

David Garrett & Associates

Engineering and Geology



June 22, 2009

Ms. Jackie Drummond
NC Division of Waste Management
Solid Waste Section
Mail Service Center 1646
Raleigh, NC 27699-1646

RE: Ground Water Assessment Work Plan – Revised
C&D Landfill, Inc. (Pitt County, NC)
ND Solid Waste Permit #74-07

Dear Ms. Drummond:

Thank you for meeting with me and Donna Wilson on June 9, 2009 to discuss the upcoming Assessment Monitoring program for the referenced facility, and your comments provided on June 18, 2009, which this revision addresses. This document formalizes our discussion and presents a brief summary of known conditions associated with the facility and a work plan for an assessment monitoring program, consistent with your expectations following our meeting. During that meeting you asked for several items, including a copy of the November 2008 monitoring report (in progress) and an Environmental Monitoring Form for the May 2008 sampling event. These documents will be transmitted in the near future under separate cover. You asked about the stream and wetlands classifications (see Background Information).

Subsequent to our meeting, I received verbal information from the May 2009 sampling event (report is in progress), which suggests that the number and concentration of constituents of concern may be decreasing. However, the regulations are specific regarding the initial course of action for the assessment. Thus, I propose an independent sampling event for Appendix II constituents at existing wells MW-3s and MW-8 (which had previously shown a slight impact), plus the installation and sampling of one new well at the property line (down gradient of the apparent impact) and three of the Phase 2 wells (upgradient of the apparent impact). Then we will review the data with the SWS to determine the next course of action.

Summary of Objectives

C&D Landfill, Inc. is entering a ground water assessment monitoring program as a requirement of North Carolina Solid Waste regulations. Assessment monitoring is a self-implementing sampling program triggered by one or more constituents, those normally monitored in the detection-stage monitoring program, that exceed North Carolina ground water protection standards (15A NCAC 2L). Detection of a handful of key constituents on the US-EPA Appendix I sampling list – common at unlined landfills – at concentrations just slightly above the 2L standards, has occurred at a small number of wells.

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The values that exceed the 2L standards have persisted for a couple of years, but (at present) both the number of constituents and the concentrations appear to be decreasing. Per the regulations, initial assessment activities shall consist of installing one or more new monitoring wells at the compliance boundary (property line) and sampling this well and a subset of the other wells for the US-EPA Appendix II sampling list for an indeterminate time. Depending on the results, amendments to the routine detection-stage monitoring program may be required.

Background Information

C&D Landfill, Inc., is an unlined construction and demolition debris landfill (CDLF) that is regulated under 15A NCAC 13B .0537 *et seq.* The regulations impose strict material acceptance requirements, and the facility has been operated in compliance based on periodic inspection by the regulatory agency. Phase 1 of the CDLF covers approximately 15 acres and opened in 2001, following site characterization studies performed ca. 2000 that identified the ground water flow conditions.

Subsurface conditions within the upper 70 feet consist of two relatively sandy aquifers (fluvial and shallow marine sediments) separated by a partial confining layer (deep marine silt-clay associated with the Yorktown Formation) – the deeper sandy layer is underlain by another confining layer. An upward hydraulic gradient exists beneath much of the site due to mild artesian pressure within the deeper aquifer. Ground water is shallow (typically within 5 feet beneath the surface) and is directed to the south, toward large receiving streams (Grindle Creek and/or the Tar River).

The downgradient area (between the facility and the streams) is mostly within the 100-year floodplain and contains extensive wetlands. There are no ground water users located down-gradient of the facility (i.e., between the landfill and the ground water discharge features), and no down-gradient development potential exists. No constituents exceeding the 2L standards have been detected in the deeper aquifer. The wetlands classifications (based on attached NWI data) are PSS and PFO, with modifiers indicating needle and deciduous vegetation, saturated and/or seasonally flooding, and partially drained/ditched.

Grindle Creek (based on NC DENR BIMS data) has a class C-NSW stream designation (fresh water, supportive of aquatic life and recreation, nutrient sensitive). Past uses of the site include agriculture and recreational hunting – both potential sources of some of the contaminants observed in excess of the 2L standards. The initial waste material brought to the facility was Hurricane Floyd flood damaged demolition debris, which was collected under emergency management conditions – materials that are not normally admitted to a CDLF under the Solid Waste regulations may have been introduced. Ground water monitoring did indicate certain inorganic background constituents – not the focus of this assessment – which are exacerbated by turbidity. The organic constituents were only recently detected.

Ground Water Monitoring Network

Currently, there are twelve (12) monitoring wells in place for Phase 1, eight (8) of which monitor the uppermost aquifer within depths of approximately 15 to 25 feet – these are sampled on a semi-annual basis in accordance with the regulations – and four (4) deeper wells that are sampled less frequently. The

background wells for Phase 1 are MW-1s and MW-1d. Planned future monitoring of Phase 2 (under permit review) includes nine (9) additional wells with one deep well (MW-14A) and another upgradient background well (MW-9A). For the initial stages of the assessment monitoring, plans are to install and sample one supplemental well at the property line (MW-3A), located down-gradient the wells historically showing the highest concentrations of Appendix I constituents (MW-8 and MW-3s), in accordance with the Solid Waste regulations, and three (3) of the proposed Phase 2 wells (MW-10, MW-11, and MW-12).

