

## **Attachment B-7**

**To: West Bay #22 Administrative Index**  
**From: Jeffrey Wawczak, Permit Writer**  
**Date: October 2014**  
**Re: West Bay #22 SWD Geologic Siting**

The purpose of the U.S. Environmental Protection Agency's Underground Injection Control (UIC) regulations is to protect underground sources of drinking water (USDW) from contamination due to the underground injection practices. Title 40 of the Code of Federal Regulations (C.F.R.) § 144.3 defines a USDW as an aquifer or its portion which (1) supplies any public water system; or (2) contains a sufficient quantity of groundwater to supply a public water system and either currently supplies drinking water for human consumption or contains fewer than 10,000 mg/l total dissolved solids. UIC regulations protect USDWs by: (1) identifying USDWs; (2) ensuring that the geological siting for each injection well is suitable for injection; and (3) applying standards for well construction, operating, and reporting. Under UIC regulations, the permitting authority reviews each permit application thoroughly to ensure compliance with relevant UIC regulations.

West Bay Exploration Company (or "West Bay") submitted an application for the West Bay #22 injection well in Jackson County, Michigan to EPA Region 5 in March of 2011<sup>1</sup>. In its application, West Bay identified two USDWs in the area. The shallower of the two USDWs is the Glacial Drift, which extends from the surface to 155 feet below ground surface (bgs). The deeper USDW is the Marshall Sandstone, which extends from 155 to 226 feet bgs. The Michigan Hydrogeological Atlas<sup>2</sup> describes the Marshall Sandstone in Jackson County, Michigan, as a good aquifer, meaning the formation is capable of yielding a significant amount of water for use in the county<sup>3</sup>.

The UIC Regulations at 40 C.F.R §144.3 define an injection zone as a geological formation, group of formations, or part of a formation receiving fluids through a well. The injection zone for the West Bay #22 well is the Niagaran Group (or Niagaran), at approximately 2,662 feet to 3,032 feet bgs. The Niagaran Group consists of several rock formations that are ideal for injection. The formations are very porous and permeable and will be capable of accepting the injection fluid<sup>4</sup>. The Michigan Hydrogeologic Atlas describes the layers in the injection zone as fine-grained limestone, dolomitized skeletal limestone and dolomitized carbonate bank reef complex<sup>2</sup>. The White Niagaran, a dolomite layer, and the Manistique Limestone are both layers in the Niagaran Group. These dolomitized zones have a porosity and rapid permeability due to widespread organic activity and the accumulation of reefal material. Over time, the dolomitizing of these units has produced very porous and permeable formations<sup>4</sup>.

In addition, the UIC Regulations at 40 C.F.R §146.3 define a confining zone as a geological formation, group of formations or part of a formation that is capable of limiting fluid movement

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<sup>1</sup> Document ID #WB-1 In West Bay #22 Administrative Record

<sup>2</sup> Michigan Hydrologic Atlas, Parts I (Hydrology for Underground Injection Control in Michigan) and Part II (atlas maps), Department of Geology, Western Michigan University, Kalamazoo, Michigan, 1981.

<sup>3</sup> Document ID #WB-146 In West Bay #22 Administrative Record, Page II-94 "Marshall Sandstone"

<sup>4</sup> Document ID #WB-146 In West Bay #22 Administrative Record, Page II-39 & II-41 "Shelf Facies" & "Bank Facies"

above an injection zone. The confining zone acts as a barrier to fluid migrating upward out of the injection zone, making it unlikely that the injection fluid will rise above the injection zone. The Salina Group is the primary confining zone for the West Bay #22 well, and is above the injection zone.

According to the Michigan Hydrogeological Atlas the Salina group is a thick sequence of carbonate, anhydrite, shale, and salts formations that will act as a confining layer to prevent flow out of the injection zone<sup>5</sup>. The Salina group contains an essentially impermeable formation called the A-1 Evaporite. The Michigan Hydrogeologic Atlas describes the A-1 Evaporite as essentially impermeable and an excellent confining layer<sup>6</sup>. Above the A-1 Evaporite sit multiple formations of carbonate, anhydrite and shale. The Michigan Hydrogeologic Atlas describes each of the above-mentioned formations as excellent confining layers, due to their low permeability and porosity<sup>7</sup>. Formations in this group contain thick salts, which makes them “essentially an aquiclude”, or a structure preventing passage of water. In addition, many of the rock layers between the confining zone and the base of the lowermost USDW are impermeable shales and evaporates<sup>8</sup>. These impermeable formations will also prevent injection fluid from moving upwards and entering the USDWs, thus acting as additional confining zones. These shale formations acting as additional confining layers above the actual confining zone include the Antrim Formation, Bedford Shale Formation, Bell Shale Formation, Sunbury Shale Formation, and Coldwater Shale Formation<sup>9</sup>.

The Michigan Department of Environmental Quality (MDEQ) has permitted several oil production wells, MDEQ permit numbers #59996, #60094, #60011, and #60010, close to the proposed well site. EPA reviewed the drilling and formation records for these wells, which show that the Niagaran is present at those wells at the approximate depths stated in the permit application for the West Bay #22 well. MDEQ permit #59996 will share the same well pad as West Bay #22 and will be in the closest proximity to the well site. The drilling records for #59996 shows that at an approximate depth of 2660 feet bgs layers of dolomite and limestone are present. Drilling records for these other wells also show 1) the presence of the Salina Group as the first confining zone; and 2) that the Salina Group’s composition is consistent with its description in the Michigan Hydrogeological Atlas<sup>10</sup>.

The proposed construction plan<sup>11</sup> West Bay submitted in its West Bay #22 application<sup>1</sup> will help ensure protection of the USDWs and is consistent with the UIC regulations. The open hole for the proposed injection well will be from approximately 2,680 feet bgs to the total depth of the well at 2,950 feet bgs. The construction of the well will consist of three separate casings, starting with an 11 3/4-inch casing, set at approximately 350 feet bgs. The second casing will be an 8 5/8-inch casing set at approximately 900 feet bgs. The last casing will be a 5 1/2-inch casing set at an approximate depth of 2680 feet bgs. Each of these casings will be cemented to the surface to prevent any fluid from migrating past the well casing. As the lowest USDW extends from the

<sup>5</sup> Document ID #WB-146 In West Bay #22 Administrative Record, Page II-42 “Salina Group”

<sup>6</sup> Document ID #WB-146 In West Bay #22 Administrative Record, Page II-43 “A-1 Evaporite”

<sup>7</sup> Document ID #WB-146 In West Bay #22 Administrative Record, Page II-42 to Pages II-55

<sup>8</sup> Document ID #WB-147 In West Bay #22 Administrative Record

<sup>9</sup> Document ID #WB-146 In West Bay #22 Administrative Record, Page II-80, II-83, II-76 & II-91

<sup>10</sup> Document ID #WB-146 In West Bay #22 Administrative Record

<sup>11</sup> Document ID #WB-1, Attachment M, Well Construction Schematic

surface to 226 feet bgs the USDWs will be protected with three levels of casing, each cemented to the surface. If the permit is issued and the well is drilled, West Bay will be required to submit all well completion records to EPA to ensure both the accuracy of the formation depths, and the construction of the well.

Overall, the proposed well will be constructed, operated, and monitored to protect the USDWs. The Michigan Hydrogeological Atlas shows that the confining zone along with other formations of shale and evaporites, such as the Antrim Formation, Bedford Shale Formation, Bell Shale Formation, Sunbury Shale Formation, and Coldwater Shale Formation above the confining zone will prevent any fluid from migrating upward into a USDW<sup>6</sup>. The Michigan Hydrogeologic Atlas also shows that the proposed injection zone, The Niagaran, will accept the proposed injection fluid. Drilling logs from nearby production wells confirm the presence of the proposed confining layers and injection layers. Given the information above, EPA has determined that the site proposed for the West Bay #22 injection well is acceptable for a brine injection well.



Figure 2.2. Stratigraphic succession in Michigan. (From MDNR, 1964, Chart 1.)

PALEOZOIC THROUGH RECENT



MICHIGAN DEPARTMENT OF CONSERVATION  
 Ralph A. MacMillan, Director  
 GEOLOGICAL SURVEY  
 Gerald E. Eddy, State Geologist

ACKNOWLEDGMENT: Correlated with the records of subsurface in the Geosyncline, the U. S. Geological Survey, Michigan's universities, state and Geological Survey, and geologists from Michigan's oil and gas industry. Dr. Harold T. Cross, Department of Geology, Michigan State University, identified beds of Mississippian age and accepted provisional age assignments.

GEOLOGIC NAMES COMMITTEE

Carlisle D. Hill, Chairman; Robert W. Taylor, Secretary;  
 Harry J. Handberg, L. David Johnson, Harry D. Swanson

INFORMAL TERMS

Principal oil and gas basins, and informal terms used in petroleum exploration and applied to parts of basins or groups in the subsurface.

STRATIGRAPHIC POSITION	INFORMAL TERMS	PAYS
Basal sandstone of Saginaw Fm.	Felton sandstone	
In lower part of Michigan	Wellsboro Merrillville Merrillville Merrillville	Gas Gas & Oil Gas & Oil
Marshall Sh.	Coldwater base	Gas & Oil
Coldwater Sh.	Coldwater base Coldwater midcut	Gas
In upper part of Ellsworth Sh.	"Base" (Western Michigan)	Oil & Gas
Berco Sh.	Base sand (Western Michigan)	Oil & Gas
Saginaw Bay Lt.	Saginaw bay	Oil & Gas
Upper part of Traverse Group in Western Michigan	Traverse horizon Traverse base	Oil & Gas
Rogers City Ls.	Rogers City zone	Oil & Gas
Dundee Ls.	Dundee zone	Oil & Gas
Dundee Ls. (?) Upper part of Lucas Fm. (?)	Kind City zone	Oil & Gas
In Lucas Fm.	Midcut well Key well near zone Midcut sandstone Midcut zone	Oil & Gas Oil & Gas
Amherstburg Fm.	Midcut zone	Oil & Gas
Part of Salina Group E Unit	1 zone 100' (or 100' zone)	Oil
Divisions of A-2 Carbonate in Western Michigan	A-2 dolomite A-2 zone	Gas
A-1 Carbonate	A-1 dolomite	Oil & Gas
Upper part of Niagara Series	Lower Niagara upper Niagara lower Niagara	Oil & Gas
Part of Niagara Series	Upper shale (Eastern Michigan)	
Trevon Group	Midcut zone	Oil & Gas
Black River Group	Black River horizon Black River zone Van Wert zone	Oil & Gas
Onondaga Dol.		Oil

PLEISTOCENE NOMENCLATURE

ERA	SYSTEM	SERIES	STAGE
CENOZOIC	QUATERNARY	RECENT	
		PLEISTOCENE	Valders Stage
			Wisconsin Glaciation
			Two Creek, Ingersoll, Marquette Stages (H. Harehoff), Cary Stage, Tazewell Stage, Sangamon Interglaciation, Illinoian Glaciation

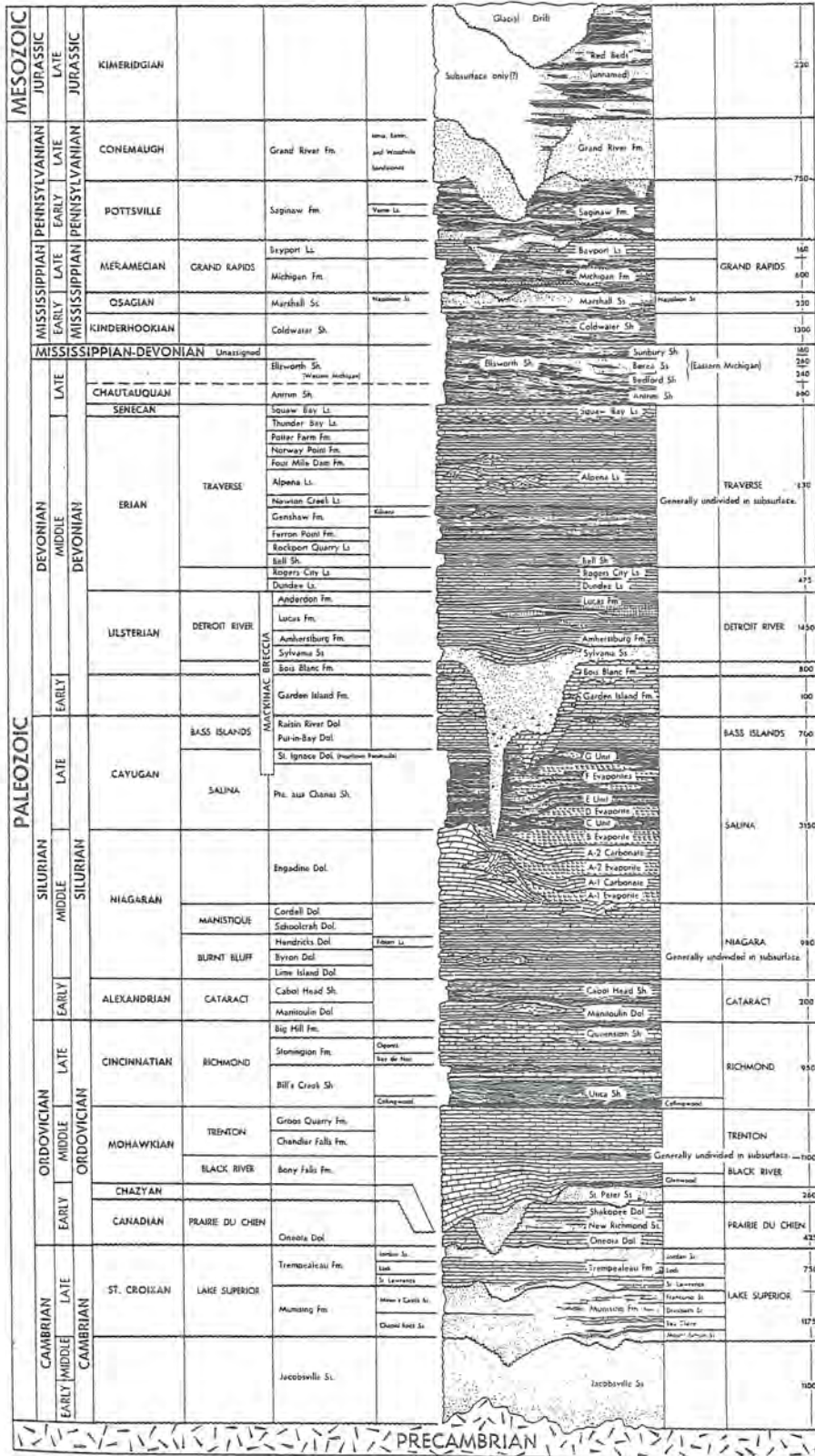
OUTCROP NOMENCLATURE

GEOLOGIC TIME	TIME-STRATIGRAPHIC	ROCK-STRATIGRAPHIC			
ERA	PERIOD	SERIES	GROUP	FORMATION	MEMBER

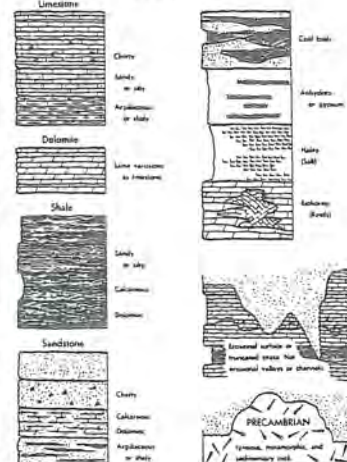
SUBSURFACE NOMENCLATURE

ROCK-STRATIGRAPHIC		
FORMATION	MEMBER	GROUP

Approximate maximum thickness, in feet, of rock units in the subsurface. NO SCALE.



