City of Lawrence, Indiana - Water & Sewer Utilities

Utility Service Board, Steven Hall, President 9001 East 59th St, Ste. 300, Lawrence, IN 46216

January 11, 2017

Ms. Shelley Love
DWSRF Program Coordinator
State Revolving Fund Loan Program
100 North Senate Avenue, Room 1275
Indianapolis, IN 46204

Subject: Lawrence Water PER Submittal

Dear Ms. Love,

On behalf of the Lawrence Municipal Utilities, we are submitting this PER for review and approval by the SRF loan program. We appreciate your consideration.

Sincerely,

Steven Hall, President
Utility Service Board

Cc: Scott Salsbery, Superintendent
Paul Wanner, Director/Operations
Jason Fenwick, Controller
Julie Kukolla, Mayor's Exec. Asst.
Utility Services Board

Preliminary Engineering Report
for Water System Improvements

prepared for the

LAWRENCE MUNICIPAL UTILITIES
LAWRENCE, INDIANA

November 2016
Revised January 9, 2017

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EXECUTIVE SUMMARY

Project Location

The project consists of many smaller project areas that are all located within the City of Lawrence's corporate limits. The project areas are located at the Richardt water treatment plant (WTP), Fort Harrison WTP, Fort Harrison and Indian Lake well fields, 52nd St. and Oaklandon Rd. elevated water storage tanks, and three water main replacements.

Project Need

Lawrence Utilities (Utility) has aging and deteriorating water system infrastructure. In order to determine the critical infrastructure for rehabilitation and replacement, an asset management evaluation was completed. The asset management evaluation resulted in a business risk evaluation rating to determine the risk each asset posed to the system in the event of catastrophic failure of the asset. In addition, the system was evaluated to determine the future 20-year demands of the community and whether the existing system is able to meet the future demands. After evaluating the system using the asset management and system demands, a list of critical items were developed as assets in need of rehabilitation or replacement which are summarized in the following sections.

Richardt WTP

The Richardt WTP was originally built in 1958 and is nearing the end of its useful life. In order to meet the Environmental Protection Agency's (EPA) Secondary Maximum Contaminant Level (SMCL), the WTP is currently producing under its rated capacity due to high iron levels in the plant discharge. High service pumps 1 and 2 are currently not in operation and the detention tank capacity is not being fully utilized. The electrical system is in disarray and the process valves are manually actuated causing operational difficulties. The physical condition of many of the WTP's components are in need of rehabilitation or replacement.

Fort Harrison WTP

The Fort Harrison WTP is able to produce water at its rated capacity. However, the infrastructure in the filter building, expanded in 1987, is in extremely poor condition. Some of the existing process valves must be manually actuated since the automatic actuators are missing. The process piping's coating system is failing resulting in extensive pipe corrosion from chemical vapors. The chemicals located in the filter building are not isolated from each other, do not have adequate ventilation, and do not have any secondary containment. As a result, the work environment is potentially hazardous to maintenance crew and WTP operators.

Fort Harrison Well Field

The Fort Harrison well field does not have an auxiliary standby power source for the wells. In the event of an extended power failure, the City would not be able to meet the water demands of the community.

Indian Lake Well Field

The Indian Lake well field does not have an auxiliary standby power source for the wells. In the event of an extended power failure, the City would not be able to meet the water demands of the community.

SCADA System

The existing SCADA system utilizes Mission for its operations. Utilizing the existing Mission SCADA system does not provide isolated functionality and automation. In addition, Mission is a web based system that cannot operate without an internet connection. In the event of a loss of internet access, the Mission SCADA system will not be functional, and local hand operation would be required.

Water Main Replacements

As with many water distribution systems in the United States, the City is experiencing a high number of water main breaks in critical areas of their distribution system. There are three project areas identified for replacement which were evaluated using a number of asset management criteria to determine the risk of catastrophic failure to the system.

Rehabilitation of Existing Tanks

The existing 52nd St. and Oaklandon Rd. elevated water storage tanks were inspected in 2008 by Tank Industry Consultants. At that time, there were a number of ANSI/OSHA safety violations on both tanks which still have not been addressed. In addition, the coating systems need to be reevaluated to determine their integrity and effectiveness against corrosion.

Proposed Project Description

The proposed Project includes the following components:

- Supply Improvements
    - Replace Richardt Wellfield Pumps and Motors
    - Add Standby power generators at Fort Harrison and Indian Lake Wellfields
    - Upgrade wellfield control system
- Treatment Improvements
    - Richardt Water Treatment Plant Phase II Improvements
    - Fort Harrison Treatment Plant Filter Building, Rehabilitation, and related Improvements
    - Upgrade Indian Lake control system
- Storage Improvements
    - Rehabilitate 52nd Street Elevated Tank
    - Rehabilitate Oaklandon Road Elevated Tank
- Distribution Improvements
    - Replace Downtown (E 47th St.) Water Main
    - Replace N. Kitley / Karen Dr. Water Main
    - Replace Sumac Lane Water Main
    - Winding Ridge Booster Station control Improvements

The estimated total pre-design project cost for the selected alternatives is **$18,749,000.** The project will be completed in two phases with Phase I construction beginning in 2018 and Phase II construction beginning in 2019. A more detailed cost estimate for each phase can be found in **Table 6.2.1.** An exhibit depicting the proposed water system improvements is provided in **Appendix A, Exhibit A-6.**

1.0 PROJECT LOCATION

1.1 Existing Service Area

The City of Lawrence (City) is located in the eastern part of Marion County, Indiana. The City is immediately east of Indianapolis. The water system is under the authority of the Lawrence Municipal Utilities (Utility).

The Utility's existing water service area is bounded by the corporate limits which extends north to Fall Creek Rd. and 86th St., east to Carroll Road, south to 42nd St., and west to Shadeland Ave. The Utility's distribution system contains approximately 14,900 customers. Refer to **Exhibit A-1** in **Appendix A** for the project location map showing the existing service area and study area.

1.2 Study Area

The Preliminary Engineering Report (PER) is based on a 20-year planning period from 2016 to 2036. The study area covers the Utility's existing water service area.

1.3 Projected 20-year Service Area

The projected 20-year service area is the same as the study area.

1.4 Project Area

The proposed project areas consist of improvements at the Fort Harrison water treatment plant (WTP), Richardt WTP, Fort Harrison and Indian Lake well fields, Oaklandon St. and 52nd St. elevated tanks, and various water main projects. Refer to **Exhibit A-1** in **Appendix A** for the location of the proposed project areas.

2.0 CURRENT SITUATION

2.1 Methodology

The Utility's existing infrastructure was evaluated to identify areas of concern and risk to the Utility. Two methods were used for this evaluation: Business Risk Exposure and System Capacity Evaluation.

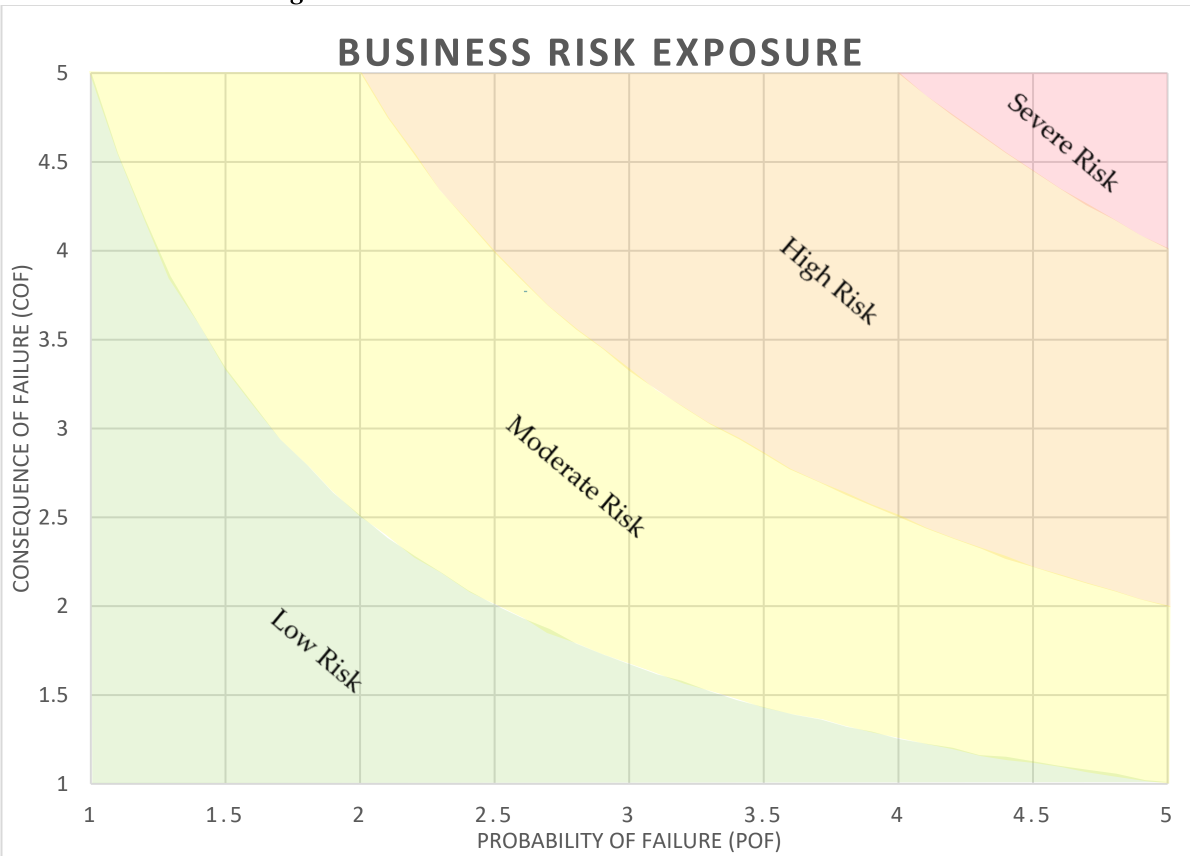
To assist with making decisions on which assets pose a high risk to the Utility, an asset management evaluation was completed for the Utility's water system. The evaluation includes two categories of assets: process and distribution. Process assets include assets at the well fields, treatment plants, storage tanks, and booster stations. Distribution assets include water mains, hydrants, valves, and services. This evaluation is considered a "bottom up" approach since it considers individual assets and the effect of a failure on the system.

In addition, a system capacity evaluation was completed to determine the ability of the system components to meet the demands at their firm operating capacity. The demands were estimated using an average of the demand information from the monthly reports of operation from 2012-2016 and population data.

2.1.1 Business Risk Exposure

A probability of failure and consequence of failure rating was developed for each asset. In addition, the process assets include a redundancy score to indicate the importance of the asset for the Utility to meet an acceptable level of service for the community. Using the probability of failure rating, consequence of failure rating, and redundancy score, a business risk exposure (BRE) rating is calculated. The BRE rating has a range of 0 to 25 where the higher the BRE rating, the higher the risk associated with that asset's failure. Different asset index and grading criteria were developed for the process and distribution piping assets. **Chart 2.1.1.1** shows the areas of varying risk based on the probability of failure and consequence of failure.

Chart 2.1.1.1: BRE Rating Scale Chart



Categories for BRE rating ranges are listed in **Table 2.1.1.1**.

Table 2.1.1.1: BRE Rating Scale

BRE Rating	*Risk Category*	*Action*
20-25	Severe	Rehabilitate/ Replace
10-20	High	
5-10	Moderate	Routine Maintenance
0-5	Low	

2.1.1.1 Asset Index and Grading Criteria

An asset index and grading criteria was developed for process assets. The grading criteria determine probability of failure, consequence of failure, and redundancy score values needed to determine the asset's BRE rating.

2.1.1.2 Probability of Failure

The probability of failure is the overall rating of weighted criteria for an asset's likelihood of failure. The criteria contributing to the probability of failure include physical condition, age, O&M protocols, repair history, and operation condition. A weight was given to each criterion, with input from the

Utility, to identify the most important criteria. The probability of failure is the weighted average of the criteria ratings.

- **Physical Condition Rating**: The physical condition rating of an asset is based upon the visual inspection, input from the Utility on the asset, and historical information such as inspection reports.
- **Age Factor Rating**: The age factor rating is calculated from the age and effective life of the asset. The percentage of its useful life is used to determine the age factor rating. The effective life for each asset is based on the EPA's rating for water assets and previous experience for typical effective life for the assets in Indiana.
- **O&M Protocol Rating**: The O&M protocol rating takes into account whether or not O&M manuals are complete, written or online, and if they are easily accessible.
- **Repair History Rating**: The repair history rating is determined by the number of repairs required for an asset over the past 10 years.
- **Operational Condition Rating**: The operational condition rating evaluates the asset on how well it functions and whether the asset needs to be rebuilt or upgraded. The operational condition received the highest weight factor for the probability of failure criteria.

Table 2.1.1.2: Probability of Failure Criteria

Criteria	*Rating*					*Weighting Factor*
	5	*4*	*3*	*2*	*1*	
Physical Condition	Very Poor	Poor	Fair	Good	Very Good	0.8
Age Factor	Greater than 80% of useful life	Between 60%-80% of useful life	Between 40%-60% of useful life	Between 20%-40% of useful life	Age less than 20% of useful life	1.3
O&M Protocols	None	Written/ online, but not complete, not current or location unknown	Written/ online, but not complete, not current or not easily accessible	Complete, written/online, current, but not easily accessible	Complete, written/online, current, and easily accessible	0.3
Repair history	Very Poor (Repaired more than 15 times in the last 10 years)	Poor (Repaired 10 to 15 times in the last 10 years)	Moderate (Repaired 5 to 10 times in the last 10 years)	Good (Repaired 1 to 5 times in the last 10 years)	Very Good (Not repaired in the last 10 years)	1.1
Operational Condition	Not operational and not repairable	Operational but needs to be rebuilt or upgraded	Operational but needs some restoration	Operational with minimal problems	No operational problems	1.5

2.1.1.3 Consequence of Failure

The consequence of failure is the overall rating of weighted criteria for the effect of failure an asset poses to the Utility. The criteria included for the consequence of failure are process, financial impact, safety, IDEM compliance, community disruption, and required response time. A weight was given to each criterion, with input from the Utility, to identify the most important criteria. The consequence of failure is the weighted average of the criteria ratings.

- **Process Rating**: The process rating considers how critical the asset is for completing the intended purpose of the process.
- **Financial Impact Rating**: The financial impact rating considers the impact of the failure of an asset on the Utility's budget.
- **Safety Rating**: The safety rating takes into account the effect of an asset failure on the health of personnel. Safety received the highest weight factor for the consequence of failure criteria.
- **IDEM Compliance Rating**: The IDEM compliance rating takes into account the importance of the asset and whether or not the issue is enforceable by IDEM.
- **Community Disruption Rating**: The community disruption rating provides a rating on the area of the community's service interrupted by the failure of the asset.

- **Required Response Time Rating**: The required response time rating takes into account how quickly the Utility's personnel need to address the issue in the event of an asset failure.

Table 2.1.1.3: Consequence of Failure Criteria

Criteria	*Rating*					*Weighting Factor*
	5	*4*	*3*	*2*	*1*	
Process	Mission Critical	Process shut-down	Loss of Redundancy	Potential process upset	No impact on process	1.17
Financial Impact	May require new borrowing or impact	May require transfer from reserves	Absorbed within current budget	Absorbed within applicable line item	Budgeted expense	0.83
Safety	Loss of life	Severe Injury to employees or public	Minor injury requiring treatment off-site or lost time	Minor injury requiring no medical treatment with no lost time	No injury	1.67
IDEM Compliance	Enforcement action by IDEM	Major issue but no enforcement action	Localized issue	Minimal Issue	100% compliance	0.33
Disruption to the community	Long term impact; area wide disruption	Short term impact but substantial disruption	Sporadic service disruptions	Minor disruption	No disruption	1.5
Required response time	1/2 hour	1/2 to 2 hours	2 to 4 hours	4 to 8 hours	> 8 hours	0.5

2.1.1.4 *Redundancy Score*

The redundancy score is a value from zero to one which accounts for multiple assets of the same type above the required amount for system operation. The redundancy score is calculated by dividing the number of required assets by the total number of assets. For example, if two pumps are required but there are three pumps available, the redundancy score would be 0.67.

2.2 Current Needs

2.2.1 Existing Water Production

The system capacity evaluation is based upon the average and maximum day demands estimated later in this section. A comparison of the current maximum day demands with the firm capacities of the existing facilities are described in more detail in the following sections. The results for each system component are listed under their respective sections. Refer to **Appendix A, Exhibit A-2** for the water system overview map.

2.2.1.1 *Population*

The 2010 U.S. Census reports the population of the City to be 46,001 residents.

2.2.1.2 Current Water Pumping Data

Table 2.2.1.1 includes a summary of available pumping data from 2012 to present using monthly reports of operations (MROs). The average day pumping data is an average of the available information for that year. The maximum day pumping data is the single maximum day for that year. The peaking factor is calculated by taking the average maximum day pumping and dividing by the average day pumping for the year listed.

Table 2.2.1.1: MRO Pumping Data Summary

Year		*Richardt WTP (MGD)*	*Fort Harrison WTP (MGD)*	*Indian Lake WTP (MGD)*	*Peaking Factor*
2012	Average Day	1.08	1.58	1.51	1.68
	Maximum Day	2.24	2.71	2.04	
2013	Average Day	1.25	1.46	1.29	1.20
	Maximum Day	1.45	2.03	1.30	
2014	Average Day	1.39	1.56	1.32	1.30
	Maximum Day	1.39	2.81	1.34	
2015	Average Day	1.13	1.36	1.27	1.32
	Maximum Day	1.31	1.65	2.00	
2016	Average Day	1.26	1.15	1.31	1.46
	Maximum Day	2.06	2.06	1.33	

2016 data is based on January 1 through July 31, 2016 data.

2.2.1.3 Water System Demands

Based on the average of the system wide data provided in **Part 2.2.1.2**, the current water system average day is estimated to be **3.99 MGD** and the current maximum day demand is estimated to be **5.54 MGD**, which results in a peaking factor of 1.39.

The current per capita average day demand is approximately 87 gallons per day (gpd), based on the 2010 population of 46,001 residents and the average day demand of 2,770 gpm (3.99 MGD). The per capita maximum day demand is 120 gpd, using the calculated peaking factor of 1.39 for the existing system.

2.2.1.4 Significant Water Users

Significant users of water include Maison Gardens Apartments, Parkwood Mobile Park, Spring Valley Mobile Homes, GSA Finance, and Westminster Village North.

2.2.2 Supply Facilities

The Utility operates three individual well fields containing a total of ten groundwater wells. The total additive current operating capacity of the ten wells in service is 8,350 gpm (12.02 MGD) at system operating pressure. The firm operating capacity of the wells with the largest well out of service at each well field is 4,950 gpm (7.13 MGD). The locations of the well fields are shown on **Exhibit A-2** in **Appendix A**. The individual firm rated capacities of each well field and the system firm rated capacity with Well No. 1 out of service are summarized in **Table 2.2.2.1.**

Table 2.2.2.1: Existing Well Field Firm Rated Capacity Summary

Richardt Street Well Field	*Fort Harrison Well Field*	*Indian Lake Well Field*	*Total Existing Well Firm Rated Capacity*
2.52 MGD	2.52 MGD	2.09 MGD	7.13 MGD

According to the *Recommended Standards for Water Works*, the groundwater source capacity must be able to meet or exceed the design maximum day demand with the largest producing well out of service. **Table 2.2.2.2** shows the existing maximum day demand compared to the existing well capacity.

Table 2.2.2.2: Existing Well Capacity Summary

Capacity Type	*Rated Capacity (MGD)*	*Existing Maximum Day Demand (MGD)*
Firm	7.13	5.54
Total	12.02	

Based on the information shown above, the Utility currently has existing well capacity to be able to meet the existing maximum day demand with the system's firm supply capacity. Therefore, no action is required for water supply at this time as a result of existing demands.

2.2.2.1 Richardt Well Field

There are a total of four active groundwater wells which serve the existing Richardt WTP. This well field is located on the existing Richardt WTP property near the intersection of 56th St. and Richardt Ave. None of the existing wells have an onsite/stationary backup power source. The total well field capacity is 3,000 gpm (4.32 MGD). With the largest well out of service (Well #1), the well field firm operating capacity is 1,750 gpm (2.52 MGD).

In 2016, an aquifer performance test and safe yield analysis was completed by Peerless Midwest to determine the safe yield capacity of the aquifer. The pump testing results were analyzed using groundwater modeling software to determine the safe yield. The resulting safe yield from the aquifer recommended by Peerless Midwest is 4,200 gpm, which is 1,200 gpm higher than the current total capacity of the wells. Wells 1, 2, and 3 are capable of being upgraded to larger pumps and motors.

2.2.2.1.1 Well 1

The well was constructed in 1959. It is a rock well, reportedly 242 feet deep, 16-inches in diameter with a 125 HP premium efficient inverter duty motor. The well has a rated capacity of 1,200 gpm and a current pumping capacity of 1,250 gpm. The well is enclosed in a masonry well house. A 2002 variable frequency drive (VFD) located in the well house is used to set the discharge rate of the well. Flow testing in 2012 indicated that the specific capacity of the well was 216. A flow totalizer and pressure switch are located on the pump discharge. The existing well house roof, door, and windows are in need of repair.

Well 1 Pump Head

Well 1 Motor

The BRE ratings of the assets associated with well 1 have been summarized in **Table 2.2.2.3**.