Background sampling for Phase 2 is required prior issuance of the Permit to Operate – although this is a separate issue from the Assessment Monitoring for Phase 1 – sampling the three Phase 2 wells as part of the Assessment will assist in determining the contaminant source. There are three stream sampling locations to monitor the discharge of the uppermost aquifer to the on-site water bodies. The well network and regional topographic conditions are shown on the accompanying drawings (**Sheets 1 through 5**).

Detection Stage Monitoring

Semi-annual sampling is conducted in May and November of each year. The sampling and analysis is performed by a local laboratory (Environment-1) in accordance with North Carolina regulations and industry protocols. The data are reviewed and reported by professional geologists. A data base has been established from which trends can be observed. The following is a summary of the constituents that exceed the 2L standards, prepared subsequent to the November 2008 sampling event but prior to the issuance of the report for the May 2009 sampling event. Preliminary results for the May 2009 sampling event were communicated by telephone for the preparation of this work plan. The full data set is summarized on the attached **Table 1**.

MW-3s:

- Benzene and 1,2-Dichloroethane have been detected **above** the 2L standards and have exhibited an upward trend in concentration since November 2007. Vinyl chloride has been detected **above** the 2L standard twice since November 2007, most recently in November 2008.
- Cis-1,2-Dichloroethene, ethylbenzene, methylene chloride and toluene have been consistently detected since November 2007 at levels **below** the 2L standards. Cis-1,2-Dichloroethene and toluene have exhibited an upward trend in concentrations.

MW-8:

- Benzene, cis-1,2-Dichloroethene and methylene chloride have been consistently detected since November 2007 at concentrations **below** the 2L standards.

MW-1s and MW-2s:

- Cis-1,2-Dichloroethene was detected in the samples collected from MW-1s and MW-2s for the first time in November 2008 at concentrations **below** the 2L standard.

Based on new information for the May 2009 sampling event, communicated by the lab via telephone – not available for a meeting with SWS on June 9, 2009 – only benzene was detected at MW-3s slightly above the 2L standard (the concentration was 1.5 µg/l, whereas the 2L standard is 1.0 µg/l).

Discussion of the Data

1,2-Dichloroethane (1,2-DCA) is a common chemical intermediate used in the production of vinyl chloride, which is the main precursor for the production of PVC. It is also used as an industrial solvent and was formerly used as an anti-knock agent in leaded gasoline (chlorinated equivalent of ethylene dibromide (EDB)). 1,2-DCA is relatively recalcitrant in the environment and can persist for many years once released to groundwater.

Cis-1,2-Dichloroethene (DCE) and vinyl chloride are environmental breakdown products of trichloroethene (TCE), which is a common industrial solvent and degreasing agent. TCE is also an environmental breakdown product of tetrachloroethene (PCE), a common industrial solvent frequently used in dry cleaning.

Methylene chloride (MC) is a common industrial solvent that is widely used as a paint stripping and degreasing agent. It is also a common laboratory contaminant introduced during preparation of samples for analysis. MC is a direct environmental breakdown product of chloroform, which is widely used as an industrial solvent and as a chemical intermediate in the production of other organic chemicals, and it is found in building materials.

Benzene, ethylbenzene, and toluene are three (of the four) chief constituents of gasoline.

Based on the above, it is likely that a contaminant source exists hydraulically upgradient of the location of MW-3s. Further, based on the mix of contaminants reported in groundwater, the source materials likely include 1,2-DCA and TCE (possibly chloroform or MC), the latter being a parent compound of the environmental breakdown products found at MW-3s and MW-8.

None of the foregoing constituents (or concentrations) indicates gross contamination or a chronic, worsening condition. In fact, the most recent data suggest a “slug” of contaminants may have been released at an unknown time and the apparent impact may be improving on its own. Concentrations of some constituents come and go, perhaps tied to seasonal water level fluctuation – there may be a tendency for the light constituents (relative to water) to reside in the partly saturated capillary space above the water table (vadose zone), only to be released during time of low water levels – petroleum products are known to exhibit such tendencies. Water levels have fluctuated in recent years due to the prolonged drought, and dilution factors associated with quantities of ground water movement come into play.

Barring any significant future changes in the data, nothing in the data appear to affect the future ability to monitor the site, nor does the data necessarily reflect on the operation of the facility.

Other Issues to Consider

Source location – It appears that the constituents detected in the ground water have been introduced to the aquifer somehow; the constituents in question are not naturally occurring compounds or believed to derive from the normal decomposition of C&D wastes. So far, the apparent ground water impacts are limited to the west side of the Phase 1 footprint, although it has not been determined if the landfill operation is responsible for the impact. The uppermost aquifer, monitored by the shallow wells, is showing a potential impact, but not the deeper well which monitors a lower aquifer, separated from the upper by a confining unit. The data trends do not clearly indicate if the impact is due to a short-term (or one-time) release or a chronic condition. Based on the new information (May 2009) the impact may be abating on its own.