EXPLANATION



GEOLOGIC NAMES COMPILED BY: Harry G. Swanson, Cambrian and Ordovician; Robert W. Taylor, Late and Middle Silurian; Carlisle D. Hill, Late Silurian through Devonian; George W. Cooper, Devonian age; Harry J. Handberg, Dundee Ls. zone through Traverse Group of Devonian age; L. David Johnson, Berco Shale through the Pennsylvanian System; F. Wells Swanson, glacial geology of the Cenozoic.

CHART 1  
1964



# STRATIGRAPHIC NOMENCLATURE FOR MICHIGAN

Michigan Dept. of Environmental Quality  
Geological Survey Division  
Harold Fitch, State Geologist  
and  
Michigan Basin Geological Society



Stratigraphic Nomenclature Project Committee:  
Dr. Paul A. Catacosinos, Co-chairman  
Mr. Mark S. Wolensak, Co-chairman

Principal Authors:  
Dr. Paul A. Catacosinos  
Dr. William B. Harrison III  
Mr. Robert F. Reynolds  
Dr. David B. Westjohn  
Mr. Mark S. Wolensak

2000

### Acknowledgements

This work is the product of the combined efforts of the geological communities of Michigan and the surrounding states and provinces. Below are given just a representative few of the contributors:

**Academia:** Dr. Aural T. Cross, Michigan State University; Dr. Robert H. Dott, Jr., University of Wisconsin; Mr. William D. Everham, Ph.D. Candidate, Michigan Technological University.

**Government:** Dr. Terry R. Carter, Ontario Ministry of Natural Resources; Mr. John M. Esch, Michigan Department of Environmental Quality; Dr. Brian D. Keith, Indiana Geological Survey; Mr. Lawrence H. Wickstrom, Ohio Geological Survey.

**Industry:** Mr. Donald J. Bailey, Consultant; Mr. Jimmy R. Myles, Scot Energy; Mr. Dan E. Pfeiffer, Pfeiffer Exploration Services.

A complete listing of all contributors will be found in the Stratigraphic Lexicon for Michigan, of which this column is an integral part.

### RELATED TERM CORRELATION

STRATIGRAPHIC POSITION	RELATED TERMS
Ionia Fm	Jurassic Red Beds
Michigan Fm	Clare Dolomite, Brown Lime, Stray Dolomite, Stray Sandstone, Stray-Stray Sandstone, Stray-Stray-Stray Sandstone, Triple Gyp
Coldwater Sh	Coldwater Red Rock, Speckled Dolomite, Wier Sand
Antrim Sh	Charlton Black Shale Member, Elfrim, Chester Black Shale Member, Upper Black Shale, Light Antrim, Lower Black, Lower Antrim, Middle Antrim, Middle Gray Antrim, Dark Antrim, Middle Gray Shale, Unit 1A, Unit 1B, Unit 1C, Crappo Creek Grey Shale Member
Dundee Ls	Reed City Member/Dolomite/Anhydrite
Lucas Fm	Freer Sandstone, Horner Member, Iuzi Member, Massive Salt/Anhydrite, Sour Zone, Big Anhydrite, Richfield Zone/Members/Sandstone, Big Salt
Amherstburg Fm	Filer Sandstone, Meldrum Member, Black Lime
St. Ignace Dolomite	Salina H Unit
Salina B Unit	Big Salt, B Salt
Ruff Formation	Salina A-1 Carbonate, Rabbit Ears Anhydrite
Cain Fm	Salina A-0 Carbonate
Guelph Dolomite	Brown Niagara, Niagara Reef, Pinnacle Reef, Engadine Dolomite
Lockport Dolomite	Gray Niagara, White Niagara
Burnt Bluff Gr	Clinton Formation
Trenton Fm	Cap Dolomite
Black River Fm	Van Wert Zone, Sneaky Peek, Black River Shale
Glenwood Fm	Goodwell Unit, Zone of Unconformity
St. Peter Sandstone	Bruggers Sandstone, Jordan Sandstone, Knox Sandstone, Massive Sand
Prairie du Chien Gr	Foster Formation, New Richmond Sandstone, Lower Knox Carbonate, St. Lawrence Formation, T-PDC, Onseta Dolomite, Brazos Shale
Trempealeau Fm	Lodi Formation
Galesville Ss	Dresbach Sandstone
Pre-Mt. Simon Clastics	Precambrian "Red Beds"

### LEGEND

Sandstone	Limestone
Limey	Shale
Shaley	Sandy
Dolomitic	Dolomite
Conglomeritic	Sandy
Siltstone	Shaley
Shale	Glacial Drift
Sandy	Anhydrite/Gypsum
Limey	Reefs/Bioherms
Dolomitic	Basement Rocks
Salt	Coal Bed

GEOLOGIC TIME				OUTCROP NOMENCLATURE			DOMINANT LITHOLOGY	SUBSURFACE NOMENCLATURE				
ERA	PERIOD	EPOCH	NORTH AMERICAN STAGES	GROUP	FORMATION	MEMBER		FORMATION	GROUP			
Mesozoic	Cretaceous	Middle	Wisconsinan		Glacial Drift			Glacial Drift				
			Oxfordian		Ionia Fm		Ionia Fm					
Mesozoic	Jurassic	Late	Conemaugh		Grand River Fm		Grand River Fm					
			Pottsville		Saginaw Fm		Saginaw Fm					
		Mississippian	Early	Meramecian			Parma Ss		Parma Ss			
							Bayport Ls		Bayport Ls			
				Oaogian			Michigan Fm		Michigan Fm			
							Marshall Ss		Marshall Ss			
				Kinderhookian			Coldwater Sh		Coldwater Sh			
							Sunbury Sh		Sunbury Sh			
				Devonian	Middle	Late	Chautauquin		Elsworth Sh (western)	Berea Ss (eastern)	Elsworth Sh (western)	Berea Ss (eastern)
										Bedford Sh		Bedford Sh
		Upper Mbr						Upper Mbr				
		Lachine Mbr						Lachine Mbr				
		Paxton Mbr						Paxton Mbr				
		Norwood Mbr						Norwood Mbr				
		Antrim Sh						Antrim Sh				
		Squaw Bay Ls						Squaw Bay Ls				
		Partridge Point Mbr						Partridge Point Mbr				
		Thunder Bay Ls						Potter Farm Mbr				
Early	Erian	Traverse Gr					Norway Point Mbr		Norway Point Mbr			
							Four Mile Dam Mbr		Four Mile Dam Mbr			
							Alpena Ls		Alpena Ls			
							Newton Creek Mbr		Newton Creek Mbr			
							Killians Mbr		Killians Mbr			
							Long Lake Ls		Long Lake Ls			
							Genshaw Mbr		Genshaw Mbr			
							Ferton Point Fm		Ferton Point Fm			
							Rockport Quarry Ls		Rockport Quarry Ls			
							Bell Sh		Bell Sh			
Paleozoic	Silurian	Late	Cayugan	Salina Gr								
							Ple. aux Chenes Fm		Ple. aux Chenes Fm			
							Salina G Unit		Salina G Unit			
							Salina F Unit		Salina F Unit			
							Salina E Unit		Salina E Unit			
							Salina D Unit		Salina D Unit			
							Salina C Unit		Salina C Unit			
							Salina B Unit		Salina B Unit			
							Salina A-2 Carb		Salina A-2 Carb			
							Salina A-2 Evap		Salina A-2 Evap			
		Ruff Fm		Ruff Fm								
		Salina A-1 Evap		Salina A-1 Evap								
		Cain Fm		Cain Fm								
Ordoevician	Middle	Niagaran	Engadine Gr									
						Bush Bay Fm		Bush Bay Fm				
						Rapson Creek Fm		Rapson Creek Fm				
						Rockview Fm		Rockview Fm				
						Manistique Gr		Manistique Gr				
						Cordell Fm		Cordell Fm				
						Schoolcraft Fm		Schoolcraft Fm				
						Hendricks Fm		Hendricks Fm				
						Fiborn Ls Mbr		Fiborn Ls Mbr				
						Burnt Bluff Gr		Burnt Bluff Gr				
		Byron Fm		Byron Fm								
		Lime Island Sh		Lime Island Sh								
		Cabot Head Sh		Cabot Head Sh								
		Manitoulin Dol		Manitoulin Dol								
Ordoevician	Early	Cincinnati	Richmond Gr									
						Big Hill Fm		Big Hill Fm				
						Stonington Fm		Stonington Fm				
						Ogontz Mbr		Ogontz Mbr				
						Bay de Noc Mbr		Bay de Noc Mbr				
						Bills Creek Sh		Bills Creek Sh				
						Collingwood Sh		Collingwood Sh				
						Trenton Fm		Trenton Fm				
						Groos Quarry Mbr		Groos Quarry Mbr				
						Chandler Falls Mbr		Chandler Falls Mbr				
Cambrian	Late	Dresbachian	Munising Gr									
						Miner's Castle Mbr		Miner's Castle Mbr				
						Chapel Rock Mbr		Chapel Rock Mbr				
						Basal Cgl		Basal Cgl				
						Jacobsville Ss		Jacobsville Ss				
						Freda Ss		Freda Ss				
						Nonesuch Sh		Nonesuch Sh				
						Copper Harbor Cgl		Copper Harbor Cgl				
						Pre-Mt. Simon Clastics		Pre-Mt. Simon Clastics				
						Precambrian Crystalline Basement Complex		Precambrian Crystalline Basement Complex				





**RECORD OF WELL DRILLING OR DEEPENING**

Required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, of Act 451 PA 1994, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment.

Permit number/Deepening number  
59996

(Submit 3 copies within 60 days of drilling completion.)

 Part 615 Oil/Gas Well  Part 625 Mineral Well

Name and address of permittee West Bay Exploration 13685 S. West Bay Shore Suite 200 Traverse City Mi. 49684		API number 21-075-59996	
Name and address of drilling contractor Advanced Enerav Services P.O. Box 85 South Boardman Mi. 49680		Well name and number West Bay #1-22	
Date drilling began 01/11/2010		Surface location NW 1/4 of SE 1/4 of SW 1/4 Section 22 T4S R2E	
Date drilling completed 01/27/2010		Township Norvell	
Total depth of well Driller 4370' Log 4369'		County Jackson	
Formation at total depth Black River		Footages North/South East/West 567' ft. from N line and 575' ft. from E line of sec.	
Elevations K.B. 1028.24 ft. R.F. ft. R.T. 1027 ft. Grd 1015.27 ft		Directionally drilled (check one) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
		Previous permit numbers	
		Subsurface location (if directionally drilled) 1/4 of 1/4 of 1/4 Section T R	
		Township County	
		Footages North/South East/West ft. from line and ft. from line of sec.	
		Feet drilled - cable tools from to	
		Feet drilled - rotary tools from surf to 4370'	

Casing, Casing Liners and Cementing, Operating Strings					Water Fill Up (F.U.) or Lost Circulation (L.C.) (X)				
Size	Where set	Cement	T.O.C.	Ft. pulled	Formation	F.U.	L.C.	Depth	Amount
11 3/4"	419'	150 lite/150 A	surface		Niagaran		x	2920	partial
8 5/8"	3112'	600 lite/200 A	surface						
5 1/2"	4151'	80 Halcem	1998'						
		300 Halcem							

Gross Pay Intervals				All Other Oil and Gas Shows Observed or Logged							
Formation	Oil or Gas	From	To	Where Observed (X)							
Formation	Oil or Gas	Depth	Sam- ples	Odor	Pits	Mud Line	Gas Log	Fill Up			
Trenton/Black River	both	3966'	4290'								

Depth Correction		Deviation Survey		Plugged Back	
Depth	Correction	Run at	Degrees	Yes	No

Geophysical / Mechanical Logs (list each type run)		
Brand	Log types	Logged intervals
Baker Atlas	CDL/CNL/GR	TD-Surf
	DLL/MLL/GR	TD-Min

Notice: Report complete sample and formation record, coring record, and drill stem test information on reverse side.

CERTIFICATION "I state that I am authorized by said owner. This report was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

Date 02/15/2010	Name and title (print) Timothy L. Baker	Signature 
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Submit to: OFFICE OF GEOLOGICAL SURVEY,  
MICHIGAN DEPT OF ENVIRONMENTAL QUALITY  
PO BOX 30256, LANSING, MI 48909-7756



MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

**RECORD OF WELL COMPLETION**

By authority of Part 615 or Part 625 of Act 451 PA 1994, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment.

