The following bullets summarize the work sequence and scope to be completed in replacement of the well:

- **Vertical Profile Borings (VP3-1 and VP3-2 [latter if needed])**: Drilling and sampling of up to two vertical profile borings (VPBs) using mud rotary methodology to a depth of approximately 700 feet below land surface (ft bls) (to the Raritan Confining Unit), including the collection of groundwater samples via hydropunch and geologic samples via split-spoon soil sampler (sampling intervals are specified in Table 1). Geophysical logs will be run in each VPB borehole (gamma and electric) once the final depth has been reached. Figure 2 shows the proposed locations of the VPBs, to be finalized based on field conditions.

- **Monitoring Well Installation/Construction (MW3-1)**: A monitoring well will be installed in one of the VPBs discussed above. The design of the monitoring well will be based on the geology determined from split-spoon samples and gamma logging, and the results of the sieve analysis and water quality sampling of the VPB(s). Table 3 provides the monitoring well construction details. Figure 3 provides a typical monitoring well construction diagram.

- **Monitoring Well Development**: Following installation, the monitoring well will be developed by pumping (and backwashing) with a submersible pump and mechanical surging/pumping or water jetting/pumping. In compliance with NYSDEC policy, every effort practicable will be made to develop the well until turbidity is less than 50 nephelometric turbidity units (NTUs).

- **Remedial Well Installation/Construction (Well 3R)**: The remedial well will be installed using reverse rotary drilling methodology and constructed of low-carbon steel casing and stainless- steel screen. The final well design will be based on the geology determined from split-spoon samples and gamma logging, and the results of the sieve analysis and water quality sampling of the VPB(s). Table 3 provides the proposed well construction details and Figure 4 provides a diagram of the proposed remedial well.

- **Remedial Well Plumbness/Alignment**: Tests for plumbness and alignment will be performed following construction of the remedial well and before development begins.

- **Remedial Well Development**: Following installation, the remedial well will be initially developed by segmental pumping and surging (backwashing) with an isolation tool (packer). Following the pumping and surging development process, a vertical turbine or submersible pump will be used to develop the well by pumping and backwashing at a minimum rate of 1,500 gpm (approximately 1.25 times the desired design capacity of 1,200 gpm).

- **Pump Test**: A final specific capacity test will be performed in steps at the conclusion of development at rates of 500 gpm, 750 gpm, and 1,000 gpm for a minimum of two hours each step.

Estimated Schedule (contingent on driller availability and site conditions):

- Utility Clearance: December 2011
- Mobilization: December 2011
- VPB Completion (assume single VPB): January 2012
- Monitoring Well Completion: January 2012
- Remedial Well Construction Completion: February 2012
- Demobilization: March 2012

Table 1. Proposed Vertical Profile Boring Drilling/Sampling Details, Remedial Well 3 Replacement, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York.

Sample ID	Sampling Intervals (ft bls)	Split-Spoon Sampling Frequency (ft)	Hydropunch Groundwater Sampling Frequency (ft)	Groundwater Laboratory Analysis [3]	Borehole Geophysical Logging
Proposed VPB					
VP-3-1	Water Table[1] to 300	20	50	TCL VOC	Gamma/ Spontaneous Potential/Resistivity
	300 - 430	20	20	TCL VOC	
	430 - 570	5	10	TCL VOC	
	570 - 630	10	20	TCL VOC	
	630 - Raritan Clay	5	20	TCL VOC	
	Raritan Clay - End of Boring[4]	Continuous	Sand Units Only	TCL VOC	
Contingency VPB					
VP-3-2 [4]	Water Table[1] to 300	20	50	TCL VOC	Gamma/ Spontaneous Potential/Resistivity
	300 - 430	20	20	TCL VOC	
	430 - 570	5	10	TCL VOC	
	570 - 630	10	20	TCL VOC	
	630 - Raritan Clay	5	20	TCL VOC	
	Raritan Clay - End of Boring[4]	Continuous	Sand Units Only	TCL VOC	

Footnotes:

(1) Water table is approximately 50 ft bls.

(2) The decision to terminate drilling of the VPB(s) will be based on the split spoon samples, laboratory analysis of groundwater samples obtained from the VPB, and depth of the Raritan Confining Unit.

(3) Laboratory analysis of groundwater samples will be performed using the TCL List of VOCs and NYSDEC ASP 2000 Method OLM 4.2. Results will be obtained on a 24 hour TAT.

(4) VP-3-2 will serve as an additional proposed location and will be drilled only if analytical results from VP-3-1 do not indicate VOC concentrations similar to that of existing Well 3 and /or if unfavaorable geologic material for a replacement well are found.