Past uses of the site – The history of the site – as well as adjacent properties – are fairly well understood, some of which could potentially lead to a contaminant being introduced to the ground water at Phase 1 (gasoline components, probably not the organic solvents). These uses include former agricultural activities and dismantling of flood damaged mobile homes in the Phase 1 area, along with the MSW transfer station and material processing area located upgradient (north) of Phase 2 – albeit these off-site facilities quite a distance away and located across wetlands features (these are not suspected facilities). The landfill began as a repository for Hurricane Floyd food-damage debris some of this material that was brought in under emergency management conditions may have contained components that would normally be excluded from a C&D landfill. The normal operation of the C&D landfill after the initial waste placement has been compliant with the regulatory requirements for waste acceptance.

Extent of impact – The intent of the assessment monitoring program is to determine the horizontal and vertical extent of the impact (if one exists), and to determine if there is any risk to the public. At a minimum, one new well is typically required (per the regulations) to check for compliance boundary (property line) violations. The assessment monitoring program also seeks to establish a baseline data base of the Appendix II list of constituents, upon which trends can be established by comparing the results of future sampling events, followed by future adjustments to the long-term monitoring program and any corrective that might be appropriate. Temporal trends are important, as well, whereas the data may indicate a temporary problem or chronic conditions, which would be treated in different ways.

Corrective action – The next logical step after assessment monitoring is consideration of corrective measures. It is premature to discuss corrective measures at this time, but one typical response to a ground water impact is to acquire more property for buffer purposes, followed by natural attenuation and continued monitoring. Other potential corrective measures that might be considered are various forms remediation, e.g., extraction and treatment, in-situ treatment (bacterial injection), and/or cut-off walls. All these measures are very dependent on the nature, concentration and ultimate fate of the contaminants.

Assessment Monitoring Work Plan

1. Prepare an Assessment Monitoring Plan (this document) and review it with NC DENR-SWS officials – this document formalizes the discussion from the June 9, 2009 and follow up reviews.
2. Install one (1) downgradient well at the property line (MW-3A) and three (3) wells in the Phase 2 monitoring network (MW-10, MW-11, MW-12) during mid-July 2009. In accordance with Rule .0545(b)(1)(B), slug testing will be performed to determine the hydraulic conductivity. The other wells for Phase 2 may be installed during this time. All new wells will be surveyed.
3. Sample these four wells plus MW-3s and MW-8 (total of six wells) for the full Appendix II list by late-July 2009 – this will be an independent sampling event relative to Phase 1, i.e., the sampling event will be out-of-sequence with the routine semi-annual sampling schedule.
4. Prepare a summary report by mid-August 2009, including a detailed evaluation of site geology and potential ground water receptors, along with the results of the independent sampling event. It should be noted that much of the data needed for the hydrogeology portion of the assessment has been completed as part of the earlier permitting studies.
5. Review the summary report with NC DENR-SWS officials to determine which wells and which, if any, Appendix II parameters might be appropriate for sampling during the next semi-annual sampling event (November 2009) – the subset of Appendix II parameters will be added to the normal Appendix I parameter list for the next four consecutive semi-annual samples.
6. Assessment of Corrective Measures will follow. Depending on the baseline data, future adjustments to the long-term sampling program may be appropriate – or the sampling might revert back to the Appendix I list.