(Submit 3 copies within 60 days of well completion.)  
 Part 615 Oil/Gas Well     Part 625 Mineral Well

Permit number/deepening permit no. 59996	API number 21-075-59996-00-00
Type of well (after completion) Oil & Gas	
Well name & number West Bay 1-22	

Name and address of permittee West Bay Exploration 13685 S. West Bay Shore #200 Traverse City, MI 49684					
Directionally drilled (check one) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Previous permit numbers		Total depth of well M.D. 4370                                  T.V.D.	
Surface location NW ¼ of SE ¼ of SW ¼ Section 22    T 4S                  R 2E			Subsurface location (if directionally drilled) ¼ of    ¼ of    ¼ Section    T                  R		
Township Norvell		County Jackson		Township County	
Footages:    North/South 750    Ft. from South line and 1400    Ft. from West    line of Sec.		Footages:    North/South Ft. from    line and		Footages:    East/West Ft. from    line of Sec.	
Part 615 - oil/gas wells Date well completed 2/5/2010			Part 625 - mineral wells Date of first injection		
Producing formation(s) Black River		Injection formation(s)		Disposal formation(s) Solution formation(s)	

**COMPLETION INTERVALS(S)**

Date	Number holes	Perforation or open hole interval	Open	
			Yes	No
1/30/2010	60	4224-4254'	X	

**STIMULATION BY ACID OR FRACTURING**

Date	Interval treated	Materials and amount used
1/30/2010	4224-4254'	500 gallons 28% Hcl Acid
2/4/2010	4224-4254;	6000 gallons 28% Hcl Acid w/ 20 Ball sealers

Operations Office  
FEB 18 2010

**PRODUCTION TEST DATA**

Oil Bbls/day	Gravity °API	Condensate Bbls/day	Gas MCF/day	Water Bbls/day	H <sub>2</sub> S Grains/100 ft <sup>3</sup>	B.H.P. and depth
200	47		90	0	NA	1768 @ 4239

CERTIFICATION "I state that I am authorized by said owner. This report was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

Name and title (print or type) Timothy L. Baker Operations Manager	Signature <i>Timothy L. Baker</i>	Date 2/16/2010
---	--------------------------------------	-------------------

Submit to: OFFICE OF GEOLOGICAL SURVEY  
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
PO BOX 30256  
LANSING MI 48909-7756



**RECORD OF WELL DRILLING OR DEEPENING**

Required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, of Act 451 PA 1994, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment.

Permit number/Deepening number  
60010

(Submit 3 copies within 60 days of drilling completion.)

Part 615 Oil/Gas Well  Part 625 Mineral Well

Name and address of permittee		API number	
West Bay Exploration 13685 S. West Bay Shore Suite 200 Traverse City Mi. 49684		21-075-60010	
Name and address of drilling contractor		Well name and number	
Advanced Energy Services P.O. Box 85 South Boardman Mi. 49680		West Bay & Boyd #1-27	
Date drilling began		Surface location	
01/30/2010	Date drilling completed	SW 1/4 of SE 1/4 of SW 1/4 Section 22 T4S R2E	
02/14/2010	Township		
Total depth of well		County	
Driller 4495 Log 4490	Formation at total depth	Norvell Jackson	
Black River	Footages North/South East/West		
Elevations		271' ft. from S line and 1440' ft. from W line of sec.	
K.B. 1043 ft. R.F.	ft. R.T. 1042 ft. Grd 1029 ft	Directionally drilled (check one)	
		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
		Previous permit numbers	
		Subsurface location (if directionally drilled)	
		NW 1/4 of NW 1/4 of NW 1/4 Section 27 T 4S R 2E	
		Township	
		County	
		Norvell Jackson	
		Footages North/South East/West	
		679' ft. from N line and 661' ft. from W line of sec.	
		Feet drilled - cable tools	
		Feet drilled - rotary tools	
		from to from surf to TD	

Casing, Casing Liners and Cementing, Operating Strings					Water Fill Up (F.U.) or Lost Circulation (L.C.) (X)				
Size	Where set	Cement	T.O.C.	Ft. pulled	Formation	F.U.	L.C.	Depth	Amount
11 3/4"	426'	150 lite/150 A	surface		Niagaran		x	3220	Partial
8 5/8"	3333'	650 lite/200 A	surface		Trenton/Black River		x	4267	Full
5 1/2"	4151'	80 Halcem	2580'						
		250 Halcem							

Gross Pay Intervals				All Other Oil and Gas Shows Observed or Logged							
Formation	Oil or Gas	From	To	Where Observed (X)							
Formation	Oil or Gas	Depth	Sam- ples	Odor	Pits	Mud Line	Gas Log	Fill Up			
Trenton/Black River	both	4273'	TD								

Depth Correction		Deviation Survey			Plugged Back		
Depth	Correction	Run at	Degrees	Yes	No	Depth	
see	attached	directional					

Geophysical / Mechanical Logs (list each type run)		
Brand	Log types	Logged intervals
Baker Atlas	CNL/GR/CCL (Unable to run open hole)	4487'-Surf
	SBT/GR/CCL	4487'-2100'

Notice: Report complete sample and formation record, coring record, and drill stem test information on reverse side.

CERTIFICATION "I state that I am authorized by said owner. This report was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

Date	Name and title (print)	Signature
02/19/2010	Timothy L. Baker	

Submit to: OFFICE OF GEOLOGICAL SURVEY,  
MICHIGAN DEPT OF ENVIRONMENTAL QUALITY  
PO BOX 30256, LANSING, MI 48909-7756



## RECORD OF WELL COMPLETION

By authority of Part 615 or Part 625 of Act 451 PA 1994, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment.

(Submit 3 copies within 60 days of well completion.)

Part 615 Oil/Gas Well  Part 625 Mineral Well

Permit number/deepening permit no. 60010	API number 21-075-60010-00-00
Type of well (after completion) Oil & Gas	
Well name & number West Bay Boyd 1-27	

Name and address of permittee West Bay Exploration 13685 S. West Bay Shore Dr #200 Traverse City, MI 49684					
Directionally drilled (check one) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Previous permit numbers		Total depth of well M.D. T.V.D.	
Surface location SW ¼ of SE ¼ of SW ¼ Section 27 T 4S R 2E			Subsurface location (if directionally drilled) NW ¼ of NW ¼ of NW ¼ Section 27 T 4S R 2E		
Township Norvell		County Jackson		Township Norvell	
Footages: North/South 271 Ft. from South line and 1440 Ft. from West line of Sec.		Footages: North/South 600 Ft. from North line and 660 Ft. from West line of Sec.		Footages: East/West	
Part 615 - oil/gas wells			Part 625 - mineral wells		
Date well completed 2/20/10	Producing formation(s) Black River	Injection formation(s)		Date of first injection	Disposal formation(s) Solution formation(s)

## COMPLETION INTERVALS(S)

Date	Number holes	Perforation or open hole interval	Open	
			Yes	No
2/19/2010	Open Hole	O.H. 4495-4525	X	

## STIMULATION BY ACID OR FRACTURING

Date	Interval treated	Materials and amount used
2/20/2010	4495-4525	5000 gal 28% Hcl Acid

## PRODUCTION TEST DATA

Oil Bbls/day	Gravity °API	Condensate Bbls/day	Gas MCF/day	Water Bbls/day	H <sub>2</sub> S Grains/100 ft <sup>3</sup>	B.H.P. and depth
200	47		95	0	0	TBD

CERTIFICATION "I state that I am authorized by said owner. This report was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

Name and title (print or type) Timothy L. Baker Operations Manager	Signature 	Date 2-23-10
---	---------------	-----------------

Submit to: OFFICE OF GEOLOGICAL SURVEY  
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
PO BOX 30256  
LANSING MI 48909-7756



## RECORD OF WELL DRILLING OR DEEPENING

Required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, of Act 451 PA 1994, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment.

Permit number/Deepening number

60011

(Submit 3 copies within 60 days of drilling completion.)

API number

21-075-60011

Well name and number

West Bay &amp; Boyd #2-27

 Part 615 Oil/Gas Well  Part 625 Mineral Well

Name and address of permittee

West Bay Exploration  
13685 S. West Bay Shore  
Suite 200  
Traverse City Mi. 49684

Surface location

SW 1/4 of SE 1/4 of SW 1/4 Section 22 T4S R2E

Township

Norvell

County

Jackson

Footages

North/South

East/West

186' ft. from S line and 1440' ft. from W line of sec.

Directionally drilled (check one)

 Yes  No

Previous permit numbers

Subsurface location (if directionally drilled)

SE 1/4 of NE 1/4 of NW 1/4 Section 27 T 4S R 2E

Name and address of drilling contractor

Advanced Energy Services  
P.O. Box 85  
South Boardman Mi.  
49680

Township

Norvell

County

Jackson

Footages

North/South

East/West

963' ft. from N line and 2264' ft. from W line of sec.

Date drilling began

02/15/2010

Date drilling completed

03/03/2010

Total depth of well

Driller 4845

Log 4846

Formation at total depth

Black River

Elevations

K.B. 1042.6 ft. R.F.

ft. R.T. 1041 ft. Grd 1029.2 ft

Feet drilled - cable tools

from to

Feet drilled - rotary tools

from surf to TD

## Casing, Casing Liners and Cementing, Operating Strings

## Water Fill Up (F.U.) or Lost Circulation (L.C.) (X)

Size	Where set	Cement	T.O.C.	Ft. pulled	Formation	F.U.	L.C.	Depth	Amount
11 3/4"	424'	150 lite/150 A	surface		Niagaran		x	3300	Partial
8 5/8"	3417'	650 lite/200 A	surface						
5 1/2"	4842'	75 Halcem	3300"						
		150 Halcem							

## Gross Pay Intervals

## All Other Oil and Gas Shows Observed or Logged

Formation	Oil or Gas	From	To	Formation	Oil or Gas	Depth	Sam- ples	Odor	Pits	Mud Line	Gas Log	Fill Up
Black River	both	4510'	4590'									

## Depth Correction

## Deviation Survey

## Plugged Back

Depth	Correction	Run at	Degrees	Yes	No	Depth
see	attached	directional				

## Geophysical / Mechanical Logs (list each type run)

Brand	Log types	Logged intervals
Baker Atlas	CNL/ZDL/GR	4846'-Surf
	DLL/MLL/GR	4846'-3417

Notice: Report complete sample and formation record, coring record, and drill stem test information on reverse side.

CERTIFICATION "I state that I am authorized by said owner. This report was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

Date	Name and title (print)	Signature
06/20/2010	Timothy L. Baker	

Submit to: OFFICE OF GEOLOGICAL SURVEY,  
MICHIGAN DEPT OF ENVIRONMENTAL QUALITY  
PO BOX 30256, LANSING, MI 48909-7756

**FORMATION F JORD**

Attach additional sheets if necessary

API number

Permit number/Deepening number

60011

Elevation used 1043	Geologist name Fowler/Baker/Vancyck	Tops taken from <input type="checkbox"/> Driller's log <input checked="" type="checkbox"/> Sample log <input checked="" type="checkbox"/> Electric log
------------------------	--	---

From	To	Formation (type, color, hardness)	From	To	Formation (type, color, hardness)
Note: if well directionally drilled, add true vertical depth formation tops where appropriate					
surf	222(log)	Drift- Unconsolidated sand and gravel			
222	290	Shale& Siltstone- brn-gy-Grn, silty at top organic at base			
290	1230	Shale-Coldwater- Md-dk Brn-Blk, Silty, incr organic at base			
1230	1370	Sunbury Sh/Berea siltstone-Sh, Md Brn-Blk Silty, pyr. mixed w/siltstone, SSO-Lt md brn, Arg			
1370	15	Antrim-Dk Brn-Blk, Pyrand incr organic at base, SG incr toward base			
1554	1622	Traverse Fm- Limestone, Dk Brn-md Brn, Dns, Pyr, Dolomite, Md Gy-Gy, Dns			
1622	1744	Traverse Limestone-Md Brn-lt Brn Vfxln, Hd,			
1744	1978	Shale intbd w Dolomite and Lmst, Md Brn-Gy, Vfxln, Dns, Pos Dundee@1728'-Brn-Lt brn, Poor Samp, Pos Cvgs			
1978	2200	Detroit River- Anhydrite and Dolomite/Limestone, Lt-Md Brn Dns, Vfxln in pt, NS			
2200	2416	Bass Island/Bois Blanc- Dolomite, Anhydrite & Limestone AA			
2416	2685	G-Unit-Dolomite-Arg, Hd grading to Anhydrite- Lt-md Gy Brn			
2685	2766	C Shale-Gy-rdBrn, W/Dolomite and Anhydrite, Lt gy-Brn-bf Poor Samp. I			
2766	2972	B Evap-Anhydrite Wh-Lt Gy W/Dolomite-Vfxln, Lt-md Gy, Intbd at base with Anhy. AA	If well was cored, attach core description		
2972	3160	Dolo & Lmst-Wh-lt Gy, Dns, Anhydritic @3110-Wh, Dns	DRILL STEM TEST DATA		
3160	3386	Niagaran-Dolomite, AA, Md Gy, Vfxln Intbd W/Anhydrite AA, V porous 2880'-3300'			
3386	3884	Clinton/Cinn-Dolomite, Arg, hd, dk gy, grd to lt gy intbd w/Lmst, Lt-md gy Dns			
3884	4212	Utica- Shale, Gy-Grn, Gummy-Hd			
4212	4526	Trenton-Dolo, Lt -Md Gy, Dns, W/ Lmst @ 4236'-4526' Lt-Md Gy Brn, Vfxln,			
4526	TD	Black River- Dolomite, Md Brn-GyBrn, SO&G@4590'			



Directional Drilling Contractors, LLC.

Job Number: DR100040

Company: WEST BAY EXPLORATION

Lease/Well: WEST BAY/ BOYD 2-27

Location: NORVELL TWP., JACKSON CO.