Definitions:

ft bls	feet below land surface
VPB	vertical profile boring
TAT	turnaround time
TCL	target compound list
VOC	volatile organic compound
NYSDEC	New York State Department of Environmental Conservation
ASP	Analytical Services Protocol

Table 2. Summary of Proposed Well Constuction Details, Remedial Well 3 Replacement, Operable Unit 2, Northrop Grumman Systems Corporation, Bethpage, New York.

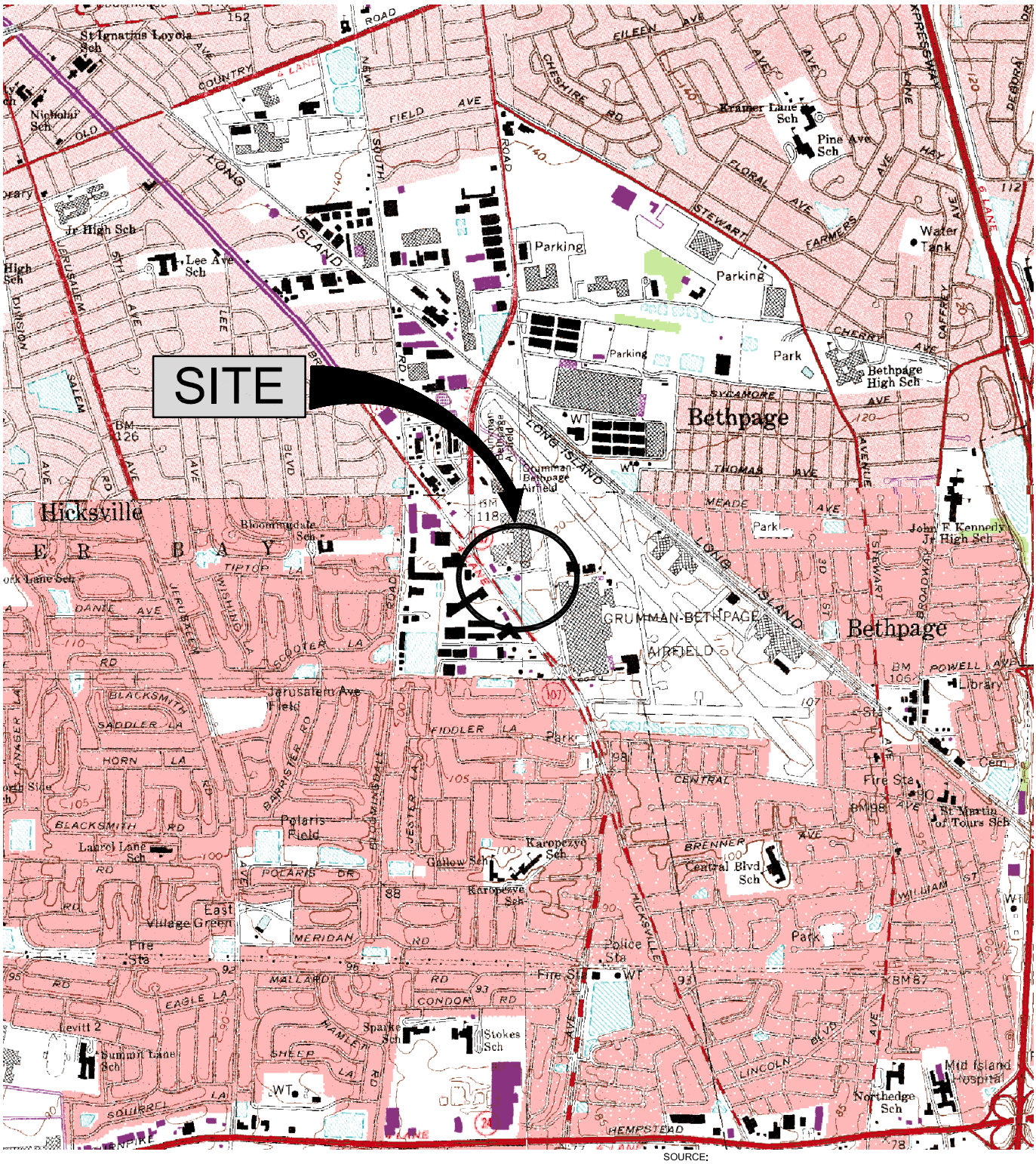
Well Identification	Nominal Borehole/ Well Diameter (in)	Casing/ Screen Material	Screen Slot Size (in)	Screen Length (ft)	Well Development Method	Protective Casing Diameter/Type	Groundwater Sampling
Monitoring Well							
MW3-1	10 / 4	Sch. 80 PVC/SS	0.01	20	AL/PS	8" FM	TCL VOC
Remedial Well							
Well 3R	24/16-inch casing and 12-inch screen	Low Carbon Steel/SS	0.05	60	AL/PS	TBD	TCL VOC

