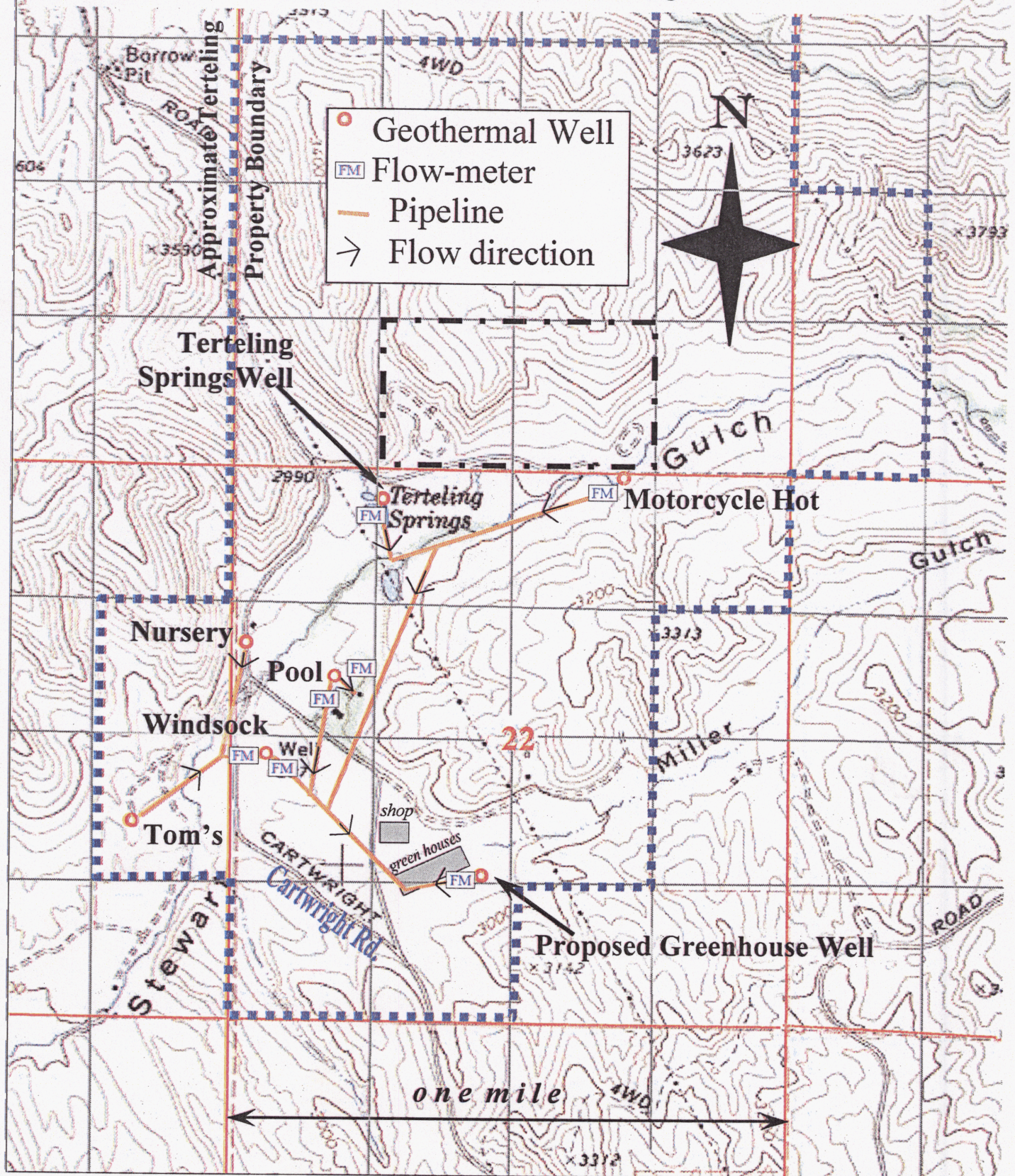


Location map for The Terteling Company's low-temperature geothermal water wells showing diagrammatic pipeline and flow-meter placements. Base map USGS 7.5-minute topographic series, showing sections in Township 4 North, Range 2 East.



RECEIVED

OCT 11 2002

WATER RESOURCES
WESTERN REGIONSTATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

AMENDED

TRANSFER OF WATER RIGHT

AMENDED

TRANSFER NO. 68558

This is to certify that: THE TERTELING COMPANY INC

3823 N 36TH ST

BOISE ID 83703

(208)338-5200

has requested a change to the water right(s) listed below. This change in water right(s) is authorized pursuant to the provisions of Section 42-222, Idaho Code. The authorized change for each affected water right, including conditions of approval, is shown on the following pages of this document.

Summary of Water Rights Before the Proposed Change

Right	Origin/Basis	Priority	Rate	Volume	Acres	Total	Source
63-12	AJC/Decreed	07/01/1921	0.14 cfs			7.5	GROUND WATER
63-13	AJC/Decreed	07/01/1922	0.66 cfs			7.5	GROUND WATER
63-15	AJC/Decreed	03/23/1927	0.80 cfs			7.5	GROUND WATER

Purpose of Transfer (Changes Proposed)

Current Number	Split	POD	POU	Add POD	Period of Use	Nature of Use
63-12	NO	NO	YES	YES	NO	NO
63-13	NO	NO	YES	YES	NO	NO
63-15	NO	NO	YES	YES	NO	NO

Summary of Water Rights After the Approved Change

Existing Right	New No. (changed portion)	Transfer Rate	Transfer Volume	Acre Limit	Total Acres	New No. (remaining portion)	Remaining Rate	Remaining Volume	Remaining Acre Limit	Remaining Total Acres
63-12	63-12	0.14 cfs	101.4 af	6.0	15.0		N/A	N/A	N/A	N/A
63-13	63-13	0.66 cfs	400.0 af	6.0	15.0		N/A	N/A	N/A	N/A
63-15	63-15	0.80 cfs	400.0 af	6.0	15.0		N/A	N/A	N/A	N/A
TOTALS		0.86 cfs	400.0 af	6.0	15.0		N/A	N/A	N/A	N/A

Detailed Water Right Description(s) attached

Dated this

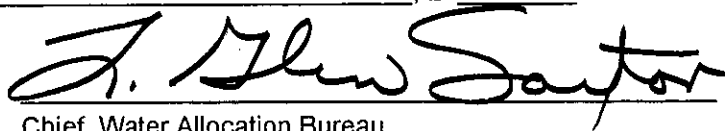
9th

day of

October

20

02



Chief, Water Allocation Bureau

WATER RIGHT NO. 63-12
As Modified by Transfer No. 68558

In accordance with the approval of Transfer No. 68558, Water Right No. 63-12 is now described as follows.

Right Holder: THE TERTELING COMPANY INC
 3823 N 36TH ST
 BOISE ID 83703

Priority Date: 07/01/1921

Source: GROUND WATER

<u>BENEFICIAL USE</u>	<u>From</u>	<u>To</u>	<u>Diversion Rate</u>	<u>Volume</u>
HEATING	01/01	12/31	0.14 CFS	101.4 AF
DOMESTIC	01/01	12/31	0.04 CFS	0.6 AF
IRRIGATION	01/01	12/31	0.14 CFS	38.0 AF
			0.14 CFS	101.4 AF

LOCATION OF POINT(S) OF DIVERSION:

GROUND WATER	NWNWSW Sec. 22Twp 04N Rge 02E ADA County
GROUND WATER	NWNWSW Sec. 28 Twp 04N Rge 02E ADA County
GROUND WATER	NENESE Sec. 29 Twp 04N Rge 02E ADA County
GROUND WATER	NENESE Sec. 29 Twp 04N Rge 02E ADA County

PLACE OF USE: HEATING & DOMESTIC

Twp Rge Sec	NE				NW				SW				SE				Totals
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
04N 02E 22									X				X				
04N 02E 29															X		

PLACE OF USE: IRRIGATION

Twp Rge Sec	NE				NW				SW				SE				Totals
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
04N 02E 22									7.0				.5				7.5
04N 02E 29															7.5		7.5

Total Acres: 15

WATER RIGHT NO. 63-12
As Modified by Transfer No. 68558

CONDITIONS OF APPROVAL

1. Right 63-12 is limited to the irrigation of 6.0 acres within the place of use described above in a single irrigation season.
2. Rights 63-12, 63-13 and 63-15 when combined shall not exceed a total annual maximum diversion volume of 38.0 af for irrigation of 6.0 acres, 0.6 af for domestic use, and 400.0 af for heating and all combined uses.
3. The total instantaneous diversion of water from all points of diversion under Rights 63-12, 63-13 and 63-15 shall not exceed 0.86 cfs, nor a total combined annual volume of 400.0 af.
4. Prior to diversion of water under approval of Transfer 68558, action shall be taken to activate Water District 63-S. Diversion and use of water from the Windsock well is contingent upon continued activity of Water District 63-S.
5. Use of water under this water right will be regulated by the watermaster of State Water District No. 63-S, Stewart Gulch.
6. Prior to diversion of water under this approval, the right holder shall provide a means of measurement and lockable controlling works for all authorized points of diversion. The means of measurement and controlling works must be suitable for control of the diversions and acceptable to the watermaster.
7. The Silkey v. Tiegs decree specifically addressed and protected artesian pressure in the aquifer. The Department, in deference to the Silkey decree, will refrain from examining whether the artesian pressure in Stewart Gulch constitutes a reasonable pumping level and is in the public interest pursuant to I.C. § 42-226 until such time as the court addresses the issue in the Snake River Basin Adjudication.
8. The measuring devices for the wells must be calibrated by an independent method of measurement at least once a year. These calibrations shall be included in the watermaster's annual report to IDWR.
9. Unless otherwise determined by the Snake River Adjudication, diversion from the Windsock well shall not significantly reduce artesian pressure for water rights bearing priority dates earlier than December 20, 2000, describing points of diversion within Water District 63-S. A significant reduction is defined as a decline in pressure below historical pressure reductions caused by diverting from the wells in the Silkey v. Tiegs decree. Upon written complaint of significant reduction from the holder of a water right bearing a priority date earlier than December 20, 2000 or upon IDWR's own initiative, and upon a preliminary finding by IDWR that there has been a significant reduction in pressure, the director may require the right holder to: (a) conduct further monitoring to determine whether diversion from the Windsock well is causing the significant reduction in pressure; (b) curtail diversion of water from the Windsock well; or (c) require mitigation for diversion of water from the Windsock well.
10. Low temperature geothermal water diverted under this right shall not be used for domestic or irrigation purposes unless it is first used for heating purposes.

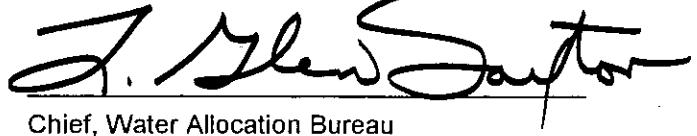
WATER RIGHT NO. 63-12
As Modified by Transfer No. 68558

CONDITIONS OF APPROVAL

11. Use of water under this right may be affected by an agreement between the protestant and the right holder.
12. Irrigation use is for inside commercial greenhouses and outside irrigation.
13. Domestic use is for business offices.
14. The Director maintains jurisdiction of this transfer up to five (5) years for the purpose of determining potential injury to existing rights, both junior and senior, in the vicinity of the transferred point of diversion.
15. The right holder shall accomplish the change authorized by this transfer within one (1) year of the date of this approval.
16. Failure of the right holder to comply with the conditions of this transfer is cause for the Director to rescind approval of the transfer.
17. Approval of this transfer does not preclude the opportunity for review of the validity of this water right in the ongoing Snake River Basin Adjudication.
18. Diversion from points of diversion authorized by this water right and other measurements described below shall be measured and recorded at least weekly. The measurements shall include aquifer shut in pressure, well-head pressure under pumping conditions, artesian flow or pumping discharge rate, totalized production volume for the period between readings, and water temperature. If these measurements are not being taken directly by the watermaster, the measurements must be reported to the watermaster at least quarterly.

This water right is subject to all prior water rights and shall be administered in accordance with Idaho law and applicable rules of the Department of Water Resources.

Dated this 9th day of October, 2002


Chief, Water Allocation Bureau

WATER RIGHT NO. 63-13
As Modified by Transfer No. 68558

In accordance with the approval of Transfer No. 68558, Water Right No. 63-13 is now described as follows.