Rig Name: ADVANCED # 2

RKB:

G.L. or M.S.L.:

State/Country: MICHIGAN / USA

Declination: 6.33 DEGREES WEST

Grid:

File name: C:\WINSERVE\ASDRIL~1\2010\BOYD227.SVY

Date/Time: 04-Mar-10 / 10:03

Curve Name: WESTBAY/BOYD 2-27 ( as drilled )

Directional Drilling Contractors  
SURVEY REPORT

WINSERVE SURVEY CALCULATIONS  
Minimum Curvature Method  
Vertical Section Plane 144.40  
Vertical Section Referenced to Wellhead  
Rectangular Coordinates Referenced to Wellhead

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	CLOSURE Distance FT	Direction Deg	Dogleg Severity Deg/100
<b>KOP @ 484 MD</b>									
484.00	.00	.00	484.00	.00	.00	.00	.00	.00	.00
486.00	.70	169.10	486.00	-.01	.00	.01	.01	169.05	35.00
516.00	1.80	164.20	515.99	-.65	.17	.62	.67	165.64	3.68
546.00	3.20	162.10	545.96	-1.90	.55	1.86	1.97	163.79	4.68
576.00	4.70	161.00	575.89	-3.85	1.21	3.84	4.04	162.59	5.01
606.00	6.10	159.30	605.76	-6.51	2.17	6.56	6.86	161.54	4.70
636.00	7.70	157.80	635.54	-9.86	3.49	10.05	10.46	160.48	5.37
667.00	9.10	156.80	666.21	-14.04	5.25	14.47	14.98	159.51	4.54
697.00	10.70	157.80	695.76	-18.80	7.23	19.49	20.14	158.95	5.36
728.00	12.80	157.80	726.11	-24.64	9.62	25.63	26.45	158.68	6.77
757.00	14.90	157.80	754.26	-31.07	12.24	32.39	33.39	158.50	7.24
788.00	17.30	157.50	784.04	-39.02	15.51	40.75	41.99	158.32	7.75
818.00	19.80	156.10	812.48	-47.78	19.28	50.08	51.53	158.03	8.46
848.00	22.10	154.30	840.50	-57.52	23.78	60.61	62.24	157.53	7.96
878.00	24.20	152.90	868.08	-68.08	29.03	72.25	74.01	156.90	7.24
907.00	26.50	151.50	894.29	-79.06	34.83	84.55	86.39	156.22	8.20
937.00	28.90	150.10	920.85	-91.22	41.64	98.41	100.28	155.47	8.29
968.00	31.00	148.00	947.71	-104.49	49.60	113.84	115.67	154.61	7.57
1008.00	31.60	144.80	981.89	-121.79	61.10	134.60	136.26	153.36	4.42
1038.00	31.70	142.70	1007.43	-134.48	70.41	150.34	151.80	152.37	3.69
1068.00	31.70	141.70	1032.95	-146.94	80.07	166.09	167.34	151.41	1.75
1097.00	31.90	141.70	1057.60	-158.93	89.54	181.35	182.42	150.60	.69
1126.00	32.20	142.00	1082.18	-171.03	99.05	196.73	197.64	149.92	1.17



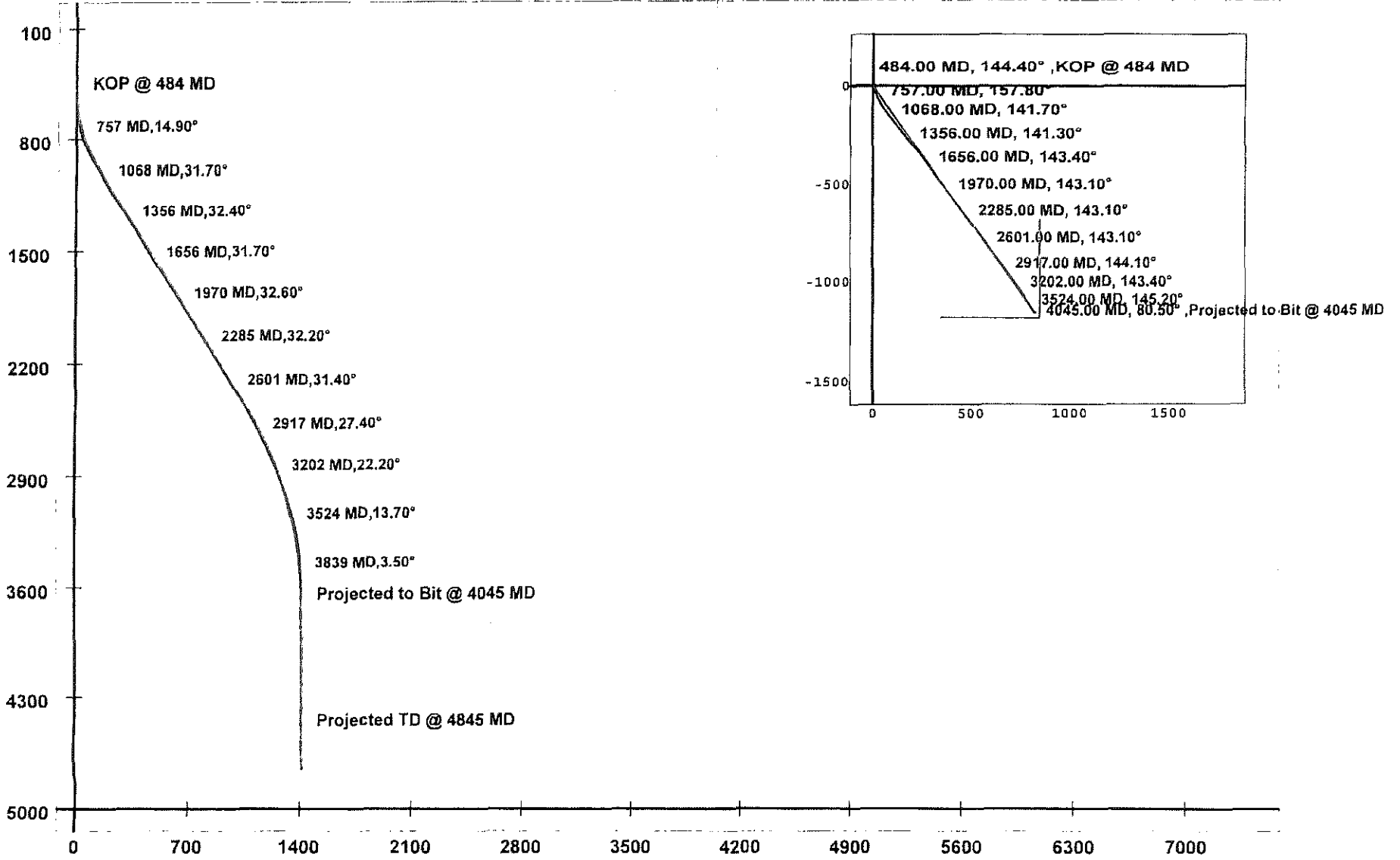
Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	C L O S U R E		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
1156.00	32.10	141.70	1107.58	-183.59	108.91	212.67	213.46	149.32	.63
1177.00	32.30	142.00	1125.35	-192.39	115.82	223.85	224.56	148.95	1.22
1207.00	32.40	142.00	1150.69	-205.04	125.71	239.89	240.50	148.49	.33
1237.00	32.70	141.70	1175.98	-217.73	135.68	256.02	256.54	148.07	1.14
1267.00	33.00	142.00	1201.18	-230.53	145.73	272.27	272.73	147.70	1.14
1297.00	32.60	141.70	1226.40	-243.31	155.77	288.51	288.90	147.37	1.44
1327.00	32.10	141.30	1251.74	-255.87	165.76	304.54	304.87	147.06	1.81
1356.00	32.40	141.30	1276.27	-267.95	175.44	319.99	320.27	146.79	1.03
1385.00	32.40	141.70	1300.75	-280.11	185.11	335.51	335.75	146.54	.74
1415.00	31.80	141.70	1326.17	-292.62	194.99	351.44	351.63	146.32	2.00
1446.00	31.80	141.70	1352.51	-305.44	205.11	367.75	367.92	146.12	.00
1476.00	30.90	140.60	1378.13	-317.60	214.90	383.34	383.47	145.92	3.56
1506.00	30.20	140.60	1403.97	-329.38	224.58	398.55	398.66	145.71	2.33
1536.00	30.20	142.00	1429.90	-341.15	234.02	413.62	413.70	145.55	2.35
1566.00	30.40	143.10	1455.80	-353.17	243.22	428.75	428.82	145.45	1.97
1596.00	30.80	143.10	1481.62	-365.38	252.39	444.01	444.08	145.37	1.33
1626.00	31.00	143.40	1507.36	-377.73	261.61	459.42	459.47	145.29	.84
1656.00	31.70	143.40	1532.98	-390.26	270.91	475.02	475.07	145.23	2.33
1688.00	31.90	143.10	1560.18	-403.77	281.00	491.88	491.93	145.16	.80
1719.00	32.30	142.40	1586.44	-416.88	290.97	508.35	508.38	145.09	1.76
1750.00	32.30	142.40	1612.65	-430.00	301.08	524.90	524.93	145.00	.00
1782.00	32.40	142.40	1639.68	-443.57	311.53	542.01	542.04	144.92	.31
1813.00	32.20	142.40	1665.88	-456.70	321.63	558.57	558.59	144.84	.65
1845.00	32.40	141.70	1692.93	-470.18	332.15	575.65	575.67	144.76	1.33
1876.00	33.10	141.30	1719.00	-483.30	342.59	592.40	592.41	144.67	2.36
1908.00	33.40	141.00	1745.76	-496.97	353.60	609.92	609.92	144.57	1.07
1939.00	33.10	142.00	1771.69	-510.27	364.18	626.89	626.90	144.48	2.02
1970.00	32.60	143.10	1797.73	-523.62	374.40	643.70	643.70	144.43	2.51
2001.00	32.60	143.10	1823.85	-536.97	384.43	660.40	660.40	144.40	.00
2031.00	32.60	143.40	1849.12	-549.92	394.10	676.56	676.56	144.37	.54
2064.00	32.90	144.80	1876.88	-564.38	404.57	694.41	694.41	144.37	2.47
2096.00	33.20	144.80	1903.70	-578.64	414.63	711.86	711.86	144.38	.94
2127.00	33.40	144.80	1929.61	-592.55	424.44	728.88	728.88	144.39	.65
2158.00	33.70	144.10	1955.44	-606.49	434.40	746.01	746.01	144.39	1.58
2189.00	34.00	144.10	1981.19	-620.48	444.52	763.28	763.28	144.38	.97
2221.00	33.30	143.80	2007.83	-634.81	454.96	781.01	781.01	144.37	2.25
2252.00	32.30	143.10	2033.88	-648.31	464.96	797.80	797.80	144.35	3.45
2285.00	32.20	143.10	2061.79	-662.39	475.53	815.41	815.41	144.33	.30
2317.00	32.50	143.10	2088.83	-676.08	485.81	832.52	832.53	144.30	.94
2348.00	32.40	143.40	2114.99	-689.41	495.76	849.15	849.16	144.28	.61
2379.00	32.40	144.10	2141.16	-702.80	505.59	865.76	865.77	144.27	1.21
2411.00	32.10	145.90	2168.22	-716.79	515.38	882.84	882.84	144.28	3.14
2442.00	31.80	146.20	2194.53	-730.40	524.54	899.23	899.23	144.32	1.09
2474.00	31.20	145.20	2221.81	-744.21	533.96	915.95	915.95	144.34	2.49
2506.00	31.60	144.80	2249.13	-757.87	543.53	932.62	932.62	144.35	1.41

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	CLOSURE		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
2538.00	31.50	144.10	2276.40	-771.49	553.26	949.36	949.36	144.35	1.19
2569.00	31.40	143.40	2302.84	-784.53	562.82	965.54	965.54	144.34	1.22
2601.00	31.40	143.10	2330.16	-797.89	572.80	982.21	982.21	144.33	.49
2632.00	31.70	144.10	2356.57	-810.95	582.42	998.42	998.43	144.31	1.95
2664.00	31.60	144.10	2383.81	-824.55	592.27	1015.22	1015.22	144.31	.31
2696.00	31.20	143.80	2411.13	-838.03	602.08	1031.89	1031.89	144.30	1.34
2727.00	30.90	143.80	2437.69	-850.93	611.52	1047.88	1047.88	144.30	.97
2759.00	30.60	143.80	2465.19	-864.13	621.19	1064.24	1064.24	144.29	.94
2791.00	30.30	143.40	2492.77	-877.19	630.81	1080.45	1080.45	144.28	1.13
2823.00	29.60	142.40	2520.50	-889.93	640.45	1096.42	1096.42	144.26	2.69
2855.00	28.70	143.10	2548.45	-902.34	649.88	1112.00	1112.01	144.24	3.01
2886.00	27.90	143.40	2575.74	-914.11	658.68	1126.70	1126.70	144.22	2.62
2917.00	27.40	144.10	2603.20	-925.71	667.18	1141.08	1141.09	144.22	1.92
2949.00	27.20	144.50	2631.64	-937.63	675.75	1155.76	1155.76	144.22	.85
<b>TOP NIAGRINE</b>									
2972.00	26.34	144.22	2652.17	-946.05	681.78	1166.12	1166.12	144.22	3.79
2981.00	26.00	144.10	2660.25	-949.27	684.11	1170.08	1170.09	144.22	3.79
3013.00	25.60	143.40	2689.06	-960.50	692.34	1184.01	1184.02	144.22	1.57
3044.00	25.10	143.40	2717.08	-971.15	700.26	1197.28	1197.29	144.21	1.61
3075.00	25.00	143.40	2745.16	-981.69	708.08	1210.40	1210.41	144.20	.32
3107.00	24.90	143.80	2774.17	-992.56	716.09	1223.90	1223.91	144.19	.61
3139.00	24.30	143.10	2803.27	-1003.26	724.02	1237.22	1237.23	144.18	2.08
3171.00	23.00	143.10	2832.58	-1013.52	731.73	1250.05	1250.06	144.17	4.06
3202.00	22.20	143.40	2861.20	-1023.07	738.86	1261.96	1261.98	144.16	2.61
3233.00	21.70	144.50	2889.95	-1032.44	745.68	1273.55	1273.56	144.16	2.09
3264.00	20.80	145.50	2918.84	-1041.64	752.13	1284.79	1284.80	144.17	3.13
3296.00	20.20	146.60	2948.82	-1050.93	758.38	1295.99	1296.00	144.18	2.23
3327.00	19.40	147.70	2977.99	-1059.75	764.08	1306.48	1306.48	144.21	2.85
3358.00	18.80	148.40	3007.28	-1068.36	769.45	1316.60	1316.60	144.24	2.07
3368.00	18.80	148.40	3016.74	-1071.10	771.14	1319.81	1319.82	144.25	.00
3430.00	17.50	149.10	3075.66	-1087.61	781.16	1339.07	1339.07	144.31	2.13
3460.00	16.30	148.40	3104.36	-1095.07	785.68	1347.77	1347.77	144.34	4.06
3492.00	15.10	146.60	3135.17	-1102.37	790.33	1356.41	1356.41	144.36	4.05
3524.00	13.70	145.20	3166.16	-1108.97	794.79	1364.37	1364.37	144.37	4.51
3556.00	12.70	144.10	3197.32	-1114.93	799.01	1371.67	1371.67	144.37	3.22
3587.00	11.40	143.40	3227.63	-1120.15	802.84	1378.14	1378.14	144.37	4.22
3619.00	10.60	143.80	3259.04	-1125.06	806.46	1384.25	1384.25	144.37	2.51
3650.00	9.20	144.80	3289.58	-1129.39	809.58	1389.58	1389.58	144.37	4.55
3682.00	7.70	146.20	3321.23	-1133.26	812.24	1394.28	1394.28	144.37	4.73
3713.00	6.60	145.90	3351.99	-1136.46	814.40	1398.14	1398.14	144.37	3.55
3744.00	5.80	144.80	3382.81	-1139.22	816.30	1401.48	1401.48	144.38	2.61
3776.00	5.10	145.50	3414.67	-1141.71	818.04	1404.52	1404.52	144.38	2.20
3808.00	4.50	145.90	3446.55	-1143.92	819.55	1407.20	1407.20	144.38	1.88
3839.00	3.50	143.40	3477.48	-1145.69	820.79	1409.36	1409.36	144.38	3.27
3870.00	2.60	141.30	3508.43	-1147.00	821.80	1411.01	1411.01	144.38	2.93

