



General Motors
Environmental and Energy Staff
Remediation Group
Argo "A" - 10th Floor
485 W. Milwaukee
Detroit, MI 48202

January 26, 1994

Ms. Barbara Cowles
Department of Natural Resources
Environmental Response Division
Shiawassee District Office
10650 S. Bennett Drive
Morrice, Michigan 48857

RE: Linden Road Landfill

Dear Ms. Cowles:

Enclosed please find a letter report from our consultant (Roy F. Weston, Inc.) documenting the abandonment of the old monitoring well network installed by Keck Consulting Services, Inc. from 1979 to 1980. These older monitoring wells provided limited data as they were constructed of galvanized riser pipe and were generally screened in the underlying clay unit. Please note that the monitoring well network recently installed by Roy F. Weston, Inc. during the site investigation has been left intact.

If you have any questions, please contact me at (313) 556-0889.

Sincerely,

Edward Peterson

With Enclosure





Roy F. Weston, Inc.
Suite 400
3 Hawthorn Parkway
Vernon Hills, Illinois 60061-1450
708-918-4000 • Fax 708-918-4055



24 January 1994

Mr. Edward Peterson
General Motors Corporation
Argonaut "A" - 1004H
485 West Milwaukee Avenue
Detroit, Michigan 48202

Work Order No. 01138-070-001

Re: Abandonment of Keck Consulting Services, Inc. Observation Wells
Linden Road Landfill Site

Dear Mr. Peterson:

On behalf of AC Rochester Division of General Motors Corporation (GM), Roy F. Weston, Inc. (WESTON®) has completed the abandonment of 18 observation wells that were installed by Keck Consulting Services, Inc. (Keck) in 1979 and 1980 at the Linden Road Landfill site (LRLF) located in Flint Township, Michigan. This letter presents the background information regarding these wells and describes the procedures followed during their abandonment.

BACKGROUND

Historical records indicated that a total of 19 observation wells were installed during Phase I and Phase II hydrogeological investigations conducted by Keck in 1979 and 1980, respectively. The locations of these wells are shown in Figure 1. Records also indicated that all the wells were constructed of 2-inch diameter, Schedule 40, galvanized pipe with a leading 2-foot, 924-#7 slot stainless steel screen. Soil boring logs and well construction diagrams from Keck's Phase I and Phase II hydrogeological investigation reports indicate that the Keck observation wells consisted of 7 shallow wells and 12 deep wells. The depths of the 19 observation wells, as estimated from well construction diagrams presented in the Phase I and Phase II hydrogeological investigation reports prepared by Keck, are included in Table 1.

Pursuant to a site investigation and interim remedial measures evaluation conducted at the site in 1991 by WESTON on behalf of GM, it was determined that because of the well screen intervals and the construction materials used, the Keck wells could only provide limited data which may not accurately reflect site conditions. Furthermore, additional groundwater monitoring wells were installed by WESTON during the site investigation. These WESTON wells used more appropriate construction materials and more accurately define site conditions. Therefore, it was recommended that the Keck wells be properly abandoned. The findings of the aforementioned site investigation and interim remedial





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measures evaluation along with recommendations were submitted to the Michigan Department of Natural Resources (MDNR) in a report entitled "Interim Remedial Measures Evaluation and Site Investigation Report, Linden Road Landfill Site, Flint Township, Michigan" (WESTON, March 1992).

OBSERVATION WELL ABANDONMENT

Well abandonment activities were conducted by WESTON's subcontractor, Mateco Drilling Company (Mateco) of Grand Rapids, Michigan. Mateco mobilized a two-man crew with a CME 850 ATV drill rig to the site on 17 November 1993. The drill rig was equipped with 4.25-inch internal diameter (I.D.) hollow stem augers (HSA). The well abandonment work began on 17 November 1993 and was completed on 2 December 1993. A WESTON geologist was present at the site to direct, supervise, and document all field activities throughout this project. The WESTON geologist also served as the Site Health and Safety Coordinator.

During well abandonment activities, field screening was performed using a 10.2 eV H_{Nu} photoionization detector (PID). The PID was used to screen all boreholes and cuttings for volatile organic compounds (VOCs). The PID was calibrated daily using factory-approved calibration gases. No readings were detected above background during abandonment at any of the well locations.