Table 2.2.2.3: Well 1 Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Pump	1.74	3.00	1.00	5.22
Motor	2.46	2.81	1.00	6.90
VFD	1.22	3.72	1.00	4.54
Lighting Panel	2.40	3.44	1.00	8.27
Power Panel	2.40	3.44	1.00	8.27
Safety Switch	2.40	3.72	1.00	8.93
Transformer	3.32	3.44	1.00	11.44
PLC	2.54	2.61	1.00	6.63
Controller	3.00	3.67	1.00	11.00
Mission Node	2.60	1.56	1.00	4.04
HMI	3.12	2.08	1.00	6.50

The transformer and controller have a BRE ratings above 10 because of their poor physical condition, O&M protocols, operational condition, and financial impact.

2.2.2.1.2 Well 2

The well was constructed in 1963. It is a rock well, reportedly 250 feet deep, 16-inches in diameter with a 100 HP premium efficient inverter duty motor. The well has a rated capacity of 1,100 gpm and a current pumping capacity of 1,000 gpm. The well is enclosed in a masonry well house. A 2011 VFD located in the well house is used to set the discharge rate of the well. Flow testing in 2012 indicated that the specific capacity of the well was 161.8. A flow totalizer and pressure switch are located on the pump discharge. The existing well house roof, door, and windows are in need of repair.

Well 2

The BRE ratings of the assets associated with well 2 have been summarized in **Table 2.2.2.4**.

Table 2.2.2.4: Well 2 Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Pump	1.90	3.00	1.00	5.70
Motor	2.08	2.81	1.00	5.84
VFD	1.22	3.72	1.00	4.54

2.2.2.1.3 Well 3

The well was constructed in 1954. It is a rock well, reportedly 291 feet deep, 12-inches in diameter with a 50 HP across the line motor. The well has a rated capacity of 580 gpm and a current pumping capacity of 750 gpm. The well is enclosed in a masonry well house which also contains Well #4 and formerly contained the chlorine gas feed equipment for the water treatment plant. A flow totalizer and pressure switch are located on the pump discharge. The existing well house electrical, roof, doors, and windows are in need of repair.

Well 3

The BRE ratings of the assets associated with well 3 have been summarized in **Table 2.2.2.5**.

Table 2.2.2.5: Well 3 Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Pump	2.20	3.00	1.00	6.60
Motor	1.06	2.81	1.00	2.97

2.2.2.1.4 Well 4

The well was constructed in 1954. It is a rock well, reportedly 289 feet deep, 8-inches in diameter with a 30 HP across the line motor. The well has a rated capacity of 250 gpm but is currently not in operation. The well is enclosed in a masonry well house which also contains Well #3 as noted above. A flow totalizer and pressure switch are located on the pump discharge.

Well 4

The BRE ratings of the assets associated with well 4 have been summarized in **Table 2.2.2.6**.

Table 2.2.2.6: Well 4 Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Pump	4.26	3.00	1.00	12.78
Motor	4.48	2.81	1.00	12.57

Well 4's physical condition and age contribute greatly to the probability of failure for both the pump and motor. The financial impact of replacing the well pump or motor contribute to the moderate consequence of failure rating.

2.2.2.2 *Fort Harrison Well Field*

There are three active groundwater wells which serve the existing Fort Harrison WTP. This well field is located on Indiana DNR property northeast of the Ft. Harrison WTP. None of the existing wells have an onsite/stationary backup power source. The total well field capacity is 3,000 gpm (4.32 MGD). With the largest well out of service (Well #8), the well field firm operating capacity is 1,750 gpm (2.52 MGD). The Wells are fed from independent 480V power sources. The motors are on Variable Frequency Drives (VFDs) that act as soft starts to help mitigate voltage drop upon motor startup. The VFDs are controlled through the existing Mission SCADA system and are cycled on and off based on the 52nd Street Elevated storage tank level.

2.2.2.2.1 Well 8

The well was constructed in 2004 and last rehabilitated in 2009. It is a tubular well, reportedly 105 feet deep, 16-inches in diameter with a 100 HP premium efficient inverter duty motor. The well has a rated capacity of 1,250 gpm and a current pumping capacity of 1,250 gpm. The well is located on an elevated platform exposed to the elements. Flow testing in 2010 indicated the well had a specific capacity of 52.26.

Well 8 Pump Head

Well 8 Motor

The BRE ratings of the assets associated with well 8 have been summarized in **Table 2.2.2.7**.

Table 2.2.2.7: Well 8 Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Pump	2.70	3.08	0.75	6.24
Motor	2.30	2.22	0.75	3.83
VFD	2.24	3.22	1.00	7.22
Safety Switch	2.86	3.22	1.00	9.22
Utility Meter	2.40	2.67	1.00	6.40
Mission System Node	2.60	1.56	1.00	4.04
Air Valve	3.36	1.94	1.00	6.53
Dual Port Throttling Device	3.52	1.94	1.00	6.84

2.2.2.2.2 Well 9

The well was constructed in 1968 and last rehabilitated in 2008. It is a gravel pack well, reportedly 111.5 feet deep, 18-inches in diameter with a 60 HP motor. The well has a rated capacity of 500 gpm and a current pumping capacity of 1,000 gpm. The well is located in a well house. Flow testing in 2010 indicated the well had a specific capacity of 32 which is substantially off from its peak production potential according to Peerless Midwest. The well house is in fair condition and in need of minor repairs.

Well 9

Well 9 Well House

The BRE ratings of the assets associated with well 9 have been summarized in **Table 2.2.2.8**.

Table 2.2.2.8: Well 9 Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Pump	2.54	3.08	0.75	5.87
Motor	2.54	2.22	0.75	4.23
Building	3.78	1.83	1.00	6.93
Safety Switch	2.40	3.22	1.00	7.73
Safety Switch x2	3.32	3.22	1.00	10.70
Transformer	3.78	2.94	1.00	11.13
Unit Heater	4.24	2.11	1.00	8.95
Mission System	2.60	1.56	1.00	4.04

The safety switches and transformer have elevated probability of failure and consequence of failure ratings as a result of the physical condition, age, operational condition, and safety concerns.

2.2.2.2.3 Well 10

The well was constructed in 1975 and was rehabilitated in 2010. It is a gravel pack well, reportedly 86 feet deep, 18-inches in diameter with a 100 HP premium efficient inverter duty motor. The well has a rated capacity of 1,000 gpm and a current pumping capacity of 750 gpm. The pump was replaced in 2010 with a six stage pump rated at 650 gpm at 372 feet of TDH. The well is located in a well house. Flow testing in 2010 indicated the well had a specific capacity of 28.05. The well house is in poor condition and requires rehabilitation.

Well 10

Well 10 Well House

The BRE ratings of the assets associated with well 10 have been summarized in **Table 2.2.2.9**.

Table 2.2.2.9: Well 10 Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Pump	2.54	3.08	0.75	5.87
Motor	2.16	2.22	0.75	3.60
VFD	1.94	3.22	1.00	6.25
Building	3.78	1.83	1.00	6.93
Disconnect	2.40	3.22	1.00	7.73
Enclosed Circuit Breaker	2.40	2.94	1.00	7.07
Lighting Panel	3.32	2.94	1.00	9.78
Transformer	3.32	2.94	1.00	9.78
Unit Heater	4.24	2.11	1.00	8.95
Mission System Node	2.60	1.56	1.00	4.04

2.2.2.3 *Indian Lake Well Field*

There are a total of three active groundwater wells which serve the existing Indian Lake WTP. This well field is located on private property in a utility easement west of the Indian Lake WTP. None of the existing wells have an onsite/stationary backup power source. The total well field capacity is 3,000 gpm (4.32 MGD). With the largest well out of service (Well #15), the well field firm operating capacity is 1,450 gpm (2.09 MGD). Well 14 is powered out of an existing 480/277V MCC located in Well House No. 14. Wells 15R and 16 are powered out of an existing 480/277V MCC located in old Well House No. 15. The Indian lake wells employ VFDs acting as soft starts to help decrease voltage drop upon motor startup. The VFDs are controlled by Mission SCADA and are cycled on and off based on the Oaklandon Elevated Storage Tank level. Historically, the wells have had issues with fine silt and iron plugging the pumps. Well 15R was cleaned using the double disc method. Well 16 was relined after the well screen failed. Since the cleaning and relining of these wells, no major cleaning has been required. However, Well 15R casing is currently settling and moving. The casing is going to be secured to attempt to resolve the issue.

2.2.2.3.1 Well 14

The well was constructed in 1990 and cleaned in 2007. It is a tubular well, reportedly 91 feet deep, 16-inches in diameter with a 125 HP premium efficient inverter duty motor. The well has a rated capacity of 1,000 gpm and a current pumping capacity of 700 gpm. The well is located in a well house. Flow testing in 2010 indicated the well had a specific capacity of 24.5.


Well 14 Pump Head


Well 14 Motor

The BRE ratings of the assets associated with well 14 have been summarized in **Table 2.2.2.10**.

Table 2.2.2.10: Well 14 Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Pump	2.54	3.08	0.75	5.87
Motor	2.54	2.22	0.75	4.23
Building	3.72	3.22	1.00	11.99
MCC	1.00	3.78	1.00	3.78
VFD	2.26	3.22	1.00	7.28
Air/Vacuum Valve	3.52	1.75	1.00	6.16
Globe Valve	3.36	1.94	1.00	6.53
8″ Silent Check Valve	3.52	2.36	1.00	8.31

The building has an elevated BRE rating as a result of its physical condition, operational condition, financial impact, and safety concerns.

2.2.2.3.2 Well 15R

The well was constructed in 2008. It is a tubular well, reportedly 85 feet deep, 16-inches in diameter a 75 HP premium efficient inverter duty motor. The well has a rated capacity of 1,000 gpm and a current pumping capacity of 900 gpm. The well is located on an elevated platform exposed to the elements.

Well 15R Pump Head

Well 15R Motor

The BRE ratings of the assets associated with well 15R have been summarized in **Table 2.2.2.11**.

Table 2.2.2.11: Well 15R Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Pump	3.02	3.08	0.75	6.98
Motor	2.70	2.22	0.75	4.50
Mini-Power Zone	3.98	2.94	1.00	11.72
Safety Switch	4.24	3.22	1.00	13.66
Power Center	3.98	3.72	1.00	14.81
Throttling	3.06	1.75	1.00	5.35
Air Release	3.52	1.75	1.00	6.16

The electrical components at Well 15R have been discolored from the well spraying water on the components. As a result, the probability of failure for mini-power zone, safety switch, and power center all have a high probability of failure and BRE rating.

2.2.2.3.3 Well 16

The well was constructed in 2001. It is a gravel pack well, reportedly 87 feet deep, 20-inches in diameter with a 75 HP premium efficient inverter duty motor. The well has a rated capacity of 1,400 gpm and a current pumping capacity of 750 gpm. The well is located on an elevated platform. Flow testing in 2010 indicated the well had a specific capacity of 35.5.

Well 16

Well 16 Pump Head

The BRE ratings of the assets associated with well 16 have been summarized in **Table 2.2.2.12**.

Table 2.2.2.12: Well 16 Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Pump	2.54	3.08	0.75	5.87
Motor	2.04	2.22	0.75	3.40
Building	3.32	1.83	1.00	6.09
Exhaust Fan	3.78	2.11	1.00	7.98
MCC	3.78	3.78	1.00	14.28
Mission System	2.40	1.56	1.00	3.73
Service Disconnect/MTS	2.40	3.50	1.00	8.40
Utility Meter	2.40	2.67	1.00	6.40
Safety Switch	2.40	3.22	1.00	7.73
VFD	2.10	3.22	1.00	6.77
Controllers	2.60	1.56	1.00	4.04
Mag Meter	2.46	1.75	1.00	4.30
Globe Valve	3.06	1.94	1.00	5.95
Air Release	3.68	1.94	1.00	7.16

The MCC at well 16 has a high probability of failure and consequence of failure because of its physical condition, age, O&M protocols, operational condition, potential disruption, financial impact, and safety.

2.2.3 Treatment Facilities

The Utility operates three individual WTPs each for the treatment and removal of iron and manganese. The total treatment capacity of the system is 5,360 gpm (7.72 MGD). The total firm capacity of the existing water treatment plants, based on the current firm production capacity of each plant, is 3,692 gpm (5.32 MGD) as summarized in **Table 2.2.3.1**. The existing WTP system schematics are shown on **Exhibit A-3** in **Appendix A**.

Table 2.2.3.1: Existing WTP Firm Rated Capacity Summary

Richardt Street WTP	*Fort Harrison WTP*	*Indian Lake WTP*	*Total Existing Treatment Firm Rated Capacity*
1.22 MGD	2.01 MGD	2.09 MGD	5.32 MGD

Table 2.2.3.2 shows the maximum day demand along with the existing treatment firm rated capacity provided in **Chapter 2**.

Table 2.2.3.2 – Existing Water Treatment Capacity Summary

Existing Maximum Day Demand	*Existing Treatment Firm Rated Capacity*
5.54 MGD	5.32 MGD

Based on the information shown above, the Utility does not have existing treatment capacity to meet the projected water demands over the 20-year planning period. To meet the existing maximum day demand, an additional **0.22 MGD (317 gpm)** of treatment capacity is needed.

2.2.3.1 Richardt WTP

The Richardt Street WTP was originally constructed in 1958 and expanded in 1971 to its current capacity and configuration. Two (2) high service pumps and an aerator are located on top of each of the two (2) detention tanks. A separate masonry building houses the plant electrical controls, telemetry equipment, face piping and control valves of the four (4) horizontal pressure filters, and metering equipment. A backwash holding tank is located on the north side of the building. The chlorine feed equipment is currently located in an isolated room in the building housing Wells 3 & 4. The site is surrounded by a 6-foot security fence.

2.2.3.1.1 Aeration

One induced draft aerator is located on top of each detention tank, for a total of two aerators. Each aerator has a reported capacity of 1,200 gpm. The aerators can be bypassed allowing flow from the wells directly to the pressure filters using valves on the site. The aerators are in poor condition but the aerator located on top of the east detention tank (Aerator 2) has failed and is not currently in operation. The internal wooden slats in the east aerator failed in early 2016 and resulted in debris getting lodged in the high service pumps. The aerator slats were replaced but the high service pumps were not.

Aerator 1

Aerator 2

The BRE ratings of the aerator assets have been summarized in **Table 2.2.3.3**.

Table 2.2.3.3: Aerator Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Aerator 1 (West)	4.28	3.50	0.50	7.49
Aerator 2 (East)	4.28	3.50	0.50	7.49

2.2.3.1.2 Detention

Two detention tanks are located on the site. The east tank was constructed with the original plant construction of 1958 and the west tank was added with the plant expansion in 1971. These tanks follow the aeration process. The detention tanks were originally designed to operate independent of each other, but in 2002 the Utility installed an interconnect pipe to allow the detention tanks to be hydraulically connected. Each detention tank is partially below ground. Each detention tank has a reported volume of 15,000 gallons, however, the west tank is approximately 4 feet lower than the east tank, and so only about 75% of the east tank volume can be utilized, resulting in a total detention volume of 26,000 gallons. This volume provides 15 minutes of detention time at 1,700 gpm plant production, which is the maximum operating rate currently used according to Utility pumping data. According to the *Recommended Standards for Water Works*, a minimum of 30 minutes of detention time is required to ensure that oxidation reactions are as complete as possible. This reduced detention time does not appear to have an impact on the oxidation of iron and manganese in the raw water, as indicated by the filter influent water quality for these parameters. The amount of ferric iron (aqueous) is 0 mg/L at the filter influent indicating the iron has been oxidized. The detention tanks are taken out of service, cleaned, and inspected annually. Currently, the east detention tank is not utilized due to inoperable high service pumps located above the tank.

West Detention Tank

East Detention Tank

The BRE ratings of the detention tank assets have been summarized in **Table 2.2.3.4**.

Table 2.2.3.4: Detention Tank Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
West Reaction Tank	3.82	4.08	1.00	15.60
East Reaction Tank	4.08	4.08	1.00	16.66

2.2.3.1.3 High Service Pumps

Four (4) high service pumps are used to pump water from the detention tanks through the pressure filters and into the distribution system. Two (2) high service pumps are located on top of each detention tank. The high service pumps located over the east detention tank are currently not in operation. The existing pumps were last serviced more than 10 years ago. Typically, the expected useful life of a high service pump is 20 years, and all pumps have exceeded this expected useful life.

The current high service pump firm capacity is approximately 850 gpm (1.22 MGD). However, this capacity is not typically utilized due to the limiting filtration capacity downstream of the high service pumps.

The Utility does experience some pump cavitation when the level in the detention tanks drops too low, and the operators have to closely monitor pumping rates of the high service pumps and the wells to ensure that a suitable detention tank level is maintained.

The high service pumps are controlled by the US Filter pump control panel in the filter building based on the water level in the 52nd Street Elevated Water Storage Tank.

High Service Pump No. 1 & 2

High service pump No. 1 and No. 2 are located on top of the east detention tank and were installed as part of the 1971 plant expansion. Both high service pumps are no longer in operation.

High Service Pump 2

High Service Pump 2

The BRE ratings of the high service pump 1 and 2 assets have been summarized in **Table 2.2.3.5**.

Table 2.2.3.5: High Service Pumps 1 & 2 Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
High Service Pump 2	3.64	2.22	0.67	5.39
HSP 2 Motor	4.26	2.22	0.67	6.31
High Service Pump 1	5.00	2.78	0.67	9.26

High Service Pump No. 3 & 4

High service pump No. 3 and No. 4 are located on top of the west detention tank. High service pump No. 3 has a current operating capacity of 850 gpm and is equipped with a VFD. High service pump No. 4 has a current operating capacity of 1,000 gpm and is equipped with a VFD. The existing motor starters for high service pumps 3 and 4 are located in the same building as the pumps.

High Service Pump 3

High Service Pump 4

The BRE ratings of the high service pumps 3 and 4 assets have been summarized in **Table 2.2.3.6**.

Table 2.2.3.6: High Service Pumps 3 & 4 Asset Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
High Service Pump 3	2.80	2.22	0.67	4.15
HSP 3 Motor	2.34	2.22	0.67	3.47
High Service Pump 4	2.36	2.22	0.67	3.50
HSP 4 Motor	2.00	2.22	0.67	2.96

2.2.3.1.4 Pressure Filters

The four (4) horizontal pressure filters are approximately 10 feet in diameter and 22 feet in length. The filter faces and face piping are located inside of the WTP masonry building. The remainders of the filter vessels are located outside of the building.

Each two-cell filter has a reported total filtering area of 220 square feet and a design capacity of 500 gpm. The maximum loading rate based on the *Recommended Standards for Water Works* is 3gpm/ft^2 of filter area. Also according to the *Recommended Standards for Water Works*, the filters shall be capable of providing the maximum demand of the system with any filter out of service. With one filter out of service, the remaining rated filter capacity is 1,500 gpm (2.16 MGD). However, in order to meet the secondary maximum contaminant level (MCL) for iron, the WTP's current operating capacity is less than 1,000 gpm.

Recently, the pressure filters have been operating as biological filters to consume the ammonia present in the raw water. In March 2016, Peerless Midwest completed an evaluation of the pressure filter and filter media conditions. The filters are experiencing corrosion resulting in structural deficiencies including failure of the bracket system holding the interior PVC headers, the poor condition of the access hatches and associated appurtenances resulting in difficult access, and corrosion of nuts and bolts. The filter media in the pressure filters consists of anthracite over a gravel support bed. Typically, filter media has an expected useful life of 15 years before its filtration capacity begins to diminish and must be replaced. The existing media in the filters was last replaced more than 15 years ago. However, the anthracite filter media in the filters are in fair condition but is not performing as intended.

Horizontal Pressure Filters

The BRE ratings of the pressure filter assets have been summarized in **Table 2.2.3.7**.

Table 2.2.3.7: Pressure Filter Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Filter E1	5.00	4.67	1.00	23.33
Filter E2	5.00	4.67	1.00	23.33
Filter W1	5.00	4.67	1.00	23.33
Filter W2	5.00	4.67	1.00	23.33

The filters have a high probability of failure as they are currently failing at their rated capacity. The consequence of failure is also high because of the process importance, financial impact for replacement, and community disruption from the potential of not meeting demands on maximum demand days.

2.2.3.1.5 Backwash System

The existing pressure filters are backwashed on a rotating basis with one filter backwashed daily from the high service pumps. The Utility currently uses a backwash rate of approximately 1,300 gpm until a desired backwash water turbidity level is achieved.

Each two-cell filter reportedly produces 10,000 to 15,000 gallons of backwash water per wash that discharges into a 40,000-gallon concrete backwash holding tank. This tank equalizes the flow while the backwash flows by gravity to the sanitary lift station which pumps to the sanitary sewer.

The existing filters are operated on a declining rate method, where the filters will decrease their filtration rate as the filter media collects iron and manganese. The Utility is not currently able to measure the individual filtration rate on each filter, which can be useful in maximizing filter run times and backwash frequencies.

Table 2.2.3.8: Backwash Tank Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Backwash Holding Tank	3.28	3.81	1.00	12.48

The backwash holding tank has a high probability of failure because of the age and condition of the tank. The consequence of failure is high because of the importance of the tank to the process, financial impact, and community disruption by not being able to backwash the filters in the event of a failure.

2.2.3.1.6 Chemical Feed Systems

The existing chemical feed equipment includes provisions for feeding chlorine, polyphosphate, and fluoride.

Chlorine Feed System

The chlorination equipment consists of a bulk sodium hypochlorite feed system located in an isolated room in the building housing wells 3 and 4. The equipment was added in 2014 to replace the on-site generation disinfection system. According to 2016 MROs, a range of approximately 3 to 102 pounds of chlorine were fed per day.

The plant provides pre-chlorination for the treatment process by the injection of sodium hypochlorite into the detention tank. Post-chlorination is injected in the common discharge pipe leaving the pressure filters. The post-chlorination chemical feed pump is set to feed 18.8 gallons per day (gpd) with a maximum capacity of 139.2 gpd. Breakpoint chlorination is used as the primary disinfectant.