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	C L O S U R E		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
3902.00	2.30	143.40	3540.40	-1148.08	822.63	1412.38	1412.38	144.38	.98
3934.00	1.70	141.00	3572.38	-1148.96	823.31	1413.49	1413.49	144.38	1.89
3965.00	.60	142.70	3603.38	-1149.45	823.70	1414.11	1414.11	144.37	3.55
3997.00	.30	80.50	3635.38	-1149.57	823.89	1414.32	1414.32	144.37	1.66
<b>Projected to Bit @ 4045 MD</b>									
4045.00	.30	80.50	3683.38	-1149.53	824.13	1414.43	1414.43	144.36	.00
<b>Projected TD @ 4845 MD</b>									
4845.00	.30	80.50	4483.37	-1148.84	828.27	1416.27	1416.28	144.21	.00

Job Number: DR100040  
 Company: WEST BAY EXPLORATION  
 Lease/Well: WEST BAY/ BOYD 2-27  
 Location: NORVELL TWP., JACKSON CO.  
 Rig Name: ADVANCED # 2  
 State/Country: MICHIGAN / USA

Declination: 6.33 DEGREES WEST  
 File name: C:\WINSERVE\ASDRIL~1\2010  
 Date/Time: 04-Mar-10 / 10:01





## RECORD OF WELL COMPLETION

By authority of Part 615 or Part 625 of Act 451 PA 1994, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment.

(Submit 3 copies within 60 days of well completion.)

Part 615 Oil/Gas Well  Part 625 Mineral Well

Permit number/deepening permit no. 60011		API number 21-075-60011	
Type of well (after completion) oil			
Well name & number West Bay Boyd #2-27			
Name and address of permittee West Bay Exploration 13685 S. West Bay Shore Drive Suite 200, Traverse City Mi. 49684			
Directionally drilled (check one) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Previous permit numbers	
Total depth of well M.D. 4845'		T.V.D. 4483'	
Surface location SW ¼ of SE ¼ of SW ¼ Section 27 T 4S R 2E		Subsurface location (if directionally drilled) SE ¼ of NE ¼ of NW ¼ Section 27 T 4S R 2E	
Township Napoleon		County Jackson	
Footages: North/South 186' Ft. from South line and 1440' Ft. from West line of Sec.		Footages: North/South 963' Ft. from North line and 2264' Ft. from West line of Sec.	
Part 615 - oil/gas wells		Part 625 - mineral wells	
Date well completed D&A	Producing formation(s) D&A	Injection formation(s)	Date of first injection
			Disposal formation(s)
			Solution formation(s)

## COMPLETION INTERVALS(S)

Date	Number holes	Perforation or open hole interval	Open	
			Yes	No
3/11/10	52	4592-4605		x
3/15/10	28	4507-4514		x

## STIMULATION BY ACID OR FRACTURING

Date	Interval treated	Materials and amount used
3/12/10	4592-4605	500 gal 28% Hcl acid
3/15/10	4507-4514	500 gal 28% Hcl acid

## PRODUCTION TEST DATA

Oil Bbls/day	Gravity °API	Condensate Bbls/day	Gas MCF/day	Water Bbls/day	H <sub>2</sub> S Grains/100 ft <sup>3</sup>	B.H.P. and depth
0				100		

CERTIFICATION "I state that I am authorized by said owner. This report was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

Name and title (print or type) Timothy L. Baker	Signature 	Date 7/29/10
--	---------------	-----------------

Submit to: OFFICE OF GEOLOGICAL SURVEY  
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
PO BOX 30256  
LANSING MI 48909-7756

**RECORD OF WELL PLUGGING  
OR CHANGE OF WELL STATUS**

Required by authority of Part 615 Supervisor of Wells or  
Part 625 Mineral Wells of Act 451 PA 1994, as amended  
Non-submission and/or falsification of this information  
may result in fines and/or imprisonment.

- Part 615 Oil/Gas Well       Plugging  
 Part 625 Mineral Well       Change of Well Status

Permit number 60094	Well name and number West Bay Boyd #2-27		
API number 21-075-60011			
Name and address of permittee West Bay Exploration 13685 S West Bay Shore Drive Suite 200, Traverse City Mi. 49684			
Name and address of contractor/service company McConnell & Scully 146 W. Main St. Homer, Mi. 49245		Type of well Oil \$ Gas	Field name
		Surface location SW 1/4   SE 1/4   SW 1/4   Sec 22   T 4S   R 2E	
		Township Napoleon	County Jackson
		Date plugging/change started 05/14/10	Date plugging/change completed 05/21/10

DEQ employee issuing plugging permit or approving Change of Well Status.

Walt Danyluk

Date issued

05/03/10

Any change of well status which results in a change of production or a change in injectivity must include production or injection test records. All records must include a narrative or daily chronology and signed certification noted on reverse.

**WELL PLUGGING**  
(Hole conditions after plugging)

## CASING

Casing size	Where set	Amount casing pulled	Depth casing cut/perfed; or windows milled
11 3/4"	424	0	NA
8 5/8"	3417	0	NA
5 1/2"	4842	0	window milled to facilitate lateral under permit # 60094

## PLUGS

Depth of plug Bottom      Top	Make and type of bridge or plug	Cement plugs: type, amount of cement & mix water	Additives, type and percent	Volume and types of spacers/flushes	Wait time	Tagged
						Top? Y/N
4571      4570	Bakerl	Mechanical				Y
4322      4321	Baker	Mechanical				Y

Check if NORM or other materials were left or reinserted into wellbore. If so, describe materials fully in the Daily Chronology section on reverse.

Check if cores were taken and attach core descriptions

Mail completed original and three copies to the appropriate DEQ district office within 60 days after completion of plugging/change of a Part 615 oil/gas well or within 30 days of a Part 625 mineral well.

OFFICE OF GEOLOGICAL SURVEY  
MICHIGAN DEPT OF ENVIRONMENTAL QUALITY  
PO BOX 30256  
LANSING, MI 48909-7756

COMPLETE BOTH SIDES

API number 21-075-60011 Permit number 60094

**CHANGE OF WELL STATUS**

Change was to:  Convert current zone to:  Remediate well:  Plugback (recomplete as)  Redrill:

Production  Perf and test existing zone  New production zone  Horizontal drain hole

Disposal  Repair casing/cement  Disposal  Collapsed casing

Secondary recovery  Other \_\_\_\_\_  Secondary recovery  Underream open hole

Storage  Storage  Storage

Other \_\_\_\_\_  Other \_\_\_\_\_  Other \_\_\_\_\_

**Well casing record - BEFORE change**

Casing		Cement		Perforations			Acid or fracture treatment record
Size	Depth	Sacks	Type	From	To	If plugged, HOW?	
11 3/4"	424'	150/150	lite/A				
8 5/8"	3417'	650/200	lite/A				
5 1/2"	4842'	75/150	Halcm/A	4592	4605		500 gal 28% Hcl acid
				4507	4514		500 gal 28% Hcl acid

**Well casing record - AFTER change (Indicate additions and changes only, complete test record)**

Casing		Cement		Perforations			Acid or fracture treatment record
Size	Depth	Sacks	Type	From	To	If plugged, HOW?	
				4592	4605	CIBP	
				4507	4514	CIBP	

**BEFORE CHANGE**

**AFTER CHANGE**

Total depth 4842	Completed Fm Black River	Well completed for Oil & Gas		Total depth 4583	Completed Fm Black River	Well completed for Oil & Gas	
BOPD 0	MCFGPD	Inj Rate	Pressure	BOPD 200	MCFGPD 98	Inj Rate	Pressure 460

**DAILY PRODUCTION TEST RECORD**

**DAILY INJECTION TEST RECORD**  Injection well  Brine disposal

Date	Oil (bbls)	Water (bbls)	Gas (Mcf)	Pressure		Date	Bbls water or Mcf gas	Pressure		Specific gravity of water
				Tubing	Casing			Beginning	Ending	
5/25/10	231	0	68	520	620					
5/26/10	178	0	96	482	688					
5/27/10	196	0	100	492	690					
5/28/10	211	0	100	460	691					
5/29/10	188	0	100	457	688					
5/30/10	195	0	100	453	688					
5/31/10	195	0	100	447	688					

**DAILY CHRONOLOGY**

Describe in detail the daily chronology of change/plugging, include days shut down. Describe exceptions to issued plugging instructions. Describe tools, tubing, etc. left in hole and any logs run. Include dates pits filled, surface restored etc. Use additional pages as needed.

Date	Narrative
5/14/10	MIRU set CIBP @ 4321' Mill Window & Kick off at 4310 under permit # 60094 land lateral at 4267', 2140' South of surface and 824' East TOH Run tbg to T.D.
5/21/10	Test Well

NOTICE: Under Part 615 Supervisor of Wells or Part 625 Mineral Wells, Act 451 PA 1994, as amended, a well owner has continuing liability for the integrity of a plugged well.

CERTIFICATION "I state that I am authorized by said owner. This report was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

Name and title (printed or typed) *Timothy L. Baker - Operations Mgr* Authorized signature *[Signature]* Date *5/21/10*

NOTE: Bonds cannot be terminated until plugging is completed, cellar, rat and mouse holes, and pits filled, site leveled and cleaned and records filed.



## REC ID OF WELL DRILLING OR DEE, NING

Required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, of Act 451 PA 1994, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment.

Permit number/Deepening number  
60094

(Submit 3 copies within 60 days of drilling completion.)

Part 615 Oil/Gas Well  Part 625 Mineral Well

Name and address of permittee		API number	
West Bay Exploration 13685 S. West Bay Shore Suite 200 Traverse City Mi. 49684		21-075-60011	
Name and address of drilling contractor		Well name and number	
Advanced Energy Services P.O. Box 85 South Boardman Mi. 49680		West Bay & Boyd #2-27 HD 1	
Date drilling began		Surface location	
05/15/2010		SW 1/4 of SE 1/4 of SW 1/4 Section 22 T4S R2E	
Date drilling completed		Township	
05/21/2010		Norvell	
Total depth of well		County	
Driller 5102 Log NA		Jackson	
Formation at total depth		Footages North/South East/West	
Black River		186' ft. from S line and 1440' ft. from W line of sec.	
Elevations		Directionally drilled (check one)	
K.B. 1042.6 ft. R.F. ft. R.T. 1041 ft. Grd 1029.2 ft		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
		Previous permit numbers	
		Subsurface location (if directionally drilled)	
		NE 1/4 of SE 1/4 of NW 1/4 Section 27 T 4S R 2E	
		Township	
		Norvell	
		County	
		Jackson	
		Footages North/South East/West	
		1590' ft. from N line and 2256' ft. from W line of sec.	
		Feet drilled - cable tools	
		Feet drilled - rotary tools	
		from to from surf to TD	

Casing, Casing Liners and Cementing, Operating Strings					Water Fill Up (F.U.) or Lost Circulation (L.C.) (X)				
Size	Where set	Cement	T.O.C.	Fl. pulled	Formation	F.U.	L.C.	Depth	Amount
11 3/4"	424'	150 lite/150 A	surface						
8 5/8"	3417'	650 lite/200 A	surface						
5 1/2"	4842'	75 Halcem	3300"						
		150 Halcem							
		(PN 60011)							

Gross Pay Intervals				All Other Oil and Gas Shows Observed or Logged								
Formation	Oil or Gas	From	To	Where Observed (X)								
Formation	Oil or Gas	Depth	Sam- ples	Odor	Pits	Mud Line	Gas Log	Fill Up				
Black River	both	4310'	5102'									

Depth Correction		Deviation Survey		Plugged Back		
Depth	Correction	Run at	Degrees	Yes	No	Depth
see	attached	directional				

Geophysical / Mechanical Logs (list each type run)		
Brand	Log types	Logged intervals
Unable to run logs in lateral		

Notice: Report complete sample and formation record, coring record, and drill stem test information on reverse side.