Right Holder: THE TERTELING COMPANY INC
 3823 N 36TH ST
 BOISE ID 83703

Priority Date: 07/01/1922

Source: GROUND WATER

<u>BENEFICIAL USE</u>	<u>From</u>	<u>To</u>	<u>Diversion Rate</u>	<u>Volume</u>
IRRIGATION	01/01	to 12/31	0.66 CFS	38.0 AF
DOMESTIC	01/01	to 12/31	0.04 CFS	0.6 AF
HEATING	01/01	to 12/31	0.66 CFS	400.0 AF
			0.66 CFS	400.0 AF

LOCATION OF POINT(S) OF DIVERSION:

GROUND WATER	NWNWSW Sec. 22 Twp 04N Rge 02E ADA County
GROUND WATER	NWNWSW Sec. 28 Twp 04N Rge 02E ADA County
GROUND WATER	NENESE Sec. 29 Twp 04N Rge 02E ADA County
GROUND WATER	NENESE Sec. 29 Twp 04N Rge 02E ADA County

PLACE OF USE: IRRIGATION

Twp Rge Sec	NE				NW				SW				SE				Totals	
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE		
04N 02E 22									7.0				.5					7.5
04N 02E 29																7.5		7.5

Total Acres: 15

PLACE OF USE: DOMESTIC & HEATING

Twp Rge Sec	NE				NW				SW				SE				Totals	
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE		
04N 02E 22									X				X					
04N 02E 29																X		

WATER RIGHT NO. 63-13
As Modified by Transfer No. 68558

CONDITIONS OF APPROVAL

1. Right 63-13 is limited to the irrigation of 6.0 acres within the place of use described above in a single irrigation season.
2. Rights 63-12, 63-13 and 63-15 when combined shall not exceed a total annual maximum diversion volume of 38.0 af for irrigation of 6.0 acres, 0.6 af for domestic use, and 400.0 af for heating and all combined uses.
3. The total instantaneous diversion of water from all points of diversion under Rights 63-12, 63-13 and 63-15 shall not exceed 0.86 cfs, nor a total combined annual volume of 400.0 af.
4. Prior to diversion of water under approval of Transfer 68558, action shall be taken to activate Water District 63-S. Diversion and use of water from the Windsock well is contingent upon continued activity of Water District 63-S.
5. Use of water under this water right will be regulated by the watermaster of State Water District No. 63-S, Stewart Gulch.
6. Prior to diversion of water under this approval, the right holder shall provide a means of measurement and lockable controlling works for all authorized points of diversion. The means of measurement and controlling works must be suitable for control of the diversions and acceptable to the watermaster.
7. The Silkey v. Tiegs decree specifically addressed and protected artesian pressure in the aquifer. The Department, in deference to the Silkey decree, will refrain from examining whether the artesian pressure in Stewart Gulch constitutes a reasonable pumping level and is in the public interest pursuant to I.C. § 42-226 until such time as the court addresses the issue in the Snake River Basin Adjudication.
8. The measuring devices for the wells must be calibrated by an independent method of measurement at least once a year. These calibrations shall be included in the watermasters annual report to IDWR.
9. Unless otherwise determined by the Snake River Adjudication, diversion from the Windsock well shall not significantly reduce artesian pressure for water rights bearing priority dates earlier than December 20, 2000, describing points of diversion within Water District 63-S. A significant reduction is defined as a decline in pressure below historical pressure reductions caused by diverting from the wells in the Silkey v. Tiegs decree. Upon written complaint of significant reduction from the holder of a water right bearing a priority date earlier than December 20, 2000 or upon IDWR's own initiative, and upon a preliminary finding by IDWR that there has been a significant reduction in pressure, the director may require the right holder to: (a) conduct further monitoring to determine whether diversion from the Windsock well is causing the significant reduction in pressure; (b) curtail diversion of water from the Windsock well; or (c) require mitigation for diversion of water from the Windsock well.
10. Low temperature geothermal water diverted under this right shall not be used for domestic or irrigation purposes unless it is first used for heating purposes.

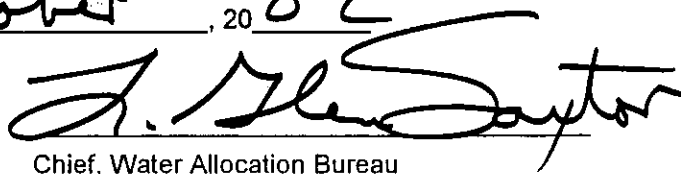
WATER RIGHT NO. 63-13
As Modified by Transfer No. 68558

CONDITIONS OF APPROVAL

11. Use of water under this right may be affected by an agreement between the protestant and the right holder.
12. Irrigation use is for inside commercial greenhouses and outside irrigation.
13. Domestic use is for business offices.
14. The Director maintains jurisdiction of this transfer up to five (5) years for the purpose of determining potential injury to existing rights, both junior and senior, in the vicinity of the transferred point of diversion.
15. The right holder shall accomplish the change authorized by this transfer within one (1) year of the date of this approval.
16. Failure of the right holder to comply with the conditions of this transfer is cause for the Director to rescind approval of the transfer.
17. Approval of this transfer does not preclude the opportunity for review of the validity of this water right in the ongoing Snake River Basin Adjudication.
18. Diversion from points of diversion authorized by this water right and other measurements described below shall be measured and recorded at least weekly. The measurements shall include aquifer shut in pressure, well-head pressure under pumping conditions, artesian flow or pumping discharge rate, totalized production volume for the period between readings, and water temperature. If these measurements are not being taken directly by the watermaster, the measurements must be reported to the watermaster at least quarterly.

This water right is subject to all prior water rights and shall be administered in accordance with Idaho law and applicable rules of the Department of Water Resources.

Dated this 9th day of October, 2002


Chief, Water Allocation Bureau

WATER RIGHT NO. 63-15
As Modified by Transfer No. 68558

In accordance with the approval of Transfer No. 68558, Water Right No. 63-15 is now described as follows.

Right Holder: THE TERTELING COMPANY INC
 3823 N 36TH ST
 BOISE ID 83703

Priority Date: 03/23/1927

Source: GROUND WATER

<u>BENEFICIAL USE</u>	<u>From</u>	<u>To</u>	<u>Diversion Rate</u>	<u>Volume</u>
DOMESTIC	01/01	to 12/31	0.04 CFS	0.6 AF
IRRIGATION	01/01	to 12/31	0.80 CFS	38.0 AF
HEATING	01/01	to 12/31	0.80 CFS	400.0 AF
			0.80 CFS	400.0 AF

LOCATION OF POINT(S) OF DIVERSION:

GROUND WATER	NWNWSW Sec. 22 Twp 04N Rge 02E ADA County
GROUND WATER	NWNWSW Sec. 28 Twp 04N Rge 02E ADA County
GROUND WATER	NENESE Sec. 29 Twp 04N Rge 02E ADA County
GROUND WATER	NENESE Sec. 29 Twp 04N Rge 02E ADA County

PLACE OF USE: DOMESTIC & HEATING

Twp Rge Sec	NE				NW				SW				SE				Totals
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
04N 02E 22									X				X				
04N 02E 29														X			

PLACE OF USE: IRRIGATION

Twp Rge Sec	NE				NW				SW				SE				Totals
	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
04N 02E 22									7.0				.5				7.5
04N 02E 29													7.5				7.5

Total Acres: 15

WATER RIGHT NO. 63-15
As Modified by Transfer No. 68558

CONDITIONS OF APPROVAL

1. Right 63-15 is limited to the irrigation of 6.0 acres within the place of use described above in a single irrigation season.
2. Rights 63-12, 63-13 and 63-15 when combined shall not exceed a total annual maximum diversion volume of 38.0 af for irrigation of 6.0 acres, 0.6 af for domestic use, and 400.0 af for heating and all combined uses.
3. The total instantaneous diversion of water from all points of diversion under Rights 63-12, 63-13 and 63-15 shall not exceed 0.86 cfs, nor a total combined annual volume of 400.0 af.
4. Water under Right 63-15 shall not be diverted or allowed to flow pending further direction from the court as described under the Silkey v. Tiegs decree dated 06-13-1930.
5. Prior to diversion of water under approval of Transfer 68558, action shall be taken to activate Water District 63-S. Diversion and use of water from the Windsock well is contingent upon continued activity of Water District 63-S.
6. Use of water under this water right will be regulated by the watermaster of State Water District No. 63-S, Stewart Gulch.
7. Prior to diversion of water under this approval, the right holder shall provide a means of measurement and lockable controlling works for all authorized points of diversion. The means of measurement and controlling works must be suitable for control of the diversions and acceptable to the watermaster.
8. The Silkey v. Tiegs decree specifically addressed and protected artesian pressure in the aquifer. The Department, in deference to the Silkey decree, will refrain from examining whether the artesian pressure in Stewart Gulch constitutes a reasonable pumping level and is in the public interest pursuant to I.C. § 42-226 until such time as the court addresses the issue in the Snake River Basin Adjudication.
9. The measuring devices for the wells must be calibrated by an independent method of measurement at least once a year. These calibrations shall be included in the watermasters annual report to IDWR.
10. Unless otherwise determined by the Snake River Adjudication, diversion from the Windsock well shall not significantly reduce artesian pressure for water rights bearing priority dates earlier than December 20, 2000, describing points of diversion within Water District 63-S. A significant reduction is defined as a decline in pressure below historical pressure reductions caused by diverting from the wells in the Silkey v. Tiegs decree. Upon written complaint of significant reduction from the holder of a water right bearing a priority date earlier than December 20, 2000 or upon IDWR's own initiative, and upon a preliminary finding by IDWR that there has been a significant reduction in pressure, the director may require the right holder to: (a) conduct further monitoring to determine whether diversion from the Windsock well is causing the significant reduction in pressure; (b) curtail diversion of water from the Windsock well; or (c) require mitigation for diversion of water from the Windsock well.

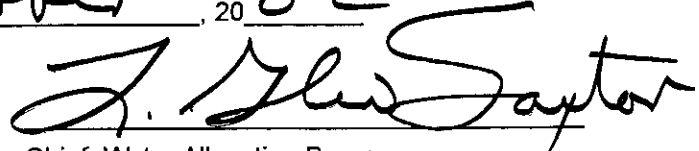
WATER RIGHT NO. 63-15
As Modified by Transfer No. 68558

CONDITIONS OF APPROVAL

11. Low temperature geothermal water diverted under this right shall not be used for domestic or irrigation purposes unless it is first used for heating purposes.
12. Use of water under this right may be affected by an agreement between the protestant and the right holder.
13. Irrigation use is for inside commercial greenhouses and outside irrigation.
14. Domestic use is for business offices.
15. The Director maintains jurisdiction of this transfer up to five (5) years for the purpose of determining potential injury to existing rights, both junior and senior, in the vicinity of the transferred point of diversion..
16. The right holder shall accomplish the change authorized by this transfer within one (1) year of the date of this approval.
17. Failure of the right holder to comply with the conditions of this transfer is cause for the Director to rescind approval of the transfer.
18. Approval of this transfer does not preclude the opportunity for review of the validity of this water right in the ongoing Snake River Basin Adjudication.
19. Diversion from points of diversion authorized by this water right and other measurements described below shall be measured and recorded at least weekly. The measurements shall include aquifer shut in pressure, well-head pressure under pumping conditions, artesian flow or pumping discharge rate, totalized production volume for the period between readings, and water temperature. If these measurements are not being taken directly by the watermaster, the measurements must be reported to the watermaster at least quarterly.

This water right is subject to all prior water rights and shall be administered in accordance with Idaho law and applicable rules of the Department of Water Resources.

Dated this 9th day of October, 2002


Chief, Water Allocation Bureau

TECHNICAL MEMORANDUM

TO: Kenneth W. Neely/ Idaho Department of Water Resources, Boise, Idaho

FROM: Ed Squires/Hydro Logic, Inc., Boise, Idaho

DATE: January 16, 2004

SUBJECT: Geothermal Aquifer Monitoring Plan for The Terteling Company, Inc.'s
Geothermal wells of the Boise Front Groundwater Management Area

RECEIVED

SEP 01 2004

WATER RESOURCES
WESTERN REGION

Overview

The Terteling Company, Inc. (TTC) owns and operates low-temperature geothermal water supply wells within the Boise Front Geothermal Groundwater Management Area. Six of these wells are subject to a monitoring and reporting plan required by the Order Accepting Settlement In Part and Stay of Proceedings Regarding Remainder of Petition issued by the Director of the Idaho Department of Water Resources (IDWR) dated September 6th, 2002 "In the Matter of Petition for Order Authorizing Additional Permits and Moratorium Order for Water Rights 63-9138 & 63-9139 in the Name of the City of Boise". Hydro Logic, Inc. is currently contracted to TTC to provide well monitoring and reporting services for their geothermal wells. TTC wells covered by this plan are within Water District 63-S as well as the Boise Front Geothermal Groundwater Management Area and are subject to the requirements of both designations.

Wells

Of the six geothermal wells to be monitored, three of the wells are located on the Terteling Ranch in Stewart Gulch 1½ -to-2¼ miles above the mouth of the gulch at Hill Road. The remaining three wells are clustered closely together at the intersection of Hill Road and 36th Street in northwest Boise at the location of the former Flora Co. site. A location map for the six TTC wells is included as Figure 1.

The Stewart Gulch (Terteling Ranch) wells include the Windsock, Pool, and Motorcycle Hot wells. These artesian wells have water levels ranging from 140-to-300 feet below land surface.

The TTC's 36th Street wells include the Silkey, Tiegs, and Office/House wells. These wells exhibit flowing artesian conditions with above ground piezometric heads ranging from about 4.76-to-14.28 psi (11-to-33 feet above land surface).

Monitoring Responsibility

Ed Squires of Hydro Logic, Inc. has primary responsibility for TTC's monitoring and reporting obligations to TTC and IDWR. Hydro Logic, Inc. can be contacted at:

Hydro Logic, Inc.
1002 W. Franklin Street
Boise, Idaho 83702
(208) 342-8369 office
hydrologic@qwest.net e-mail

Monitoring Instruments and Equipment

All below ground water level measurements are taken using a chalked steel tape manufactured specifically for that purpose. 500-foot Lufkin spring steel tapes, with a measurement increment of 0.01-foot, are used for all measurements (Figure 2).