The BRE ratings of the chlorine feed system assets have been summarized in **Table 2.2.3.9**.

Table 2.2.3.9: Chlorine Feed System Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Chlorine Pump Post-Filtration	3.50	4.39	1.00	15.36
Chlorine Pump Motor Post-Filtration	2.58	4.39	1.00	11.32
Chlorine Pump Pre-Filtration	2.28	3.25	1.00	7.41
Chlorine Pump Motor Pre-Filtration	1.06	3.25	1.00	3.44
Chlorine Transfer Pump	2.12	2.11	1.00	4.48

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Chlorine Transfer Pump Motor	1.96	2.11	1.00	4.14
Temp. Pre-Filtration Chlorine Pump	3.02	3.25	1.00	9.81
Chlorine Analyzer	2.10	2.58	1.00	5.42
Chlorine Analyzer	1.88	3.58	1.00	6.74
Sodium Hypochlorite Tank Top	2.38	2.94	1.00	7.01
Sodium Hypochlorite Tank Base	2.38	3.78	1.00	8.99

The post-filtration feed pump was not in operation at the time of this report. As a result, the BRE rating is high.

Phosphate Chemical Feed System

Phosphate is added to sequester iron in the finished water as it leaves the WTP. The phosphate feed pump is currently set to feed 25.4 gpd with a maximum capacity of 190 gpd.

2.2.3.1.7 Electrical

The main service panel in the WTP was replaced as part of the 1971 plant addition. The electrical service to the plant is distributed through a 480V, 3phase, 3wire, 1200A main disconnect and a 600A 480V, MCC, which then feeds a local 400Amp, 480V, MCC in the filter building. The electrical main distribution gear is well passed its design life and after years of manipulation poses a potential shock hazard to staff as the front safety shields are no longer isolating the inner electrical equipment from operators. The overhead electrical service to the plant poses a danger to the staff as it is within reach while entering the main power distribution building.

The BRE ratings of the electrical assets have been summarized in **Table 2.2.3.10**.

Table 2.2.3.10: Electrical Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
HSP 1 VFD	2.68	3.50	1.00	9.38
HSP 2 VFD	2.68	3.50	1.00	9.38
Chlorine Speed Control	1.90	3.03	1.00	5.75
Chlorine Speed Control	1.90	3.08	1.00	5.86
Filter Building Transformer	3.32	4.78	1.00	15.86
Filter Room Transformer	3.78	4.78	1.00	18.06
Main Service Disconnect Switch	3.32	4.78	1.00	15.86
MCC	4.24	4.42	1.00	18.73
Motor Starter	2.54	4.78	1.00	12.14

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Portable Generator	1.62	2.83	1.00	4.59
U.S. Filter Control	2.94	3.67	1.00	10.78
Filter Building Transformer	3.32	3.44	1.00	11.44
Admin. Building Transformer	2.40	3.44	1.00	8.27
Filter Building MCC Transformer	3.32	3.44	1.00	11.44

The BRE ratings for the electrical components are due to their age, physical condition, operating condition, safety, process impact, and financial impact.

2.2.3.1.8 SCADA

The existing SCADA system consists of a US Filter system that collects the 52nd Street Elevated storage tank level from mission and controls the HSPs based on tank level. The onsite wells at Richardt are controlled via the US Filter system control panel based on the level in the clear well. Data collection and monitoring is completed using Mission. The plant lacks a full functioning and integrated SCADA system and instead operates as separate entities.

The BRE ratings of the SCADA assets have been summarized in **Table 2.2.3.11**.

Table 2.2.3.11: SCADA Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Instrumentation & Control	3.58	3.67	1.00	13.13

The instrumentation and control at Richardt has a BRE rating above 10 due to the age, O&M protocols, impact on process, financial impact, and community disruption in the event of a failure.

2.2.3.1.9 Standby Power

There is currently no standby power at the Richardt WTP.

2.2.3.2 Fort Harrison WTP

The Fort Harrison WTP was originally constructed in 1980. The Fort Harrison well field pumps groundwater through the nine (9) vertical pressure filters located in the filter building into the 3 MG finished water ground storage reservoir. Three (3) high service pumps are located in the pumping building that pump water from the reservoir into the distribution system. The site is surrounded by a security fence.

2.2.3.2.1 Filters

The nine (9) filters at Fort Harrison are each rated at 174 gpm and are in fair condition. Filters 7-9 were originally installed as water softeners and have since been converted to vertical pressure filters. In the past, a foam protectant was placed around the filter body to minimize corrosion. Recently, the foam was removed from the exterior of the filters exposing the metal body of the filters. If the plant continues to operate in its current condition, the chemical vapors present in the filter building will begin to cause corrosion on the newly exposed filter body. The other portions of the filters which have been exposed are showing signs of corrosion.

Also according to the *Recommended Standards for Water Works*, the filters shall be capable of providing the maximum demand of the system with any filter out of service. The firm rated capacity of the filters is 1,392 gpm with one filter out of service.

The filter media in the pressure filters reportedly consists of anthracite over a gravel support bed. Typically, filter media has an expected useful life of 15 years before its filtration capacity begins to diminish and must be replaced. The condition of the existing media, interior coating, and interior steel is unknown and in need of evaluation.

Filter 6

The BRE ratings of the filter assets have been summarized in **Table 2.2.3.12**.

Table 2.2.3.12: Filter Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Filter 1	3.32	3.08	0.89	9.10
Filter 2	3.32	3.08	0.89	9.10
Filter 3	3.32	3.08	0.89	9.10
Filter 4	3.32	3.08	0.89	9.10
Filter 5	3.32	3.08	0.89	9.10
Filter 6	3.32	3.08	0.89	9.10
Filter 7	3.32	3.08	0.89	9.10
Filter 8	3.32	3.08	0.89	9.10
Filter 9	3.32	3.08	0.89	9.10

2.2.3.2.2 High Service Pumps

The current high service pump firm rated capacity with the largest pump out of service is approximately 1,800 gpm (2.59 MGD). The high service pumps are controlled by the water level in the 52nd St. Elevated Water Storage Tank.

High Service Pump 1

High service pump 1 is located in the pumping building and produces 800 gpm. The pump is a horizontal centrifugal pump with a 50 HP motor and VFD. The pump is in fair condition and the motor is in good condition.

High Service Pump 1

High Service Pump 1 Motor

The BRE ratings of the high service pump 1 assets have been summarized in **Table 2.2.3.13**.

Table 2.2.3.13: High Service Pump 1 Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
High Service Pump 1	3.34	2.72	1.00	9.09
HSP 1 Motor	2.62	2.72	1.00	7.13

High Service Pump 2

High service pump 2 is located in the pumping building and produces 1,200 gpm. The pump is a horizontal centrifugal pump with a 75 HP motor and VFD. The pump and motor are in fair condition.

High Service Pump 2

High Service Pump 2 Motor

The BRE ratings of the high service pump 2 assets have been summarized in **Table 2.2.3.14**.

Table 2.2.3.14: High Service Pump 2 Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
High Service Pump 2	2.48	2.72	1.00	6.75
HSP 2 Motor	2.22	2.72	1.00	6.04

High Service Pump 3

High service pump 3 is in the pumping building and produces 1,000 gpm. The pump is a horizontal centrifugal pump with a 75 HP motor and VFD. The pump was not in operation at the time of this report, but the motor is in good condition.

High Service Pump 3

High Service Pump 3 Motor

The BRE ratings of the high service pump 3 assets have been summarized in **Table 2.2.3.15**.

Table 2.2.3.15: High Service Pump 3 Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
High Service Pump 3	3.62	2.72	1.00	9.85
HSP 3 Motor	2.00	2.72	1.00	5.44

2.2.3.2.3 Process Piping

The process piping located in the pumping building is all in good condition. There are no signs of corrosion and it appears that portions of the process piping were recently coated. However, the process piping shows signs of significant corrosion in the filter building. The existing coating system is flaking off the pipe exposing the metallic pipe to the corrosive chemical vapors present in the filter building.

Process Piping in Pumping Building

Process Piping in Filter Building

2.2.3.2.4 Valves

The valves located in the pumping building are butterfly, singer, or silent check valves. There is one gate valve that is no longer used in the process. The butterfly valves all have manual actuators. They are all in good condition and there are no operating issues with the valves. In the filter building, the valves are all butterfly valves with either manual or pneumatic actuators. Many of the valves are missing actuators and are showing signs of corrosion. There are several valves in poor operating condition.

Butterfly and Check Valve in Pumping Building

Butterfly Valve in Filter Building

2.2.3.2.5 Actuators

The valve actuators in the pumping building are all manual and in good condition. The actuators for the butterfly valves in the filter building are pneumatic and in poor condition or missing altogether.

Electric Actuator in Filter Building

Manual Actuator in Pumping Building

2.2.3.2.6 Chemical Feed Systems

The Fort Harrison plant feeds phosphates and chlorine in the filter building. However, the chlorine and phosphate feeds and storage tanks are located in the filter room. As a result, the process piping, actuator components, valves, etc. are corroding due to the chemical vapors present in the building.

Process Piping & Chlorine Feed

Corroded Process Piping

Chlorine Feed System

Lawrence feeds bulk sodium hypochlorite at the Fort Harrison WTP as their method of disinfection. There are two chlorine feed points in the WTP located prior to and after the filters. The sodium hypochlorite is stored outside of the filter building in a polyethylene storage tank. Lawrence uses breakpoint chlorination for disinfection. According to the MROs for 2016, the amount of chlorine fed per day varies from an average of 15 pounds per day (ppd) to 50 ppd. The pre-chlorination chemical feed pump is set to feed 51 gpd with a maximum capacity of 190 gpd. The post-chlorination chemical feed pump is set to feed 6 gpd with a maximum capacity of 190 gpd. The sodium hypochlorite is stored in a day tank inside the filter building. The pre-filtration sodium hypochlorite feed is injected by a metering pump. The chemical feed is not contained and there is not a secondary containment in place for the day tank inside the building. In addition, chemical vapors are corroding metallic surfaces due to the lack of chemical isolation. The post-filtration chlorine feed pump is in good condition.

Pre-Filtration Chlorine Feed

Post-Filtration Chlorine Feed

The BRE ratings of the chlorine feed system assets have been summarized in **Table 2.2.3.16**.

Table 2.2.3.16: Chlorine Feed System Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Chlorine Feed Pump Post-Filtration	1.86	4.39	1.00	8.16
Chlorine Feed Pump Pre-Filtration	2.38	3.25	1.00	7.73
Chlorine Transfer Pump 1	2.12	2.11	1.00	4.48
Chlorine Transfer Pump 1 Motor	1.34	2.11	1.00	2.83
Chlorine Transfer Pump 2	2.12	2.11	1.00	4.48
Chlorine Transfer Pump 2 Motor	2.18	2.11	1.00	4.60
Chlorine Analyzer 1 – Pumping Building	2.60	4.00	1.00	10.40
Chlorine Analyzer 2 – Filter Building	2.60	4.00	1.00	10.40
Chlorine Scale	2.54	1.86	1.00	4.73
Bleach Storage Tank Top	2.54	2.94	1.00	7.48
Bleach Storage Tank Bottom	2.54	3.78	1.00	9.60

The chlorine analyzers have a high consequence of failure since an over dosing or under dosing chlorine.

Fluoride Feed System

Fluoride was added to the Fort Harrison WTP beginning in 1992 and is fed to promote dental health for consumers. The fluoride chemical feed pump is set to feed 2.9 gpd with a maximum capacity of 24 gpd.

Phosphate Feed System

Lawrence also feeds phosphate for conditioning of the existing distribution system and to sequester any iron present in the system. According to the 2016 MROs, the amount of phosphate used ranges from approximately five to 25 ppd. The phosphate is fed with a Watson Marlow metering pump in the filter building. The phosphate chemical feed pump is set to feed 9.6 gpd with a maximum capacity of 44 gpd.

The BRE ratings of the phosphate feed system assets have been summarized in **Table 2.2.3.17**.

Table 2.2.3.17: Phosphate Feed System Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Phosphate Mixer	2.84	1.75	1.00	4.97

2.2.3.2.7 Electrical

The Fort Harrison WTP consists of two buildings the Pump Building and the Filter Building. The Filter Building has a 480/277V, 600A, MCC that powers miscellaneous three phase loads including unit heaters. The HSPs are on VFDs to help reduce voltage drop during start-up. The Filter Building has miscellaneous single phase electrical loads including chemical feed pumps, building lighting, and control panels for chemical dosing and filter backwash operation. Due to the corrosive environment in the filter building the control panels, conduit, and actuators are in poor physical condition.

The BRE ratings of the electrical assets have been summarized in **Table 2.2.3.18**.

Table 2.2.3.18: Electrical Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
HSP 1 VFD	1.48	4.00	1.00	5.92
HSP 2 VFD	1.48	4.00	1.00	5.92
HSP 3 VFD	1.48	4.00	1.00	5.92
HSP MCC	2.34	4.78	1.00	11.18
Automatic Transfer Switch	1.88	4.78	1.00	8.98
Filter House MCC	3.26	4.78	1.00	15.58
Generator Alternator	1.88	3.19	1.00	6.01
Generator Engine	1.88	3.19	1.00	6.01

The filter house and high service pump MCCs have a high consequence of failure because of the community impact, process disruption, safety concerns, and age.

2.2.3.2.8 SCADA

The Mission Control system is the only form of SCADA system located at the plant. Operators can monitor and call the high service pumps into operation, but the existing controller at the plant is no longer working. The system operation is clumsy and would be extremely difficult to manage if the current operators were not able to assist with daily operations. There are miscellaneous Click PLCs throughout the complex to control simple controls such as chemical systems and backwash, but the systems do not integrate with one another for a true SCADA system.

The BRE ratings of the SCADA assets have been summarized in **Table 2.2.3.19**.

Table 2.2.3.19: SCADA Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Filter Control Panel 1	2.86	2.61	1.00	7.47
Filter Control Panel 2	2.86	2.61	1.00	7.47
Instrumentation & Control	3.58	3.67	1.00	13.13
Filter Control PLC	2.54	3.67	1.00	9.31
HMI	2.54	2.08	1.00	5.29
Level Controller	2.62	3.14	1.00	8.22
Mission System Node 1	3.06	1.56	1.00	4.76
Mission System Node 2	2.60	1.56	1.00	4.04
Mission System Node 3	2.60	1.56	1.00	4.04
Well Field PLC	2.68	3.31	1.00	8.86
Well Field Control Panel	3.12	3.67	1.00	11.44

The instrumentation and control and well field control panel have BRE ratings above 10 due to the age, O&M protocols, impact on process, financial impact, and community disruption in the event of a failure.

2.2.3.2.9 Standby Power

The Fort Harrison WTP has a 200 kW, 480/277V, standby diesel generator to power the operations at the pumping and filter buildings. The generator has been in error mode due to a fault in the oil and lubrication system recently. Maintenance crews have been sent multiple times but the problem persists. The generator will not function unless the error is cleared and manual starting is initiated so the existing ATS located in the Pump House will not operate as it should.

The BRE ratings of the standby power assets have been summarized in **Table 2.2.3.20**.

Table 2.2.3.20: Standby Power Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Generator Alternator	1.88	3.19	1.00	6.01
Generator Engine	1.88	3.19	1.00	6.01

2.2.3.3 *Indian Lake WTP*

The Indian Lake WTP was originally constructed in 1989. The Indian Lake well field pumps groundwater to the two (2) aerators located on top of the detention tank. Three (3) high service pumps are located in the building that pump water from the detention tank through the four (4) horizontal pressure filters and into the distribution system. The site is surrounded by a security fence.

2.2.3.3.1 Aeration

There are two General Filter aluminum forced draft aerators rated at 1,300 gpm each that were installed in 1989.

Aerator

The BRE ratings of the aeration assets have been summarized in **Table 2.2.3.21**.

Table 2.2.3.21: Aeration Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Aerator 1	3.06	2.06	0.50	3.14
Aerator 2	3.06	2.06	0.50	3.14

2.2.3.3.2 Detention

A single 50,000-gallon detention tank is located under the building. The tank was constructed with the original plant construction in 1989. The detention tank volume provides over 30 minutes of detention time at 1,500 gpm plant production, which is the firm operating rate of the WTP. According to the *Recommended Standards for Water Works*, a minimum of 30 minutes of detention time is required to ensure that oxidation reactions are as complete as possible.

The BRE ratings of the detention tank assets have been summarized in **Table 2.2.3.22**.

Table 2.2.3.22: Detention Tank Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Detention Tank	2.00	3.81	1.00	7.61

2.2.3.3.3 High Service Pumps

The current high service pump firm rated capacity is approximately 2,084 gpm (3.00 MGD). The high service pumps are controlled by the water level in the Oaklandon Road Elevated Water Storage Tank.

High Service Pump 1

High service pump 1 has a current operating capacity of 1,000 gpm. The pump is a vertical turbine pump with a 50 HP motor and VFD. The pump and motor were installed in 2012 and are in good condition.

High Service Pump Head 1

High Service Pump 1 Motor

The BRE ratings of the high service pump 1 assets have been summarized in **Table 2.2.3.23**.

Table 2.2.3.23: High Service Pump 1 Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Pump	1.90	2.72	0.67	3.45
Motor	1.74	2.72	0.67	3.16

High Service Pump 2

High service pump 2 has a current operating capacity of 1,000 gpm. The pump is a vertical turbine pump with a 50 HP motor and VFD. The pump and motor were installed in 2012 and are in good condition.

High Service Pump 2

High Service Pump 2 Motor

The BRE ratings of the high service pump 2 assets have been summarized in **Table 2.2.3.24**.

Table 2.2.3.24: High Service Pump 2 Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Pump	1.90	2.72	0.67	3.45
Motor	1.74	2.72	0.67	3.16

High Service Pump 3

High service pump 3 has a current operating capacity of 1,000 gpm. The pump is a vertical turbine pump with a 50 HP motor and VFD. The pump and motor were installed in 2012 and are in good condition.

High Service Pump 3

High Service Pump 3 Motor

The BRE ratings of the high service pump 3 assets have been summarized in **Table 2.2.3.25**.

Table 2.2.3.25: High Service Pump 3 Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Pump	1.90	2.72	0.67	3.45
Motor	1.74	2.72	0.67	3.16

2.2.3.3.4 Filters

There are four (4), two-cell horizontal pressure filters at the Indian Lake WTP each with a capacity of 486 gpm installed in 1989. The filter faces and face piping are located inside of the WTP masonry building. The remainders of the filter vessels are located outside of the building. The pressure filters are all in good condition.

Also according to the *Recommended Standards for Water Works*, the filters shall be capable of providing the maximum demand of the system with any filter out of service. The firm rated capacity of the filters is 1,944 gpm with one filter out of service. The condition of the existing media, interior coating, and interior steel was evaluated in 2011 by Peerless Midwest. The filter media was installed in 1990 and is well past its useful life of 7-10 years. The edges of the filter media are sub-rounded to rounded and are significantly smaller than their original size. In addition, the particles are soft and turn to dust when subjected to “finger” pressure.

Filter E2

The BRE ratings of the filter assets have been summarized in **Table 2.2.3.26**.

Table 2.2.3.26: Filter Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Filter E1	2.32	3.08	0.50	3.58
Filter E2	2.32	3.08	0.50	3.58
Filter W1	2.32	3.08	0.50	3.58
Filter W2	2.32	3.08	0.50	3.58

2.2.3.3.5 Process Piping

The process piping is showing signs of corrosion due to chemical off gassing present in the filter room.

2.2.3.3.6 Valves

The process valves are all butterfly or gate valves. All of the filter face piping valves were replaced in 2015 with new butterfly valves. The valves are all in good condition but some are showing signs of corrosion due to the chemical odors present in the environment.

2.2.3.3.7 Actuators

The actuators for the filter face valves were all replaced with new pneumatic vane style actuators in 2015. The remaining actuators are manual.

Filter W2, Process Piping, Valves, and Actuators

2.2.3.3.8 Chemical Feed Systems

Lawrence feeds chlorine, fluoride, and phosphates. However, the phosphate feed pump and storage tank are located in the filter room. As a result, the process piping, actuator components, valves, etc. are corroding due to the chemical vapors present in the building.

Chlorine Feed System

Lawrence feeds bulk sodium hypochlorite at the Indian Lake WTP as their method of disinfection. There are two chlorine feed points in the WTP located prior to and after the filters. The sodium hypochlorite is stored in an isolated room in the filter building in a polyethylene storage tank. The pre-chlorination chemical feed pump is set to feed 65.5 gpd with a maximum capacity of 190 gpd. The post-chlorination chemical feed pump is set to feed 14.5 gpd with a maximum capacity of 190 gpd. Both pumps are in good condition.

The BRE ratings of the chlorine feed system assets have been summarized in **Table 2.2.3.27**.

Table 2.2.3.27: Chlorine Feed System Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Chlorine Feed Pump Pre-Filtration	2.54	3.19	1.00	8.11
Chlorine Feed Pump Post-Filtration	2.38	4.39	1.00	10.45
Chlorine Transfer Pump	2.12	2.11	1.00	4.48
Chlorine Transfer Pump Motor	1.22	2.11	1.00	2.58
Sodium Hypochlorite Tank Top	2.54	3.69	1.00	9.38
Sodium Hypochlorite Tank Bottom	2.54	4.81	1.00	12.21
Chlorine Analyzer	2.60	3.58	1.00	9.32
Chlorine Analyzer Controller	3.52	3.58	1.00	12.61
Chlorine Day Tank Scale	2.54	1.75	1.00	4.44

The chlorine components have a high BRE rating as a result of the high consequence of failure and potential harm to the community and Utility personnel.

Fluoride Chemical Feed System

Fluoride was added to the Indian Lake WTP in 1992 and is added to the water for the dental health benefits to consumers. The fluoride feed pump is currently set to feed 2.1 gpd with a maximum capacity of 24 gpd.