CERTIFICATION "I state that I am authorized by said owner This report was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

Date	Name and title (print)	Signature
06/22/2010	Timothy L. Baker	

Submit to: OFFICE OF GEOLOGICAL SURVEY,  
MICHIGAN DEPT OF ENVIRONMENTAL QUALITY  
PO BOX 30256, LANSING, MI 48909-7756



# FORMATION RECORD

Attach additional sheets if necessary

API number

Permit number/Deepening number

60094

Elevation used

Geologist name

Tops taken from

1043

Fowler/Baker/Vancycle

Driller's log

Sample log

Electric log

From	To	Formation (type, color, hardness)	From	To	Formation (type, color, hardness)
<p>Note: if well directionally drilled, add true vertical depth formation tops where appropriate</p>					
surf	222(log)	Drift- Unconsolidated sand and gravel			
222	290	Shale& Siltstone- brn-gy-Grn, silty at top organic at base			
290	1230	Shale-Coldwater- Md-dk Brn-Blk, Silty, incr organic at base			
1230	1370	Sunbury Sh/Berea siltstone-Sh, Md Brn-Blk Silty, pyr. mixed w/siltstone, SSO-Lt md brn, Arg			
1370	15	Antrim-Dk Brn-Blk, Pyrand incr organic at base, SG incr toward base			
1554	1622	Traverse Fm- Limestone, Dk Brn-md Brn, Dns, Pyr, Dolomite, Md Gy-Gy, Dns			
1622	1744	Traverse Limestone-Md Brn-lt Brn Vfxln, Hd,			
1744	1978	Shale intbd w Dolomite and Lmst, Md Brn-Gy, Vfxln, Dns, Pos Dundee@1728'-Brn-Lt brn, Poor Samp, Pos Cvgs			
1978	2200	Detroit River- Anhydrite and Dolomite/Limestone, Lt-Md Brn Dns, Vfxln in pt, NS			
2200	2416	Bass Island/Bois Blanc- Dolomite, Anhydrite & Limestone AA			
2416	2685	G-Unit-Dolomite-Arg, Hd grading to Anhydrite- Lt-md Gy Brn			
2685	2766	C Shale-Gy-rdBrn, W/Dolomite and Anhydrite, Lt gy-Brn-bf Poor Samp. l			
2766	2972	B Evap-Anhydrite Wh-Lt Gy W/Dolomite-Vfxln, Lt-md Gy, Intbd at base with Anhy. AA	If well was cored, attach core description		
2972	3160	Dolo & Lmst-Wh-lt Gy, Dns, Anhydritic @3110-Wh, Dns	DRILL STEM TEST DATA		
3160	3386	Niagaran-Dolomite, AA, Md Gy, Vfxln Intbd W/Anhydrite AA, V porous 2880'-3300'			
3386	3884	Clinton/Cinn-Dolomite, Arg, hd, dk gy, grd to lt gy intbd w/Lmst, lt-md gy Dns			
3884	4212	Utica- Shale, Gy-Grn, Gummy-Hd			
4212	4526	Trenton-Dolo, Lt -Md Gy, Dns, W/ Lmst @ 4236'-4526' Lt-Md Gy Brn, Vfxln,			
4526	TD	Black River- Dolomite, Md Brn-GyBrn, SO&G@4590'			
	Under PN 60011				

4311

5102

discriptions of rock cuttings after  
drilling window  
Dolomite- Lt Gy - Lt Brn, fxln,so &G,  
G cut & Flu ,Tr Frac,Partial loss of  
returns

LIST ATTACHMENTS

OFFICE OF GEOLOGICAL SURVEY USE ONLY

Reviewed by

Date of review



Directional Drilling Contractors, LLC.

Job Number: DR100134

Company: WEST BAY EXPLORATION

Lease/Well: WEST BAY/ BOYD 2-27 HD1

Location: NORVELL TWP., JACKSON CO.

Rig Name: MCCONNELL & SCULLY

RKB:

G.L. or M.S.L.:

State/Country: MICHIGAN / USA

Declination: 6.37 DEGREES WEST

Grid:

File name: C:\WINSERVE\PENDING\2010\BOYD227.SVY

Date/Time: 24-May-10 / 12:20

Curve Name: WEST BAY/BOYD 2-27 HD1 (as drilled)

Directional Drilling Contractors  
SURVEY REPORT

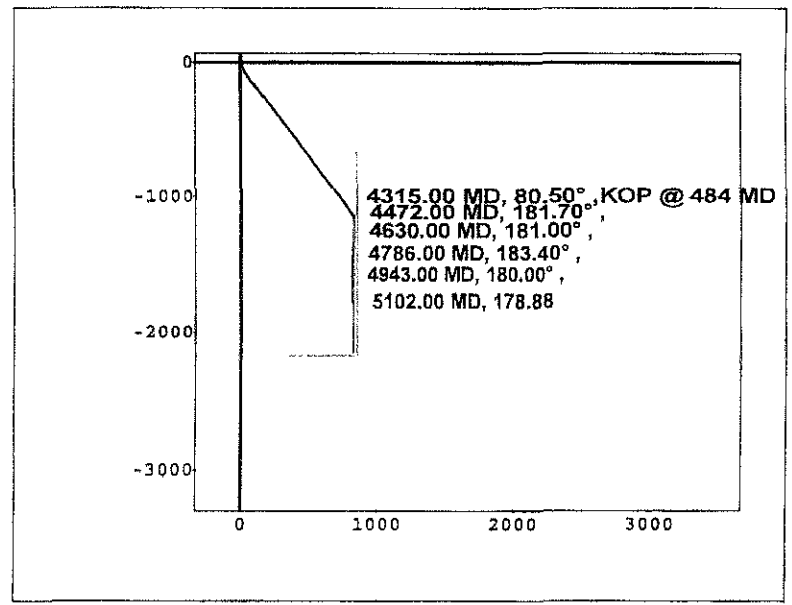
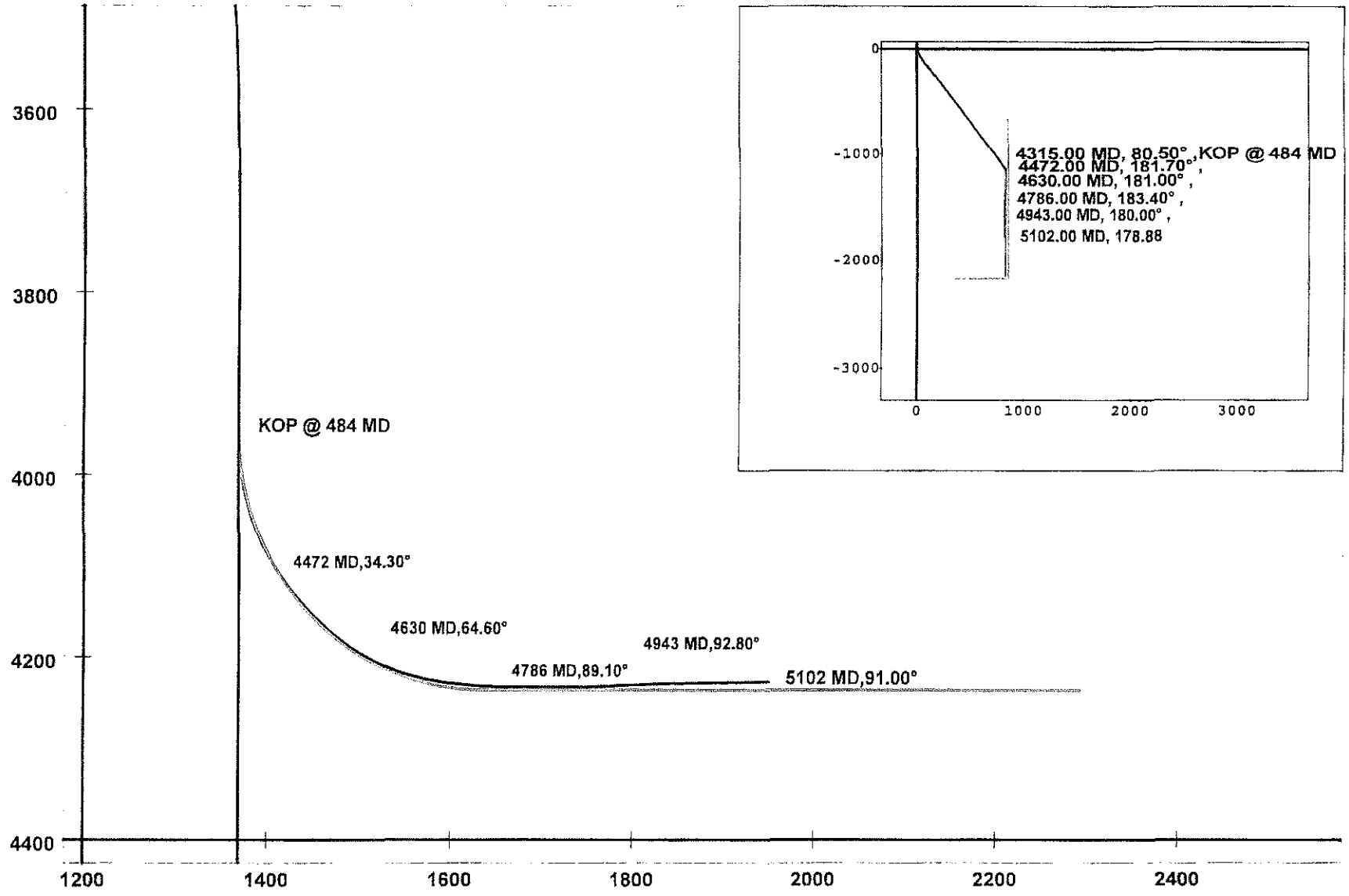
WINSERVE SURVEY CALCULATIONS  
Minimum Curvature Method  
Vertical Section Plane 158.94  
Vertical Section Referenced to Wellhead  
Rectangular Coordinates Referenced to Wellhead

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	CLOSURE		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
<b>KOP @ TIE @ 4315 MD</b>									
4315.00	.30	80.50	3953.37	-1149.29	825.53	1369.17	1415.05	144.31	.00
4346.00	5.20	164.10	3984.33	-1150.63	826.00	1370.59	1416.41	144.33	16.69
4379.00	11.30	164.50	4016.97	-1155.19	827.27	1375.30	1420.86	144.39	18.49
4409.00	18.00	173.60	4045.98	-1162.63	828.57	1382.72	1427.67	144.52	23.55
4440.00	25.90	180.70	4074.72	-1174.18	829.03	1393.66	1437.36	144.78	26.84
4472.00	34.30	181.70	4102.38	-1190.21	828.67	1408.49	1450.28	145.15	26.30
4503.00	40.00	181.70	4127.08	-1208.92	828.12	1425.75	1465.35	145.59	18.39
4535.00	45.80	181.70	4150.51	-1230.68	827.47	1445.83	1483.00	146.08	18.12
4567.00	51.30	181.40	4171.68	-1254.65	826.83	1467.96	1502.59	146.61	17.20
4598.00	57.90	180.70	4189.63	-1279.90	826.37	1491.36	1523.49	147.15	21.37
4630.00	64.60	181.00	4205.01	-1307.94	825.95	1517.37	1546.90	147.73	20.95
4662.00	72.30	183.10	4216.76	-1337.66	824.87	1544.72	1571.54	148.34	24.82
4693.00	79.20	184.90	4224.39	-1367.61	822.77	1571.92	1596.03	148.97	22.96
4722.00	83.30	184.50	4228.80	-1396.17	820.42	1597.73	1619.38	149.56	14.20
4754.00	86.60	184.50	4231.61	-1427.94	817.92	1626.48	1645.61	150.20	10.31
4786.00	89.10	183.40	4232.81	-1459.84	815.72	1655.46	1672.28	150.80	8.53
4817.00	89.90	182.40	4233.08	-1490.80	814.15	1683.78	1698.63	151.36	4.13
4848.00	89.60	180.70	4233.22	-1521.79	813.31	1712.40	1725.49	151.88	5.57
4880.00	90.20	180.00	4233.28	-1553.79	813.12	1742.19	1753.69	152.38	2.88
4911.00	92.70	180.70	4232.49	-1584.77	812.93	1771.04	1781.11	152.84	8.37
4943.00	92.80	180.00	4230.96	-1616.74	812.73	1800.80	1809.52	153.31	2.21

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	CLOSURE		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
4974.00	91.40	179.30	4229.82	-1647.71	812.92	1829.77	1837.34	153.74	5.05
5036.00	90.70	178.20	4228.68	-1709.69	814.28	1888.09	1893.69	154.53	2.10
5092.00	90.95	178.88	4227.87	-1765.66	815.70	1940.84	1944.98	155.20	1.29
<b>PROJECTED TD @ 5102 MD</b>									
5102.00	91.00	179.00	4227.70	-1775.66	815.89	1950.24	1954.13	155.32	1.29

Job Number: DR100134  
Company: WEST BAY EXPLORATION  
Lease/Well: WEST BAY/ BOYD 2-27 HD1  
Location: NORVELL TWP., JACKSON CO.  
Rig Name: MCCONNELL & SCULLY  
State/Country: MICHIGAN / USA

Declination: 6.37 DEGREES WEST  
File name: C:\WINSERVE\\_PENDING\2C  
Date/Time: 24-May-10 / 12:17





## RECORD OF WELL COMPLETION

By authority of Part 615 or Part 625 of Act 451 PA 1994, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment.

(Submit 3 copies within 60 days of well completion.)

Part 615 Oil/Gas Well  Part 625 Mineral Well

Permit number/deepening permit no. 60094	API number 21-075-60011
Type of well (after completion) oil	
Well name & number West Bay Boyd #2-27 HD 1	

Name and address of permittee West Bay Exploration 13685 S. West Bay Shore Drive Suite 200, Traverse City Mi. 49684					
Directionally drilled (check one) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Previous permit numbers		Total depth of well M.D. 5102' T.V.D. 4228'	
Surface location SW ¼ of SE ¼ of SW ¼ Section 22 T 4S R 2E			Subsurface location (if directionally drilled) NE ¼ of SE ¼ of NW ¼ Section 27 T 4S R 2E		
Township Napoleoni		County Jackson		Township Napoleon	
Footages: North/South 186' Ft. from South line and 1440' Ft. from West line of Sec.		Footages: North/South 1590' Ft. from North line and 2256' Ft. from West line of Sec.		East/West	
Part 615 - oil/gas wells			Part 625 - mineral wells		
Date well completed oil & Gas	Producing formation(s) Black River	Injection formation(s)	Date of first injection	Disposal formation(s)	Solution formation(s)

## COMPLETION INTERVALS(S)

Date	Number holes	Perforation or open hole interval	Open	
			Yes	No
5/25/10	open hole	4311-5102'	X	

## STIMULATION BY ACID OR FRACTURING

Date	Interval treated	Materials and amount used

## PRODUCTION TEST DATA

Oil Bbls/day	Gravity °API	Condensate Bbls/day	Gas MCF/day	Water Bbls/day	H <sub>2</sub> S Grains/100 ft <sup>3</sup>	B.H.P. and depth
200	43		98			

CERTIFICATION "I state that I am authorized by said owner. This report was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

Name and title (print or type) Timothy L. Baker	Signature 	Date 05/30/10
--	---------------	------------------

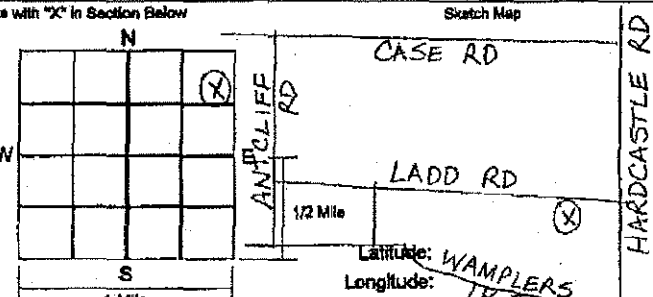
Submit to: OFFICE OF GEOLOGICAL SURVEY  
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
PO BOX 30256  
LANSING MI 48909-7756

12148 LADD

Geological Survey No.