Footnotes

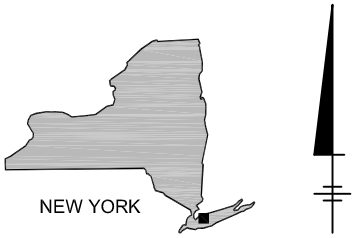
(1) Total depth and screened intervals of the monitoring well and remedial well will be determined based upon results from Vertical Profile Boring VP-3-1 or VP-3-2. Well specifications may be modified in the field based on site conditions.

Definitions

SS	Stainless Steel wire-wrapped
PVC	Polyvinyl chloride
in	inches
ft	feet
FM	Flush mount
AL/PS	Air lift/Pump and surge
NA	Not applicable
TBD	To Be Determined



SOURCE:
USGS 7.5 MIN. AMITYVILLE QUADRANGLE, AMITYVILLE, N.Y., 1994,
FREEPORT QUADRANGLE, FREEPORT, N.Y., 1994,
HICKSVILLE QUADRANGLE, HICKSVILLE, N.Y., 1967, PHOTOREVISED 1979,
HUNTINGTON QUADRANGLE, HUNTINGTON , N.Y., 1967, PHOTOREVISED 1979



0 2000' 4000'
SCALE IN FEET

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

SITE LOCATION

ARCADIS

FIGURE
1

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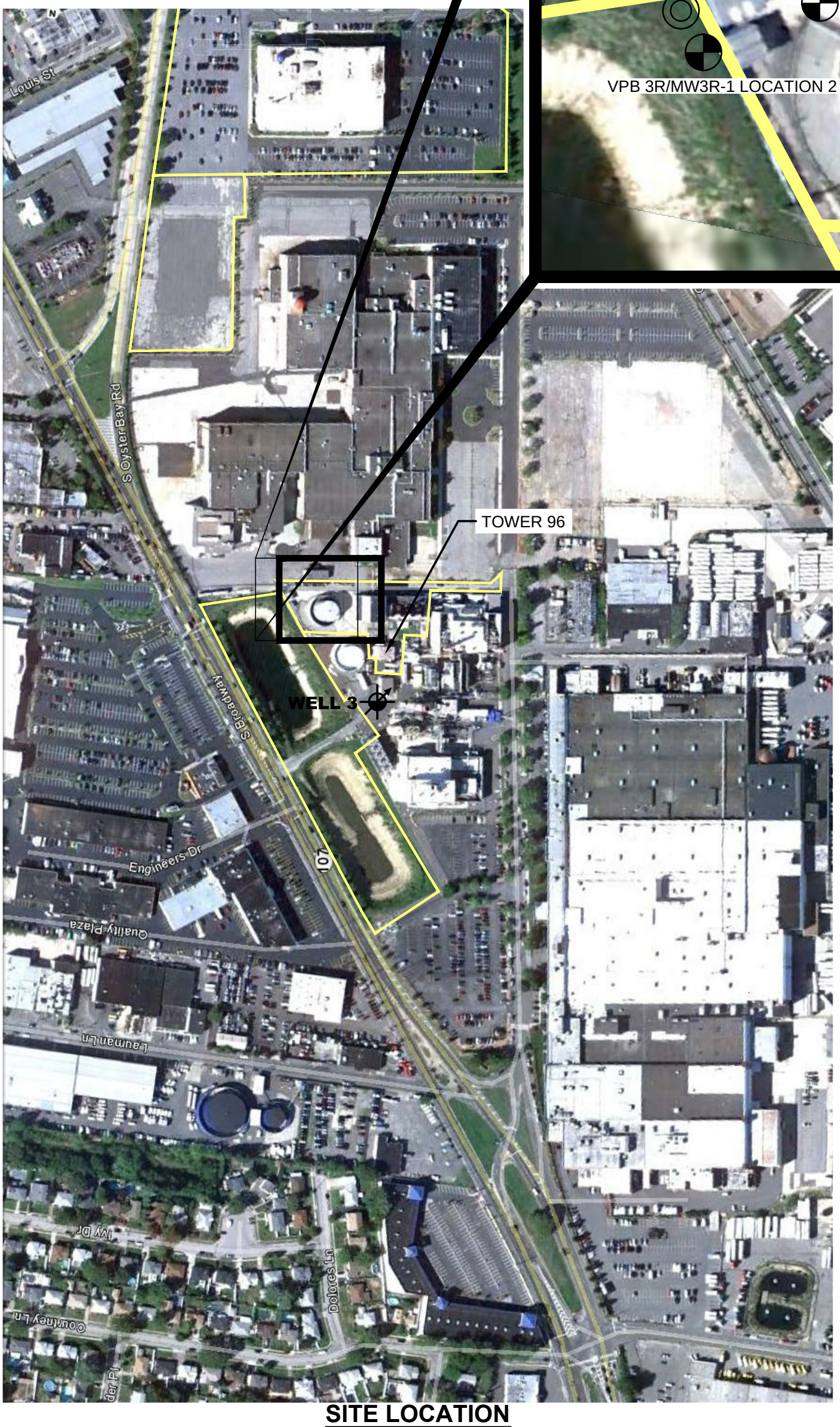