WELL ABANDONMENT PROCEDURES

Prior to abandonment, the total depth of each well was measured using an electronic water level indicator. The wells were then overdrilled with the HSA to the approximate depth of each well. On reaching the approximate depth of each well with the augers, the well casing was hoisted from inside the augers with a rig winch. The well casings were disassembled at the connections. The drill cuttings as well as all the removed well materials (well casings and screens) were stockpiled at the respective well locations within the site for appropriate management during the remedial action.

During the overdrilling of Wells OW-1D and OW-7D, the well casings began to sink into the subsurface along with the augers. When this occurred the overdrilling was suspended and the well casings were hoisted without drilling down to the full depth of the wells.

After removing the well materials from the borehole, the HSAs were pressure-grouted with cement/bentonite grout using the tremmie method. The grout mix was prepared using a proportion of 6 bags of portland cement (approximately 100 pounds per bag) to 40 to 50

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pounds of bentonite in 100 gallons of water. The cement/bentonite grout was circulated through the grout pump attached to the drill rig to achieve a smooth consistency. The grout was then pumped into the borehole starting at the bottom using a tremmie pipe. After the hole was partially filled, the augers were slowly removed while continuing to add grout using the tremmie pipe as necessary to ensure that a constant head of grout was kept inside the augers. The constant head of grout assured the borehole was completely filled with grout. The volumes of grout pumped into each well were also carefully monitored to confirm that the entire length of the borehole was fully grouted.

The drill rigs, the HSAs, hoses, tremmie pipe, and other associated drilling equipment were steam cleaned between well locations to prevent any potential cross-contamination. The well casing and screens removed were also decontaminated by steam cleaning prior to staging beside each well location.

SUMMARY OF WELL ABANDONMENT ACTIVITIES

Table 1 presents a summary of well abandonment details including well identification numbers, estimated well depths, measured well depths, length of casing removed, depth of overdrilling, and dates of well abandonment. As shown in Table 1, the depths estimated from Keck reports and those measured during abandonment are similar. This comparison indicates that the well depths are reasonably accurate and provides support for proper and complete abandonment of the wells. As also shown in Table 1, the entire lengths of casing and screen material from all the wells except for a 2-foot screen (from well OW-3D) were removed from the subsurface during the abandonment.

Of the total number of 19 observation wells reported to be installed by Keck, 18 wells were located, identified, and abandoned. Well OW-8D, reported in the Keck reports to be a 65-foot deep well installed in the west portion of LRLF approximately 750 feet north of the southwest fence corner of the landfill (Figure 1), could not be located. In addition to a visual search, a backhoe was used to remove surface soils to a depth of 2 to 3 feet in an area of approximately 300 feet by 14 feet (covering the surrounding area of the reported location of the well) to confirm the absence of this well. It is possible that this well may have been abandoned previously by Keck. According to the Keck reports, well OW-8D was sampled during the Phase I investigation but neither the presence of this well nor sampling of this well was documented in Keck's Phase II investigation report.



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General Motors Corporation

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If you have any questions or require additional information regarding the well abandonment activities at the Linden Road Landfill site, please call either of the undersigned at (708) 918-4000.

Very truly yours,

ROY F. WESTON, INC.

A handwritten signature in black ink, appearing to read "S. Babusukumar".

S. Babusukumar, P.G.
Project Manager

A handwritten signature in black ink, appearing to read "Scott D. Springer".

Scott D. Springer
Project Director

SB:SDS/slr
Attachment

Table 1

**Keck Observation Well Abandonment Summary
Linden Road Landfill Site
November/December 1993
(All Depths/Lengths in feet)**

Well Number	Estimated** Well Depth	Measured Well Depth	Approximate Length of Casing and Screen Removed	Approximate Depth Overdrilled	Date Abandoned
OW-1S	20	22	22	24	11/17/93
OW-1D	75	75	75	55	12/02/93
OW-2S	30	30	30	30	12/02/93
OW-2D	80	75	75	80	11/19/93
OW-3S	25	25	25	25	11/23/93
OW-3D	65	61	59	62	11/18/93
OW-4D	80	74	74	75	11/21/93
OW-5D	80	78	78	78	11/30/93
OW-6D	80	79	79	72	12/01/93
OW-7D	90	85	85	50	12/01/93
OW-8D*	65	NA	NA	NA	NA
OW-9S	38	32	32	33	11/20/93
OW-9D	60	60	60	60	11/20/93
OW-10S	22	22	22	23	11/22/93
OW-10D	55	52	52	55	11/22/93
OW-11S	19	20	20	21	11/21/93
OW-11D	43	40	40	41	11/22/93
OW-12S	24	25	25	25	11/23/93
OW-12D	60	55	55	55	11/30/93

* Well not present.