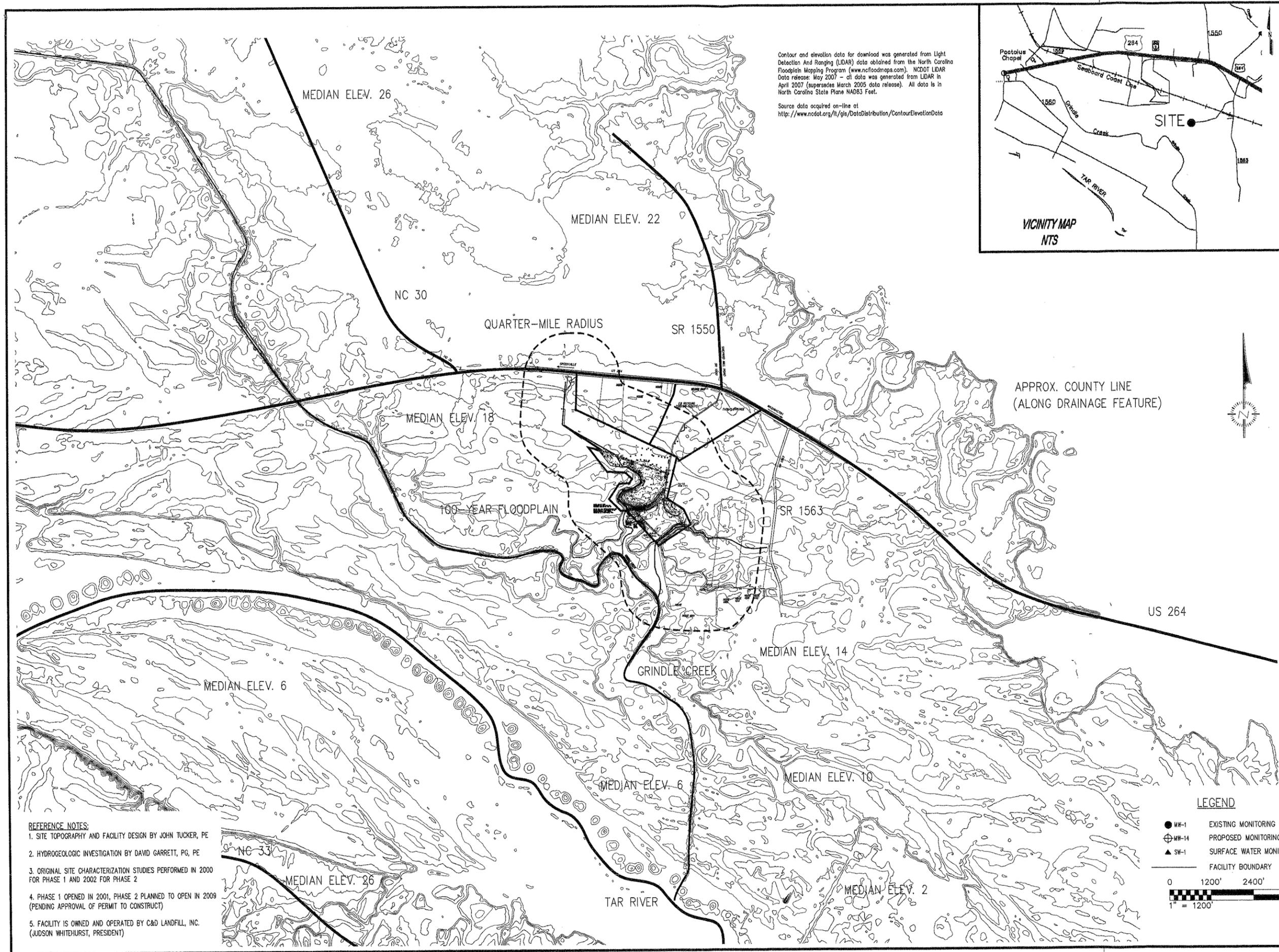
In accordance with Rule .0545(a)(2) and (3), the approved work plan for the Assessment Monitoring program and subsequent data will be placed in the facility operating record and, in the event that an off-site migration is detected, local government officials and adjacent property owners will be notified.

Please contact me if you have any questions or concerns. I propose to implement the assessment in accordance with the schedule outlined in the following document, same as discussed in our meeting, which involves installing and sampling the new wells within the next six weeks. I will review the data with you when it becomes available, then we can discuss the next course of action.

Cordially yours,

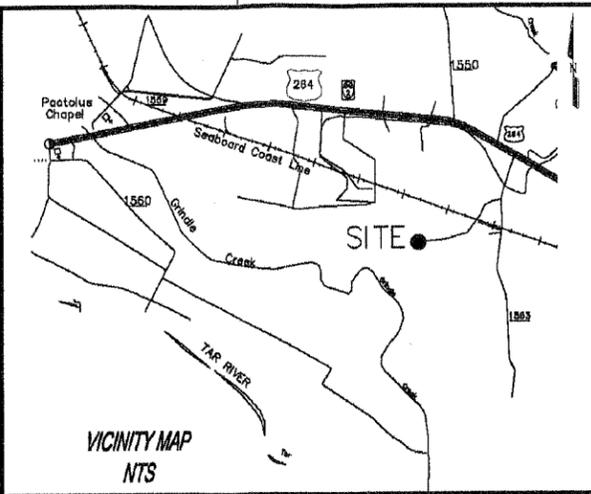

G. David Garrett, PG, PE

cc: Judson Whitehurst, Wayne Bell – C&D Landfill, Inc.
Donna Wilson – NC DENR-DWM, SWS



Contour and elevation data for download was generated from Light Detection And Ranging (LIDAR) data obtained from the North Carolina Floodplain Mapping Program (www.ncfloodmaps.com). NCDOT LIDAR Data release: May 2007 - all data was generated from LIDAR in April 2007 (supersedes March 2005 data release). All data is in North Carolina State Plane NAD83 Feet.

Source data acquired on-line at <http://www.ncdot.org/it/gis/DataDistribution/ContourElevationData>



REVISION	NO.	DATE

ISSUED FOR REGULATORY REVIEW
6-18-09

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PROJECT TITLE
C&D LANDFILL, INC.
ASSESSMENT MONITORING
PITT COUNTY, NC
PERMIT #74-07

DRAWING TITLE
REGIONAL TOPOGRAPHY
AND SURFACE DRAINAGE
W/ QUARTER-MILE RADIUS

DESIGNED BY: G.D.G.	DRAWN BY: G.D.G.
CHECKED BY: J.A.T.	PROJECT NO.: CDLF-3
SCALE: AS SHOWN	DATE: JUNE 2009
FILE NAME: C&D LANDFILL ASSESSMENT	SHEET NO.: 1
DRAWING NO.:	S1