Phosphate Chemical Feed System

Lawrence also feeds phosphate for conditioning of the existing distribution system and to sequester any iron present in the system. According to the 2016 MROs, the amount of phosphate used ranges from approximately 10 to 30 ppd. The phosphate is fed with a peristaltic Watson Marlow pump in the filter building. The phosphate chemical feed pump is currently set to feed 16.7 gpd with a maximum capacity of 44 gpd.

The BRE ratings of the phosphate feed system assets have been summarized in **Table 2.2.3.28**.

Table 2.2.3.28: Phosphate Feed System Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Phosphate Feed Pump	2.54	1.75	1.00	4.44
Phosphate Mixer	1.96	1.56	1.00	3.05

2.2.3.3.9 Electrical

The Indian Lake WTP has a 480/277V, 800A, MCC as its main power distribution center. Due to the highly corrosive environment the MCC is in poor condition. The exterior of the MCC shows extensive rust which may be an early indication of potential failure should the internal contacts begin to rust and eventually stick. The HSPs are powered by VFDs that are used as "Soft Starters" to help reduce voltage drop upon starting.

The BRE ratings of the electrical assets have been summarized in **Table 2.2.3.29**.

Table 2.2.3.29: Electrical Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
HSP 1 VFD	1.48	4.00	1.00	5.92
HSP 2 VFD	1.48	4.00	1.00	5.92
HSP 3 VFD	1.48	4.00	1.00	5.92
MCC	3.52	4.78	1.00	16.82
Safety Switches x2	3.06	3.72	1.00	11.39

The MCC and safety switches have a high consequence of failure because of the community impact, process disruption, safety concerns, and age.

2.2.3.3.10 SCADA

Mission SCADA has been commissioned to control the high service pumps based on the level in the Oaklandon elevated storage tank. Mission also controls the remote wells at the Indian Lake well field. Mission SCADA is used for data collection including chlorine residual, basin (detention tank) level, effluent flow rate, backwash flow rate, alarm thresholds, system pressure, and pump run times. A local Click PLC is used to control automatic backwash sequencing as well as chemical dosing.

The BRE ratings of the SCADA assets have been summarized in **Table 2.2.3.30**.

Table 2.2.3.30: SCADA Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
HSP Control Panel	2.80	3.67	1.00	10.27
Well Pump Control Panel	2.80	3.14	1.00	8.79
Instrumentation & Control	3.58	3.67	1.00	13.13
Chlorine Controls	3.06	3.42	1.00	10.46
HMI	2.08	2.14	1.00	4.45
Mission System Node	2.60	1.56	1.00	4.04

The instrumentation and control, HSP field control panel, and chlorine controls have BRE ratings above 10 due to the age, O&M protocols, impact on process, financial impact, and community disruption in the event of a failure.

2.2.3.3.11 Standby Power

Indiana Lake does not have standby power but has a portable generator connection. However, the portable generator receptacle is not connected to the WTP and is unable to be used.

The BRE ratings of the standby power assets have been summarized in **Table 2.2.3.31**.

Table 2.2.3.31: Standby Power Assets Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Portable Generator Receptacle	1.62	2.67	1.00	4.32

2.2.4 Storage Facilities

The Utility operates four individual water storage facilities to serve the water distribution system. The total storage capacity of the four active water storage facilities is 5.1 million gallons (MG).

According to the *Recommended Standards for Water Works,* the minimum storage capacity (or equivalent capacity) shall be equal to the average day consumption. This requirement may be reduced when the source and treatment facilities have sufficient capacity with standby power to supplement peak demands of the system.

For this analysis, the average day demand is used to determine the storage capacity requirement for the system. **Table 2.2.4.1** summarizes the water storage requirements.

Table 2.2.4.1: Existing Water Storage Requirements

Average Day Demand	*Existing Storage Volume*	*Additional Storage Required?*
3.99 MGD	5.10 MG	No

By determining the required storage requirements using the method above, the Utility has adequate storage requirements to meet the current storage volume requirements. No additional storage facilities are required at this time to meet existing requirements.

2.2.4.1 Fort Harrison Water Storage Reservoir

The 3 MG ground storage reservoir located at the Fort Harrison WTP site was installed circa 1913, last cleaned in 2004 and needs inspection. The roof of the tank requires a structural evaluation by a certified structural engineer. Due to the apparent age of the tank and lack of periodic maintenance, it is probable that the tank will require some rehabilitation.

3 MG Ground Storage Reservoir

3 MG Ground Storage Reservoir Roof

The BRE rating of the 3 MG ground storage reservoir has been summarized in **Table 2.2.4.2**.

Table 2.2.4.2: Fort Harrison Ground Storage Reservoir Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Ground Storage Reservoir	3.42	4.31	1.00	14.72

The consequence of failure for the ground storage reservoir is high because of the large finished storage volume for the system. In addition, the Fort Harrison WTP will not be able to operate if the reservoir is not in operation.

2.2.4.2 Oaklandon Elevated Storage Tank

The Oaklandon tank is a 0.50 MG elevated pedestal spheroid steel tank erected in 1983 by Universal Tank & Iron Works. It is located on Oaklandon Road at Broadway Street. The water level in this tank controls the operation of the high service pumps at Indian Lake WTP.

In 2008, the tank was inspected by Tank Industry Consultants. The following are items that were observed in 2008 that have not been addressed:

- Exterior coating does not have strong adhesion to the tank
- Interior dry coating is showing signs of surface rust and the topcoating is peeling off
- Interior wet coating is showing signs of surface rust
- ANSI/OSHA and other safety related deficiencies that include:
    - A uncovered junction box on the lighting system conduit exposed wiring
    - The base cone, pedestal, bowl manhole, and interior wet ladder side rails are dimensionally too small
    - The base cone, pedestal, bowl manhole, and interior wet ladder head clearances are dimensionally too small
    - The base cone, pedestal, bowl manhole, access tube, and interior wet ladder rungs are not of a slip resistant design
    - The base cone, pedestal, and bowl manhole ladder rungs are not spaced at consistent intervals
    - Conduits and cables are attached to the base cone, pedestal, and access tube ladders which could interfere with the climber's use of the ladder side rails
    - The base cone and pedestal ladder safe-climbing devices do not extend the industry recommended height above the condensate and top platforms
    - The spacing between horizontal bars and vertical bars on the base cone ladder safety cage exceed the maximum allowed spacing intervals
    - The base cone ladder safety cage width is dimensionally too small
    - The toe rooms on the access tube ladder and interior wet ladder are dimensionally too small
    - The access tube and interior wet ladders are not equipped with safe-climbing devices
    - The top platform access opening is not equipped with a cover
- AWWA, sanitary, and operational deficiencies that include:
    - The gap between the overflow pipe and flap gate could allow the ingress of insects into the tank
    - The screening on the overflow pipe flap gate is not restrictive enough to prevent the ingress of insects in the tank
    - The roof vent is not of a clog-resistant design
    - The vertically-orientated roof vent screening is not shielded from wind-driven dust and debris
    - The gaps in the roof vent protective screening could allow the ingress of insects into the tank

The BRE rating of the Oaklandon elevated storage tank has been summarized in **Table 2.2.4.3**.

Table 2.2.4.3: Oaklandon Elevated Storage Tank Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Oaklandon Tank	3.48	3.94	1.00	13.73

The Oaklandon elevated storage tank has a high consequence of failure due to the impact on the community because of the potential drop in water pressure near the tank and loss of fire flow protection.

2.2.4.3 52nd St. Elevated Storage Tank

The 52nd Street tank is a 0.50 MG toro-ellipsoidal steel legged tank erected in 1973 by Universal Tank & Iron Works. It is located on East 52nd Street at Briar Creek Lane. The water level in this tank controls the operation of the high service pumps at Richardt Street and Fort Harrison WTPs.

In 2008, the tank was inspected by Tank Industry Consultants. The following are items that were observed in 2008 that have not been addressed:

- Interior coating was in adequate condition at the time of inspection but was recommended to be recoated within three to four years from the time of inspection
- ANSI/OSHA and other safety related deficiencies that include:
  - The rust on the exterior ladder safe-climbing devices may not allow the devices to function properly
  - The head clearance on the tower ladder at the balcony access is not dimensionally compliant
  - The exterior ladder side rails are not dimensionally compliant
  - The rungs are not of a slip-resistant design
  - The tower ladder is not equipped with a vandal deterrent
  - The balcony access opening is not equipped with closure chains or a cover to deter personnel from accidentally falling from the balcony
  - The balcony railing is not dimensionally compliant
  - Pipes and other debris on the balcony floor create a trip hazard
  - The transition cone opening in the bowl is not equipped with a safety grate or railing
- AWWA and operational deficiency:
  - A gap is present at the perimeter of the roof vent pallet

The BRE rating of the 52nd Street elevated storage tank has been summarized in **Table 2.2.4.4**.

Table 2.2.4.4: 52nd St. Elevated Storage Tank Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
52nd St. Tank	2.80	3.94	1.00	11.04

2.2.4.4 Winding Ridge Ground Storage Tank

The Winding Ridge tank is a 1.10 MG bolted steel finished water ground storage tank erected in 2004 by Engineered Storage Products, Co. The purpose of the tank is to provide additional storage in the southeast portion of the distribution system. However, the entire tank volume is not able to be utilized. Thus, approximately 750,000 gallons of the total volume can be utilized for storage. There is a modulating valve connected to a timed program that controls the level in the tank. In general, the tank fills at night and water is drawn out during the day.

The BRE rating of the Winding Ridge tank has been summarized in **Table 2.2.4.5**.

Table 2.2.4.5: Winding Ridge Ground Storage Tank Evaluation Summary

Asset Description	*Probability of Failure*	*Consequence of Failure*	*Redundancy Score*	*BRE Rating*
Winding Ridge	2.60	2.69	1.00	7.00

2.2.5 Distribution System Facilities

The water distribution system contains approximately 224 miles of water mains, 5,050 valves, and 2,100 municipal hydrant assemblies (this does not include private hydrants on the system). There are approximately 14,900 service connections (domestic, commercial, and industrial) within the system. All water customers are on metered services. The system has a single pressure zone with a typical pressure range of 50-75 psi. The distribution system is bound on all sides by the City of Indianapolis water system (Citizens Water).

The existing water distribution system was analyzed for hydraulic capacity, flow, pressure, and water age. This analysis was completed with the use of WaterCAD hydraulic modeling software. The existing system model analyzed was based on the hydraulic model provided by the Utility and then updated to reflect the existing water demand data discussed in **Chapter 2**. The existing system model contained information on the existing water mains, pumps, wells, and tanks. No water main size smaller than 6 inches was included in the modeling analysis or distribution system evaluation. No additional verification or calibration of the existing WaterCAD model was made as part of this evaluation.

According to the *Recommended Standards for Water Works*, the normal working pressure in the distribution system should not be less than 35 psi, and the system shall be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all flow requirements.

2.2.5.1 Water Main Break and Customer Complaint Evaluation

Historical water main break and customer complaint information was used to prepare the distribution system evaluation. The date and location of each break and customer complaint was provided by the Utility. Water main break data was available from 2010 to 2015 and customer complaint information was available from mid-2013 until early 2016. Both water main breaks and customer complaints were mapped in geographical information system (GIS) to evaluate the data points. Areas throughout the distribution system with a high concentration of data points were then assessed on an individual basis to further understand the nature of the water main break or customer complaint point cluster.

High concentration areas of water main breaks were reviewed and compared to the Utility's distribution system map to determine if the high number of breaks were occurring on the same water main, parallel mains, branch mains, services or failing appurtenances. The type of breaks was also considered to help understand what may be causing the failures (i.e. corrosive environment, defective pipe, installation error) in addition to asset age. If applicable, these areas were then considered for potential replacement. Each water main replacement project scope was developed considering any surrounding, less frequent breaks and practical extents for each replacement project.

Customer complaint information was reviewed when it occurred within or adjacent to a water main replacement project area or when complaints were tightly clustered but outside the scope of a water main replacement project. The majority of complaints around project areas were a result of the leak, break or repair work completed. Typically, tightly clustered complaints outside of project areas were not a result of distribution system caused issues but rather a result of issues caused by the main break. For this reason, customer complaints were not considered as a sole basis for a potential project area.

2.2.5.2 Pressure Evaluation

The distribution system was evaluated under the existing average day and maximum day demand scenarios based on the demand distribution provided in the existing system model. Based on this analysis, no area of the existing distribution system experiences pressures less than 50 psi. Therefore, no changes to the hydraulic grade line elevation, operating conditions, or distribution characteristics of the existing system are required to meet the pressure requirements for the projected demands during the planning period.

2.2.5.3 Fire Flow Evaluation

The fire flow analysis used a flow rate corresponding to a fire demand requirement of at least 1,500 gpm under static conditions in addition to existing and future maximum day demands. This fire flow rate was applied to each node in the WaterCAD model and the residual system pressures in the system were analyzed. Based on the model, most looped areas in the system meet the fire flow requirement. The locations that did not achieve 1,500 gpm available fire flow where those located on dead end mains or in the residential areas in the western portion of the distribution system. The portions of the distribution system that were, according to the model results, unable to provide at least 1,500 gpm fire flow are shown in **Appendix A, Exhibit A-4.** These parts of the distribution system could benefit from improved hydraulics.

2.2.5.4 Hydraulic Evaluation

An additional evaluation of the existing system was made to identify portions of the system that create flow restrictions during average and maximum day operating conditions. Based on this scenario, no section of pipe in the system model experienced a flow velocity greater than 5.5 feet per second (fps), which is considered to be an upper design limit for water main design. Pipes smaller than 6 inches in diameter were not evaluated.

2.2.5.5 Citizens Energy Group Connections

The Utility currently has ten physical connection points with Citizens Energy Group (CEG). Four of these connections are metered and will remain and include:

- Glennway Dr. and Fox Rd.
- Timberline Dr. and Fall Creek Rd.
- 8450 Carroll Rd.
- 46th and Mitthoeffer Rd.

The connections without meters will be disconnected. The connections are normally isolated by closed valves, but are considered a standby source of water by Utility personnel. At this time, the Utility is able to purchase water from CEG at their wholesale rate.

2.2.6 Water Quality

2.2.6.1 Field Data

The average amount of iron measured at the filter discharge for April 2016 was 0.06 mg/L with a maximum of 0.11 mg/L. The average amount of manganese for April 2016 was 0.044 mg/L with a maximum of 0.055 mg/L. The levels of iron and manganese exceeded the SMCL 25 and 4 times, respectively. The iron levels are regularly exceeding the SMCL at flow rates required to meet the system's average day demands.

The Richardt WTP was evaluated to determine the cause of the iron and manganese levels above the SMCL at higher flow rates. The water quality was analyzed from the pre-filtration point to determine the amount of iron being oxidized. By doing so, the detention time of less than 30 minutes at 1,200 gpm could be evaluated as the cause of the elevated iron and manganese levels.

Water quality tests were performed in April 2016 to determine the quality of the water entering the pressure filters. The existing filter media requires that iron and manganese be oxidized from an aqueous form to a particulate form in order for the physical filtration process to take place. Total iron and manganese were tested, with and without ascorbic acid to identify the oxidized amount of these constituents prior to entering the filters. Refer to **Tables 2.2.6.1 and 2.2.6.2** for the water quality summary for manganese and iron.

Table 2.2.6.1: Filter Influent – Manganese Levels

Manganese (oxidized)	*Manganese (aqueous)*	*Total Manganese*	*Manganese SMCL*
0.038 mg/L	0.028 mg/L	0.066 mg/L	0.05 mg/L

Table 2.2.6.2: Filter Influent – Iron Levels

Ferrous Iron (oxidized)	*Ferric Iron (aqueous)*	*Total Iron*	*Iron SMCL*
1.29 mg/L	0 mg/L	1.29 mg/L	0.30 mg/L

Refer to **Appendix C** for the raw water quality analyses at the Richardt, Fort Harrison, and Indian Lake well fields.

2.2.6.2 Modeling Results

The existing system was analyzed by hydraulic modeling to estimate the age of the water in the system. Water age is the amount of time between the treatment of the water by the Utility and its use by the consumer. The age of water is a major factor in the deterioration of water quality in a distribution system and can affect the taste, odor, and color of the water, as well as the decay of the chlorine residual in the system. Water age in a system can be reduced by providing a water distribution network with minimal dead end mains. According to the *AWWA Water Industry Database*, a water age of 1.5 days is considered average and 3 days is considered a maximum.

Based on the hydraulic model, locations within the existing system that have water ages that exceed 1.5 days generally occur in dead end mains and in the fringes of the distribution system where residential customers are located. A summary of areas that may have water ages in excess of 1.5 days is as follows:

- Various dead end water mains
- Residential area near Edlou Place and Lowe Drive
- Area near 46th Street and Kingsboro Drive
- Residential area near Van Spronsen Way and Red Rock Road
- Area near 79th Street and Winding Creek Drive

The Utility currently has a flushing program to address dead end mains and other areas of low demand in the distribution system to ensure that disinfection residuals are being adequately maintained.

3.0 FUTURE SITUATION

3.1 Planning Period

This Preliminary Engineering Report (PER) is based on a 20-year planning period from 2016 to 2036.

3.2 Population Projections

It is assumed that the City will continue to experience an increase in population similar to that of Marion County. The 2010 census reports that the current population of Marion County is 903,393. According to the *Indiana Business Research Center*, the population for Marion County is projected to increase to 993,289 in 2030, which is a 10% increase in population, or 0.5% per year.

Using a 0.5% annual population increase for Lawrence, the estimated population in 2036 is 52,375 residents.

3.3 20-year Design Demands

Using the per capita demands calculated in **Part 2.2.1.3** along with the population projections calculated in **Part 3.2**, the projected water consumption in the year 2036 for the water system is as shown in **Table 3.3.1.**

Table 3.3.1 – Projected 2036 System Demand Summary

Average Day	*Maximum Day*
4.54 MGD	6.41 MGD

These values were used to evaluate the capacity of the system and the future need for additional system treatment, storage, and distribution capacity during the study period.

3.4 20-year System Needs

According to the *Recommended Standards for Water Works*, the water facilities shall be designed for the maximum day demand at the design year. Following is a summary of the current and projected maximum day demands, along with the firm capacities of the existing facilities.

3.4.1 Supply Capacity

Table 3.4.1.1 shows the maximum day demand values provided in **Chapter 3**, along with the existing well capacity provided in **Chapter 2**.

Table 3.4.1.1 – Well Capacity Summary

Year	*Maximum Day Demand*	*Existing Supply Firm Rated Capacity*
2016	5.54 MGD	7.13 MGD
2036	6.41 MGD	

Based on the information shown above, the Utility does have existing well capacity to be able to meet the projected water demands over the 20-year planning period. To meet the future maximum day demand, no additional well capacity is needed.

3.4.2 Treatment Capacity

Table 3.4.2.1 shows the maximum day demand values provided in **Chapter 3**, along with the existing treatment capacity provided in **Chapter 2**.

Table 3.4.2.1 – Water Treatment Capacity Summary

Year	*Maximum Day Demand*	*Existing Treatment Capacity*
2016	5.54 MGD	5.32 MGD
2036	6.41 MGD	

Based on the information shown above, the Utility does not have existing treatment capacity to meet the projected water demands over the 20-year planning period. To meet the projected 2036 maximum day demand, an additional **1.09 MGD (757 gpm)** of treatment capacity is needed.

3.4.3 Storage Capacity

3.4.3.1 Average Day Volume Method

According to the *Recommended Standards for Water Works*, the minimum storage capacity (or equivalent capacity) shall be equal to the average day consumption. This requirement may be reduced when the source and treatment facilities have sufficient capacity with standby power to supplement peak demands of the system.

For this analysis, the average day demand is used to determine the storage capacity requirement for the system. **Table 3.4.3.1** summarizes the water storage requirements.

Table 3.4.3.1 – Average Day Water Storage Requirements

Year	*Average Day Volume*	*Existing Storage Volume*	*Additional Storage Required*
2016	3.99 MG	5.10 MG	None
2036	4.54 MG	5.10 MG	None

By determining the required storage requirements using the method above, the Utility has adequate storage requirements to meet the future storage volume requirements. No additional storage facilities are required to meet future requirements.

3.4.3.2 Operational, Fire Flow, and Emergency Volume Method

The general rule for using an average day as the necessary volume for a water supply system does not always apply. Small systems require more than an average day in order to provide fire protection, while larger systems require less than an average day in storage because of multiple source, treatment, supply, and storage sources. This break from an average day demand in storage generally occurs when a population reaches 20,000 to 25,000 people. Because of this, it is recommended that the Utility considers the following analysis in determining the necessary water storage volumes for the system.

The *American Water Works Association (AWWA)* recommends the total storage in a system should be equal to the operating storage plus the fire flow storage and the emergency storage.

3.4.3.2.1 Operating Storage

A water system should have 20% of the maximum day water demand in water storage capacity to reduce pumping cycles, to meet surge demands, and to meet short term emergencies. This typically equates to the portion of the storage that the Utility uses to control the pumps.

3.4.3.2.2 Fire Flow

The Utility's distribution system should be able to meet a design fire flow rate for the planning period concurrent with the operating storage and emergency supply requirement listed. The following assumptions and/or guidelines were utilized to represent system conditions and design fire flow.

- 3-hour duration fire flow
- 2,500 gpm fire flow

3.4.3.2.3 Emergency Supply

To determine the emergency supply of water required for a water utility, a judgment about the perceived vulnerability of the utility's water supply must be made.

Typically, if a utility has several sources and treatment facilities with standby power, the need for emergency storage is small. However, care should be taken to ensure that some storage would be available to handle a catastrophic pipe break, should one occur that could not be readily isolated and/or repaired. If a utility has a single supply source with no standby power and a relatively unreliable distribution system, a significant volume of emergency storage is recommended. The Utility has multiple sources of water, but does not have a standby power source at all locations. For this report, an emergency storage volume equal to 25% of the average day demand is assumed.