All above ground aquifer pressures are measured using a brace of Ashcroft Duraguage Plus gauges mounted in a manifold capable of measuring pressures simultaneously (Figure 2). The two gauges are direct reading, Model # 1279AS, 0-to-30 psi range, guaranteed accurate to +/- 5% of full scale (~.35 feet), gages with 4½-inch diameter indicator scales. These are non-fluid filled gages to ensure accuracy at a wide range of temperatures.

Thermometers used to measure water temperature are Model 315, “tpi” brand digital thermometers with a resolution of 0.1 °F, a sampling interval of 1.5 seconds, and a range of -58 °F-to-302 °F. Although the guaranteed accuracy of these thermometers is +/- 2.0 °F, we check calibration of the field thermometers with a VWR Model 61102-005 mercury-filled, ASTM-rated thermometer with 0.5 °F accuracy and a Hannah Instruments Model 9023 multi-meter with +/- 0.9 °F accuracy prior to field measurements. We have consistently found the accuracy of the used digital thermometers to be within 0.5-to-0.75 °F of the guaranteed-accurate thermometers. We have selected these units for field use because non-mercury-filled thermometers do not have the desired accuracy and because of the cost and ease of use.

Individual well head equipment and measurement protocol is listed, by well, in the tables below.

Individual Well Head Data and Field Monitoring Protocol

1. Terteling Ranch Pool Well (Figure 3).
 - a. Flow-meter:
 - i. McCrometer brand, 3-inch diameter, propeller-type flow-meter.
 - ii. This is a factory installed, spooled unit with integral flow-straightening vanes.
 - iii. Indicates instantaneous flow and total volume pumped.
 - iv. Flow range of 1-to-250 gpm.
 - v. Serial # 94 9019 3.
 - vi. Model # MF103
 - b. System pressure gage:
 - i. US Gauge 3-inch bourdon-type with a 0-to-60 psi range.
 - c. Monitoring tube:
 - i. A designated ½-inch diameter, un-spliced plastic monitoring tube is installed with the pump column to just above the pump’s bowls.
 - d. Digital data acquisition:
 - i. A Model # 3001 LT F65 “Levellogger” data-logger/pressure-transducer (Serial #46875), produced by Solinst Canada is installed in the well on a Solinst Direct-Read cable to 214 feet below datum. This instrument records depth of water over the transducer and water temperature.

- e. Measuring datum:
 - i. Measuring point is the top of the ½-inch diameter measuring tube which is 0.1 feet above the top of the discharge head flange plate (Figure 3).
 - ii. Measuring point datum is 2904.37 feet above mean sea level.
- f. Monitoring protocol:
 - i. With each site visit, the totalized gallons pumped are recorded from the flow meter along with the instantaneous flow (if well is being pumped).
 - ii. Record system pressure from the gauge on the well head plumbing.
 - iii. Measure water level using a chalked steel tape (one clean/clear measurement suffices).
 - iv. Measure water temperature (if pump operating).
 - v. Download Solinst data-logger. Data logger is set to record artesian pressure and water temperature twice daily at 12-hour intervals (noon and midnight).
 - vi. Weekly on site measurements are required for two six-week periods per year. These are February 1 through mid March and September 1 through mid October (a total of 12 hand measurements annually) for data-logger calibration purposes and to ensure that the high and low pressure fluctuations of the aquifer system are documented. The remaining portion of the year, the digital data-loggers are relied upon to obtain the measurements. Typically, this well is visited and measured more often than is required.

2. Terteling Ranch Windsock Well (Figure 4 and 5).

- a. Flow-meter:
 - i. McCrometer brand, 6-inch diameter, propeller-type flow-meter.
 - ii. This is a saddle-type meter inserted into the discharge line (Figure 5).
 - iii. Indicates instantaneous flow and total volume pumped.
 - iv. Flow range of 1-to-1,300 gpm.
 - v. Serial # 94 8080 6.
 - vi. Model # MO306
- b. System pressure gage:
 - i. Ashcroft Gauge, 3-inch bourdon-type with a 0-to-200 psi range.
- c. Monitoring tube:
 - i. A rigid 2-inch diameter, flush-joint PVC plastic, designated monitoring pipe is installed and affixed to the pump column to just above the pump's bowls.
- d. Digital data acquisition:
 - i. A Model # 3001 LT F300 "Levellogger" data-logger/pressure-transducer (Serial # 42647), produced by Solinst Canada is installed in the well on a Solinst Direct-Read cable to 335 feet below datum. This instrument records depth of water over the transducer and water temperature.

- e. Measuring datum:
 - i. Measuring point is the top of the 2-inch diameter measuring pipe which is the same elevation as the concrete floor of the pump house (Figure 4). 0.1 feet above the top of the discharge head flange plate (Figure 4).
 - ii. Measuring point datum is 2871.32 feet above mean sea level.
- f. Monitoring protocol:
 - i. With each site visit, the totalized gallons pumped are recorded from the flow meter along with the instantaneous flow (if well is being pumped).
 - ii. Record system pressure from the gauge on the well head plumbing.
 - iii. Measure water level using a chalked steel tape (one clean/clear measurement suffices).
 - iv. Measure water temperature (if pump operating).
 - v. Download Solinst data-logger. Data logger is set to record twice daily at 12-hour intervals (noon and midnight).
 - vi. Weekly on site measurements are required for two six-week periods per year. These are February 1 through mid March and September 1 through mid October (a total of 12 hand measurements annually) for data-logger calibration purposes and to ensure that the high and low water level fluctuations of the aquifer system are documented. The remaining portion of the year, the digital data-loggers are relied upon to obtain the measurements. Typically, this well is visited more often than is required.

3. Terteling Ranch Motorcycle Hot Well (Figure 6).

- a. Flow-meter:
 - i. McCrometer brand, 6-inch diameter, propeller-type flow-meter.
 - ii. This is a saddle-type meter inserted into the discharge line (Figure 6).
 - iii. Indicates instantaneous flow and total volume pumped.
 - iv. Flow range of 1-to-1,300 gpm.
 - v. Serial # 93 6 8143.
 - vi. Model # MO306
- b. System pressure gage:
 - i. US Gauge, 3-inch bourdon-type with a 0-to-160 psi range.
- c. Monitoring tube:
 - i. A designated 1-inch diameter, flush-joint PVC plastic monitoring pipe is installed with the pump column to just above the pump's bowls.
- d. Digital data acquisition:
 - i. A Model # 3001 LT F300 "Levellogger" data-logger/pressure-transducer (Serial # 42656), produced by Solinst Canada is installed in the well on a Solinst Direct-Read cable to 453 feet below datum.
- e. Measuring datum:
 - i. Measuring point is the top of the 16-inch diameter discharge head flange at the top of the casing (Figure 6) which is 0.95 feet above land surface.
 - ii. Measuring point datum is 3026.09 feet above mean sea level.

- f. Monitoring protocol:
 - i. With each site visit, the totalized gallons pumped are recorded from the flow meter along with the instantaneous flow (if well is being pumped).
 - ii. Record system pressure from the gauge on the well head plumbing.
 - iii. Measure water level using a chalked steel tape (one clean/clear measurement suffices).
 - iv. Measure water temperature (if pump operating).
 - v. Download Solinst data-logger. Data logger is set to record temperature and water level twice daily at 12-hour intervals (noon and midnight).
 - vi. Weekly on site measurements are required for two six-week periods per year. These are February 1 through mid March and September 1 through mid October (a total of 12 hand measurements annually) for data-logger calibration purposes and to ensure that the high and low water level fluctuations of the aquifer system are documented. The remaining portion of the year, the digital data-loggers are relied upon to obtain the measurements. Typically, this well is visited and measured more often than is required.

4. Terteling Silkey (Shed) Well (Figures 7 and 8).

- a. Flow-meter:
 - i. Master Meter MMT brand, 4-inch diameter, turbine-type flow-meter.
 - ii. This is a spooled (factory flanged) meter plumbed directly in the discharge line of the well (Figure 7).
 - iii. Indicates instantaneous flow and total volume pumped.
 - iv. Flow range of 1-to-1,000 gpm.
 - v. Serial # WT-4"-99-8873.
 - vi. Model # MMT
- b. System pressure gage:
 - i. We rely upon our own set of gages described above. Permanently installed pressure gages in the geothermal piping appear to be problematic and short-lived owing to geothermal water chemistry and conditions within pump houses (installed gauge is recorded and replaced as necessary).
- c. Monitoring tube:
 - i. A designated monitoring tube is not installed in this well owing to the high above ground pressure head and the tight clearances in the well head casing. This does not interfere with shut-in pressure measurements because the piezometric head is almost always above ground when shut-in.
- d. Digital data acquisition:
 - i. A Model # 3001 LT F65 "Levellogger" data-logger/pressure-transducer (Serial # 46878); produced by Solinst Canada is installed directly into the well head plumbing. This instrument records line pressure and water temperature (Figure 7).

- e. Measuring datum:
 - i. Measuring point is the pressure gauge pipe-tee at the top of the well head which is 3.68 feet above the concrete floor of the pump house (Figure 7).
 - ii. Measuring point datum is 2694.36 feet above mean sea level.
 - f. Monitoring protocol:
 - i. With each site visit, the totalized gallons pumped are recorded from the flow meter along with the instantaneous flow (if well is being pumped or if it is flowing under natural artesian pressure).
 - ii. Record system pressure using a double gauge manifold described above.
 - iii. Measure shut in pressure head. The well head valve is closed and shut in pressure recorded after the gage needle ceased to fluctuate (usually less than a minute).
 - iv. Measure water temperature (if pump operating or if well is flowing).
 - v. Download Solinst data-logger. Data logger is set to record temperature and pressure twice daily at 12-hour intervals (noon and midnight).
 - vi. Weekly on site measurements are required for two six-week periods per year. These are February 1 through mid March and September 1 through mid October (a total of 12 hand measurements annually) for data-logger calibration purposes and to ensure that the high and low pressure fluctuations of the aquifer system are documented. The remaining portion of the year, the digital data-loggers are relied upon to obtain the measurements. Typically, this well is visited more often than is required.
5. Terteling Tiegs (Triangle) Well (Figures 9 and 10).
- a. Flow-meter:
 - i. Master Meter MMT brand, 4-inch diameter, turbine-type flow-meter.
 - ii. This is a spooled (factory flanged) meter plumbed directly in the discharge line of the well (Figure 9).
 - iii. Indicates instantaneous flow and total volume pumped.
 - iv. Flow range of 1-to-1,000 gpm.
 - v. Serial # WT-4"-99-8658.
 - vi. Model # MMT
 - b. System pressure gage:
 - i. We rely upon our own set of gages described above (Figure 2). Permanently installed pressure gages in the geothermal piping appear to be problematic and short-lived. (Installed gauge is recorded and replaced as necessary).
 - c. Monitoring tube:
 - i. A designated monitoring tube is not installed in this well owing to the high above ground pressure head and the tight clearances in the well head casing. This does not interfere with shut-in pressure measurements because the piezometric head is almost always above ground when shut-in.

- d. Digital data acquisition:
 - i. A Model # 3001 LT F65 “Levellogger” data-logger/pressure-transducer (Serial # 33807); produced by Solinst Canada is installed directly into the well head plumbing (Figure 9). This instrument records line pressure and water temperature.
- e. Measuring datum:
 - i. Measuring point is the pressure gauge tee at the top of the well head plumbing which is 0.04 feet below the top of the concrete sidewalk around the well vault (Figure 9).
 - ii. Measuring point datum is 2693.12 feet above mean sea level.
- f. Monitoring protocol:
 - i. With each site visit, the totalized gallons pumped are recorded from the flow meter along with the instantaneous flow (if well is being pumped or if it is flowing under natural artesian pressure).
 - ii. Record flowing and shut-in system pressures using a double gauge manifold described above.
 - iii. Measure flowing and shut in pressure head. The well head valve is closed and shut in pressure recorded after the gage needle ceases to fluctuate (usually less than a minute). Note: this well is presently not being pumped or flowed as it is being used as a long-term designated monitoring well. Should these conditions change in the future, the above protocol for measurement of flowing and shut in pressures will be used to measure the well.
 - iv. Measure water temperature (if pump operating or if well is flowing).
 - v. Download Solinst data-logger. Data logger is set to record temperature and well head pressure twice daily at 12-hour intervals (noon and midnight).
 - vi. Weekly on site measurements are required for two six-week periods per year. These are February 1 through mid March and September 1 through mid October (a total of 12 hand measurements annually) for data-logger calibration purposes and to ensure that the high and low pressure fluctuations of the aquifer system are documented. The remaining portion of the year, the digital data-loggers are relied upon to obtain the measurements. Typically, this well is visited and measured more often than is required.

6. Terteling 36th Street House (Office) Well (Figure 11).

- a. Flow-meter:
 - i. Master Meter MMT brand, 2-inch diameter, turbine-type flow-meter.
 - ii. This is a spooled (factory flanged) meter plumbed directly in the discharge line of the well (Figure 11).
 - iii. Indicates instantaneous flow and total volume pumped.
 - iv. Flow range of 1-to-100 gpm.
 - v. Serial # 2470822.
 - vi. Model # MMT

- b. System pressure gage:
 - i. We rely upon our own set of gages described above. Permanently installed pressure gages in the geothermal piping appear to be problematic and short-lived.
- c. Monitoring tube:
 - i. A designated monitoring tube is not installed in this well owing to the high above ground pressure head and the tight clearances in the 2-inch diameter well head casing. This does not interfere with shut-in pressure measurements because the piezometric head is almost always above ground when shut-in.
- d. Measuring datum:
 - i. Measuring point is the pressure gauge tee at the top of the well head plumbing is 3.24 feet above the concrete sidewalk around the well (Figure 11).
 - ii. Measuring point datum is 2693.97 feet above mean sea level.
- e. Monitoring protocol:
 - i. With each site visit, the totalized gallons pumped are recorded from the flow meter along with the instantaneous flow (if well is being pumped or if it is flowing under natural artesian pressure).
 - ii. Record system pressure using a double gauge manifold described above.
 - iii. Measure flowing and shut in pressure heads. For shut in pressure, the well head valve is closed and shut in pressure recorded after the gage needle ceased to fluctuate (usually less than a minute).
 - iv. Weekly on site measurements are required for two six-week periods per year. These are February 1 through mid March and September 1 through mid October (a total of 12 hand measurements annually). Typically, this well is visited more often than is required.