- REFERENCE NOTES:**
1. SITE TOPOGRAPHY AND FACILITY DESIGN BY JOHN TUCKER, PE
 2. HYDROGEOLOGIC INVESTIGATION BY DAVID GARRETT, PG, PE
 3. ORIGINAL SITE CHARACTERIZATION STUDIES PERFORMED IN 2000 FOR PHASE 1 AND 2002 FOR PHASE 2
 4. PHASE 1 OPENED IN 2001, PHASE 2 PLANNED TO OPEN IN 2009 (PENDING APPROVAL OF PERMIT TO CONSTRUCT)
 5. FACILITY IS OWNED AND OPERATED BY C&D LANDFILL, INC. (JUDSON WHITEHURST, PRESIDENT)

APPROX. COUNTY LINE
(ALONG DRAINAGE FEATURE)



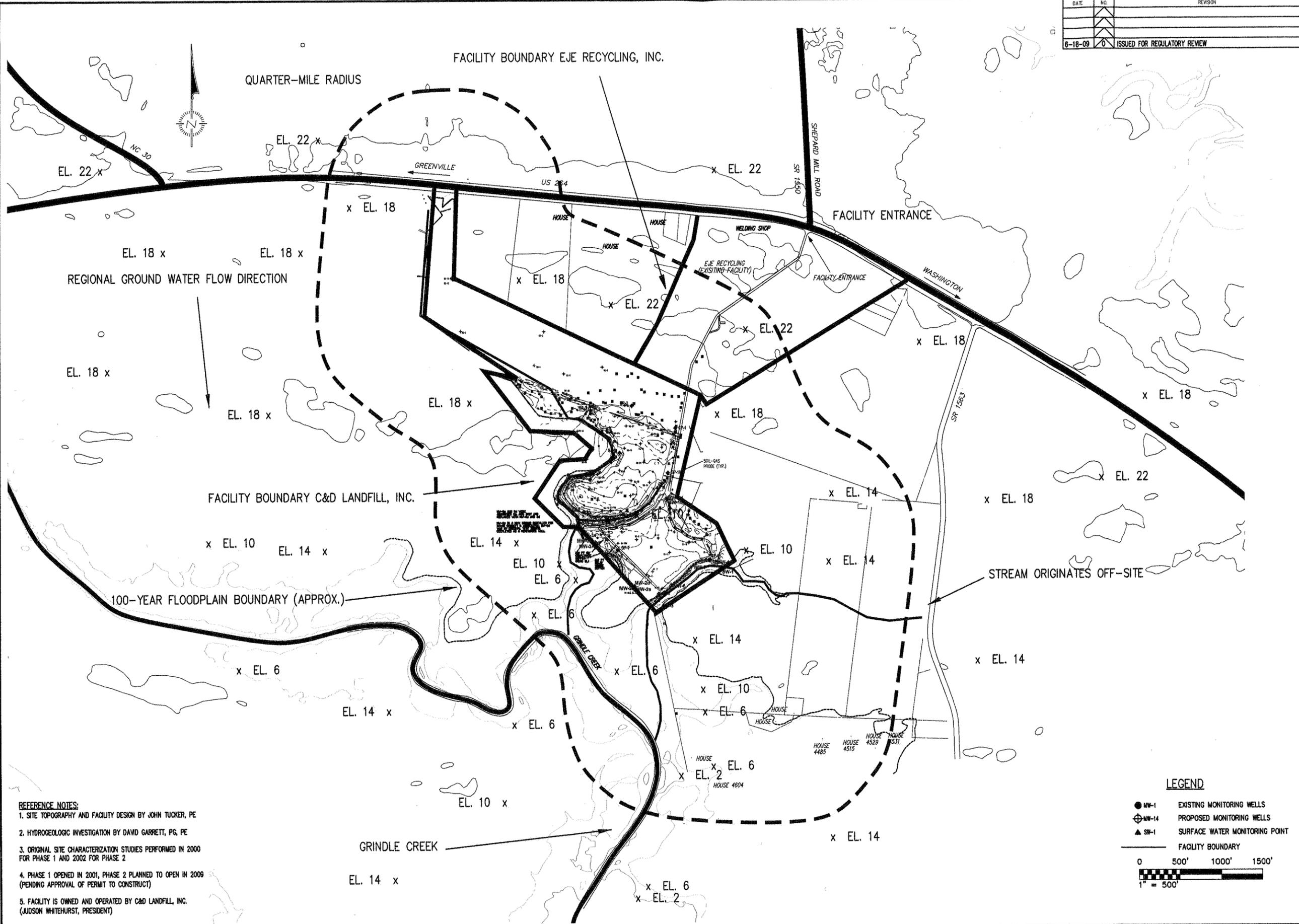
LEGEND

- MW-1 EXISTING MONITORING WELLS
- ⊕ MW-14 PROPOSED MONITORING WELLS
- ▲ SW-1 SURFACE WATER MONITORING POINT
- FACILITY BOUNDARY

0 1200' 2400' 3600'

1" = 1200'