Table 3.4.3.2 summarizes the water storage calculations from **Parts 3.4.3.2.1** through **3.4.3.2.2** above.

Table 3.4.3.2 – Estimated Water Storage Requirements

Year	*Operating Storage (MG)*	*Fire Flow Storage (MG)*	*Emergency Storage (MG)*	*Total Storage Required (MG)*	*Existing Storage Volume (MG)*	*Additional Storage Required (MG)*
2016	1.31	0.45	1.00	2.76	4.75	None
2036	1.50	0.45	1.14	3.09	4.75	None

3.4.4 Distribution System

The existing water distribution system was analyzed for hydraulic capacity, flow, pressure, and water age under future demand conditions. The results are the same as the existing flow conditions as listed in **Part 2.2.5**. No additional pressure, fire flow, hydraulic, or water quality issues are expected in the current distribution system configuration during the 20-year study period for the future demand conditions.

4.0 EVALUATION OF ALTERNATIVES

4.1 Introduction

Several alternatives were evaluated to determine the most cost-effective solution to the future water treatment, storage, and distribution needs of the Utility. Whenever possible, actual costs obtained from equipment suppliers were used to derive the estimated costs for the various alternate solutions. The analysis of project costs includes both construction and non-construction costs associated with the alternative. Non-construction costs include design and construction engineering services, warranty services, O&M manuals, surveys, soil borings and tests, permits, legal and financial services, and administrative costs.

4.2 Preliminary Screening of Alternatives

Alternatives considered worthy of detailed evaluation were limited to processes that could be expected to provide an adequate level of service to the Utility over the 20-year planning period. Alternatives that were eliminated from further consideration are as described below:

4.2.1 No Action Alternative

The no action alternative involves no improvements at this time to the water system and allows the current situation to continue. The Utility's infrastructure has deteriorated to a level resulting in a high level of risk to providing customers with an acceptable level of service. In addition to the deteriorating infrastructure assets, the treatment of raw water at the Richardt WTP is currently not meeting the secondary maximum contaminant level for iron at its firm rated capacity. As a result, the WTP must operate at less than 1,000 gpm to meet the secondary MCLs and the Utility is unable to meet the existing and future maximum day demands without exceeding the secondary MCLs.

As recommended in the *Recommended Standards for Water Works*, a standby power supply shall be provided through a dedicated portable or in-place auxiliary power of adequate supply and connectivity. The Fort Harrison Well Field and Indian Lake Well Field currently do not have standby power or portable auxiliary power connection.

If no action is taken and the water storage elevated tanks are allowed to continue to deteriorate, the ANSI/OSHA violations will remain a hazard for workers, the coating will continue to deteriorate which will allow the steel to corrode and potentially leak.

The water mains planned for replacement are aging mains that are experiencing a high number of breaks over the previous five years. If no action is taken, these water mains will continue to deteriorate and pose problems to the Utility and customers in the community.

As a result, this alternative has been eliminated from further consideration.

4.2.2 Rehabilitate Existing Richardt and Fort Harrison WTPs

This alternative includes modifying and/or upgrading the existing Richardt and Fort Harrison WTPs to address current operational and maintenance items and plant components most in need of replacement. The assets located at the WTPs are high risk assets with a BRE rating above 10 indicating the asset should be planned for replacement. By replacing the assets, this alternative will address most of the existing operational issues at the WTPs, but will not address the overall adequacy of the Utility's treatment capacity to meet current and future maximum day demands. As a result, this alternative has been eliminated from further consideration.

4.2.3 Utilize Existing Telemetry/SCADA System

Utilizing the existing Mission SCADA system does not provide isolated functionality and automation. Mission is a web based system that cannot operate without an internet connection. In the event of a loss of internet access, the Mission SCADA system will not be functional, and local hand operation would be required. Due to the limitations of the Mission SCADA system and potential for automation loss, it is not recommended to utilize the existing system.

4.3 Feasible Alternatives

The following alternatives are considered cost-effective, technologically, and environmentally suitable methods of water treatment for the Utility, and are appropriate for analysis. The project alternatives were developed from the results of the BRE evaluation and capacity analysis of the system. By combining the two evaluations, the feasible alternatives address the most critical components of the water system to alleviate risk and provide water to meet future demands.

4.3.1 Supply Alternatives

In order to meet future maximum day demands, the well field capacity needs to be maintained at current levels. Maximization of existing groundwater resources should also be considered for long term system planning to ensure continued reliability. Further, operation and maintenance costs should be considered when assessing rehabilitation and/or decommissioning of existing assets. Two alternatives were evaluated for the supply facilities with respect to cost, reliability and O&M.

4.3.1.1 Alternative WS-1: Maintain Three Well Fields

This alternative includes maintaining the Fort Harrison and Indian Lake well fields, while the Richardt well field pumps and motors will be upsized to further utilize the capacity of the groundwater resource. This will allow for the Utility to increase annual pumping from the Richardt well field, which historically has been the well field with the lowest O&M costs of the three wellfields. This alternative will meet the system capacity and condition needs for the 20-year planning period.

The existing well assets, especially at the Richardt well field, are aged and will required additional rehabilitation in the future that may impact their available capacity. Should lining of the Richardt well casings be necessary, additional future sources of water supply will need to be investigated to supplement the capacity lost by casing lining. The existing Richardt site is not suitable for the installation of additional wells due to sanitary setback restrictions. Two potential locations for future wells are east of the Richardt site on Lawrence Schools property and south of the Richardt site at the soccer fields.

As the Indian Lake well field ages, the existing wells will likely need to be replaced in the future. This is not expected to be necessary during the 20-year planning period based on the age and condition of the existing wells. When well replacement is needed, the existing well field parcel is suitable for the addition of these replacement wells. Because of the unique aquifer characteristics in this area, consideration should be made in the future to properly establish the separation between the replacement wells and existing well casings.

As the Ft. Harrison well field ages, the existing wells will likely need replacement. Similar to Indian Lake, this is not expected in the 20-year study period. The placement of any replacement wells is limited by the existing 40-foot utility easements from DNR to the Utility. Coordination with DNR and IDEM will be necessary to confirm any variance to the control of the sanitary setback by the Utility, which would not be met by the existing easement configuration. Should the opportunity to expand the land rights within this well field develop in the future, the Utility should expand the well field to provide more flexibility in future well placement.

Presently, none of the well fields have a dedicated standby power source. In case of emergencies resulting in loss of power, the community would not be able to meet demands. Exhibits depicting the proposed well field improvements are provided in **Appendix A, Exhibits A-9 and A-10.** The estimated total project cost for this alternative is **$1,369,000**. A more detailed cost estimate can be found in **Appendix B, Table B-1.**

A more detailed discussion of the components of this alternative is as follows:

Replace Richardt Well Pumps and Motors

By maintaining the Fort Harrison and Indian Lake Well Fields, the well firm operating capacity of these two well field will remain at 3,200 gpm (4.61 MGD). In order to meet the future maximum day demand of 6.41 MGD, the Richardt well field needs to be able to produce a firm capacity of at least 2,000 gpm (2.89 MGD). It is recommended to replace the pumps and motors at Wells 1 and 2 to provide 1,900 gpm each and Well 3 to provide 1,100 gpm, which would be a firm rated capacity of 3,000 gpm (4.32 MGD). This increase in capacity will utilize the groundwater resource capacity at the Richardt well field, allowing for long term production capacity in the system with providing short term flexibility in well operations. Well 5 should be pump tested and either brought into service or properly abandoned. Well 2 should be televised to confirm the well casing condition.

Fort Harrison Well Field Standby Generator

The Fort Harrison well field is located in a flood zone so the generators will likely need to be installed on elevated platforms approximately 10 feet above grade. Wells No. 8 and 10 will require a 200kW, 480/277V, 3-phase standby diesel generator. Well No. 9 will require a 120kW, 480/277V, 3-phase, standby diesel generator. All wells will require an Automatic Transfer Switch (ATS) so that in the event of a power failure the generator will automatically start to restore power to the station and shut down when utility power returns. Providing generators to serve multiple wells should be evaluated during design to determine if overall project costs can be potentially reduced.

Indian Lake Well Field Standby Generator

The Indian Lake well motors are fed from a central MCC so a single standby generator will provide power to all three wells. The wells will need a 550kW, 480/277V, 3-phase, standby diesel generator. An ATS will need to be provided for Automatic power restoration in the event of a power loss.

SCADA

The Indian Lake Well Field will continue to operate based on the level in the Indian Lake WTP clear well. The WTP PLC will send data over the Lawrence Water SCADA network via radio to the wells to call for operation. Operators will be able to adjust which wells operate or if automatic operation is desired a lead lag sequence can be programmed to allow for significant demand fluctuations and response. The wells can also be programmed to alternate so that well run times can be normalized. In the event that communication to the well cannot be obtained operators will be able to run the wells locally by utilizing the local HMI keypad on the VFD.

4.3.1.2 Alternative WS-2 –Decommission Indian Lake Well Field

Because, historically, O&M costs at the Indian Lake well field have been relatively high, an alternative was developed for decommissioning this well field and relying solely in Ft. Harrison and Richardt for source water capacity. This alternative includes decommissioning the existing Indian Lake well field, maintaining the existing Fort Harrison well field and increasing the capacity of the existing wells in the Richardt well field. Based on a 2016 evaluation, the Richardt well field is capable of a safe yield of 4,200 gpm (6.04 MGD). By increasing the rated capacity of the wells in the Richardt well field and maintaining the rated capacity of the Fort Harrison well field, the total firm rated capacity of the well fields could increase to 5,950 gpm (8.57 MGD). The Indian Lake well field and WTP would be decommissioned as a part of this alternative. The estimated total project cost for this alternative is **$741,000**. A more detailed cost estimate can be found in **Appendix B, Table B-2.**

The future well limitations discussed in Alternative WS-1 also apply to this alternative and should be considered when evaluating the suitability of each well alternative.

A more detailed discussion of the components of this alternative is as follows:

Fort Harrison Well Field Standby Generators

The Fort Harrison well field is located in a flood zone so the generators will need to be installed on elevated platforms approximately 10 feet above grade. Wells No. 8 and 10 will require a 200kW, 480/277V, 3-phase standby diesel generator. Well No. 9 will require a 120kW, 480/277V, 3-phase, standby diesel generator. All wells will require an Automatic Transfer Switch (ATS) so that in the event of a power failure the generator will automatically start to restore power to the station and shut down when utility power returns.

Replace Richardt Well Pumps and Motors

The Fort Harrison well field firm operating capacity is currently 1,750 gpm (2.52 MGD). By maintaining the Fort Harrison well field and decommissioning the Indian Lake well field, the required Richardt well field firm operating capacity to meet the maximum day demand would need to be at least 2,700 gpm (3.89 MGD) to meet the future maximum day demand of 6.41 MGD. As a result, it is recommended to replace the pumps and motors at Wells 1 and 2 to provide 2,400 gpm each and Well 3 to provide 1,100 gpm, which would be a firm rated capacity of 3,500 gpm (5.04 MGD).

4.3.2 Treatment Alternatives

4.3.2.1 Alternative WT-1: Maintain Three Treatment Plants

This alternative includes the treatment facility improvements necessary to match Supply Alternative WS-1. Generally, this alternative includes the following:

- New Richardt WTP (4.32 MGD FIRM Rated)
- Ft. Harrison WTP Improvements
- Indian Lake WTP Improvements

The estimated total project cost for this alternative part is **$12,339,000**. A more detailed description of the parts of this alternative are as follows:

4.3.2.1.1 Part A: Richardt WTP Phase II

The Richardt WTP project was previously designed, bid, and permitted but not constructed. The costs for the prior design, bid, and permitting were not included in this report. The new Richardt WTP will have a total capacity of 3,000 gpm (4.32 MGD) and a firm rated capacity of 2,000 gpm (2.88 MGD). This will increase the water system firm treatment capacity to 6.98 MGD, which meets the existing maximum day water demand. The existing wells will be used to supply the new facility. Select components, as noted below, will be sized for a 3,000 gpm firm capacity to accommodate a capacity expansion of the entire facility in the future. An exhibit depicting the proposed Richardt Street Water Treatment Plant site plan is provided in **Appendix A, Exhibit A-8.** The estimated total project cost for this alternative part is **$5,824,500**. A more detailed cost estimate can be found in **Appendix B, Table B-3.** The components of this part of alternative WT-1 are more particularly described as follows:

Treatment Building

A new treatment building will be constructed to house the filter piping and high service pumps for the new treatment process. The new building (Phase II) will add on to the Phase I facility that was previously constructed in 2013. The base construction method for the building will be steel framed, steel sided construction to match the Phase I facility. CMU block to 3' above grade and a standing seam roof will also be provided to match the Phase I facility.

The base treatment building will be sized to contain three (3) pressure filters with room for a fourth, and three (3) high service pumps with room and below-grade piping for a fourth. This plan will require a building footprint of 30' by 70' at a minimum, and is based on the high service pumps being installed in the same room and across from the filter piping.

Raw Water Connection

The connection for the new treatment facility will be made to the raw water piping between well No. 1 and the west detention basin with a new ductile iron main. A tapping sleeve and valve can be used to maintain continued operation of the existing wells and treatment facility until the new facility is ready for startup.

Aerators

Two (2) induced draft aerators, each having a rated capacity of 1,500 gpm, will be provided. Piping provisions will be provided to bypass the aerators or to isolate one aerator at a time for service.

Detention Tank

A cast-in-place concrete detention tank will be provided. The detention tank will be sized based on a plant firm capacity of 3,000 gpm for 30 minutes of detention time, which results in a tank volume of 90,000 gallons. The detention tank will be below-grade and located remotely from the treatment building. The location of the detention tank away from the treatment building will reduce the construction duration for the facility and eliminate the constant source of humidity and other atmospheric influences of the tank compared to if it were located under the treatment building floor. The detention tank will be configured so that one half of the tank can be taken off-line at a time for maintenance and cleaning. Pressure transmitters will be provided in each half of the detention tank to monitor the water levels in the tank.

High Service Pumps

Three (3) high service pumps will be provided. Each high service pump will be of the vertical turbine type and have a rated capacity of 1,000 gpm to match the plant filtration rate. The high service pumps will be configured to pump from the detention tank through the pressure filters and into the distribution system. It is anticipated that the required total dynamic head of the pumps will be around 160-170 feet, which will result in 60 HP motors on the pumps. Premium efficiency inverter duty rated motors with VFDs will be provided for the high service pumps.

The overall height of the treatment building will be coordinated with the high service pump dimensions, and an overhead rail hoist system will be provided to allow the Utility to pull each pump and motor for service.

Pressure Filters

Three (3) pressure filters will be provided. Each filter will have a filtration capacity of 1,000 gpm based on a filter loading rate of 3 gpm/ft^2. The filters will be horizontal, end-piped, two cell units with anthracite filter media for iron and manganese removal. The filters are expected to be 12′ diameter by 38′ long with the face piping inside the treatment building and the remainder of the filters located outside. The total filtration capacity will be 3,000 gpm, and the firm filtration capacity will be 2,000 gpm with one filter out of service. At a backwash rate of 15 gpm/ ft^2 of filter area, each cell will require 2,500 gpm for a backwash cycle.

Each filter will be provided with a flow meter and loss of head gauge. An online turbidity meter will be provided on the backwash header for monitoring backwash effluent quality. Backwash cycles will be fully automated with manual overrides, and filter valves will be pneumatically actuated by a compressed air system.

Backwash Tank

A new cast-in-place backwash tank will be provided on the site. The backwash tank will be sized to accept the wash water from three pressure filters. Using a backwash rate of 2,500 gpm per cell for 15 minutes, a two-cell backwash for three filters will require a backwash tank volume of approximately 60,000 gallons.

The backwash tank will discharge to the existing sanitary sewer collection system. The pumping station rate will need to be approximately 85 gpm based on emptying the detention tank over a 12 hour period. This pumping duration assumes that none of the backwash water will be recycled.

Chemical Feed Improvements

New chlorine feed points will be provided in the detention tank and post-filtration. The chemical pumps will be adjustable based on the process flow rate at each respective feed point. It is anticipated that phosphate will continue to be fed with the new WTP.

Electrical Improvements

The new electrical room will be located in the north end of the Phase I building. Because the Phase I building is already constructed, it will be necessary to identify the size and location of the required electrical equipment and their respective conduit. Because of this, it will be necessary to run conduit and wire overhead from the Phase I electrical room to interior loads. Exterior loads and feeds can be routed through the wall, but the number of conduit required may become excessive and it is recommended that the primary and generator feeds are placed in conduit through the Phase I floor slab if practical.

The new MCC in the base alternative will contain the starters for all the high service pumps and other loads within the building. Also, new starters with VFDs for the wells will be located in the Phase I building new MCC and the necessary electrical modifications at the well houses themselves will be provided. The relocation of the well starters and VFD to the new facility will greatly improve the environmental conditions for those pieces of equipment, which will result in increased longevity and reduced service requirements.

A new electrical service to the facility will be required. The location of the service feed and transformer will be based on the location of the electrical room and coordinated with the electric utility. A new service to the facility will allow the existing plant to operate on the existing feed without disruption to service for reconfiguration to the new plant.

Standby Power Improvements

According to the *Recommended Standards for Water Works*, a dedicated standby power source shall be provided so that water may be treated and/or pumped to the distribution system during power outages to meet the average day demand. To meet this requirement, a new standby power generator will be provided. The base alternative generator will be pad mounted with a diesel fuel supply and a sound attenuating enclosure. The generator will be sized to run the new plant and wells based on the firm rated capacity (i.e. 2 high service pumps and 3 wells). Preliminary sizing of the generator indicates that a 500 kW unit will be sufficient.

SCADA Improvements

The SCADA system will tie in local control equipment as well as remote sites located throughout the City. Unlicensed radios and/or cellular modems will be utilized where applicable. The SCADA system will provide a common monitoring and control platform for all equipment, in addition to system wide alarming and reporting capability.

The SCADA system will allow for full monitoring, control, and partial automation of the treatment process, including the status of well pumps, detention tank levels, high service pumps, filter rates, filter backwash automation, valve status, chemical feed rates, and flow metering.

Existing Facility Demolition

Once the new treatment plant is complete and online, the existing detention basins, aerators, high service pumps, filter building, filters, backwash tank, piping, electrical, and other items will be demolished. The existing wells, well houses, and raw water piping will remain in service with the new WTP. The existing site will be re-graded and seeded.

Site Work and Yard Piping

The site work consists of new yard piping, electrical, water, and sewer connections, backwash water piping, drives and sidewalks, new fencing, grading, asphalt, drainage systems, new site entrance, and landscaping.

4.3.2.1.2 Part B - New Fort Harrison WTP Filter Building and Facility Rehabilitation

The filter building and interior process components are in extremely poor condition. The chlorine day tank, fluoride tank, and phosphate tank are located in the same room as the filters and process piping causing extensive corrosion. According to the *Recommended Standards for Water* Works, fluoride should be isolated from other chemicals to prevent contamination, vented to the outdoors, secondary controls in place to prevent overfeeding, and personal protective equipment nearby including emergency deluge showers and eye wash stations. As a result, it is recommended that the filter building be demolished and a new building be constructed. Select components, as noted below, will be sized for a 3,000 gpm (4.32 MGD) future firm capacity to accommodate expansion of the entire facility in the future. An exhibit depicting the proposed Fort Harrison Water Treatment Plant site plan is provided in **Appendix A, Exhibit A-7.** The estimated total project cost for this alternative part is **$6,137,500**. A more detailed cost estimate can be found in **Appendix B, Table B-4.** The components of this part of alternative WT-1 are more particularly described as follows:

Filter Building

In the new filter building, larger, end-piped horizontal pressure filters will be used to reduce the filter building footprint. The new filter building will be constructed of brick facia and white siding for the gable to match the existing pump house building and a minimum of 2,200 square feet.

Aerators

Two (2) induced draft aerators, each having a rated capacity of 1,500 gpm, will be provided. Piping provisions will be provided to bypass the aerators or to isolate one aerator at a time for service.

Detention Tank

A cast-in-place concrete detention tank will be provided. The detention tank will be sized based on a plant firm capacity of 3,000 gpm for 30 minutes of detention time, which results in a tank volume of 90,000 gallons. The detention tank will be below-grade and located remotely from the treatment building. The location of the detention tank away from the treatment building will reduce the construction duration for the facility and eliminate the constant source of humidity and other atmospheric influences of the tank compared to if it were located under the treatment building floor. The detention tank will be configured so that one half of the tank can be taken off-line at a time for maintenance and cleaning. Pressure transmitters will be provided in each half of the detention tank to monitor the water levels in the tank.

Pressure Filters

Three pressure filters will be provided each with a capacity of 1,000 gpm based on a loading rate of 3 gpm/ft^2. The filters will be horizontal, end-piped, two cell units with dual media sand and anthracite media for iron and manganese removal. The filters are expected to be 12' diameter by 38' long with the face piping inside the filter building and the remainder of the filters located outside. The total filter capacity will be 3,000 gpm (4.32 MGD) and the firm rated capacity will be 2,000 gpm (2.88 MGD). The new filter building will allow for expansion to be able to house a fourth to increase the total filter capacity to 4,000 gpm (5.76 MGD) and a firm rated capacity of 3,000 gpm (4.32 MGD).

Backwash Tank

A new cast-in-place backwash tank will be provided on the site. The backwash tank will be sized to accept the wash water from three pressure filters. Using a backwash rate of 2,500 gpm per cell for 15 minutes, a two-cell backwash for three filters will require a detention tank volume of approximately 60,000 gallons.