Instrument and Flow Meter Calibration

1) Measuring Instruments.

- a. Pressure gauges.
 - i. In general, we have found that installed (on the well head plumbing) pressure gauges have short-lived accuracy on the geothermal system piping. If only single gauge is used, the monitoring should be considered highly questionable.
 - ii. Rather, we rely on a separate twin set of high-accuracy gauges that are kept in a controlled environment and carried to the well during field visits (Figure 2). In this way, the gauges are calibrated with each measurement. The well head plumbing is equipped with a quick-connect pressure measuring port to which the brace of gauges is connected. With both gauges at the same elevation, they must read identically or one of the instruments is considered faulty.

b. Thermometers.

- i. Thermometers used to measure water temperature are Model 315, "tpi" brand digital thermometers with a resolution of 0.1 °F, a sampling interval of 1.5 seconds, and a range of -58 °F-to-302 °F. Although the guaranteed accuracy of these thermometers is +/- 2.0 °F, we check calibration of the field thermometers with a VWR Model 61102-005 mercury-filled, ASTM-rated thermometer with 0.5 °F accuracy and a Hannah Instruments Model 9023 multi-meter with +/- 0.9 °F accuracy prior to field measurements. We have consistently found the accuracy of the used digital thermometers to be within 0.5-to-0.75 °F of the guaranteed-accurate thermometers. We have selected these units for field use because non-mercury-filled thermometers do not have the desired accuracy and because of the cost and ease of use.

c. Water-level sounding tapes.

- i. Steel tapes. Steel tapes require no calibration as such. Care is taken to ensure that the wetted chalk measurement is accurate and that "held" footage is known with confidence. Only when an unclear first measurement is obtained or when a measurement is markedly different, is a second conformational measurement obtained. Owing to the relatively great depth to water and the time (cost) to carry out routine monitoring runs, the number of repetitive measurements is considered adequate to avoid multiple measurements in each well during each visit.
- ii. Electric tapes. If electric sounding tapes are used, which they are generally not for this monitoring, only complete full-length tapes are used and only when calibrated with a steel tape.

2) Permanently Installed Gauges and Flow Meters

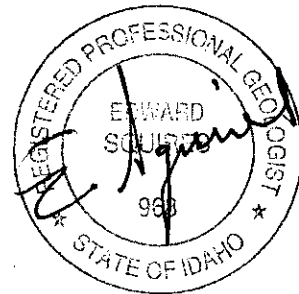
a. Flow meter calibration.

- i. According to Exhibit 1 of the Boise Front Geothermal Aquifer Monitoring and Reporting Plan of the Stipulated Agreement For Settlement In Part And Stay Of Proceedings Regarding Remainder Of Petition, the IDWR shall annually visit each well listed in Tables 1-4 for purposes of calibration checks of monitoring equipment to include calibration checks of flow meters using the IDWR ultrasonic flow meter or other means.
- ii. The Terteling Company has, also, an informal protocol for calibration of well flow meters whenever it is convenient or coupled with other work or testing of individual wells. For example, the following wells have been recently calibrated.
 1. Windsock well – flow meter calibrated by Ed Squires and Dan Brown on April 13, 1994 with report to IDWR.
 2. Motorcycle Hot well – New (1999) factory calibrated flow meter that has not been used to date.
 3. Pool well – factory calibrated prior to installation around the turn of the century.
 4. Silkey well - Calibrated by Hydro Logic, Inc. at various flow rates in December of 2001. Meter was factory calibrated in 1999.

5. Tiegs well - Calibrated by Hydro Logic, Inc. at various flow rates in December of 2001. Meter factory calibrated in 1999.
6. Office well – Not field calibrated since factory calibration of 1999.

Reporting

All field and digitally-acquired data is submitted to IDWR on a quarterly schedule. Specifically, within 30 days of the end of each annual quarter year (December 31, May 31, June 30, and September 30), all data is transmitted electronically to IDWR.



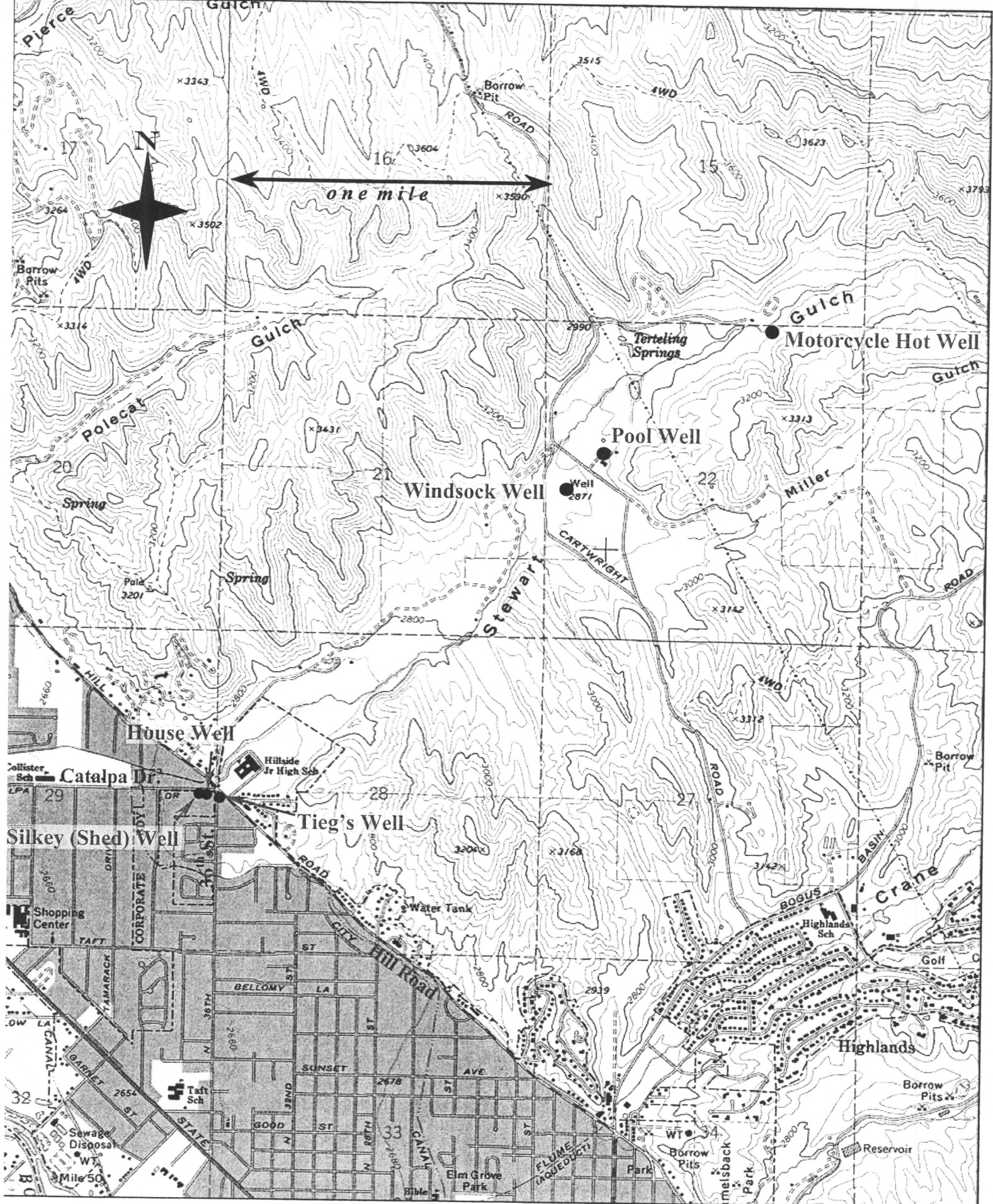


Figure 1 - Location map for The Terteling Company's geothermal wells subject to the Boise Front Geothermal Aquifer Monitoring and Reporting Plan dated September 6, 2002. Base map USGS 7 ½ - minute topographic series.

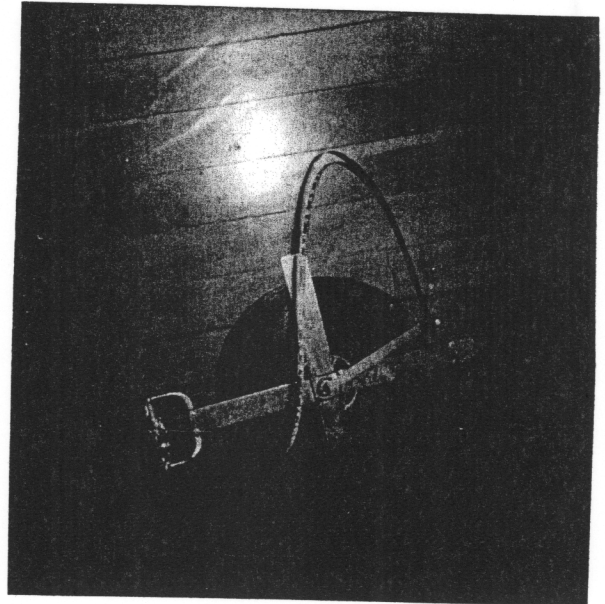
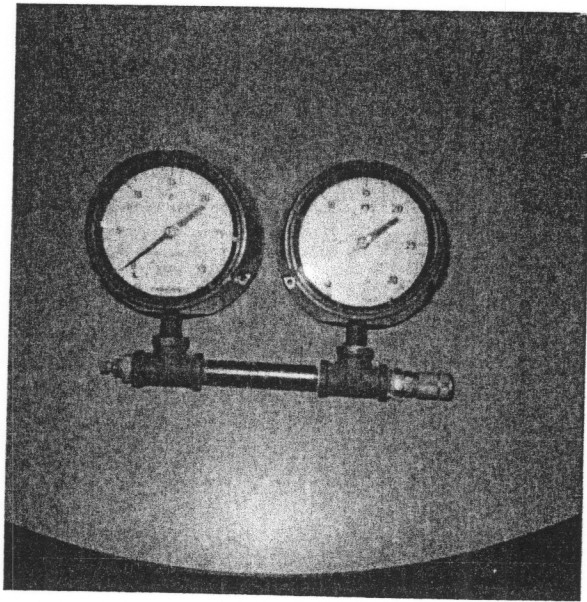


Figure 2. Water level and aquifer pressure monitoring instruments used by Hydro Logic, Inc. for monitoring of the Boise Front Geothermal Aquifer Wells. Photograph on the right shows a Lufkin, 500-foot spring steel tape used for below-ground, water-level measurements in wells. The blue-chalked loop of tape depicts the 0.01-foot measurement increments. To the left, is shown the brace of 4½-inch diameter, 0-to-30 psi pressure gauges used to measure the above ground piezometric head within artesian wells with above ground head.