DATE	NO.	REVISION
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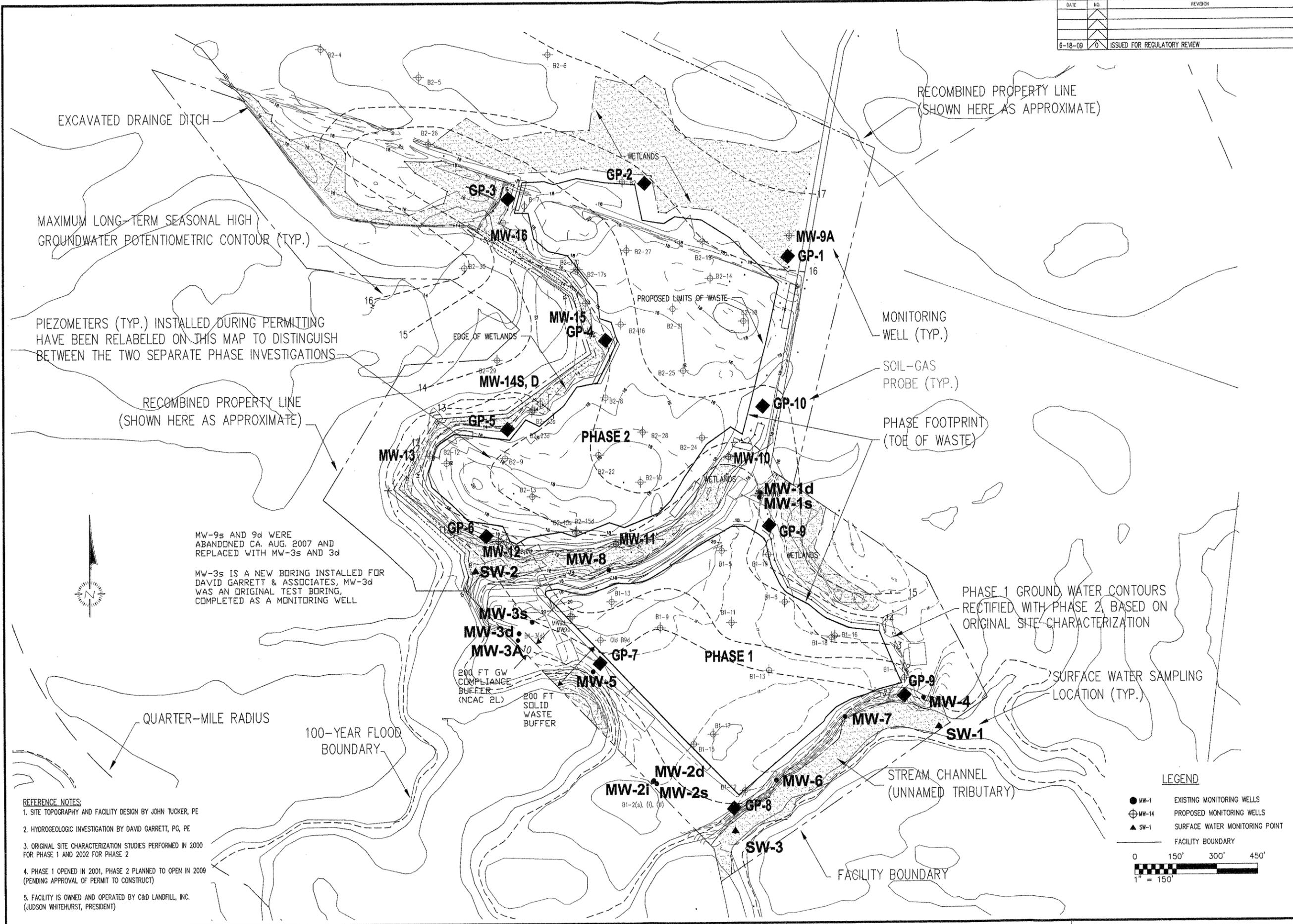


PROJECT TITLE:
C&D LANDFILL, INC.
ASSESSMENT MONITORING
PITT COUNTY, NC
PERMIT #74-07

OVERALL FACILITY PLAN
 RECYCLING FACILITY AND
 CDLF (PHASES 1 AND 2)

DESIGNED BY: G.D.G.	DRAWN BY: G.D.G.
CHECKED BY: J.A.T.	PROJECT NO.: CDLF-3
SCALE: AS SHOWN	DATE: JUNE 2009
FILE NAME: C&D LANDFILL ASSESSMENT	SHEET NO. DRAWING NO.
2	S2

DATE	NO.	REVISION
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MW-9s AND 9d WERE ABANDONED CA. AUG. 2007 AND REPLACED WITH MW-3s AND 3d
 MW-3s IS A NEW BORING INSTALLED FOR DAVID GARRETT & ASSOCIATES, MW-3d WAS AN ORIGINAL TEST BORING, COMPLETED AS A MONITORING WELL

LEGEND

- MW-1 EXISTING MONITORING WELLS
- ⊕ MW-14 PROPOSED MONITORING WELLS
- ▲ SW-1 SURFACE WATER MONITORING POINT
- FACILITY BOUNDARY

0 150' 300' 450'
 1" = 150'

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C&D LANDFILL, INC.
 ASSESSMENT MONITORING
 PITT COUNTY, NC
 PERMIT #74-07

PRE-CONSTRUCTION
 GROUND WATER CONTOURS
 (PHASES 1 AND 2)