The backwash tank will discharge to the existing sanitary sewer collection system. The pumping station rate will be based on emptying the detention tank over a 12 hour period, which will result in a backwash pumping rate of approximately 85 gpm.

3 MG Ground Storage Reservoir

The 3 MG ground storage reservoir requires an inspection and structural evaluation of the roof. It is assumed that the tank will remain and continue to be used. However, any recommended improvements from the structural evaluation should be addressed as a part of this project.

High Service Pumps

High service pumps 1 and 3 will be replaced with new horizontal centrifugal type pumps rated at a capacity of 1,200 gpm. The high service pumps will be configured to pump from the 3 MG storage reservoir into the distribution system. New premium efficiency inverter duty rated motors with VFDs will be provided for the high service pumps.

Process Valves and Actuators

The new filter building will have flanged ductile iron process piping with valves and pneumatic actuators. The actuators and backwash process will be automatically controlled via SCADA, but provisions will be available to manually control the backwash process.

Chlorine Feed System

A new sodium hypochlorite feed system will be located in an isolated chlorine room. The feed system will include feed piping, feed pump, secondary containment, louver, exhaust fan, and unit heater.

Fluoride Feed System

A new fluoride feed system will be located in an isolated room. The feed system will include feed piping, feed pump, louver, and exhaust fan.

Electrical

The new filter house will include an electrical room which will serve to isolate the electrical equipment. A power panel will be installed to serve the HVAC loads as well as a new lighting panel transformer. Power to the new filter building will be served by the high service pump MCC, ensuring both buildings remain in operation in the event of a power outage.

SCADA

The SCADA system will tie in local control equipment as well as remote sites located throughout the township. Unlicensed radios and/or cellular modems will be utilized where applicable. The SCADA system will provide a common monitoring and control platform for all equipment, in addition to system wide alarming and reporting capability.

The SCADA system will allow for full monitoring, control, and partial automation of the treatment process, including the status of well pumps, detention tank levels, high service pumps, filter rates, filter backwash automation, valve status, chemical feed rates, and flow metering.

4.3.2.1.3 Part C – Indian Lake WTP Improvements

The estimated total project cost for this alternative part is **$377,000**. A more detailed cost estimate can be found in **Appendix B, Table B-5.** The components of this part of alternative WT-1 are more particularly described as follows:

SCADA

The Indian Lake WTP will need a new centralized PLC which will be the data concentrator for the plant. I/O for the high service pumps, chemical pumps, electric actuators, and any other miscellaneous devices will be routed through the PLC and the programmed to perform their desired functions. Some of these functions will include automatic backwash control based on flow rates to help conserve water that is wasted during the backwash sequence. Chemical dosing control with online analyzers may also be utilized to ensure correct dosing as well as to reduce chemical consumption.

4.3.2.2 Alternative WT-2: Decommission Indian Lake Water Treatment Plant

This alternative includes the treatment facility improvements necessary to match Supply Alternative WS-2. Generally, this alternative includes the following:

- New Richardt WTP (5.40 MGD FIRM Rated)
- Ft. Harrison WTP Improvements
- Indian Lake WTP Decommissioned

The estimated total project cost for this alternative part is **$12,331,000**. A more detailed description of the parts of this alternative are as follows:

4.3.2.2.1 Part A: Richardt WTP Phase II

This alternative also includes the construction of a new groundwater treatment plant on the existing Richardt Street site, similar to as described in Alternative WT-1. However, the new treatment plant will have a total capacity of 5,000 gpm (7.20 MGD) and a firm rated capacity of 3,750 gpm (5.40 MGD). This will increase the water system firm treatment capacity to 7.92 MGD, which meets the existing and future maximum day water demands. Select components, as noted below, will be sized for a 3,750 gpm firm capacity to accommodate a capacity expansion of the entire facility in the future. The estimated total project cost for this alternative is **$6,193,500**. A more detailed cost estimate can be found in **Appendix B, Table B-6.** This alternative is more particularly described as follows:

Treatment Building

A new treatment building will be constructed to house the filter piping and high service pumps for the new treatment process. The new building (Phase II) will add on to the Phase I facility previously constructed in 2013. The base construction method for the building will be steel framed, steel sided construction to match the Phase I facility. CMU block to 3' above grade and a standing seam roof will also be provided to match the Phase I facility.

The base treatment building will be sized to contain three (3) pressure filters with room for a fourth, and three (3) high service pumps with room and below-grade piping for a fourth. This plan will require a building footprint of 30' by 70' at a minimum, and is based on the high service pumps being installed in the same room and across from the filter piping.

Raw Water Connection

The connection for the new treatment facility will be made to the raw water piping between well No. 1 and the west detention basin with a new ductile iron main. A tapping sleeve and valve can be used to maintain continued operation of the existing wells and treatment facility until the new facility is ready for startup.

Aerators

Two (2) induced draft aerators, each having a rated capacity of 2,000 gpm, will be provided. Piping provisions will be provided to bypass the aerators or to isolate one aerator at a time for service.

Detention Tank

A cast-in-place concrete detention tank will be provided. The detention tank will be sized based on a future plant firm capacity of 3,750 gpm for 30 minutes of detention time, which results in a tank volume of 112,500 gallons. The detention tank will be below-grade and located remotely from the treatment building. The location of the detention tank away from the treatment building will reduce the construction duration for the facility and eliminate the constant source of humidity and other atmospheric influences of the tank compared to if it were located under the treatment building floor. The detention tank will be configured so that one half of the tank can be taken off-line at a time for maintenance and cleaning. Pressure transmitters will be provided in each half of the detention tank to monitor the water levels in the tank.

High Service Pumps

Three (3) high service pumps will be provided with room for a fourth. Each high service pump will be of the vertical turbine type and have a rated capacity of 1,250 gpm to match the plant filtration rate. The high service pumps will be configured to pump from the detention tank through the pressure filters and into the distribution system. It is anticipated that the required total dynamic head of the pumps will be around 160-170 feet, which will result in 75 HP motors on the pumps. Premium efficiency inverter duty rated motors with VFDs will be provided for the high service pumps.

The overall height of the treatment building will be coordinated with the high service pump dimensions, and an overhead rail hoist system will be provided to allow the Utility to pull each pump and motor for service.

Pressure Filters

Three (3) pressure filters will be provided with room for a fourth. Each filter will have a filtration capacity of 1,250 gpm based on a filter loading rate of 3 gpm/ft^2. The filters will be horizontal, end-piped, two cell units with anthracite filter media for iron and manganese removal. The filters will have the face piping inside the treatment building and the remainder of the filters located outside. The total filtration capacity will be 3,750 gpm, and the firm filtration capacity will be 2,500 gpm with one filter out of service. At a backwash rate of 15 gpm/ ft^2 of filter area, each cell will require 2,500 gpm for a backwash cycle.

Each filter will be provided with a flow meter and loss of head gauge. An online turbidity meter will be provided on the backwash header for monitoring backwash effluent quality. Backwash cycles will be fully automated with manual overrides, and filter valves will be pneumatically actuated by a compressed air system.

Backwash Tank

A new cast-in-place backwash tank will be provided on the site. The backwash tank will be sized to accept the wash water from three pressure filters. Using a backwash rate of 3,125 gpm per cell for 15 minutes, a two-cell backwash for three filters will require a backwash tank volume of approximately 95,000 gallons.

The backwash tank will discharge to the existing sanitary sewer collection system. The pumping station rate will be based on emptying the detention tank over a 12 hour period, which will result in a backwash pumping rate of approximately 130 gpm. This pumping duration assumes that none of the backwash water will be recycled.

Chemical Feed Improvements

New chlorine feed points will be provided in the detention tank and post-filtration. The chemical pumps will be adjustable based on the process flow rate at each respective feed point. It is anticipated that phosphate will continue to be required to be fed with the new WTP.

Electrical Improvements

The new electrical room will be located in the north end of the Phase I building. Because the Phase I building has been constructed, it is necessary to identify the size and location of the required electrical equipment and their respective conduit. Because of this, it will be necessary to run conduit and wire overhead from the Phase I electrical room to interior loads. Exterior loads and feeds can be routed through the wall, but the number of conduit required may become excessive and it is recommended that the primary and generator feeds are placed in conduit through the Phase I floor slab if practical.

The new MCC in the base alternative will contain the starters for all the high service pumps and other loads within the building. Also, new starters with VFDs for the wells will be located in the Phase I building new MCC and the necessary electrical modifications at the well houses themselves will be provided. The relocation of the well starters and VFD to the new facility will greatly improve the environmental conditions for those pieces of equipment, which will result in increased longevity and reduced service requirements.

A new electrical service to the facility will be required. The location of the service feed and transformer will be based on the location of the electrical room and coordinated with the electric utility. A new service to the facility will allow the existing plant to operate on the existing feed without disruption to service for reconfiguration to the new plant.

Standby Power Improvements

According to the *Recommended Standards for Water Works*, a dedicated standby power source shall be provided so that water may be treated and/or pumped to the distribution system during power outages to meet the average day demand. To meet this requirement, a new standby power generator will be provided. The base alternative generator will be pad mounted with a diesel fuel supply and a sound attenuating enclosure. The generator will be sized to run the new plant and wells based on the firm rated capacity (i.e. 2 high service pumps and 3 wells).

SCADA Improvements

The SCADA system will tie in local control equipment as well as remote sites located throughout the township. The local Fiber Network will be the primary network infrastructure. Unlicensed radios and/or cellular modems will be utilized where fiber is not applicable. The SCADA system will provide a common monitoring and control platform for all equipment, in addition to system wide alarming and reporting capability.

The SCADA system will allow for full monitoring, control, and partial automation of the treatment process, including the status of well pumps, detention tank levels, high service pumps, filter rates, filter backwash automation, valve status, chemical feed rates, and flow metering.

Existing Facility Demolition

Once the new treatment plant is complete and online, the existing detention basins, aerators, high service pumps, filter building, filters, backwash tank, piping, electrical, and other items will be demolished. The existing wells, well houses, and raw water piping will remain in service with the new WTP. The existing site will be re-graded and seeded.

Site Work and Yard Piping

The site work consists of new yard piping, electrical, water, and sewer connections, backwash water piping, drives and sidewalks, new fencing, grading, asphalt, drainage systems, new site entrance, and landscaping.

4.3.2.2.2 Part B - New Fort Harrison WTP Filter Building and Facility Rehabilitation

This part of Alternative WT-2 is the same as described in Alternative WT-1 for the Fort Harrison Treatment Plant.

The filter building and interior process components are in extremely poor condition. The chlorine day tank, fluoride tank, and phosphate tank are located in the same room as the filters and process piping causing extensive corrosion. According to the *Recommended Standards for Water* Works, fluoride should be isolated from other chemicals to prevent contamination, vented to the outdoors, secondary controls in place to prevent overfeeding, and personal protective equipment nearby including emergency deluge showers and eye wash stations. As a result, it is recommended that the filter building be demolished and a new building be constructed. Select components, as noted below, will be sized for a 3,000 gpm (4.32 MGD) future firm capacity to accommodate expansion of the entire facility in the future. An exhibit depicting the proposed Fort Harrison Treatment Plant site plan is provided in **Appendix A, Exhibit A-7.** The estimated total project cost for this alternative part is **$6,137,500**. A more detailed cost estimate can be found in **Appendix B, Table B-4.** The components of this part of alternative WT-1 are more particularly described as follows:

4.3.2.2.3 Part C – Indian Lake WTP Decommissioned

Once the Richardt and Fort Harrison Wells and Treatment facilities are upgraded, the existing Indian Lake Treatment Plant will be removed from service.

4.3.3 Storage Alternatives

The two elevated tanks were inspected in 2008 by Tank Industry Consultants. After the tanks were inspected, not all of the recommended safety and maintenance improvements were completed due to funding limitations.

4.3.3.1 Alternative ST-1 - Oaklandon Rd. Elevated Tank Rehabilitation

The 2008 inspection report recommended the interior and exterior of the tank be recoated over the next five years. Since 2008, the exterior and interior of the tank have not been recoated and will be completed as a part of the tank rehabilitation. The rehabilitation work will also address the number of ANSI/OSHA safety-related deficiencies and AWWA operating deficiencies present, as listed in **Chapter 3**. An inspection of the tank is recommended prior to completing any work and is included in the total project cost.

The estimated project cost of the work is **$600,000**. A more detailed cost estimate can be found in **Appendix B, Table B-7.**

4.3.3.2 Alternative ST-2 - 52nd St. Elevated Tank Rehabilitation

The 2008 inspection report recommended the interior and exterior of the tank be recoated over the next five years. In 2014, the exterior of the tank was recoated by L.C. United Painting Co. Since 2008, the interior of the tank has not been recoated and will be completed as a part of the tank rehabilitation. The rehabilitation work will also address the number of ANSI/OSHA safety-related deficiencies and one AWWA operating deficiency present, as listed in **Chapter 3**. An inspection of the tank is recommended prior to completing any work and is included in the total project cost.

The estimated project cost of the work is **$476,000**. A more detailed cost estimate can be found in **Appendix B, Table B-8.**

4.3.4 Distribution System

The water main projects identified for replacement are old cast iron mains that have been experiencing a high number of breaks over the past 5 years. Two of the water main projects are located near the old downtown area of the City and impact a high number of customers as well.

4.3.4.1 Alternative DS-1 - Downtown (E 47th St.) Water Main

The 2-inch to 8-inch cast iron water mains located in this project area have a high number of breaks and service connections. The Downtown E. 47th St. Water Main Replacement project consists of the replacement of approximately 5,950 feet of 2-inch to 8-inch cast iron water mains with PVC water mains including valves, hydrants, and other related appurtenances necessary for installation. The project is located on E. 47th St. between N. Sadler Dr. and N. Franklin Rd.

The estimated project cost of the work is **$1,528,000**. A more detailed cost estimate can be found in **Appendix B, Table B-9.**

4.3.4.2 Alternative DS-2 - N. Kitley Ave./Karen Drive Area Water Main

The 4-inch and 6-inch cast iron water mains located in this project area have a high number of breaks and service connections. The N. Kitley Ave., Leone Dr., Karen Dr. Water Main Replacement project consists of the replacement of approximately 6,950 feet of 4-inch to 6-inch cast iron water mains with PVC water mains including valves, hydrants, and other related appurtenances necessary for installation. The project is located on N. Kitley Ave., Katherine Dr., N. Kenyon Dr., Karen Dr., and Leone Dr. on the west side of the distribution system.

The estimated project cost of the work is **$1,844,000**. A more detailed cost estimate can be found in **Appendix B, Table B-10.**

4.3.4.3 Alternative DS-3 - Sumac Lane Water Main

The 6-inch and 8-inch ductile iron water mains located in the project area serve a low number of customers but have experienced a high number of breaks. The Sumac Ln. Water Main Replacement project consists of the replacement of approximately 2,600 feet of 6-inch to 8-inch cast iron water mains with PVC water mains including valves, hydrants, and other related appurtenances necessary for installation. The project area is located on Fall Creek Dr. and Sumac Ln. south of Hermosa Dr.

The estimated project cost of the work is **$469,000**. A more detailed cost estimate can be found in **Appendix B, Table B-11.**

4.3.4.4 Alternative DS-4 – Winding Ridge Booster Station Improvements

A new PLC will allow operators to monitor and control the existing booster pump control panel as well as miscellaneous I/O including standby power, alarming, tank level, etc. The booster station can operate based on an operator set time, or the PLC can be programmed to automatically recycle the tank on an operator selectable schedule. The estimated project cost of the work is **$124,000**. A more detailed cost estimate can be found in **Appendix B, Table B-12.**

5.0 EVALUATION OF ENVIRONMENTAL IMPACTS

The Utility is proposing drinking water system improvements that are required to meet the water needs of its Utility customers in the coming years, as determined in the Utility's 2016 Water System Capital Improvements Plan. The Utility's existing water service area is bound by its corporate limits which extend north to Fall Creek Road and 86th Street, east to Carroll Road, south to 42nd Street, and west to Shadeland Avenue. The Utility's distribution system contains approximately 14,900 customers.

The proposed project areas consist of improvements at the Fort Harrison water treatment plant (WTP), Richardt WTP, Fort Harrison and Indian Lake well fields, the Oaklandon Road and 52nd Street elevated tanks, and three water main projects. Refer to **Exhibit A-1** in **Appendix A** for the location of the proposed project areas. This section of the PER will focus on the environmental impacts for the 11 proposed projects.

The proposed project areas are located within Lawrence Township of Marion County, on the Cumberland, Fishers, McCordsville and Indianapolis East Quadrangle Maps. The proposed project areas are located in Section 11, Township 16 North, Range 4 East; Section 12, Township 16 North, Range 4 East; Section 8, Township 16 North, Range 5 East; Section 5, Township 16 North, Range 5 East; Section 30, Township 17 North, Range 5 East; Section 29, Township 17 North, Range 5 East; and Section 34, Township 17 North, Range 5 East. A USGS Topographic Map is provided in **Appendix A**, **Exhibit A-12**.

5.1 Disturbed and Undisturbed Land

Land is considered undisturbed if it has not been significantly disturbed by construction activity in the last 50 years. Land that has been cleared of trees is considered archeologically undisturbed. The primary land disturbances for the proposed project areas will occur in previously disturbed lands. Details for each proposed project are listed below:

1) Fort Harrison Well Field Standby Power Generators – The Fort Harrison Well Field has a total of three active groundwater wells that supply water to the Fort Harrison WTP. None of the existing wells have an onsite/stationary backup power source; this project proposes to install a diesel/electric dual-powered generator at each active well. The installation of the generators will include an elevated platform for each generator and the installation of electrical conduit below grade from the generator to the well house. Based on the previous construction of the well houses, access drives, and aerial photographs, the platforms and the electrical conduit will be installed in previously disturbed land. The total area of land disturbance for the generators and conduit is not expected to exceed one acre.

2) Indian Lake Well Field Standby Power Generator – The Indian Lake Well Field has a total of three active groundwater wells that supply water to the Indian Lake WTP. None of the existing wells have an onsite/stationary backup power source; this project proposes to install a diesel/electric dual-powered generator at Well #14 to remedy this issue. The two additional active wells have existing electrical connections to Well #14. The installation of the generators will include an elevated platform and the installation of electrical conduit below grade from the generator to the well house. Based on the previous construction of the well houses, access drives, and aerial photographs, the platforms and the electrical conduit will be installed in previously disturbed land. The total area of land disturbance is not expected to exceed one acre.

3) Richardt WTP Phase IA – The production capacity at the Richardt WTP is currently limited by the amount of iron and manganese present in the finished water. To remedy this issue, the condition of the filter media is to be investigated and corrected as necessary. It is expected that the filter media and hatches will need to be replaced with new air valves added to the filters. All work will be performed in previously disturbed land within the existing footprint of the WTP and no land disturbance is expected.

4) Richardt WTP Phase II – The project consists of constructing a new groundwater treatment plant on the existing Richardt Street site that will be approximately 2,100 square feet. All construction will occur on previously disturbed land. The total area of land disturbance is expected to exceed one acre.

5) Fort Harrison WTP Improvements – The project includes demolishing the existing WTP and constructing a new filter building. The project will occur on previously disturbed land. The total area of land disturbance is expected to exceed one acre.

6) Water System Telemetry & SCADA Improvements –The SCADA system will connect local control equipment and remote sites located throughout the township allowing for full monitoring, control, and partial automation of the treatment process, including the status of well pumps, detention tank levels, high service pumps, filter rates, filter backwash automation, valve status, chemical feed rates and flow monitoring. The project consists of interior improvements only and will not disturb any land.

7) Downtown East 47th Street Water Main Project – The project consists of replacing approximately 5,950 feet of 2-inch to 8-inch cast iron water mains with PVC water mains including valves, hydrants, and other related appurtenances necessary for installation. The existing mains are expected to remain in the ground, either to be capped or filled with fillable material. The new mains are to be installed in near proximity to the existing mains, within the same right-of-way and easements, along City streets. The corridor for installation of the water main will be less than 20 feet. All work for this project will occur within previously disturbed land. The total area of land disturbance is expected to exceed one acre.

8) N. Kitley Avenue/Karen Drive Area Water Main Project – The project consists of replacing approximately 6,950 feet of 4-inch to 6-inch cast iron water mains with PVC water mains including valves, hydrants and other related appurtenances necessary for installation. The existing mains are expected to remain in the ground, either to be capped or filled with fillable material. The new mains are to be installed in near proximity to the existing mains, within the same right-of-way and easements, along City streets. The corridor for installation of the water main will be less than 20 feet. All work for this project will occur within previously disturbed land. The total area of land disturbance is expected to exceed one acre.

9) Sumac Drive Water Main Project – The project consists of replacing approximately 2,600 feet of 6-inch to 8-inch cast iron water mains with PVC water mains including valves, hydrants, and other related appurtenances necessary for installation. The existing mains are expected to remain in the ground, either to be capped or filled with fillable material. The new mains are to be installed in near proximity to the existing mains, within the same right-of-way and easements, along City streets. The corridor for installation of the water main will be less than 20 feet. All work for this project will occur within previously disturbed land. The total area of land disturbance is expected to exceed one acre.

10) Oaklandon Road Tank Rehabilitation – The rehabilitation of the Oaklandon Road Tank includes the repainting of the exterior and interior surfaces. Safety and operating deficiencies previously identified will also be corrected. All work will occur within previously disturbed land, within the existing footprint of the facility and no land disturbance is expected.

11) 52nd Street Tank Rehabilitation – The rehabilitation of the 52nd Street Tank includes the repainting of the interior surface and cathodic protection added to the interior of the tank. Safety and operating deficiencies previously identified will also be corrected. All work will occur within previously disturbed land, within the existing footprint of the facility and no land disturbance is expected.