** Obtained from Keck's Phase I and Phase II hydrogeological investigation reports.

NA - Not applicable.

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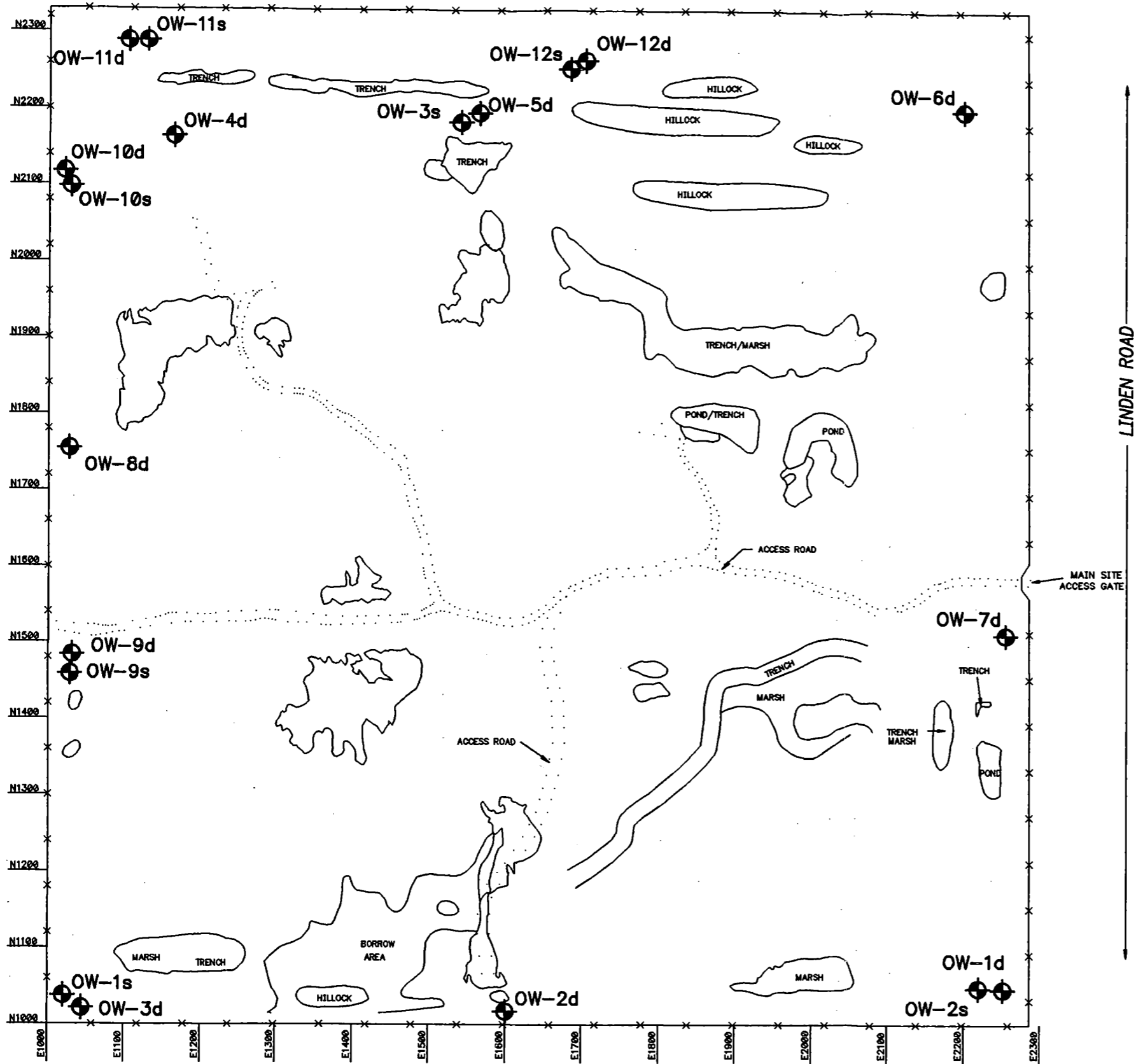


FIGURE 1



Three Hawthorn Parkway
Vernon Hills, Illinois
60061

KECK, INC.
OBSERVATION WELL LOCATIONS
LINDEN ROAD LANDFILL SITE
Flint, Michigan