DESIGNED BY: G.D.G. DRAWN BY: G.D.G.
 CHECKED BY: J.A.T. PROJECT NO.: CDF-3
 SCALE: DATE: JUNE 2009
 FILE NAME: C&D LANDFILL ASSESSMENT
 SHEET NO.: 3 DRAWING NO.: AP1

DATE	NO.	REVISION
6-18-09	0	ISSUED FOR REGULATORY REVIEW

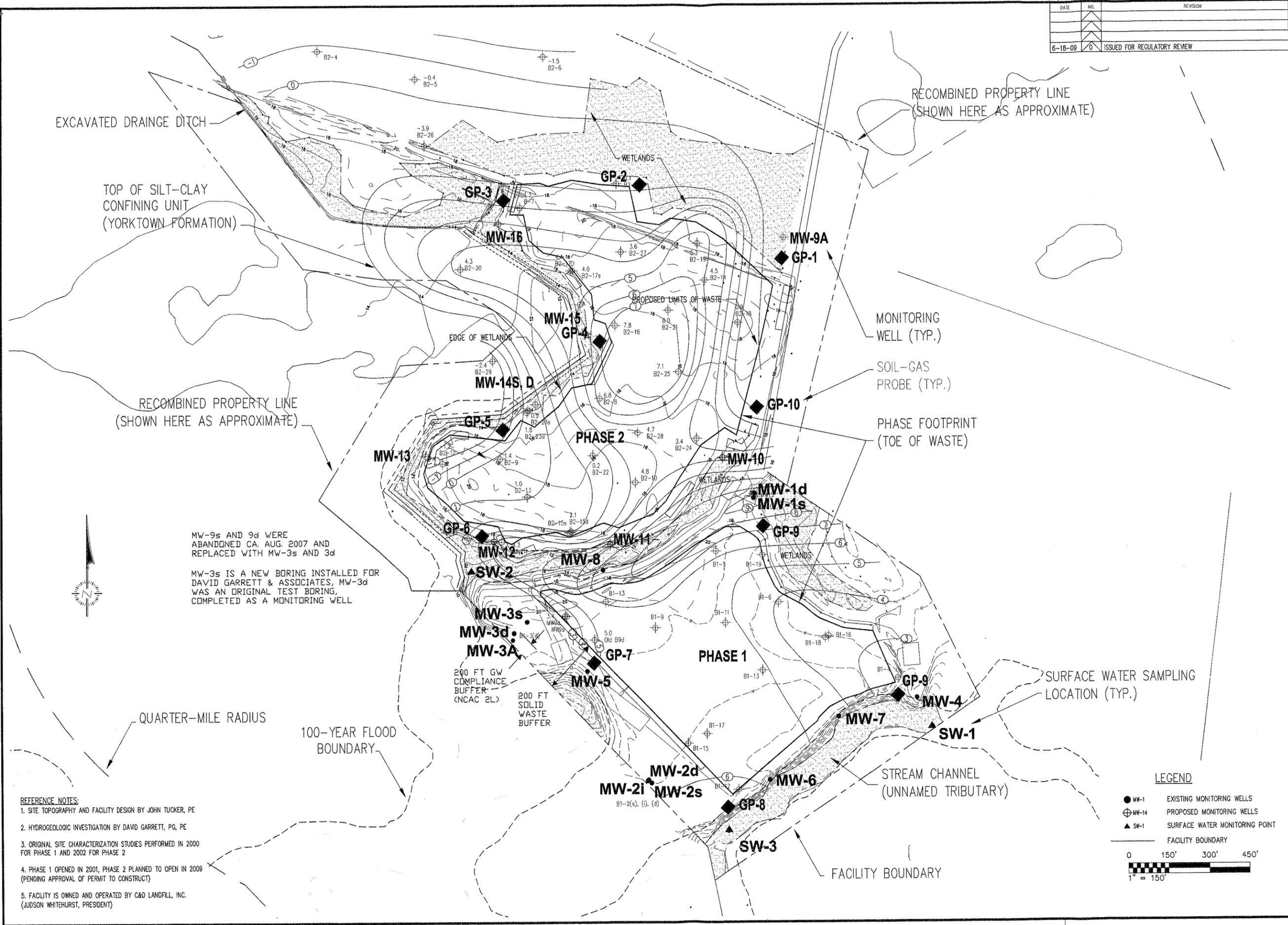
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C&D LANDFILL, INC.
 ASSESSMENT MONITORING
 PITT COUNTY, NC
 PERMIT #74-07

**TOP OF CONFINING UNIT
 PER SITE CHARACTERIZATION
 (WHOLE FACILITY)**

DESIGNED BY: G.D.G.	DRAWN BY: G.D.G.
CHECKED BY: J.A.T.	PROJECT NO.: CDLF-3
SCALE: AS SHOWN	DATE: JUNE 2009
FILE NAME: C&D LANDFILL ASSESSMENT	SHEET NO. / DRAWING NO. 4 / AP2