Soil excavation will be required during the construction processes as identified above. Borrow soil will not be needed during construction. Sediment removed during construction will be stockpiled and used as backfill. Excess soil that remains from excavation activities will be disposed of properly. For projects where the total area of land disturbance is expected to exceed one acre, a Construction/Land Disturbance Stormwater Permit will be obtained in accordance with 327 IAC 15-5 (Rule 5 permit) for stormwater runoff associated with construction activities. Silt fencing, erosion control blankets and other appropriate measures, if necessary, will be utilized to prevent erosion in the areas of construction activity. Based on aerial photographs, minimal tree removal is likely. Disturbed land will be temporarily seeded if permanent seeding is delayed.

5.2 Archaeological, Historical and Architectural Resources

5.2.1 Archaeological Survey

The proposed project areas are located on previously developed land and will have no negative impacts on archaeological sites. The project areas have been previously disturbed during construction of the wells, well houses, access roads, installation of water lines, and other construction activities. As such, a Phase I Archaeological Reconnaissance is not required.

5.2.2 Historic Sites and Architectural Resources

The proposed projects have been evaluated for the presence of historical or architectural structures and landmarks. The Pike and Lawrence Townships, Marion County Interim Report (March 1994) was reviewed for historic properties within the proposed project areas. The report identified the following properties near the proposed project areas:

1) Fort Harrison Well Field Standby Power Generators – no historical structures are located near the project area.

2) Indian Lake Well Field Standby Power Generator – no historical structures are located near the project area.

3) Richardt WTP Phase IA – the construction and operation of the project will not affect the following: Lawrence High School located at 7500 East 56th Street (097-295-00154).

4) Richardt WTP Phase II – the construction and operation of the project will not affect the following: Lawrence High School located at 7500 East 56th Street (097-295-00154).

5) Fort Harrison WTP Improvements – no historical structures are located near the project area.

6) Water System Telemetry & SCADA Improvements – no historical structures will be impacted.

7) Downtown East 47th Street Water Main Project – the construction and operation of the project will not affect the following: the house located at 7480 East 46th Street (097-295-00156) and the house located at 7602 East 46th Street (097-295-00157).

8) N. Kitley Avenue/Karen Drive Area Water Main Project – no historical structures are located near the project area.

9) Sumac Drive Water Main Project– the construction and operation of the project will not affect the following: Day Cemetery located at 7800 Indian Lake Road (097-393-00034) and Emery House located at 7700 Indian Lake Road (097-393-00035).

10) Oaklandon Road Tank Rehabilitation – the construction and operation of the project will not affect the following: Oaklandon State Bank located at 6546 Oaklandon Road (097-393-00072), Dr. J. K. Heltman House located at 6564 Oaklandon Road (097-393-00073), Morse/Lingle House located at 11904 Broadway (097-393-00100), and the house located at 6555 Oaklandon Road (097-393-00110).

11) 52nd Street Tank Rehabilitation – no historical structures are located near the project area.

The relevant sections and associated maps of the Marion County Interim Report are located in **Appendix D**. Refer to **Appendix A, Exhibit A-13** for a map from the Indiana State Historic Architectural and Archeological Research Database (SHAARD) mapping tool (SHAARDGIS). Additional assessments or actions may be required for the proposed project areas once the review by the State Revolving Fund (SRF) staff is completed and agency comments reviewed.

The proposed projects will avoid impacts to historical properties and cemeteries. The following websites were checked for historic sites around the project areas.

- The SHAARDGIS from the DNR DHPA viewed online (http://gis.in.gov/apps/dnr/SHAARDGIS/) – the tool identified Day Cemetery, Fort Harrison State Park, Historic District near Fort Harrison WTP, and the Historic District near Oaklandon Road Tank. Day Cemetery and the two Historic Districts will not be affected by construction or operation of the projects. The Fort Harrison Well Field is located within the Fort Harrison State Park, however, all work will be minor in nature and will occur within existing utility easements.
- The National Park Services' National Historic Landmark Survey information for Indiana, viewed online (http://www.nature.nps.gov/nnl/state.cfm?State=IN) – No National Natural Landmark sites were identified in or near the project areas.
- The DNR DHPA Indiana Properties Recently Listed in the National and State Registers (dated Mary 2014), viewed online (http://www.in.gov/dnr/historic/files/hp-Recent_listings.pdf) - Oaklandon Historic District (NR-2298) listed on September 18, 2013. The Oaklandon Tank Rehabilitation project is located near the identified Oaklandon Historic District; however, the Historic District will not be affected by the construction or operation of the project.

5.3 Wetlands

Wetlands are areas that are inundated or saturated by water for a period of time that allows vegetation to grow that is adapted for such soil conditions. Wetlands are identified by having hydric soils, wetland hydrology and hydrophytic vegetation. Wetlands are important because they provide a wildlife habitat, filter nutrients and sediments and control flooding. A Wetlands Map from the Indiana Map GIS Atlas (http://inmap.indiana.edu/ viewer.htm) is provided as **Appendix A**, **Exhibit A-14**.

Wetlands are not identified within the proposed project areas; thus wetlands will not be affected by construction or operation of the projects. Impacts and disturbance of wetlands will be avoided or minimized if identified for the proposed projects. The Indiana Department of Environmental Management (IDEM) and the U.S. Army Corps of Engineers (USACE) regulate construction activities in a wetland. A USACE Section 404 Permit under the Clean Water Act (CWA) and an IDEM Section 401 Water Quality Certification (401/404 Permits) will not be required for the proposed work.

5.4 Hydrology

5.4.1 Surface Waters

Surface waters include rivers, streams, creeks, lakes and reservoirs. Surface waters are important sources of drinking water, irrigation, power generation and recreation. The Indiana Map GIS Atlas was used to identify any ephemeral (intermittent) and perennial (permanent) streams. The surface water map is included as **Appendix A, Exhibit A-15**. Disturbances in a waterway below the ordinary high water mark require 401/404 Permits. Permits will be likely for an unnamed tributary to Fall Creek for the Sumac Drive Water Main project unless impacts can be minimized by directionally drilling. The unnamed tributary is identified as an intermittent stream. A trenchless method of installation will be used if possible to avoid impacts to the waterway. If open cutting is necessary, measures to minimize impacts and mitigate waterway will be implemented. Additionally, regulations were reviewed to determine if the Project will impact streams characterized as any of the below:

- Waters of limited use listed in 327 IAC 2-1.5-19 (a) and 327 IAC 2-1-11 (a) – None in the Project Areas.
- Exceptional use streams listed in 327 IAC 2-1-11(b) – None in the Project Areas.
- Natural, Scenic Recreational Rivers and Streams listed in 312 IAC 7-2 – None in the Project Areas.
- Salmonid Streams listed in 327 IAC 2-1.5-5(a) (3) – None in the Project Areas.
- Outstanding River list (Natural Resource Commission Non-Rule Policy Document) – None in the Project Areas.

As described in Section 5.1, a Rule 5 Permit is expected for the Richardt WTP Phase II project, Fort Harrison WTP Improvements project, Downtown East 47th Street Water Main project, N. Kitley Avenue/Karen Drive Area Water Main project, and the Sumac Drive Water Main project. The plans will include appropriate erosion and sediment control measures and practices to be implemented to minimize siltation of adjacent waterways and erosion of soils during the construction.

5.4.2 100-Year Floodplains and Floodways

A floodway is the river and the adjacent land reserved to carry and discharge flood waters. The 100-year floodplain is the land along a waterway that has a one percent chance of flooding in a year. Floodplains help reduce flooding and recharge groundwater. The Indiana Map GIS Atlas was used to identify the 100-year floodplain and floodway. The Floodplain Map is included as **Appendix A, Exhibit A-16**. The Fort Harrison Well Field Standby Power Generator project and the Indian Lake Well Field Standby Power Generator project are located within the floodway for Fall Creek. The above-grade structures will be elevated on platforms at least two feet above the base flood elevation (BFE) per regulatory requirements for critical infrastructure. The floodplain for Fall Creek falls under DNR jurisdiction and may require a permit for construction in a floodway; however, an exemption is expected since the planned construction practices will have no adverse loss to the cross-sectional area of the floodway.

Approximately 400 feet of water main will be installed within the floodway/floodplain for the Sumac Drive Water Main Project. The construction of the underground water main will be temporary in nature and not adversely affect the cross-sectional area of the floodway. Additionally, the drainage area of the unnamed tributary is less than one square mile which is exempt from permitting requirements.

5.4.3 Soil Conditions and Groundwater

The Web Soil Survey program (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm) developed and maintained by the National Resource Conservation Service (NRCS) was referenced to obtain information on the depth to the water table for the proposed project areas. The proposed project areas located in the Fort Harrison and Indian Lake Well Fields are comprised primarily of Gessie silt loam (Ge) with a depth to groundwater of 153 centimeters. The remaining proposed project areas are comprised primarily of Crosby Silt Loam (CrA) and Brookston Silty Clay Loam (Br) with a depth to groundwater of 15 centimeters. Dewatering may be required to temporarily lower the groundwater table in some areas while installing the water mains. Minor fluctuations in groundwater levels will be temporary in nature. Discharge from dewatering activities will be filtered or settled to remove sediment and will not be directly discharged to any waterway, wetland or stormwater conveyance. Notes to this effect will be included in the Project plan sheets and specifications. Soil borings will be obtained as necessary to evaluate soil suitability and determine groundwater depths. A Soil Survey Map is provided in **Appendix A**, **Exhibit A-17**.

The Wellhead Protection Program was implemented in Indiana to protect groundwater drinking supplies from pollution and implemented strategies for municipalities to prevent the contamination of the drinking water sources. Based on the type of project, some additional construction practices may apply when a project is located within a Wellhead Protection Area (WHPA). IDEM's Wellhead Proximity Determinator (http://www.in.gov/ idem/cleanwater/pages/wellhead/) was viewed to determine if the project areas are located within a WHPA. The application identified that the Richardt WTP Phase IA & Phase II, Fort Harrison Well Field Standby Power Generator, and Indiana Lake Well Field Standby Power Generator projects are located within a WHPA. Appropriate measures will be taken to ensure construction activities for the identified proposed projects do not present a contamination risk to groundwater supplies.

Oil and gas wells are borings in the ground that are used to extract petroleum hydrocarbons and natural gas. The wells are direct openings to the ground and groundwater and are susceptible to contamination from petroleum spills. The Indiana Map GIS Atlas indicated no oil or gas wells are identified near or adjacent to the proposed project areas. No underground pipelines are located within the proposed project areas or traverse a portion of the proposed projects.

A sole source aquifer is an underground water supply designated by the U.S. Environmental Protection Agency (USEPA) as the principal source of drinking water for an area. Due to the limited alternatives of drinking water in these areas, additional project approval by the USEPA is required. According to the USEPA Region 5 Designated Sole Source Aquifer map (https://www3.epa.gov/region5/water/gwdw/solesourceaquifer/), the proposed projects are not located in the counties associated with a Sole Source Aquifer.

5.5 Plants and Animals

Endangered, threatened and rare species are evaluated by the DNR or the USFWS to protect significant natural areas and the species that depend on those areas. Protecting these areas and species is important to biodiversity, agriculture and ecosystems. The construction and operation of the proposed projects are not expected to pose a threat to or negatively impact state or federal-listed endangered species and their habitat. Minimal tree removal is expected as the proposed projects are located in previously disturbed or cleared lands.

DNR will be contacted immediately if it is determined that a species from the Indiana or Federal List is found to be disturbed by construction activities. The proposed projects will be implemented to minimize impacts to non-endangered species and their habitat.

The Indiana Bat (*Myotis Sodalis*) is a Federal and State listed endangered species and the northern long-eared bat (*Mytosis septentrionalis*) is a state species of concern that both migrate into Indiana in the summer months. Minimal tree removal is expected for construction of the proposed projects and the project areas may include bat habitat. If requested by a State agency, tree removal will not be conducted between April 1 and September 30 to avoid potential impacts to the Indiana Bat.

Emerald Ash Borer (*Agrilus planipennis Fairmaire*) is an exotic beetle that damages all species of ash trees (genus *Fraxinus*) and other hardwood trees. Marion County is designated as an Emerald Ash Borer Quarantined County by IDEM. In accordance with State (327 IAC 18-3-18) and Federal (7 CFR 301.53-1 through 301.53-9) regulations, all trees potentially containing Emerald Ash Borer will be managed appropriately.

5.6 Prime Farmland

The loss of farmland as a natural resource due to construction activities that may threaten the ability to produce food in sufficient quantities for the United States. The NRCS was contacted to determine the impacts for the proposed projects on prime and/or unique farmland. A Farmland Conversion Impact Rating form was submitted to NRCS. The NRCS concluded that the proposed projects will not cause a conversion of prime farmland. Refer to **Appendix E** for copies of NRCS correspondence and the completed Farmland Conversion Impact Rating form.

A Rule 5 Permit for stormwater runoff associated with construction activities is expected for the Richardt WTP Phase II project, Fort Harrison WTP Improvements project, Downtown East 47th Street Water Main project, N. Kitley Avenue/Karen Drive Area Water Main project, and the Sumac Drive Water Main project since they will disturb more than one acre of land as indicated in Section 5.1. The plans will include appropriate erosion and sediment control measures and practices to be implemented to minimize siltation of adjacent waterways and erosion of soils on the construction site.

5.7 Influence of Local Geology

Karst is a landscape formed from the dissolution of limestone and is characterized by sinkholes, caves and underground drainage systems. Karst features and underground aquifers are susceptible to pollution and contamination from infiltrating surface waters. The study area does not contain Karst features. These underground features are not prevalent for the project areas according to the information obtained from the Indiana Map GIS Atlas.

5.8 Air Quality

Air pollution is generated from factories, vehicles, equipment and naturally occurring sources such as windblown dust. Short-term air quality impacts for the proposed projects may generate dust and noise during construction. The project areas are located in residential, commercial and undeveloped areas.

Mitigation measures include limiting construction activity to daylight hours on weekdays to minimize noise effects. Construction specifications will require proper control measures be utilized to control wind erosion from construction areas. Proper cleanup practices will be required to reduce the generation of dust and other construction debris. When impacts cannot be avoided, appropriate measures will be utilized. Long-term air quality impacts are not expected for this Project. Open burning of trees and brush is not allowed for this Project according to 326 IAC 4.

The USEPA has established ambient air quality standards for criteria pollutants (carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide) to protect the environment and public welfare. Counties and populated areas are designated as attainment or nonattainment areas. If a pollutant level is above the regulated level, then the air quality is worse than the established acceptable standards (nonattainment area). The air quality for an attainment area is equal to or less than the established level for a pollutant. Lawrence Township in Marion County is considered an attainment area for the criteria pollutants that may affect public health and welfare (http://www.in.gov/idem/airquality/2339.htm). The proposed projects will operate emergency generators for the WTPs and Well Fields. The operation of the emergency generators will follow the requirements established by the National Emissions Standards for Hazardous Air Pollutants (NESHAP) and are expected to have minimal impacts on future compliance with air quality standards.

5.9 Open Space and Recreational Opportunities

Open and recreational spaces are non-developed areas for public use that enhance the environmental quality of neighborhoods or communities. The construction and operation for the proposed projects will neither create nor destroy open space and recreational opportunities. Construction specifications will require that proper control measures be utilized to control stormwater runoff and erosion from proposed construction sites. The project areas that are located near or in areas used for recreational activities were identified according to local and county websites available and a review of aerial photographs; the identified projects are listed below:

- The Oaklandon Road Tank Rehabilitation project is located within the City's Oaklandon Play Park; however, a portion of the Park is reserved for Utility use. The project will only cause a temporary impact during construction activities that will not eliminate any open or recreational spaces. Upon completion of the project the Oaklandon Play Park will resume normal operation.
- The Fort Harrison WTP project is located within the defined boundaries of the Fort Harrison State Park; however, the portion of the Park where the project is located is reserved for Utility use. The project will not cause any temporary or permanent impacts to any other portions of the Park.
- The Sumac Drive Water Main project is located adjacent to the Upper Fall Creek Loop Trail. The project is not expected to cause any temporary or permanent impacts to the Upper Fall Creek Loop Trail.
- The Indian Lake Well Field Standby Generator project is located adjacent to the Upper Fall Creek Loop Trail; however, the location of the project is reserved for Utility use. The project is not expected to cause any temporary or permanent impacts to the Upper Fall Creek Loop Trail.
- The Fort Harrison Well Field Standby Generator project is located within the boundary of the Upper Fall Creek Look Trail; however, the location of the project is reserved for Utility use. The project is not expected to cause any temporary or permanent impacts to the Upper Fall Creek Loop Trail.

5.10 Lake Michigan Coastal Program

The DNR program coordinates local agencies and organizations for the protection and sustainable use of natural and cultural resources along Lake Michigan. The program protects areas and properties, improves recreational areas and revitalizes waterfronts. The Coastal Program Area map provided on IDEM's website (http://www.in.gov/dnr/lakemich/6039.htm) was reviewed. The construction and operation of the proposed projects will not affect the Lake Michigan Coastal Zone.

5.11 National Natural Landmarks

The National Parks Service protects areas recognized as containing outstanding biological and geological resources or examples of natural history. The Indiana National Natural Landmarks website (http://www.nature.nps.gov/nnl/state.cfm?State=IN) identified no National Natural Landmarks within the project areas or Marion County. Therefore, the construction and operation of the proposed projects will not affect National Natural Landmarks. No local landmarks were identified in or near the project areas. The construction and operation of the proposed projects will not affect local landmarks.

5.12 Secondary Impacts

The Utility, through the authority of its council, planning commission or other means, will ensure that future development, as well as future drinking water systems or treatment works projects connected to SRF-funded facilities will not adversely impact wetlands, wooded areas, steep slopes, archaeological/historical/structural resources, or other sensitive environmental resources. The Utility will require new development and infrastructure projects to be constructed within the guidelines of the USFWS, DNR, IDEM and other environmental review authorities.

5.13 Mitigation Measures

Erosion control measures will be implemented during all construction activity. Areas disturbed by construction will be restored and revegetated with seeding and other measures such as erosion control blankets, as necessary. A Rule 5 Permit for stormwater runoff associated with construction activities is expected for the Richardt WTP Phase II project, Fort Harrison WTP Improvements project, Downtown East 47th Street Water Main project, N. Kitley Avenue/Karen Drive Area Water Main project, and the Sumac Drive Water Main project since they will disturb more than one acre of land. The Sumac Drive Water Main project involves one (1) waterway crossing of an unnamed tributary to Fall Creek. As stated in section 5.4.1, a trenchless method of installation for the water main will be used if possible to avoid impacts to the waterway. If open cutting is necessary, measures to minimize impacts and mitigate waterway should be implemented. No wetland impacts are expected for any of the proposed projects. Tree removal is likely, but will be minimal and avoided where possible. Tree cutting restrictions may be required to minimize the potential for impacts to the Indiana Bat.

6.0 PROPOSED PROJECT

6.1 Description

The recommendations were made after evaluation of construction costs, feasibility of construction, environmental impacts, and prioritization of benefits to the Utility.

6.1.1 Selected Alternatives

The selected alternatives for the proposed project include alternatives WS-1, WT-1 (Parts A, B, & C), ST-1, ST,2, DS-1, DS-2, DS-3, and DS-4. Phase I includes alternatives WS-1, WT-1 (Part A), ST-1, and DS-3. Phase II includes alternatives WT-1 (Parts B & C), ST-2, DS-1, DS-2, and DS-4.

6.2 Estimated Project Costs

The estimated pre-design project costs of the proposed project are shown in **Table 6.2.1**.

Table 6.2.1 – Estimated Pre-Design Project Costs

Project No.	*Description*	*Cost*	*Phase I*	*Phase II*
WS-1	Well Field Rehabilitation and Capacity Expansion	$1,095,000	$1,095,000	--
WT-1A	Richardt WTP Phase II	$5,038,500	$5,038,500	--
WT-1B	Fort Harrison WTP Filter Building and Asset Rehabilitation	$4,909,500	--	$4,909,500
WT-1C	Indian Lake WTP Improvements	$301,000	--	$301,000
ST-1	Oaklandon Rd. Elevated Tank Rehabilitation	$473,000	$473,000	--
ST-2	52nd St. Elevated Tank Rehabilitation	$374,000	--	$374,000
DS-1	Downtown (E 47th St) Water Main	$1,222,000	--	$1,222,000
DS-2	N Kitley Ave/Karen Dr Area Water Main	$1,475,000	--	$1,475,000
DS-3	Sumac Lane Water Main	$375,000	$375,000	--
DS-4	Winding Ridge Booster Station Improvements	$99,000	--	$99,000
	Total Estimated Construction Costs	**$15,362,000**	**$6,981,500**	**$8,380,500**
	Total Estimated Non-Construction Costs	**$3,387,000**	**$1,281,000**	**$2,106,000**
	Total Estimated Project Costs	**$18,749,000**	**$8,262,500**	**$10,486,500**

6.3 Project Schedule

The proposed schedule for the Phase I and Phase II water system improvements is listed in **Table 6.3.1.**

Table 6.3.1 – Proposed Schedule

Activity	***Phase I Date***	***Phase II Date***
Public hearing	December 13, 2016	
Rate Study	December 2016	
Submit PER to SRF	January 2017	
Anticipated PER approval by SRF	March 2017	
Begin Engineering Design	March 2017	March 2018
Submit IDEM Construction Permit Application including Plans & Specifications	October 2017	October 2018
Anticipated approval of IDEM Construction Permit including Plans & Specifications	November 2017	November 2018
Receipt of Bids	November 2017	November 2018
Post-Bid Financial & Loan Closing	December 2017	December 2018
Contract Award	February 2018	February 2019
Start Construction	March 2018	March 2019
Substantial Completion of Construction	June 2019	June 2020
Final Completion	July 2019	July 2020

7.0 LEGAL, FINANCIAL, AND MANAGERIAL CAPABILITIES

The Lawrence Utilities Service Board, consisting of five members, serves as the governing body for the water utility. Currently, the Utility's water distribution system is metered; usage rates are tiered depending on customer usage. The Utility's water rates are included in **Appendix F**. In addition, there is a billing system in place; monthly statements are sent to customers.