### MICHIGAN DEPARTMENT OF PUBLIC HEALTH WATER WELL AND PUMP RECORD

W 7671  
PERMIT NUMBER

<b>1 LOCATION OF WELL</b>			<b>3 OWNER OF WELL:</b> ROBERT A. BRISTLE 12148 LADD BROOKLYN MI 49230 <small>Address Same as Well Location? <input checked="" type="checkbox"/></small>	
County <b>JACKSON</b>	Township Name <b>NORVELL</b>	Fraction <b>SE 1/4 NE 1/4 NE 1/4</b>	Section <b>27</b>	Town Number <b>4 S</b>
Distance and Direction From Road Intersection  12148 LADD BROOKLYN MI 49230 <small>Street Address City of Well location</small>			<b>4 WELL DEPTH:</b> 188 ft.      Date Completed: 8/6/99 <b>NEW WELL</b>	
Locate with "X" in Section Below  			<b>5 DRILLING METHOD:</b> ROTARY	
<b>2 FORMATION DESCRIPTION</b>			<b>6 USE:</b> DOMESTIC	
	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM	<b>7 CASING:</b> PLASTIC Diameter 5" to 173 ft. depth  Grouted Drill Hole Diameter 9" to 173 ft. depth	
SAND	20	20	Height: ABOVE Surface 1'	
YELLOW CLAY	8	28	Weight SDR 21	
GRAY CLAY	24	52	Drive Shoe? <input type="checkbox"/>	
GRAVEL	3	55	<b>8 SCREEN:</b> Type: NONE      Diameter " Nominal	
GRAY CLAY	112	167	<b>FITTINGS:</b>	
SAND ROCK	21	188	<b>9 STATIC WATER LEVEL:</b> 52 ft. below land surface      Flow? <input type="checkbox"/>	
PUMPING LEVEL			<b>10 PUMPING LEVEL:</b> below land surface 52 ft. after 2 hrs. pumping at 12 G.P.M.	
EST WITH AIR			<b>11 WELL HEAD COMPLETION:</b> PITLESS ADAPTOR	
100+ GPM			<b>12 WELL GROUTED?</b> <input checked="" type="checkbox"/> EZ SEAL From 0 to 173 ft. 19 bags of cement.	
<p style="font-size: 1.2em; font-weight: bold;">RECEIVED SEP 09 1999</p> <p style="font-size: 0.8em;">MICR DEPT OF ENVIRONMENTAL QUALITY</p> <p style="font-size: 1.2em; font-weight: bold;">OCT 08 1999</p> <p style="font-size: 0.8em;">Drinking Water &amp; Foundation Protection Ground Water Protection Section WELL CONSTRUCTION UNIT</p>			<b>13 NEAREST SOURCE OF CONTAMINATION:</b> Type SEPTIC Distance 150 ft. Direction S Well disinfected upon completion? <input checked="" type="checkbox"/> Old Well Plugged? <input type="checkbox"/>	
			<b>14 PUMP:</b> Manufacturers name RED JACKET Model number 75CNSWI-125BC HP 3/4 VOLTS 230V Length of Drop Pipe 75 ft. capacity 12 G.P.M. Type SUBMERSIBLE  PRESSURE TANK: Manufacturers Name AMTROL (OWNERS) Model Number WX 202 Capacity 6.2 Gallons	
<b>CRIBLEY OFFICE NOTES</b>  WELLS AWC 5-1 1" PVC 75 CDCW14574P18609			<b>15 WATER WELL CONTRACTOR'S CERTIFICATION:</b> This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.  Cribley Drilling Co., Inc.      81-0524 REGISTERED BUSINESS NAME      REGISTRATION NO. Address: 8300 Dexter Chevrolet Rd., Dexter, MI 48130 Signed: <i>Jack A. Clark</i> Date: 8/17/99 AUTHORIZED REPRESENTATIVE	
<b>15 REMARKS, ELEVATION, SOURCE OF DATA, ETC.</b>  NO LINER			<b>16 WATER WELL CONTRACTOR'S CERTIFICATION:</b> This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.  Cribley Drilling Co., Inc.      81-0524 REGISTERED BUSINESS NAME      REGISTRATION NO. Address: 8300 Dexter Chevrolet Rd., Dexter, MI 48130 Signed: <i>Jack A. Clark</i> Date: 8/17/99 AUTHORIZED REPRESENTATIVE	
<b>17 RIG OPERATOR'S NAME</b>  KEN PEARCE				

D67d 2/89

**IMPORTANT: File with dect.**

GEOLOGICAL SURVEY COPY

Authority: Act 368 PA 1976  
 Completion: Required  
 Penalty: Conviction of a violation of any provision is a misdemeanor

H 313-675-8958  
W 313-481-7901

**DEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY**  
**DRINKING WATER & RADIOLOGICAL PROTECTION DIVISION**

**WATER WELL AND PUMP RECORD**

Completion is required under authority of Part 127 Act 368 PA 1978  
Failure to comply is a misdemeanor

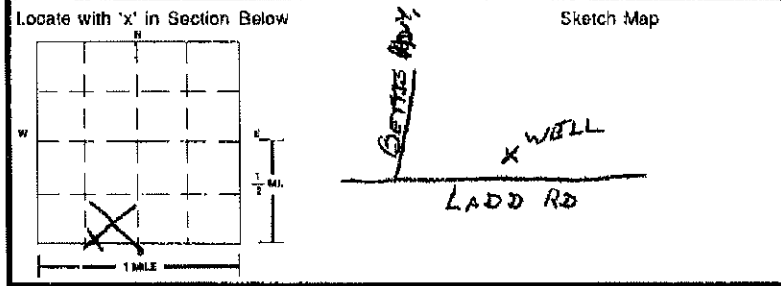
PERMIT NO:

W-4119

TAX NO: \_\_\_\_\_

1. LOCATION OF WELL  
County JACKSON Township Name NORWELL Fraction S<sup>1</sup>/<sub>4</sub> S<sup>1</sup>/<sub>4</sub> S<sup>1</sup>/<sub>4</sub> S<sup>1</sup>/<sub>4</sub> Section No. 22 Town No. 45 Range No. 2E

Distance and Direction from Road Intersection  
1/4 MILE EAST OF BETTIE'S HWY. ON N. SIDE OF LADD RD.



3. OWNER OF WELL LARRY KLOPPER  
Address 12160 LADD RD. BROOKLYN, MI  
Address Same as Well Location  Yes  No

4. WELL DEPTH: 114 ft. Date Completed 5/20/98  
 New Well  Replacement Well

5.  Cable Tool  Rotary  Driven  Dug  
 Hollow Rod  Auger/Bored  Jetted

6. USE:  Household  Type I Public  Type III Public  
 Irrigation  Type IIa Public  Heat Pump  
 Test Well  Type IIb Public

7. CASING:  Steel  Threaded  Welded  
 Plastic  Other  
Height: Above/Below Surface: 1 ft  
Diameter: 5 in. to 108 ft. depth Weight: PVC lbs/ft.  
BORE HOLE: Diameter: 8 in. to 114 ft. depth  Drive Shoe  Shaft Packer

8. SCREEN:  Not Installed  Gravel-Packed  
Type JOHNSON Diameter 4"  
Slot/Gauze .020 Length: 6 FT  
Set Between 108 ft. and 114 ft.  
FITTINGS:  K-Packer  Bremer Check  
 Blank Above Screen 1 ft. Other THREAD ON

9. STATIC WATER LEVEL: 30 ft. Below Land Surface  Flowing

10. PUMPING LEVEL: Below Land Surface  
50 ft. After 2 hrs. Pumping at 12 G.P.M.  
 Plunger  Bailor  Air  Test Pump

11. WELL HEAD COMPLETION:  
 Pitless Adapter  12" Above Grade  
 Basement Offset  Well House

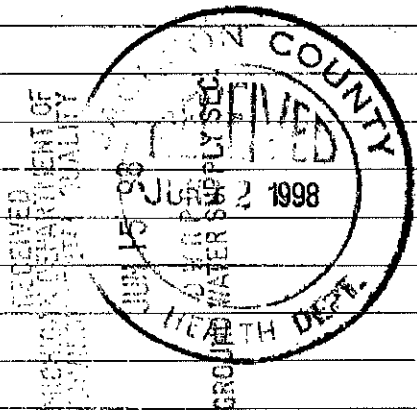
12. WELL GROUTED?  No  Yes From 0 to 108 ft.  
 Neat Cement  Bentonite  Other  
No. of Bags 5 1/2 Additives BELSEAL

13. NEAREST SOURCE OF POSSIBLE CONTAMINATION:  
Type SEPTIC Distance 50+ ft. Direction NORTH  
Type \_\_\_\_\_ Distance \_\_\_\_\_ ft. Direction \_\_\_\_\_

14. PUMP:  Not Installed  Pump Installation Only  
Manufacturer's Name MYERS  
Model Number JS12A HP 1/2 Volts 230  
Length of Drop Pipe 80 ft. Capacity 10 G.P.M.  
TYPE:  Submersible  Jet  Other  
PRESSURE TANK:  
Manufacturer's Name WEL-X-TROL  
Model Number WX-202 Capacity 20 Gallons

2. FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
<u>SAND</u>	<u>27</u>	<u>27</u>
<u>CLAY</u>	<u>64</u>	<u>91</u>
<u>GRAVEL + CLAY</u>	<u>12</u>	<u>103</u>
<u>SAND + GRAVEL</u>	<u>11</u>	<u>114</u>



USE A 2ND SHEET IF NEEDED

15. ABANDONED WELL PLUGGED?  Yes  No  
Casing Diameter \_\_\_\_\_ in. Depth \_\_\_\_\_ ft.  
PLUGGING MATERIAL:  Neat Cement  Bentonite Slurry  
 Cement/Bentonite Slurry  Concrete Grout  Bentonite Chips  
No. of Bags \_\_\_\_\_ Casing Removed?  Yes  No

16. REMARKS: (Elevation, Source of Data, etc.)

17. DRILLING MACHINE OPERATOR:  
 Employee  Subcontractor  
Name CHARLES F. TORNOW

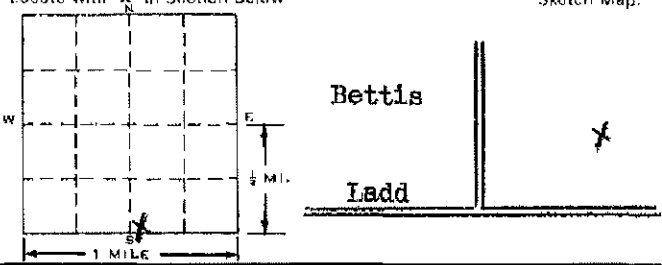
18. WATER WELL CONTRACTOR'S CERTIFICATION:  
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.  
GARDNER & SONS INC. 3039  
REGISTERED BUSINESS NAME REGISTRATION NO.  
Address 3768 M-50 TIRTON, MI 49287  
Signed Philip R. Gode Date 5-20-98  
AUTHORIZED REPRESENTATIVE



**WATER WELL AND PUMP RECORD**

PART 127 ACT 368, P.A. 1978

PERMIT NUMBER

<b>1 LOCATION OF WELL</b>		Fraction <u>SW 1/4 SW 1/4 SE 1/4</u> Section Number <u>(22) 21</u> Town Number <u>T4S N/S</u> Range Number <u>R2E E/W</u>	
County <b>Jackson</b>	Township Name <b>Norvell</b>		
Distance And Direction From Road Intersection <b>1/2 mi E Bettis &amp; Ladd Roads</b>		3 OWNER OF WELL: <b>Harry Haligus</b> Address <b>12180 Ladd Road Brooklyn, MI 49230</b>	
12180 Ladd Rd		Address Same As Well Location? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Street Address & City of Well Location		4 WELL DEPTH: (completed) <b>180</b> ft Date of Completion <b>11/30/83</b>	
Locate with "X" in Section Below		5 <input type="checkbox"/> Cable tool <input checked="" type="checkbox"/> Rotary <input type="checkbox"/> Driven <input type="checkbox"/> Dug <input type="checkbox"/> Hollow rod <input type="checkbox"/> Auger <input type="checkbox"/> Jetted <input type="checkbox"/>	
Sketch Map: 		6 USE: <input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Type I Public <input type="checkbox"/> Type III Public <input type="checkbox"/> Irrigation <input type="checkbox"/> Type IIa Public <input type="checkbox"/> Heat pump <input type="checkbox"/> Test Well <input type="checkbox"/> Type IIb Public <input type="checkbox"/>	
2 FORMATION DESCRIPTION		7 CASING Diameter: <input type="checkbox"/> Steel <input type="checkbox"/> Threaded <input checked="" type="checkbox"/> Plastic <input type="checkbox"/> Welded 5 in. to 156 ft depth 8 in. to 156 ft. depth Grouted Drill Hole Diameter 8 in. to 156 ft. depth	
		Height Above/Surface <input checked="" type="checkbox"/> Surface 1 ft Weight 2 lbs./ft. Drive Shoe <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
		8 SCREEN: <input checked="" type="checkbox"/> Not installed Type _____ Diameter _____ Slot/Gauze _____ Length _____ Set between _____ ft and _____ ft. FITTINGS <input type="checkbox"/> K-Packer <input type="checkbox"/> Lead Packer <input type="checkbox"/> Bremer Check <input type="checkbox"/> Blank above screen _____ ft. Other _____	
		9 STATIC WATER LEVEL: <b>43</b> ft. below land surface <input type="checkbox"/> Flow	
		10 PUMPING LEVEL: below land surface <b>44</b> ft. after <b>1</b> hrs. pumping at <b>15</b> G.P.M. _____ ft. after _____ hrs. pumping at _____ G.P.M.	
11 WELL HEAD COMPLETION <input type="checkbox"/> Piless adapter <input checked="" type="checkbox"/> 12" above grade <input type="checkbox"/> Basement offset <input type="checkbox"/> Approved pit		12 WELL GROUTED? <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes From <b>1</b> to <b>156</b> ft. <input type="checkbox"/> Neat cement <input checked="" type="checkbox"/> Bentonite <input type="checkbox"/> Other _____ No. of bags of cement <b>1</b> Additives _____	
13 Nearest source of possible contamination Type _____ Distance _____ ft. Direction _____ Well disinfected upon completion? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		14 PUMP: <input checked="" type="checkbox"/> Not Installed <input type="checkbox"/> Pump Installation Only Manufacturer's name _____ Model number _____ HP _____ Volts _____ Length of Drop Pipe _____ ft. capacity _____ G.P.M. TYPE: <input type="checkbox"/> Submersible <input type="checkbox"/> Jet _____ PRESSURE TANK: Manufacturer's name _____ Model number _____ Capacity _____ Gallons	
15. Remarks, elevation, source of data, etc.  <b>RECEIVED</b> Mich. Dept. of Public Health <b>JUN 7 1984</b> Bureau of Environmental and Occupational Health - SWCS		16. WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief. <b>Fox &amp; Boley Well Drilling, Inc.</b> 167 - 1517 REGISTERED BUSINESS NAME REGISTRATION NO. Address <b>6655 Brooklyn Rd., Jackson, MI 49201</b> Signed <b>Thomas L. Melville</b> Date <b>5/14/84</b> AUTHORIZED REPRESENTATIVE	