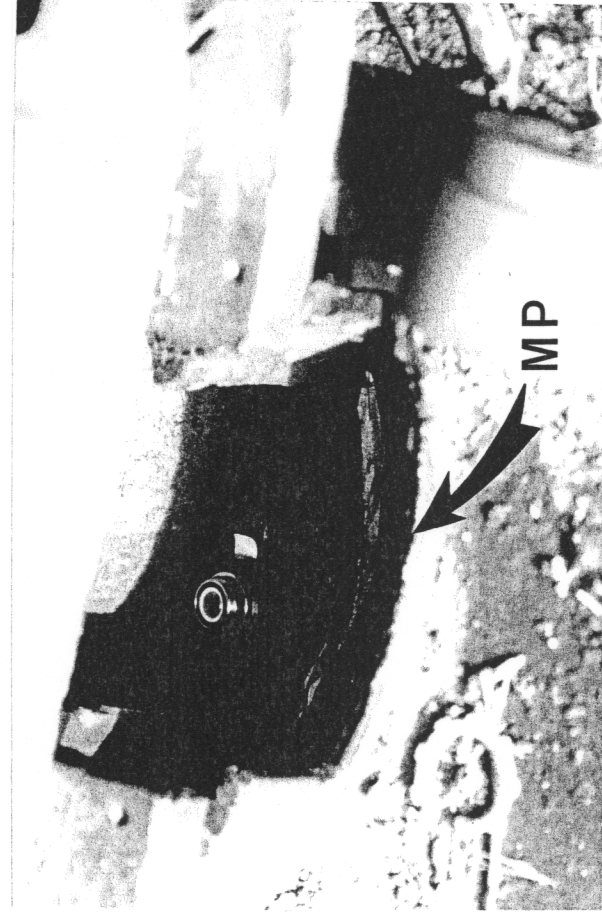
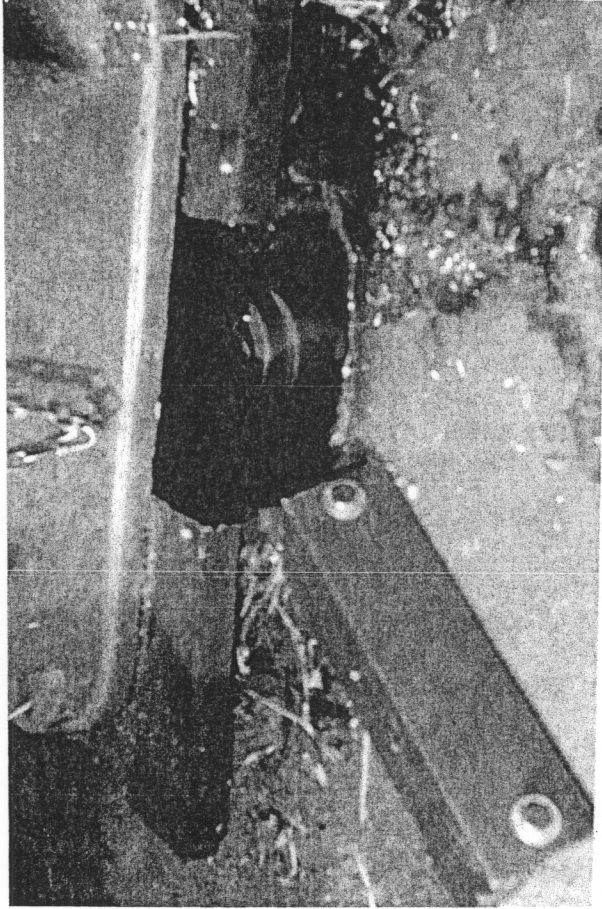
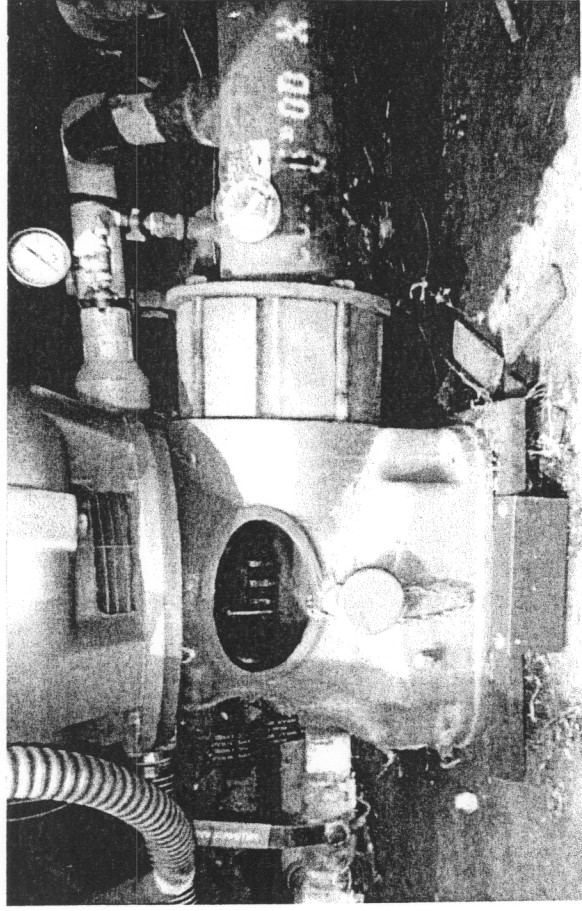
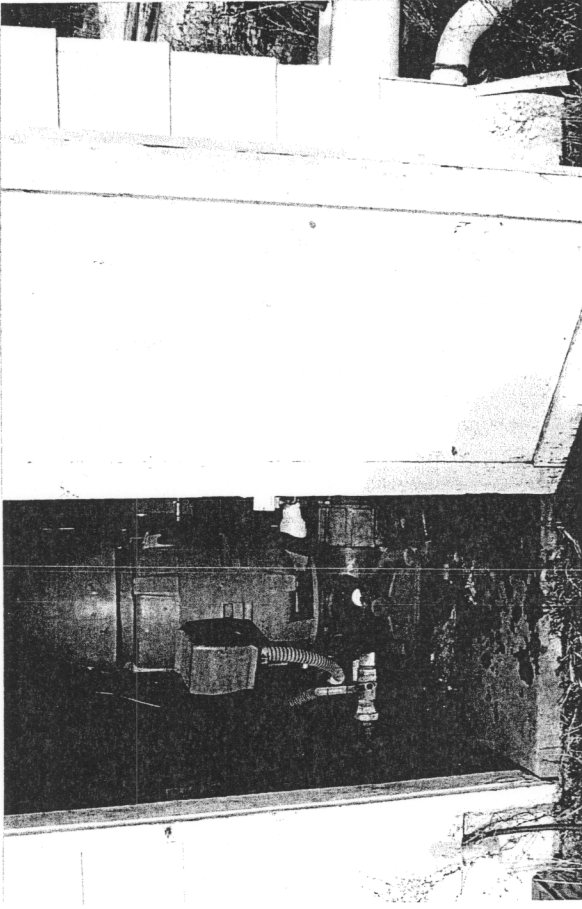


Figure 4. Terteling Windsock Well (January, 2004): The Windsock well is housed in a small wood-frame pump house located on the Terteling airstrip. The line-shaft turbine pump sits on a $\frac{3}{4}$ -inch thick steel plate on the concrete pump house floor (upper left photo). The monitoring tube and measuring point are covered by a short length of angle iron bolted to the base plate below the pump base (view in upper right). The monitoring tube is a 2-inch, flush-joint PVC pipe extending to the pump bowls. This pipe serves as the housing for the digital data logger/pressure transducer and as the measurement tube for water level sounding tapes, is capped with a 2-inch plastic cover (lower left). The measuring point datum for this well is the top of the two inch pipe, the top of the 12-inch diameter well casing, and the surface of the pump house floor which are all the same elevation (lower right). The well discharges to a six-inch pipe that exists the pump house through the east wall before it subsides below ground to the water distribution system..

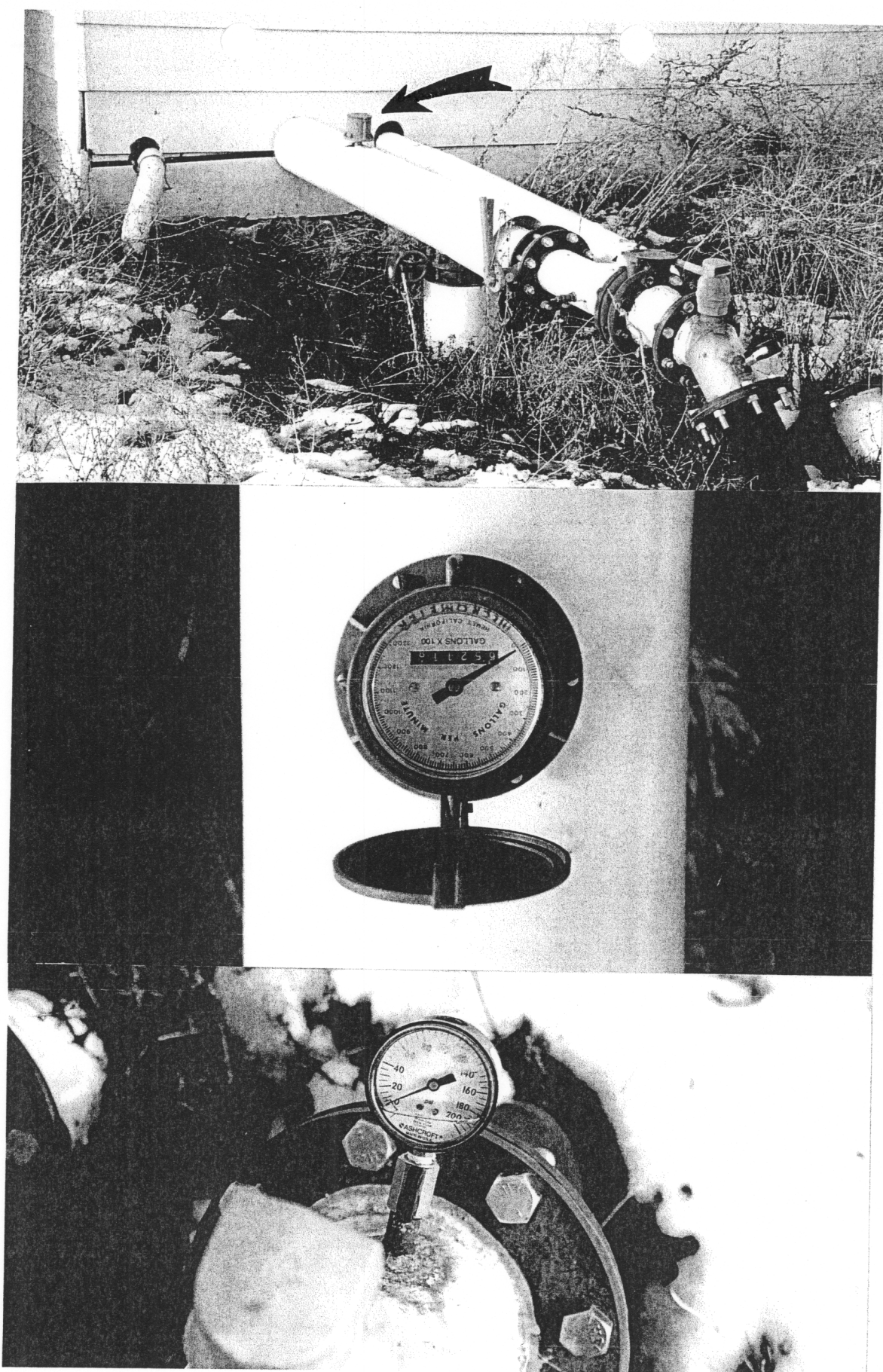


Figure 5. Terteling Ranch Windssock well (January, 2004). Upper photograph shows the 6-inch geothermal discharge piping exiting the pump house. Flow meter is indicated by black arrow and is located outside of the pump house in the distribution main line. Middle view shows the open face of the Windssock flow meter. Lower picture is of the line-pressure gage in the geothermal main line just prior to it going below ground.

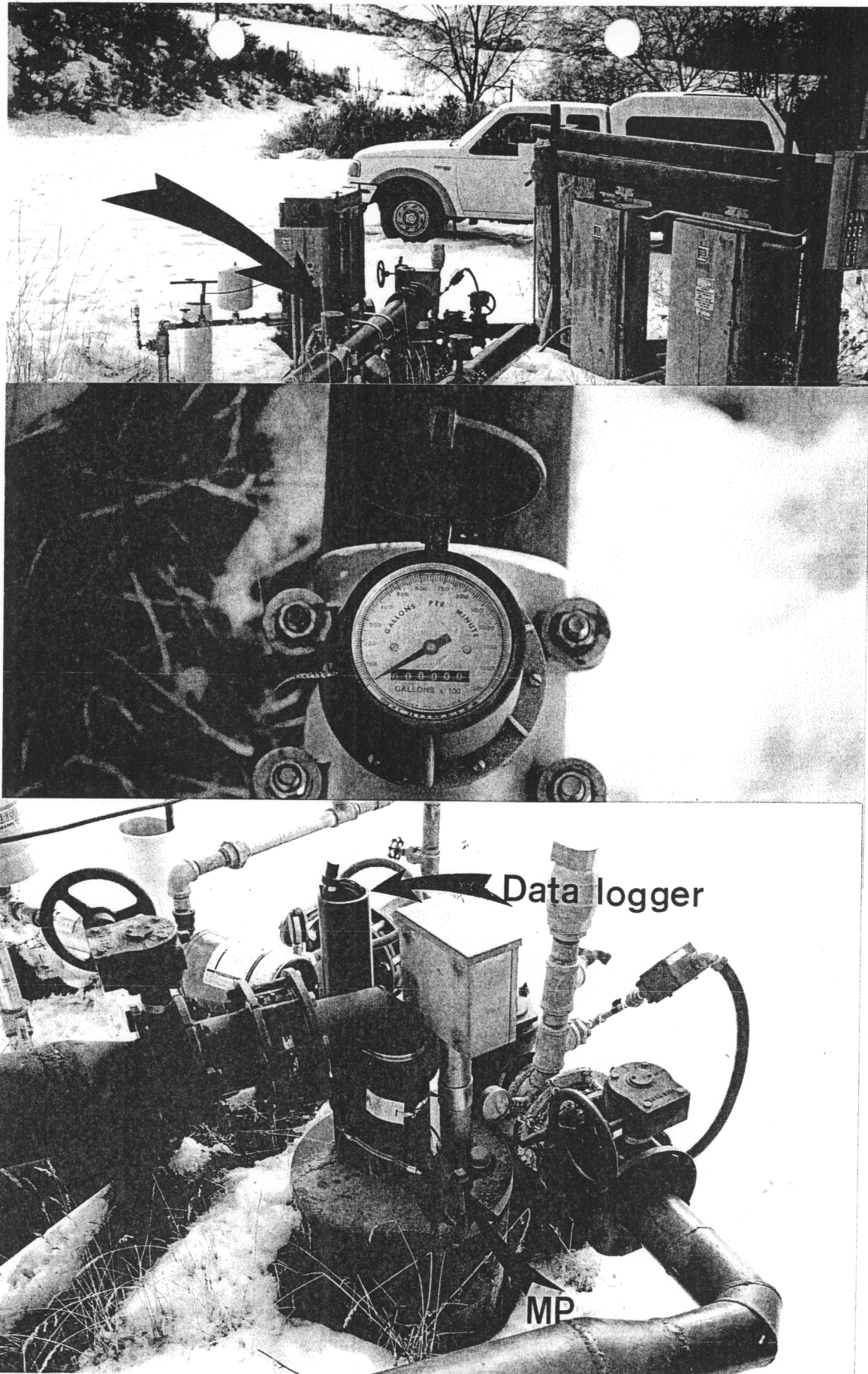


Figure 6. Terteling Ranch Motorcycle Hot well (January, 2004). Upper photograph shows the general location, well head piping and electrical service (black arrow indicates flow meter). Middle view shows the open face of the Motorcycle Hot well flow meter. Lower shot shows the measuring datum which is the top surface of the 16-inch diameter discharge-head plate at the top of the well casing. Also visible is the position of the installed digital data-logger housing pipe.