PROPOSED LOCATIONS

0 50' 100'

SCALE IN FEET

LEGEND:

NORTHROP GRUMMAN SYSTEMS CORPORATION OWNED PROPERTY (AS OF 2009)

PROPOSED VERTICAL PROFILE BORING AND MONITORING WELL

PROPOSED REMEDIAL WELL

SITE LOCATION

0 300' 600'

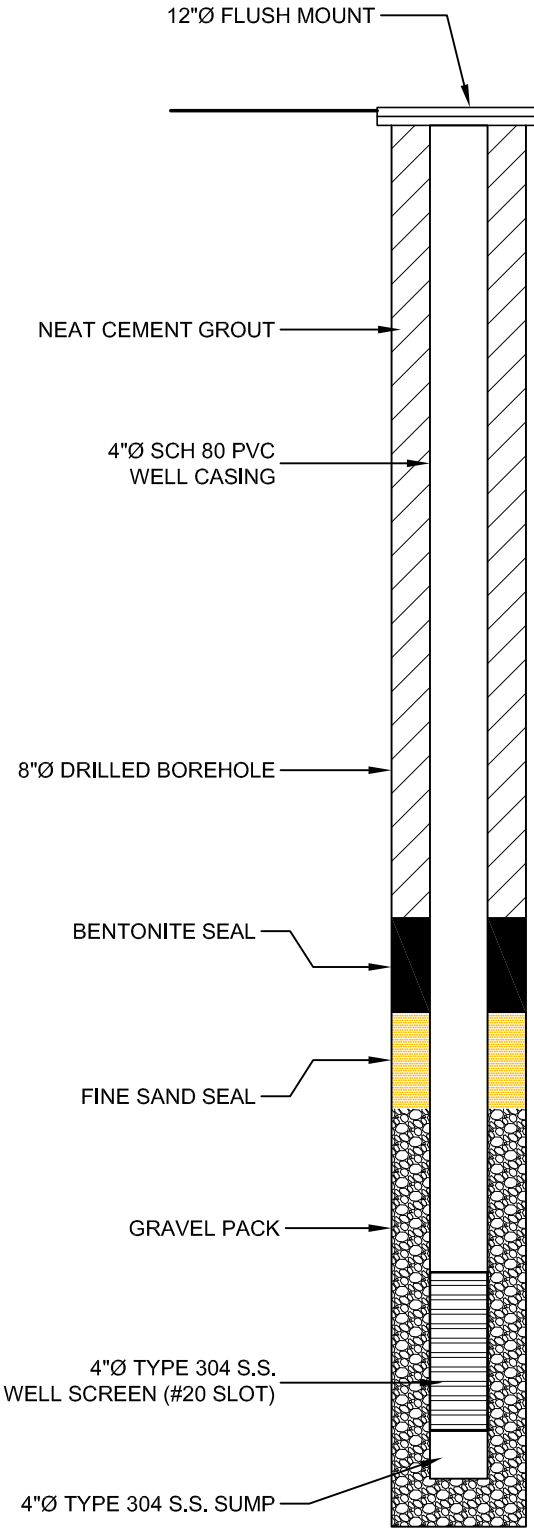
SCALE IN FEET

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

PROPOSED VPB/MONITORING WELL AND REMEDIAL WELL LOCATIONS

ARCADIS

FIGURE
2



NOTES:

1. WELL CONSTRUCTION DEPTHS AND RELATED WELL CONSTRUCTION ITEMS (i.e., SCREEN LENGTHS/SLOT SIZE, GRAVEL PACK) ARE APPROXIMATE. WELL DESIGN WILL BE FINALIZED BASED ON VERTICAL PROFILE BORING RESULTS.