DATE	NO.	REVISION
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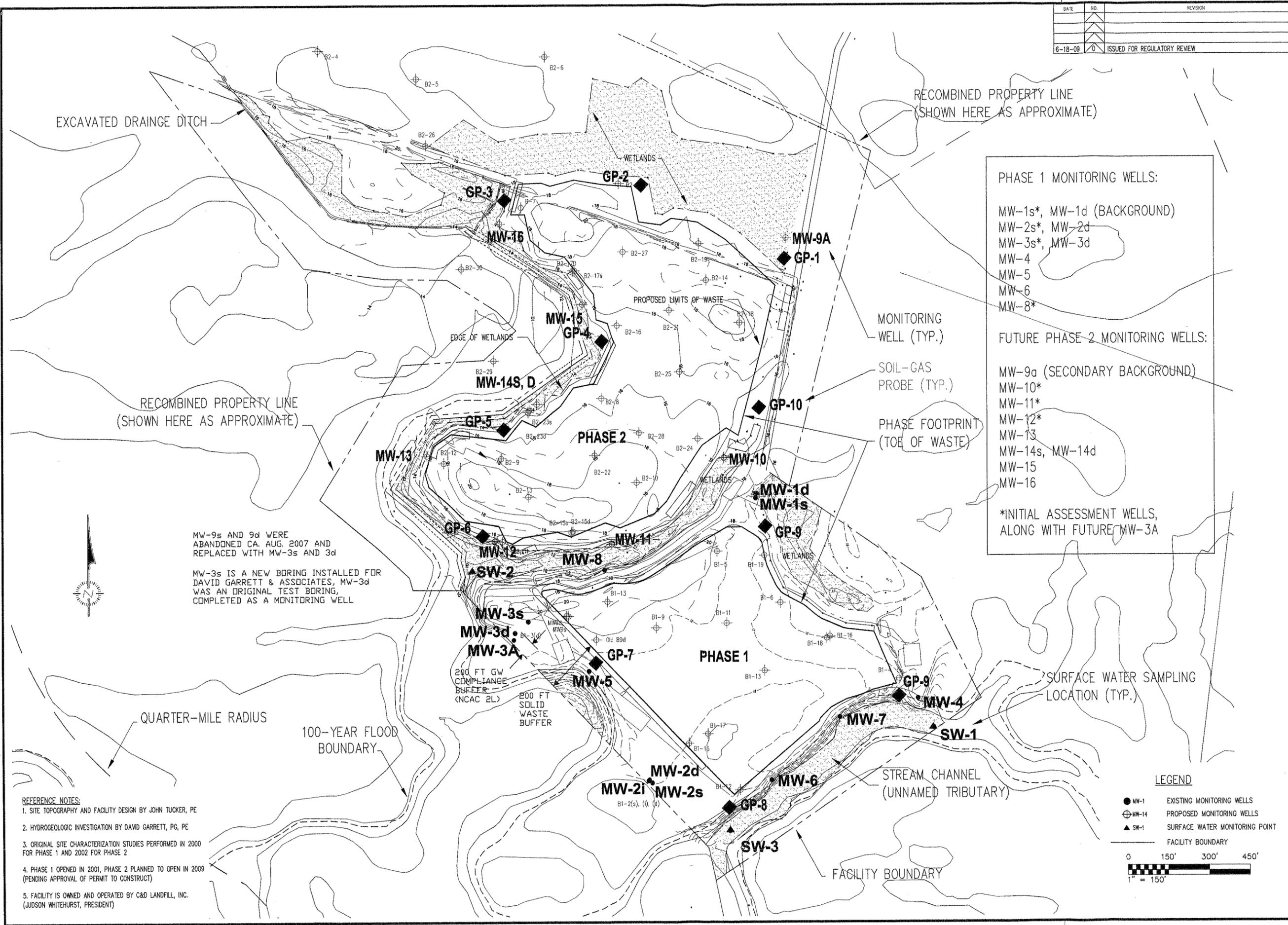
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PROJECT TITLE: C&D LANDFILL, INC.
 ASSESSMENT MONITORING
 PITT COUNTY, NC
 PERMIT #74-07

GROUND WATER
 MONITORING LOCATIONS
 (PHASES 1 AND 2)

DESIGNED BY: G.D.G.	DRAWN BY: G.D.G.
CHECKED BY: J.A.T.	PROJECT NO.: COLF-3
SCALE: AS SHOWN	DATE: JUNE 2009
FILE NAME: C&D LANDFILL ASSESSMENT	
SHEET NO.: 5	DRAWING NO.: AP3



- PHASE 1 MONITORING WELLS:**
- MW-1s*, MW-1d (BACKGROUND)
 - MW-2s*, MW-2d
 - MW-3s*, MW-3d
 - MW-4
 - MW-5
 - MW-6
 - MW-8*
- FUTURE PHASE-2 MONITORING WELLS:**
- MW-9a (SECONDARY BACKGROUND)
 - MW-10*
 - MW-11*
 - MW-12*
 - MW-13
 - MW-14s, MW-14d
 - MW-15
 - MW-16
- *INITIAL ASSESSMENT WELLS, ALONG WITH FUTURE MW-3A

MW-9s AND 9d WERE ABANDONED CA. AUG. 2007 AND REPLACED WITH MW-3s AND 3d

MW-3s IS A NEW BORING INSTALLED FOR DAVID GARRETT & ASSOCIATES, MW-3d WAS AN ORIGINAL TEST BORING, COMPLETED AS A MONITORING WELL

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