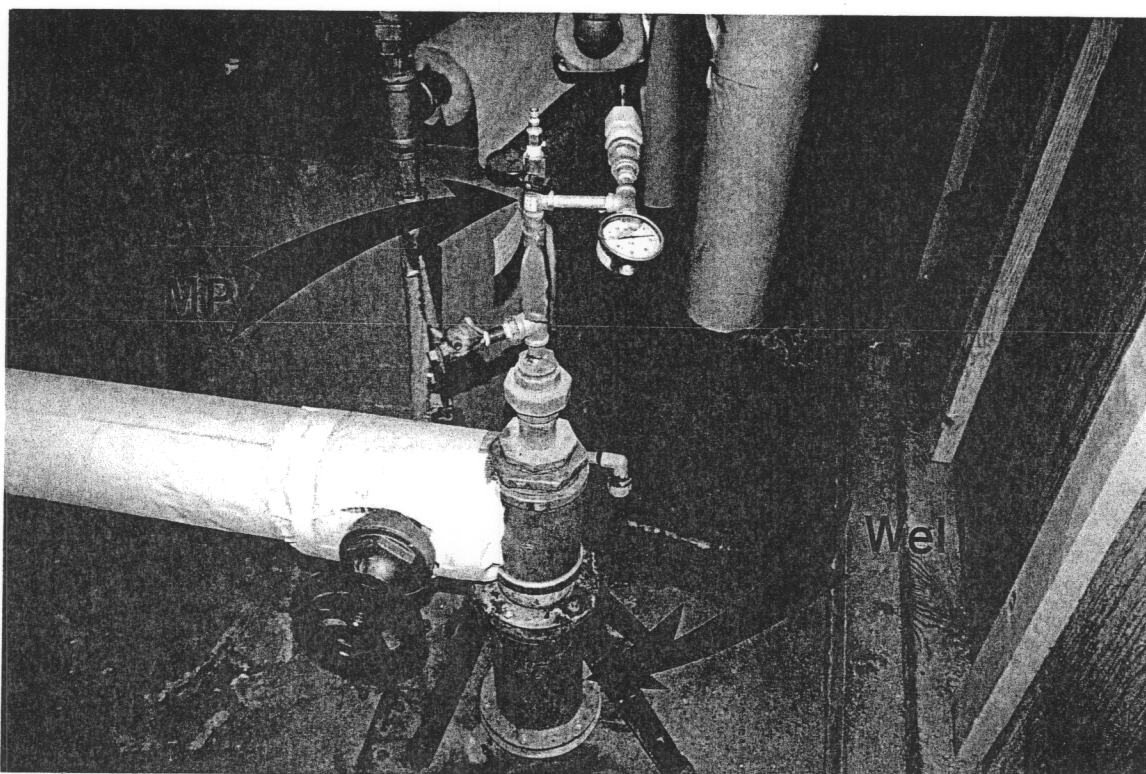
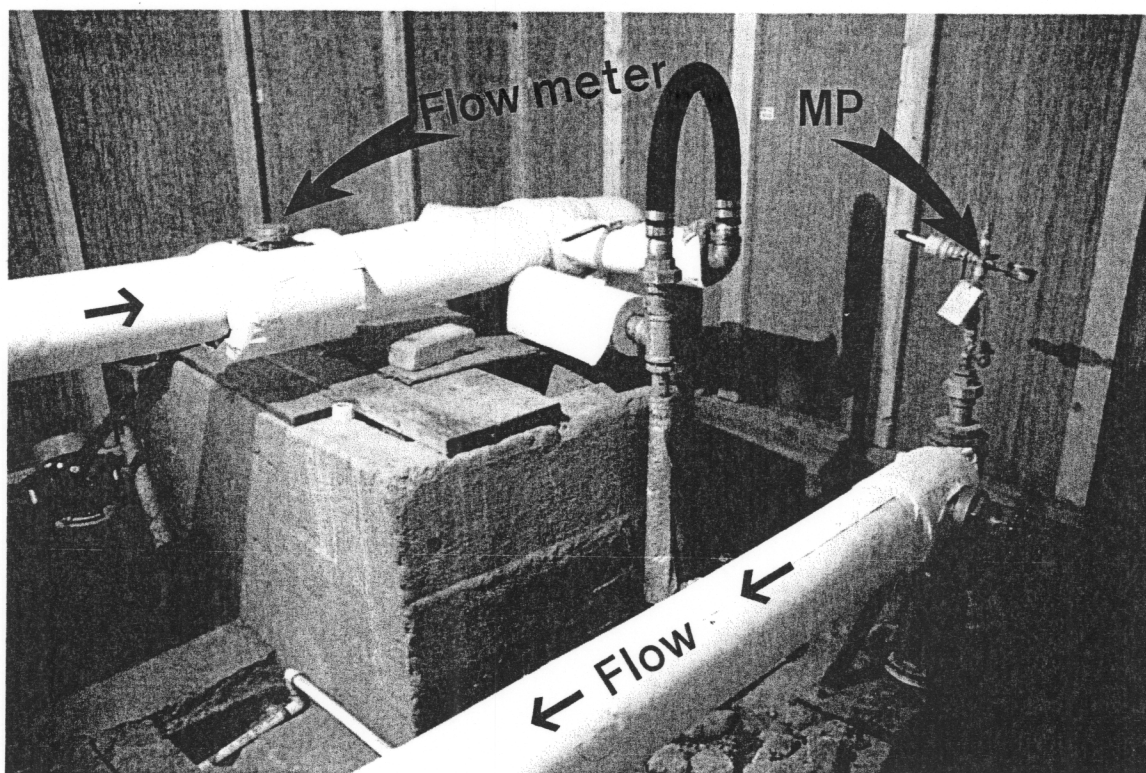


Figure 7. Terteling Silkey (Shed) Well (January 2004). Silkey well is housed inside of a small wood frame building (shed) on the west side of the residence at 3823 N. 36th Street. Upper photo depicts the Silkey well head as it protrudes through the concrete floor of the pump house. The black arrow shows the measuring point which is the small pipe-tee holding the pressure gage and the Solinst data logger at 3.68 feet above the floor. Lower view shows the well head with respect to the insulated geothermal water lines and the in-line flow-meter.

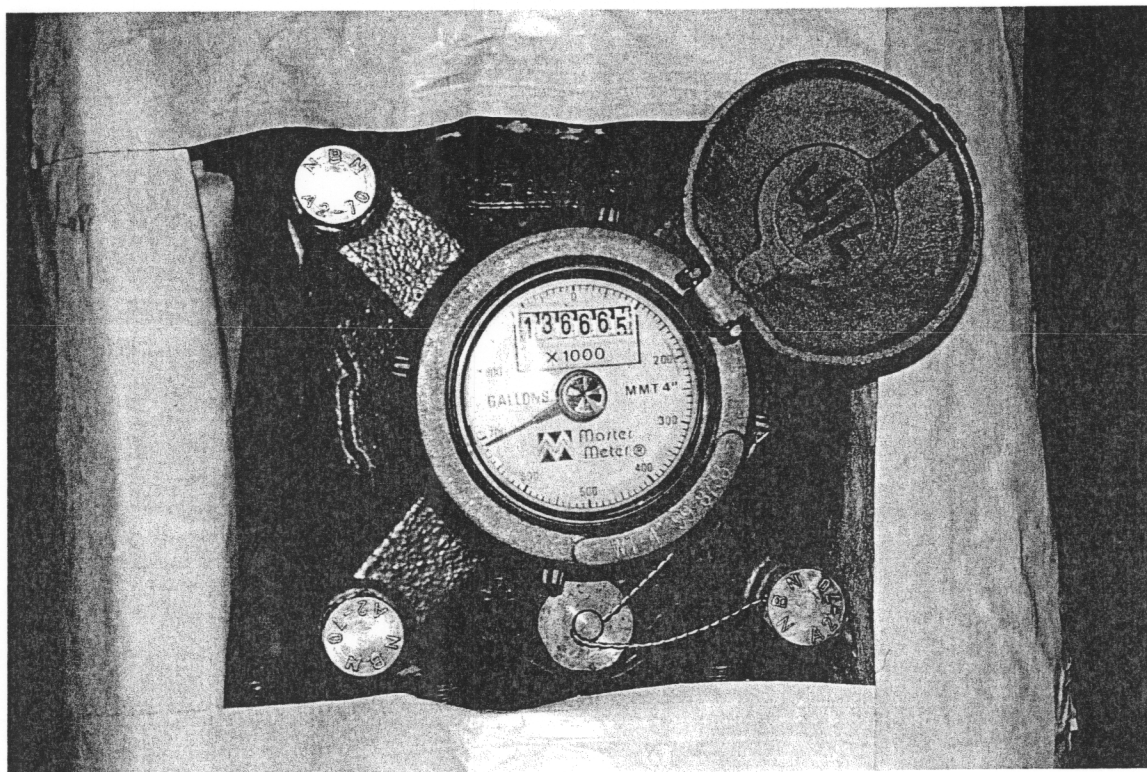
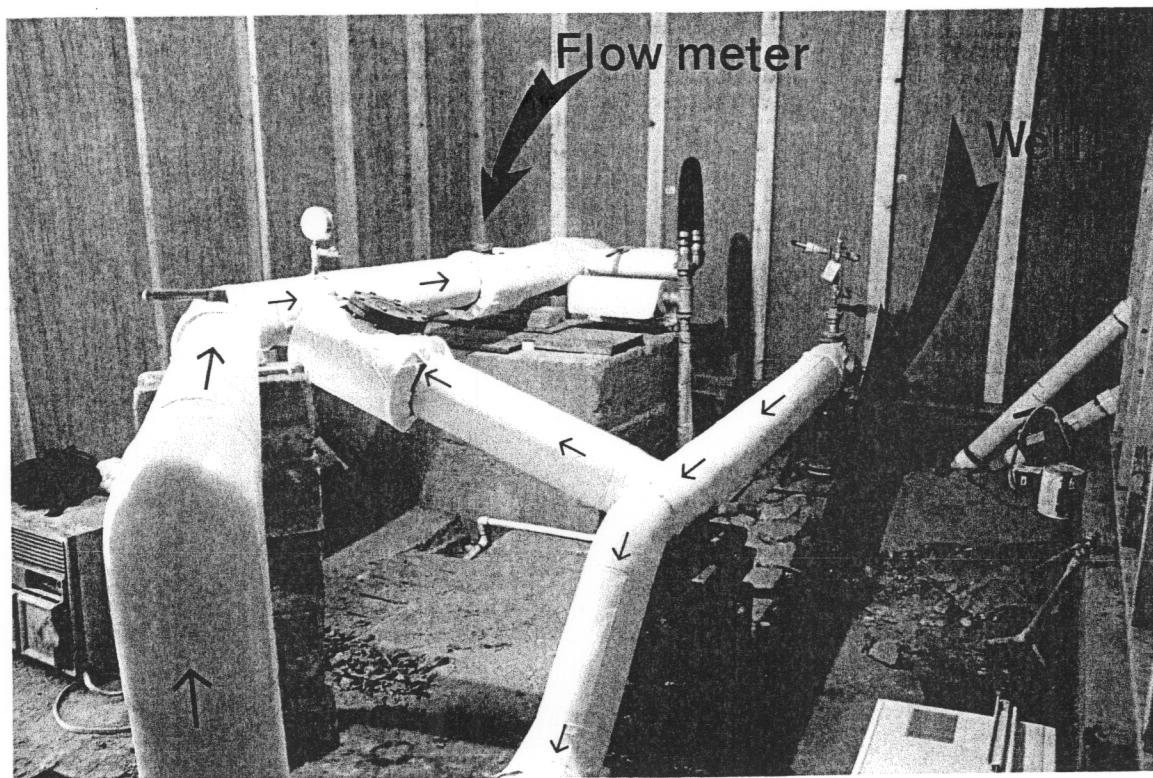


Figure 8. Terteling Silkey (Shed) Well (January 2004). The Terteling Silkey well is housed inside of a small wood frame building (shed) on the west side of the residence at 3823 N. 36th Street. Upper photograph depicts the Silkey well head plumbing for natural flow or boosted pressure (small arrows indicate flow direction). Larger black arrows point out the well head and the location of the flow meter prior to geothermal flow leaving the building. Lower view is of the open face of the in-line flow-meter. The in-line pump, used to boost system pressure, is just out of view in lower foreground.