DRAWING NOT TO SCALE

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

PROPOSED MONITORING WELL CONSTRUCTION DETAIL

ARCADIS

FIGURE
3

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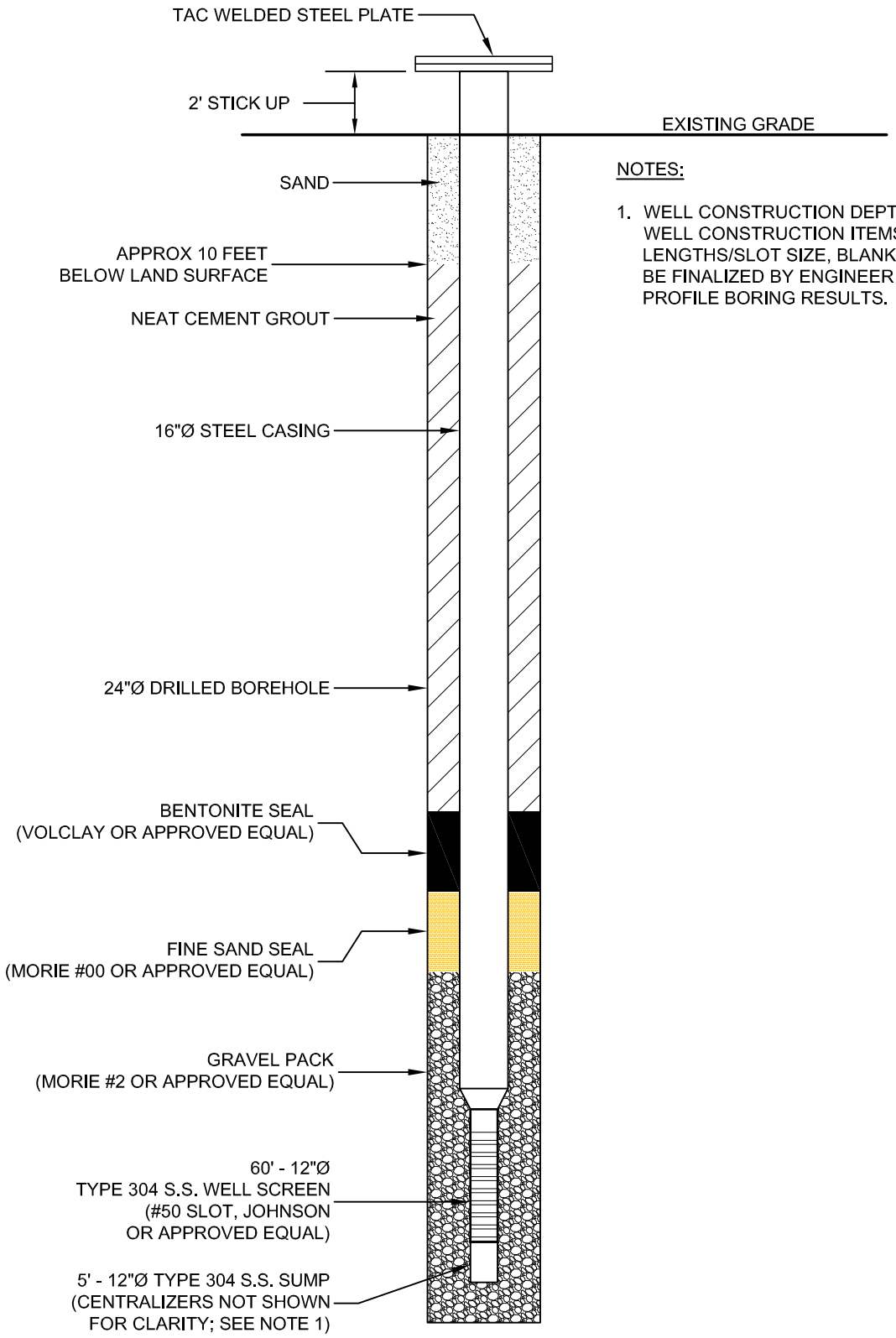

NOTES:

1. WELL CONSTRUCTION DEPTHS AND RELATED WELL CONSTRUCTION ITEMS (i.e., SCREEN LENGTHS/SLOT SIZE, BLANKS, GRAVEL PACK) WILL BE FINALIZED BY ENGINEER BASED ON VERTICAL PROFILE BORING RESULTS.

DRAWING NOT TO SCALE

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

PROPOSED WELL 3 REPLACEMENT CONSTRUCTION DETAIL

ARCADIS

FIGURE
4

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