8640

ADDED INFO BY DRILLER, ITEM NO.  
CORRECTED BY  
ADDITION BY  
ELEVATION  
DEPTH TO SPACK

770hally  
12215 Ladd Rd



# Water Well And Pump Record



Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Import ID:

<b>Tax No:</b>	<b>Permit No:</b> 11701	<b>County:</b> Jackson		<b>Township:</b> Norvell	
<b>Well ID: 38000006689</b>		<b>Town/Range:</b> 04S 02E	<b>Section:</b> 27	<b>Well Status:</b> Active	<b>WSSN:</b>
		<b>Source ID/Well No:</b>			
<b>Elevation:</b>					
<b>Latitude:</b> 42.10084738					
<b>Longitude:</b> -84.18260323					
<b>Method of Collection:</b> Interpolation-Map					
<b>Distance and Direction from Road Intersection:</b> .4 MILE E OF LADD RD & BETTIS RD					
<b>Well Owner:</b> NEIL WELCH					
<b>Well Address:</b> 1215 LADD RD			<b>Owner Address:</b> 305 CASS AVE JACKSON, MI 49203		

<b>Drilling Method:</b> Rotary	<b>Pump Installed:</b> Yes	<b>Pump Installation Only:</b> No
<b>Well Depth:</b> 196.00 ft.	<b>Pump Installation Date:</b>	<b>HP:</b> 0.50
<b>Well Type:</b> New	<b>Manufacturer:</b> Aermotor	<b>Pump Type:</b> Submersible
<b>Well Use:</b> Household	<b>Model Number:</b> A-12-50	<b>Pump Capacity:</b> 12 GPM
<b>Date Completed:</b> 8/1/2003	<b>Drop Pipe Length:</b> 65.00 ft.	<b>Pump Voltage:</b>
<b>Casing Type:</b> PVC plastic	<b>Drop Pipe Diameter:</b>	<b>Drilling Record ID:</b>
<b>Casing Joint:</b> Unknown	<b>Draw Down Seal Used:</b> No	
<b>Casing Fitting:</b> Shale packer/trap	<b>Pressure Tank Installed:</b> Yes	
<b>Height:</b>	<b>Pressure Tank Type:</b> Unknown	
<b>Diameter:</b> 5.00 in. to 168.00 ft. depth	<b>Manufacturer:</b> Well-Mate	
<b>Borehole:</b> 8.00 in. to 168.00 ft. depth	<b>Model Number:</b> WM-6	<b>Tank Capacity:</b> 5.0 Gallons
4.75 in. to 196.00 ft. depth	<b>Pressure Relief Valve Installed:</b> No	

<b>Static Water Level:</b> 43.00 ft. Below Grade (Not Flowing) <b>Unrestricted Flow Rate:</b> <b>Well Yield Test:</b> Pumping level 47.00 ft. after 1.00 hrs. at 20 GPM	<b>Yield Test Method:</b> Test pump	<b>Formation Description</b>	<b>Thickness</b>	<b>Depth to Bottom</b>
		Clay Sand Gravel	8.00	8.00
		Sand & Gravel W/Stones	4.00	12.00
		Sand & Gravel	25.00	37.00
		Clay	18.00	55.00

<b>Screen Installed:</b> No <b>Intake:</b> Bedrock Well	Clay Sand Gravel	31.00	86.00
	Sand & Gravel Silty	19.00	105.00
	Clay Sand Gravel	50.00	155.00
	Sand & Gravel	7.00	162.00
	Gray Sandstone	34.00	196.00

<b>Well Grouted:</b> Yes	<b>Grouting Method:</b> Unknown		
<b>Grouting Material:</b> Bentonite slurry	<b>Bags:</b> 16.00	<b>Additives:</b> None	<b>Depth:</b> 0.00 ft. to 168.00 ft.

<b>Wellhead Completion:</b> Pitless adapter	<b>Geology Remarks:</b>
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<b>Nearest Source of Possible Contamination:</b>	<b>Drilling Machine Operator Name:</b> TBURKHOLDER/MSEXTON
<b>Type:</b> Septic tank	<b>Employment:</b> Employee
<b>Distance:</b> 50 ft.	
<b>Direction:</b> Southwest	

<b>Contractor Type:</b> Water Well Drilling Contractor	<b>Reg No:</b> 167
<b>Business Name:</b> FOX & BOLEY WELL DRILLING, INC	
<b>Business Address:</b>	

<b>Water Well Contractor's Certification</b>	
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.	
<b>Signature of Registered Contractor</b>	<b>Date</b>

<b>General Remarks:</b>
<b>Other Remarks:</b>

**ATTENTION WELL OWNER: FILE WITH DEED**



# Water Well And Pump Record



Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Import ID:

<b>Tax No:</b>	<b>Permit No:</b> 8613	<b>County:</b> Jackson		<b>Township:</b> Norvell	
<b>Well ID:</b> 38000004062	<b>Town/Range:</b> 04S 02E	<b>Section:</b> 27	<b>Well Status:</b> Active	<b>WSSN:</b>	<b>Source ID/Well No:</b>
	<b>Distance and Direction from Road Intersection:</b> 2/10 MI E. OF LADD RD. & BETTIS RD				
	<b>Well Owner:</b> HOLLIS HAMM				
<b>Elevation:</b>	<b>Well Address:</b>		<b>Owner Address:</b>		
<b>Latitude:</b> 42.10158183	12161 LADD RD.		12161 LADD RD.		
<b>Longitude:</b> -84.18806133	BROOKLYN, MI 49230		BROOKLYN, MI 49230		
<b>Method of Collection:</b> Address Matching-House Number					

<b>Drilling Method:</b> Rotary	<b>Well Use:</b> Household	<b>Pump Installed:</b> Yes	<b>Pump Installation Only:</b> No
<b>Well Depth:</b> 212.00 ft.	<b>Date Completed:</b> 7/7/2000	<b>Pump Installation Date:</b>	<b>HP:</b> 1.00
<b>Well Type:</b> New	<b>Height:</b>	<b>Manufacturer:</b> Aermotor	<b>Pump Type:</b> Submersible
<b>Casing Type:</b> PVC plastic		<b>Model Number:</b> A+20-100	<b>Pump Capacity:</b> 20 GPM
<b>Casing Joint:</b> Other		<b>Drop Pipe Length:</b> 65.00 ft.	<b>Pump Voltage:</b>
<b>Casing Fitting:</b> Drive shoe		<b>Drop Pipe Diameter:</b>	<b>Drilling Record ID:</b>
<b>Diameter:</b> 5.00 in. to 176.00 ft. depth		<b>Draw Down Seal Used:</b> No	
<b>Borehole:</b> 8.00 in. to 176.00 ft. depth		<b>Pressure Tank Installed:</b> Yes	
		<b>Pressure Tank Type:</b> Unknown	
		<b>Manufacturer:</b> Well-Mate	
		<b>Model Number:</b> WM-14WB	<b>Tank Capacity:</b> 14.0 Gallons
		<b>Pressure Relief Valve Installed:</b> No	

<b>Static Water Level:</b> 45.00 ft. Below Grade (Not Flowing) <b>Unrestricted Flow Rate:</b> <b>Well Yield Test:</b> Pumping level 46.00 ft. after 1.00 hrs. at 20 GPM	<b>Yield Test Method:</b> Test pump	<b>Formation Description</b>	<b>Thickness</b>	<b>Depth to Bottom</b>
		Sand & Gravel	2.00	2.00
		Clay	7.00	9.00
		Sand & Gravel	6.00	15.00
		Clay	4.00	19.00

<b>Screen Installed:</b> No <b>Intake:</b> Bedrock Well	Clay Sand Gravel	65.00	84.00
	Sand & Gravel	11.00	95.00
	Sand & Gravel	13.00	108.00
	Clay Sand Gravel	22.00	130.00
	Gray Sandstone	2.00	132.00
	Clay Sand Gravel	20.00	152.00
	Sand Gravel Clay	8.00	160.00
	Sand & Gravel	11.00	171.00
	Gray Sandstone	27.00	198.00

<b>Well Grouted:</b> Yes	<b>Grouting Method:</b> Unknown	<b>(Continued On Page 2)</b>		
<b>Grouting Material:</b> Bentonite slurry	<b>Bags:</b> 18.00	<b>Additives:</b> Other	<b>Depth:</b> 0.00 ft. to 175.00 ft.	<b>Geology Remarks:</b>

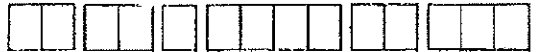
<b>Wellhead Completion:</b> Pitless adapter	
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<b>Nearest Source of Possible Contamination:</b>	<b>Drilling Machine Operator Name:</b> TBURKHOLDER/HARRIS
<b>Type:</b> None	<b>Employment:</b> Employee
<b>Distance:</b>	
<b>Direction:</b>	

<b>(Continued on page 2)</b>	
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<b>General Remarks:</b>
<b>Other Remarks:</b> Casing Joint:GLUED, Grouting Additive 1:QUICK-GROUT/BENSEAL

**ATTENTION WELL OWNER: FILE WITH DEED**



MAR 30 1973

**WATER WELL RECORD**  
ACT 294 PA 1965

MICHIGAN DEPARTMENT  
OF  
PUBLIC HEALTH

<b>1 LOCATION OF WELL</b>					
County <b>Jackson</b>	Township Name <b>Norvell</b>	Fraction <b>SW<sup>1</sup>/<sub>4</sub> SW<sup>1</sup>/<sub>4</sub> SW<sup>1</sup>/<sub>4</sub></b>	Section Number <b>22</b>	Town Number <b>T4S N/S.</b>	Range Number <b>R2E E/W.</b>

Distance And Direction from Road Intersections  
**NE corner Bettis & Ladd Roads**

Street address & City of Well Location  
**Ladd Road**

Locate with "X" in section below

**3 OWNER OF WELL:**  
Address **Joseph Natter**  
**1005 Lakeview**  
**Brooklyn, Michigan 49230**

**4 WELL DEPTH:** (completed) Date of Completion  
**180** ft. **2/7/73**

**5**  Cable tool  Rotary  Driven  Dug  
 Hollow rod  Jotted  Bored

**6 USE:**  Domestic  Public Supply  Industry  
 Irrigation  Air Conditioning  Commercial  
 Test Well

**7 CASING:** Threaded  Welded  Height: Above/Below  
Diam. \_\_\_\_\_ Surface **1** ft.  
Weight **11** lbs./ft.  
Drive Shoe? Yes  No

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	15	15
Shale and gravel	110	125
Shale	8	137
Gravel	8	145
Shale	10	155
Gravel	6	161
Shale	4	165
Sandstone	15	180

**8 SCREEN:**  
Type: none Dia.: \_\_\_\_\_  
Slot/Gauze \_\_\_\_\_ Length \_\_\_\_\_  
Set between \_\_\_\_\_ ft. and \_\_\_\_\_ ft.  
Fittings: \_\_\_\_\_

**9 STATIC WATER LEVEL**  
**45** ft. below land surface

**10 PUMPING LEVEL** below land surface  
**50** ft. after **2** hrs. pumping **20** g.p.m.  
\_\_\_\_\_ ft. after \_\_\_\_\_ hrs. pumping \_\_\_\_\_ g.p.m.

**11 WATER QUALITY** in Parts Per Million:  
Iron (Fe) \_\_\_\_\_ Chlorides (Cl) \_\_\_\_\_  
Hardness \_\_\_\_\_ Other \_\_\_\_\_

**12 WELL HEAD COMPLETION:**  In Approved Pit  
 Pitless Adaptor  12" Above Grade

**13 Well Grouted?**  Yes  No  
 Neat Cement  Bentonite   
Depth: From \_\_\_\_\_ ft. to \_\_\_\_\_ ft.

**14 Nearest Source of possible contamination**  
**none** feet \_\_\_\_\_ Direction \_\_\_\_\_ Type \_\_\_\_\_  
Well disinfected upon completion  Yes  No

**15 PUMP:**  Not installed **as yet**  
Manufacturer's Name \_\_\_\_\_  
Model Number \_\_\_\_\_ HP \_\_\_\_\_ Volts \_\_\_\_\_  
Length of Drop Pipe \_\_\_\_\_ ft. capacity \_\_\_\_\_ G.P.M.  
Type:  Submersible  Jet  Reciprocating

**16 Remarks, elevation, source of data, etc.**

ADDED INFO. BY DRILLER, ITEM ALL

CORRECTED BY

ADDITION

**17 WATER WELL CONTRACTOR'S CERTIFICATION:**  
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

**For Brothers Drillers, Inc.** REGISTRATOR NO. **167**

Address **6655 Brooklyn Road, Jackson, Michigan 49201**

Signed *[Signature]* Date **2/20/73**  
AUTHORIZED REPRESENTATIVE