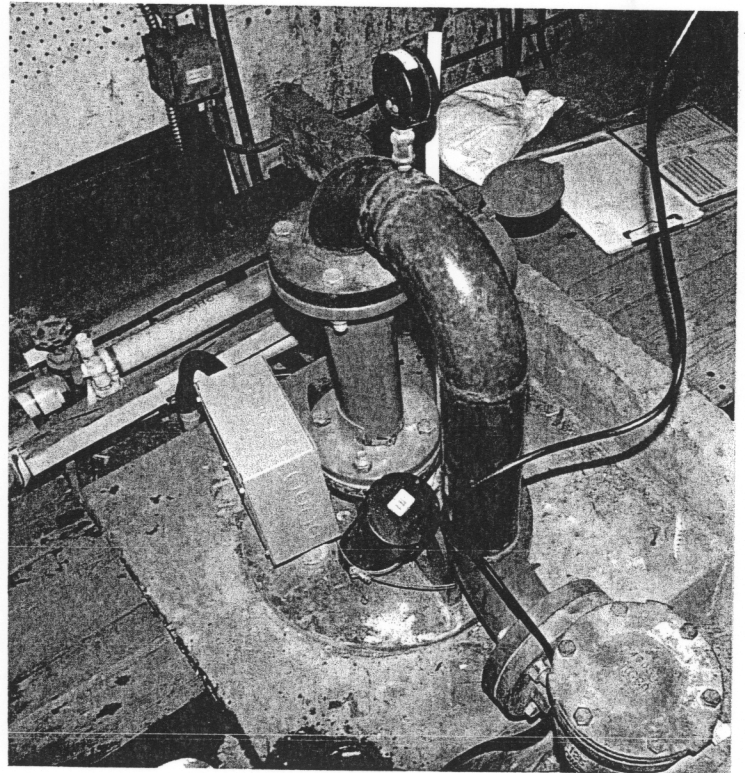
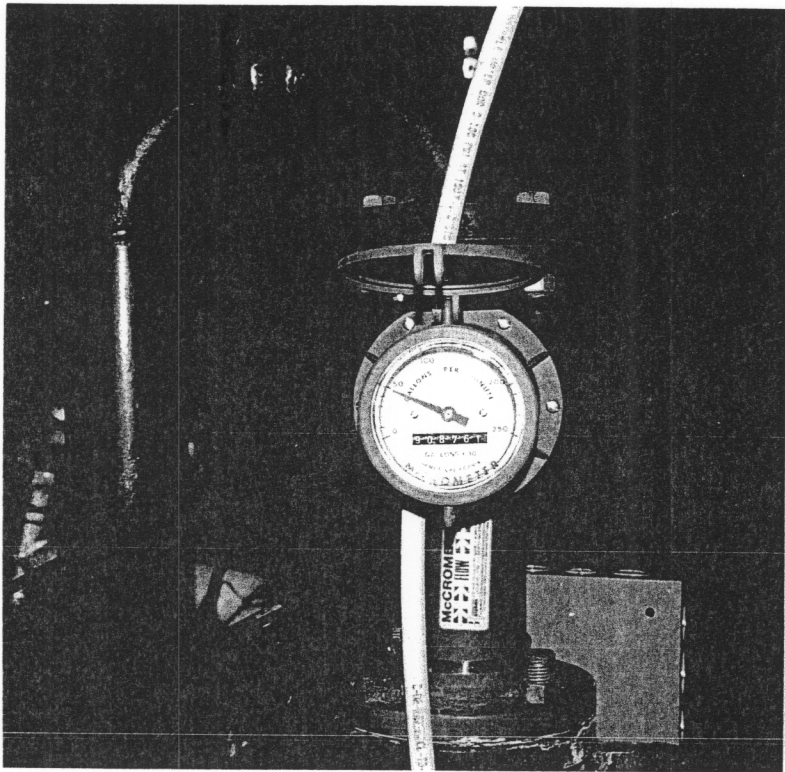
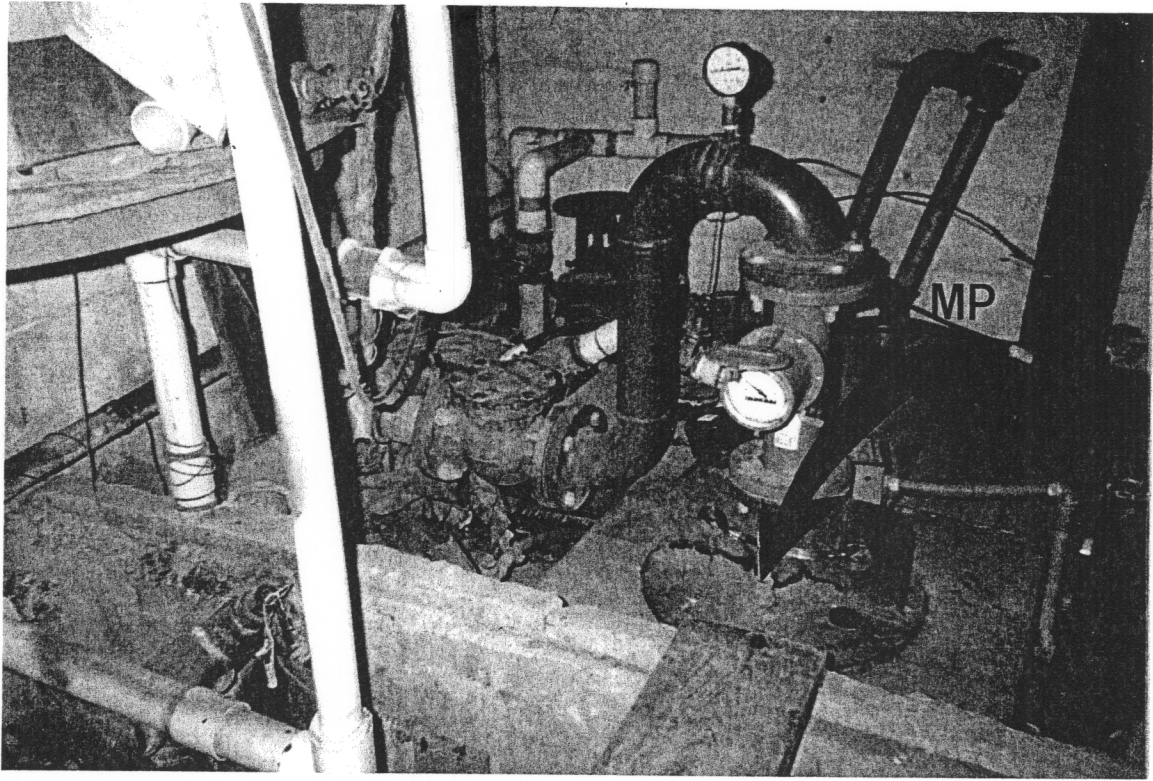


Figure 3. Terteling Ranch Pool well. (January 2004). The Pool well is housed inside of a detached cinder block building adjacent to the Terteling residence swimming pool on the northeast side of the main residence. The measuring datum for the Pool well is the top of a designated monitoring tube which is 0.1 feet above the top surface of the submersible discharge head base plate of the well (upper photograph). Lower left photograph shows the open face plate of the factory-spoiled flow meter, mounted in the discharge line immediately at the top of the well. View at lower right is the surface cap for the installed digital data-logger's down hole pipe.

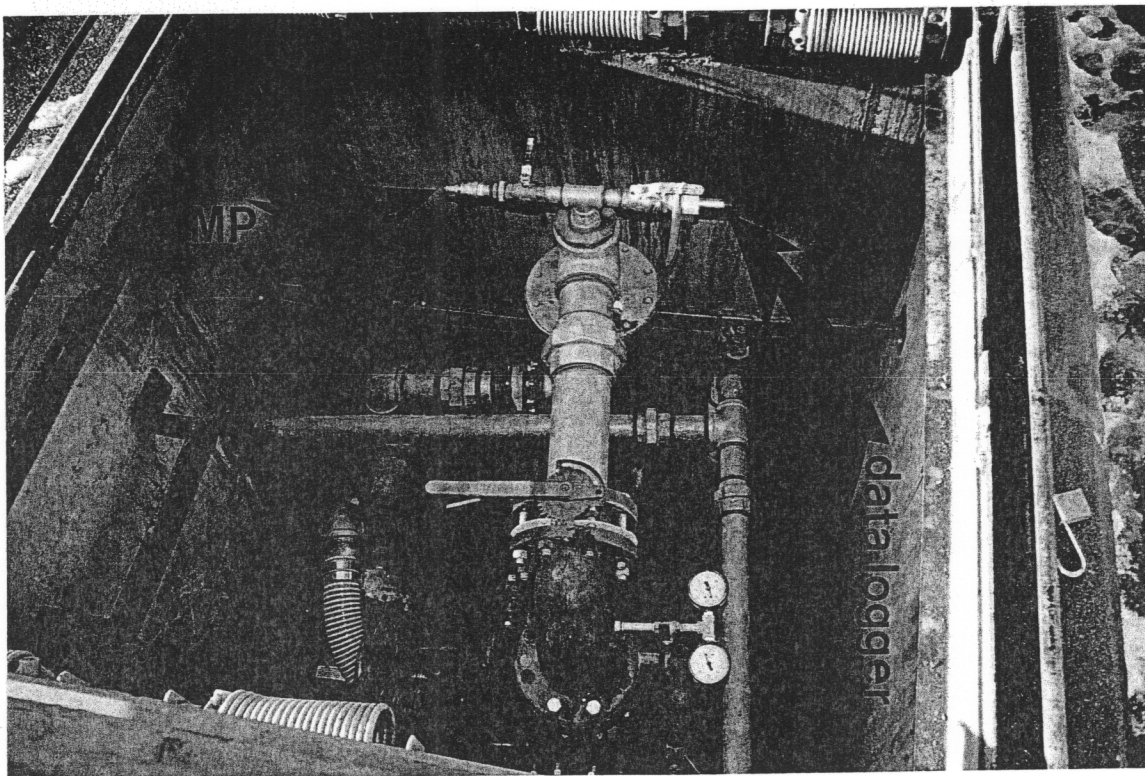
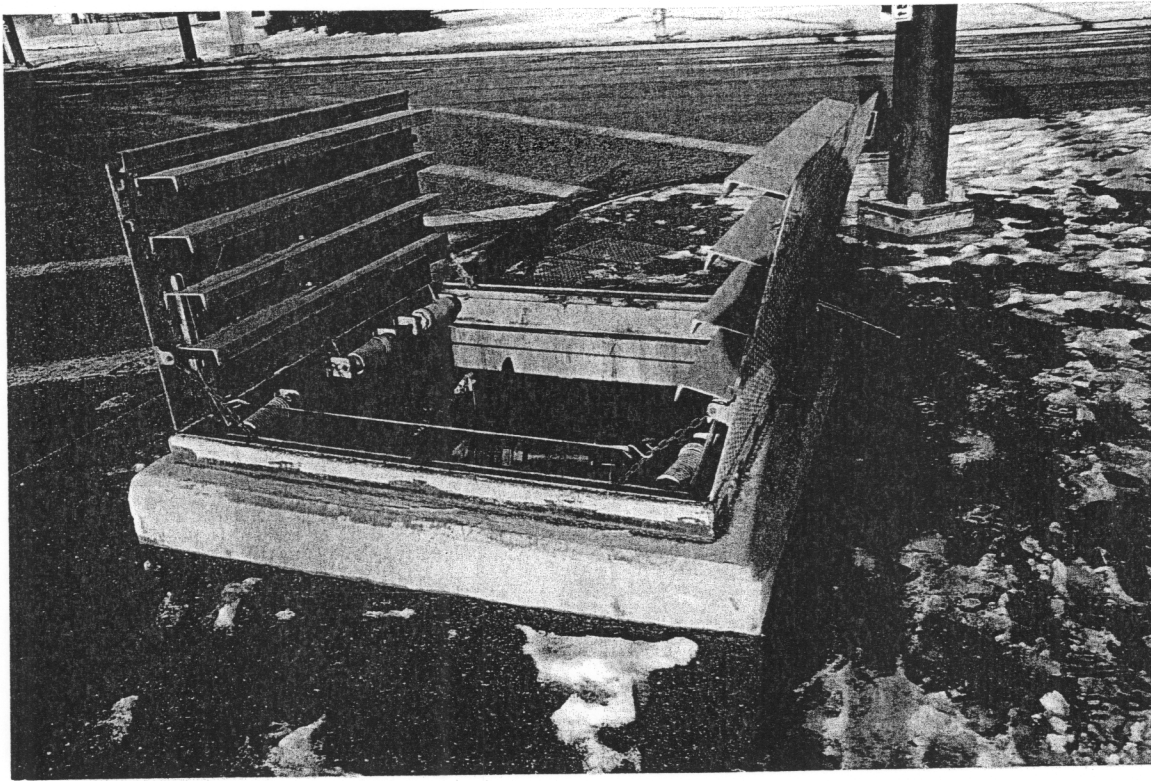


Figure 9. Terteling Ties (Triangle) Well (January 2004). The Ties well is housed inside of a small, below ground concrete vault beneath the sidewalk on the southeast corner of N. 36th Street and Hill Road. The upper photograph shows the open metal doors that form the roof of the vault. The lower view is of the inside of the Ties well vault showing the well head piping and the measurement point which is the center of the galvanized pipe-tee at the top of the well. The measurement datum is 0.04 feet below the surface elevation of the sidewalk. Also visible is the installed digital pressure-transducer/data-logger at the same measurement datum.

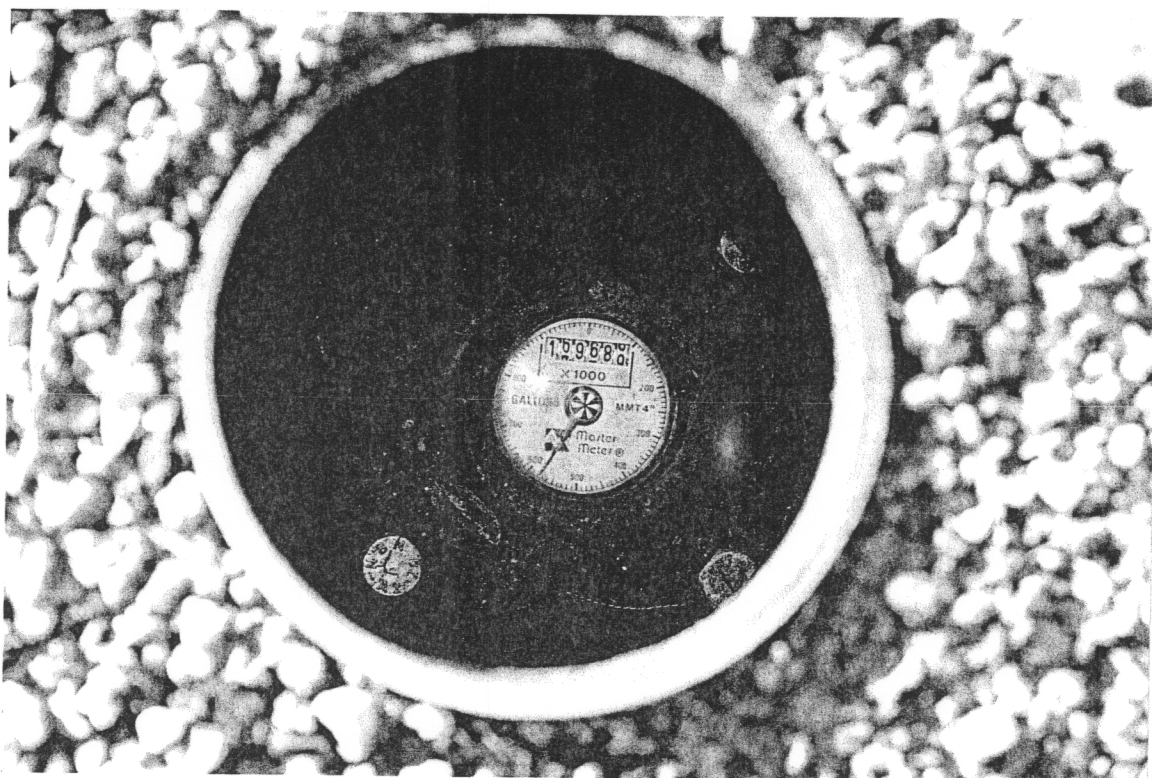
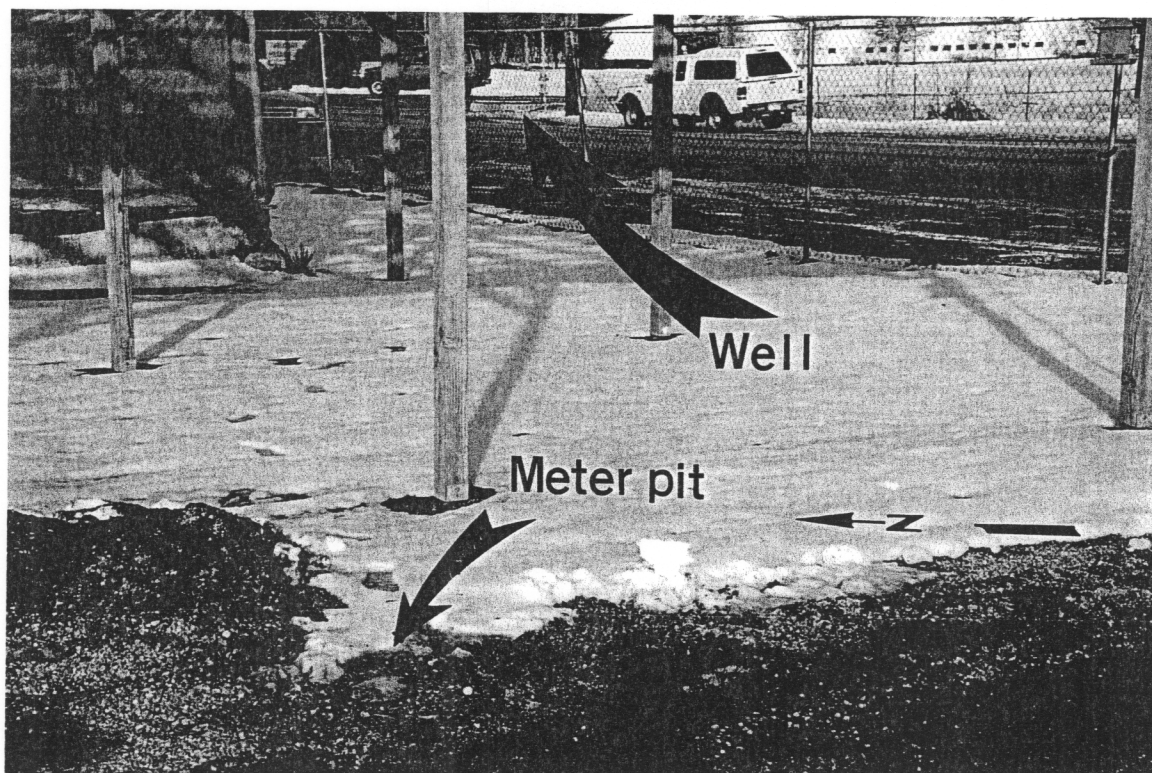


Figure 10. Terteling Tieg (Triangle) Well (January 2004). The Tieg well flow meter is housed inside of a small, below ground meter pit beneath the gravel parking lot of the commercial property on the southwest corner of N. 36th Street and Hill Road (3823 N. 36th Street). The upper photograph shows the location of the below ground flow-meter with respect to the Tieg well (in distance across N. 36th Street). The lower view is of the open face of the buried flow-meter which is installed in a straight section of the geothermal main line distribution pipe which comes directly from the well across N. 36th Street.

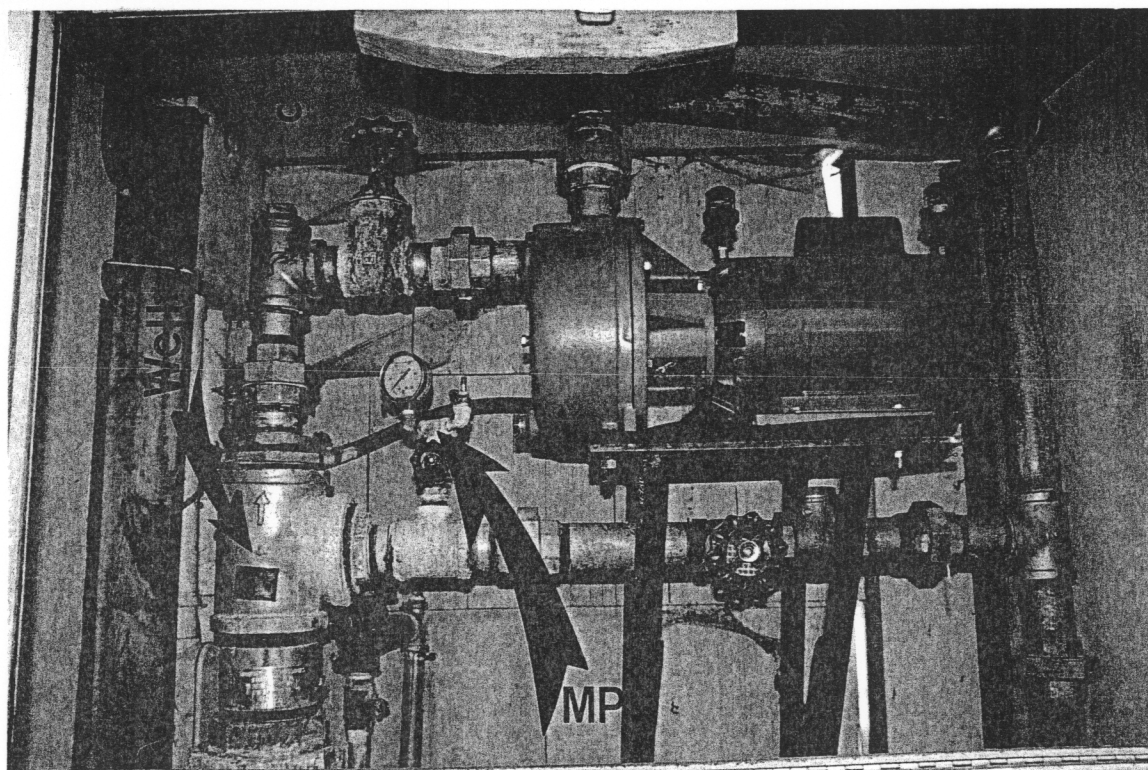
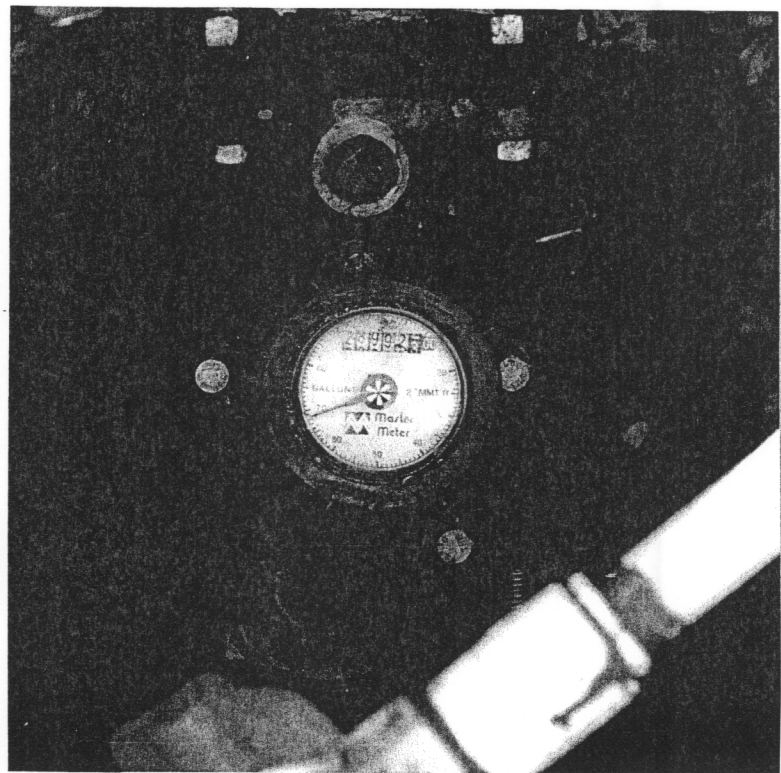
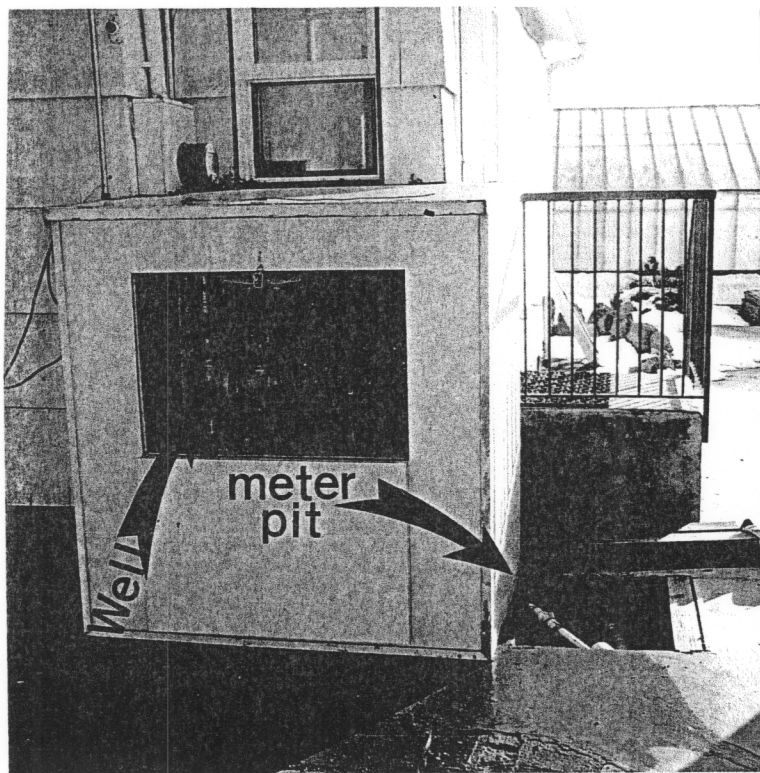


Figure 11. Terteling 36th Street House (Office) Well (January 2004). The House well is located inside of a small wood enclosure on the northwest corner of the house/office building at 3823N 36th Street (upper left photograph) with the below ground flow-meter pit immediately adjacent. The open face of the flow meter is shown in the upper right photograph. The measuring point datum (MP) for the House well is the center of the galvanized pipe tee on the well head plumbing (lower photograph) which is 3.24 feet above the surface of the sidewalk (ground level).