The Utility plans to finance the improvement costs through the State Revolving Fund (SRF) Loan Program, which would provide for a 20-year, low interest loan. A preliminary rate case study has not been conducted at this point but will be completed in the future.

A completed Signatory Authorization Resolution Form, PER Acceptance Resolution form, and SRF Financial Information Form is included in **Appendix F**.

8.0 PUBLIC PARTICIPATION

A copy of this PER will be delivered to the Mayor's Office and Utility Operations Center on December 3, 2016. It was available at the Utility Operations Center for the public to view for ten days prior to the public hearing.

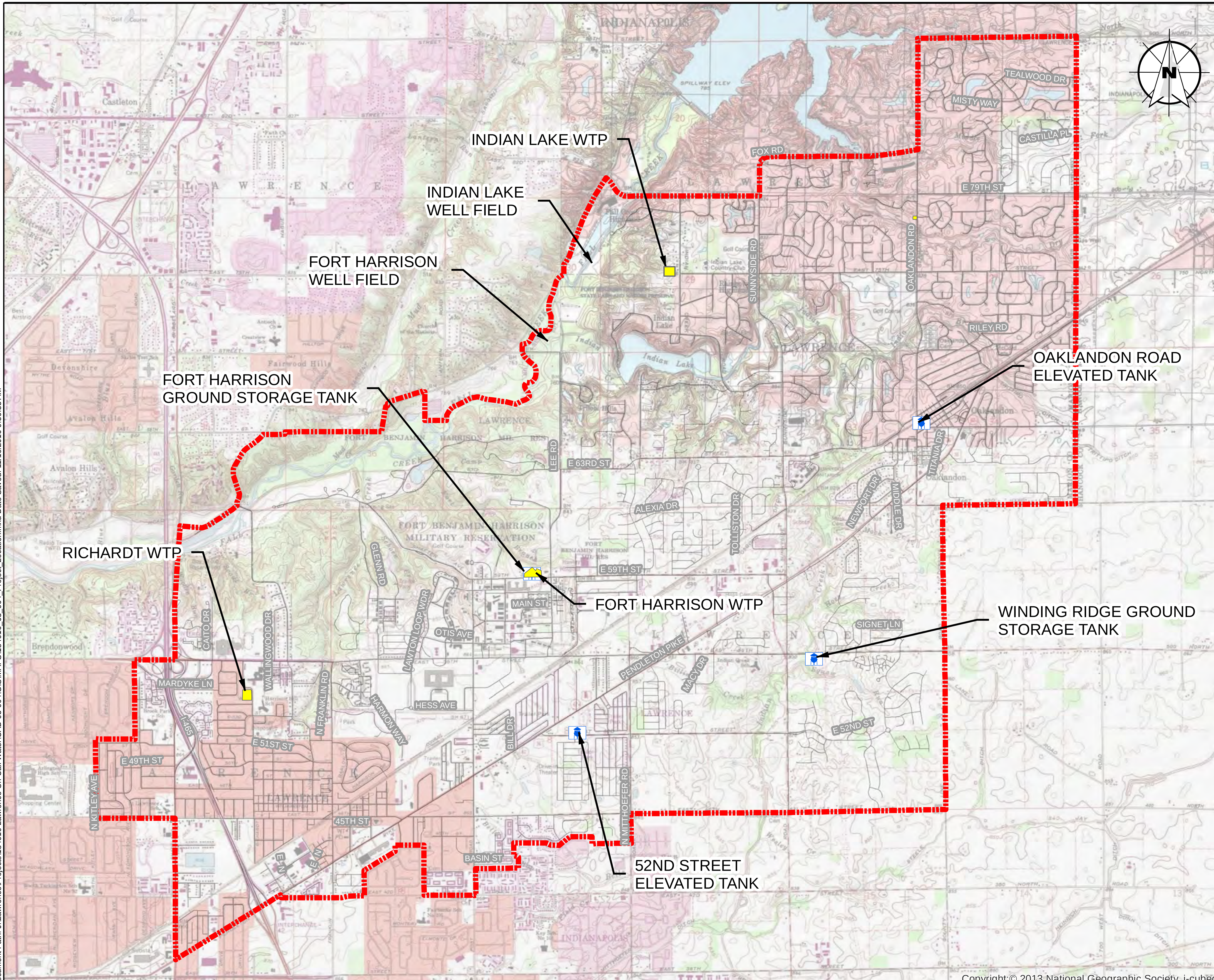
A public hearing to discuss the PER was held at the City of Lawrence Government Building on December 13, 2016. The following items relating to public participation are provided in **Appendix G**.

- Copy of the Publisher's Affidavit from the newspaper for the public hearing notice,
- Public hearing attendance record,
- Minutes of the public hearing, and
- Copy of the mailing labels for public hearing attendees and other parties that might be interested in receiving copies of the Environmental Impact Statement.

Written comments received from the public during the period from ten days before to five days after the public hearing will be submitted to SRF once they have been received.

APPENDIX A

Exhibits



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WESSLER
ENGINEERING
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LEGEND

- Corporate Limits
- Water Treatment Plant
- Water Storage Tanks
- Roadway

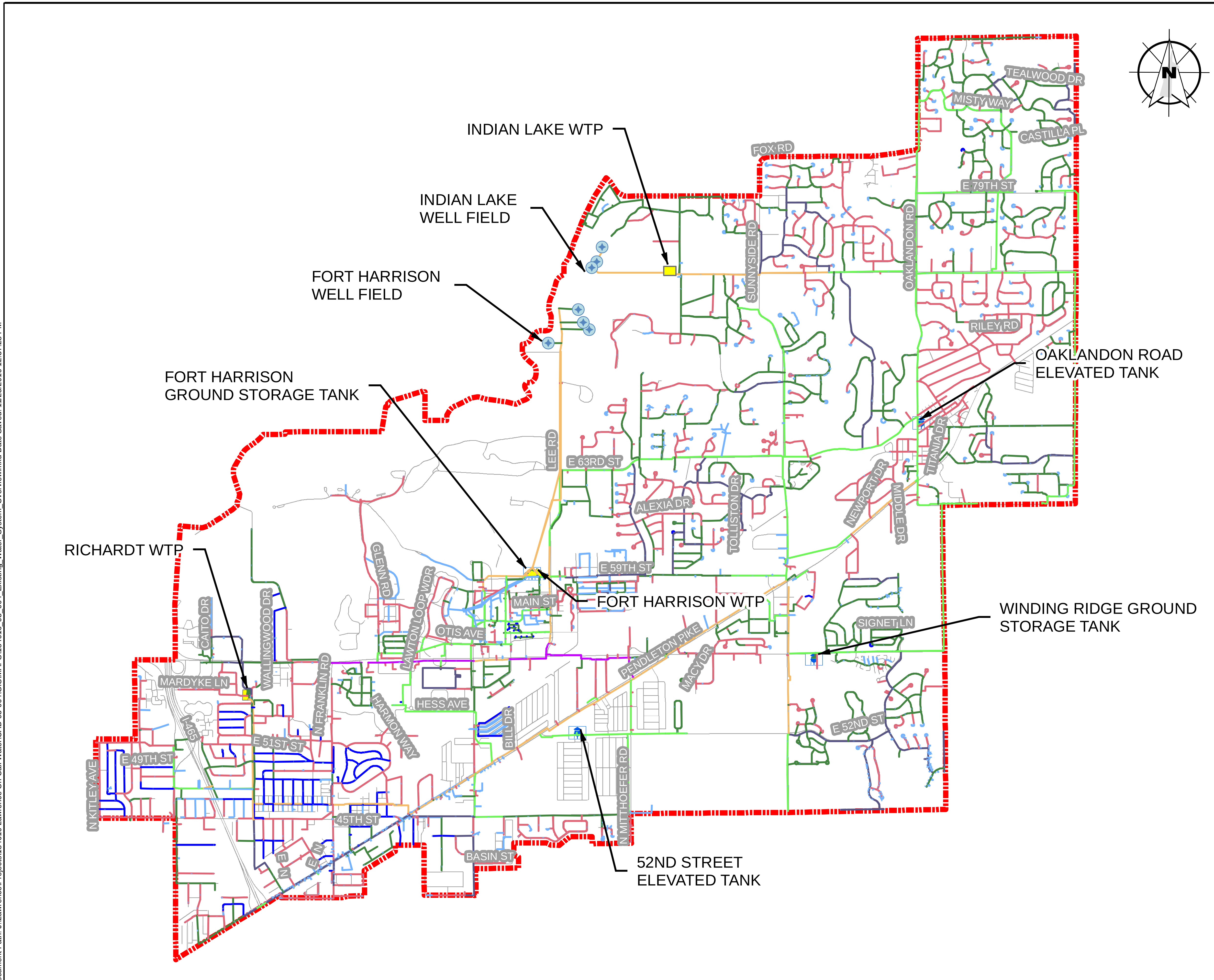
0 1,500 3,000 6,000 FT

EXHIBIT A-1

Project Location

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

November 2016
184616-03-004



![WESSLER ENGINEERING More than a Project™]

LEGEND

Water Mains (Diameter, Inches)

- Less than 3
- 4
- 6
- 8
- 10
- 12
- 16
- 20
- Corporate Limits
- Water Treatment Plant
- Water Storage Tanks
- WELLS
- Roadway

0 1,500 3,000 6,000 FT

EXHIBIT A-2

Existing Water System

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

November 2016
184616-03-004

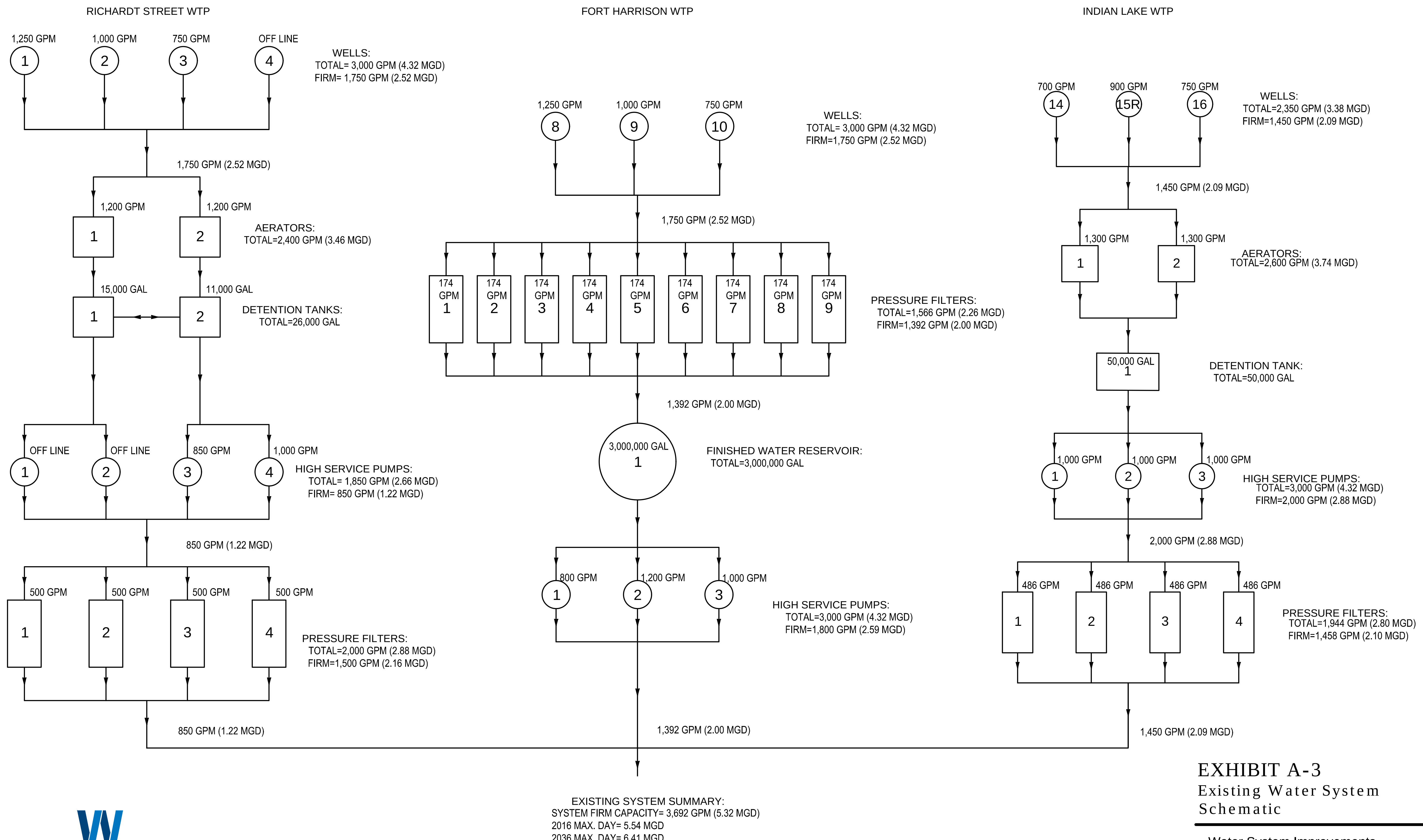


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EXHIBIT A-3

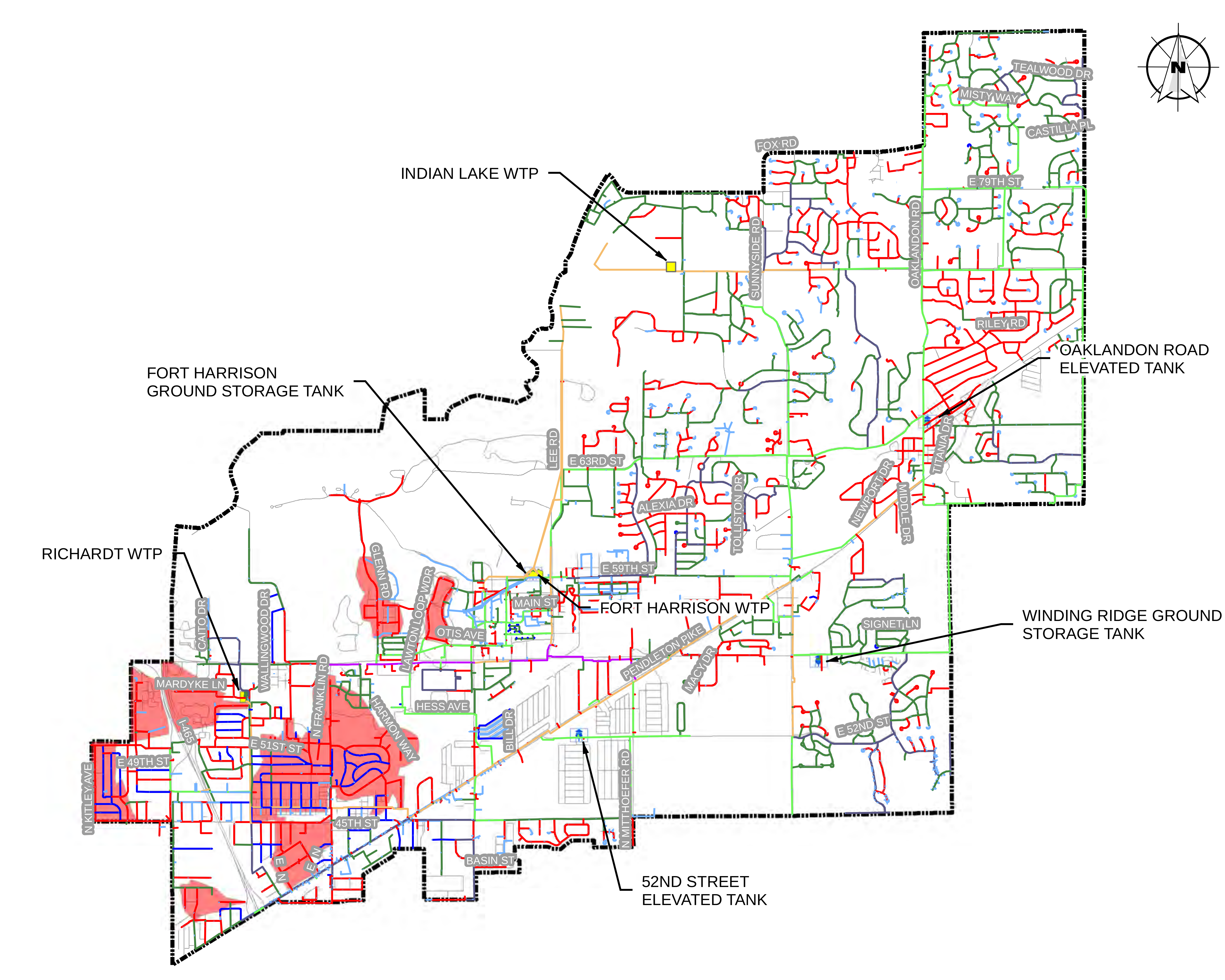
Existing Water System Schematic

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

November 2016
184616-03-004

Revised January 2017

Drawing: J:\Lawrence\Projects\184616 Lawrence On-Call Water\CAD 03-004\DWG\Exhibit\184616-03-004-System-Schematic.dwg | Layout: Figure A-3 | Plotted: 01/10/17 @ 01:03:08 | LastSavedBy: MichelleE



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More than a Project™

LEGEND

Water Mains (Diameter, Inches)

- Less than 3
- 4
- 6
- 8
- 10
- 12
- 16
- 20
- Corporate Limits
- Areas with Available Fire Flows Less Than 1,500 GPM
- Water Treatment Plant
- Water Storage Tanks
- Roadway

0 1,500 3,000 6,000 FT

EXHIBIT A-4

Max Day Fire Flow Analysis

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

November 2016
184616-03-004

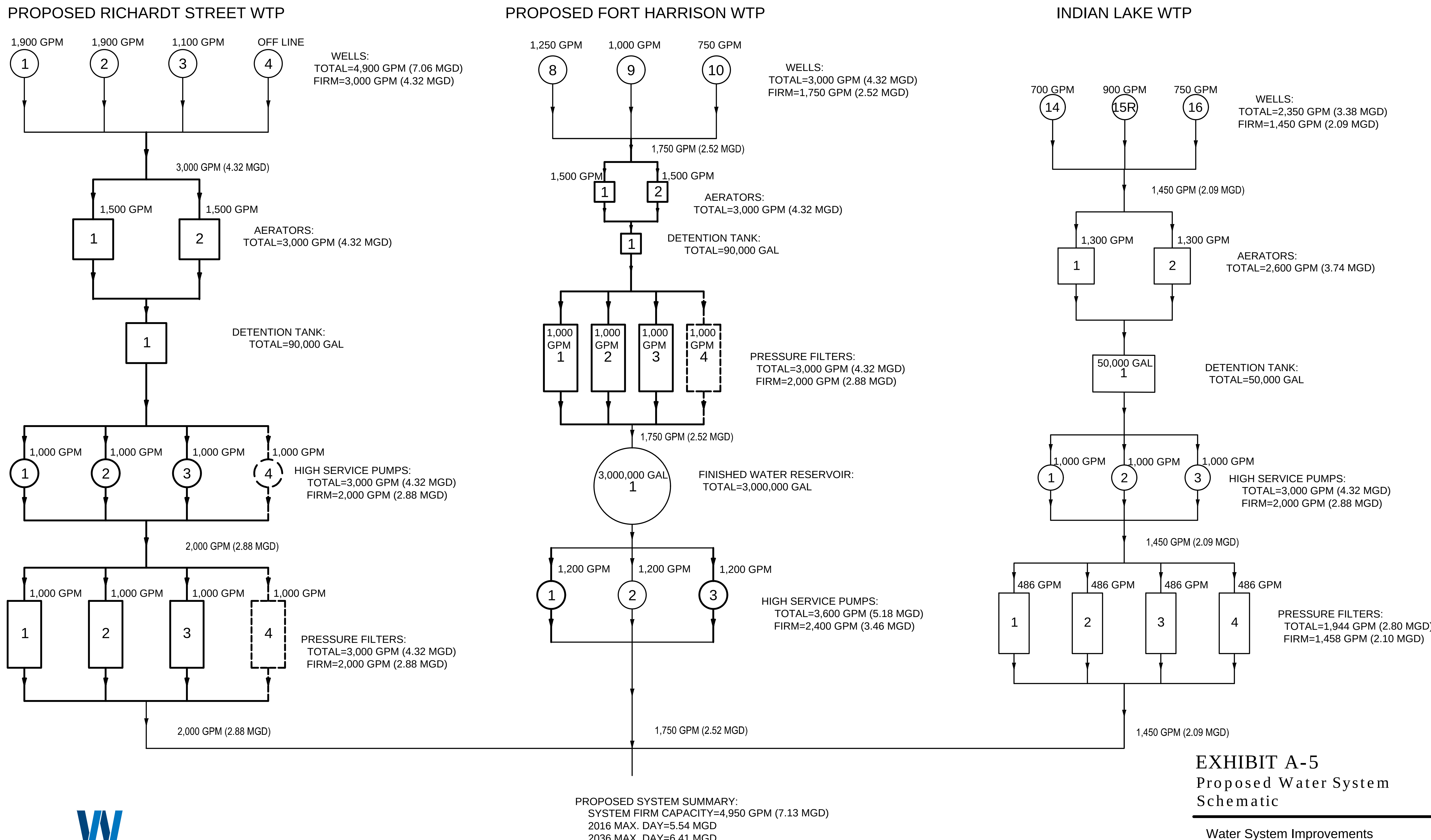


EXHIBIT A-5
Proposed Water System Schematic

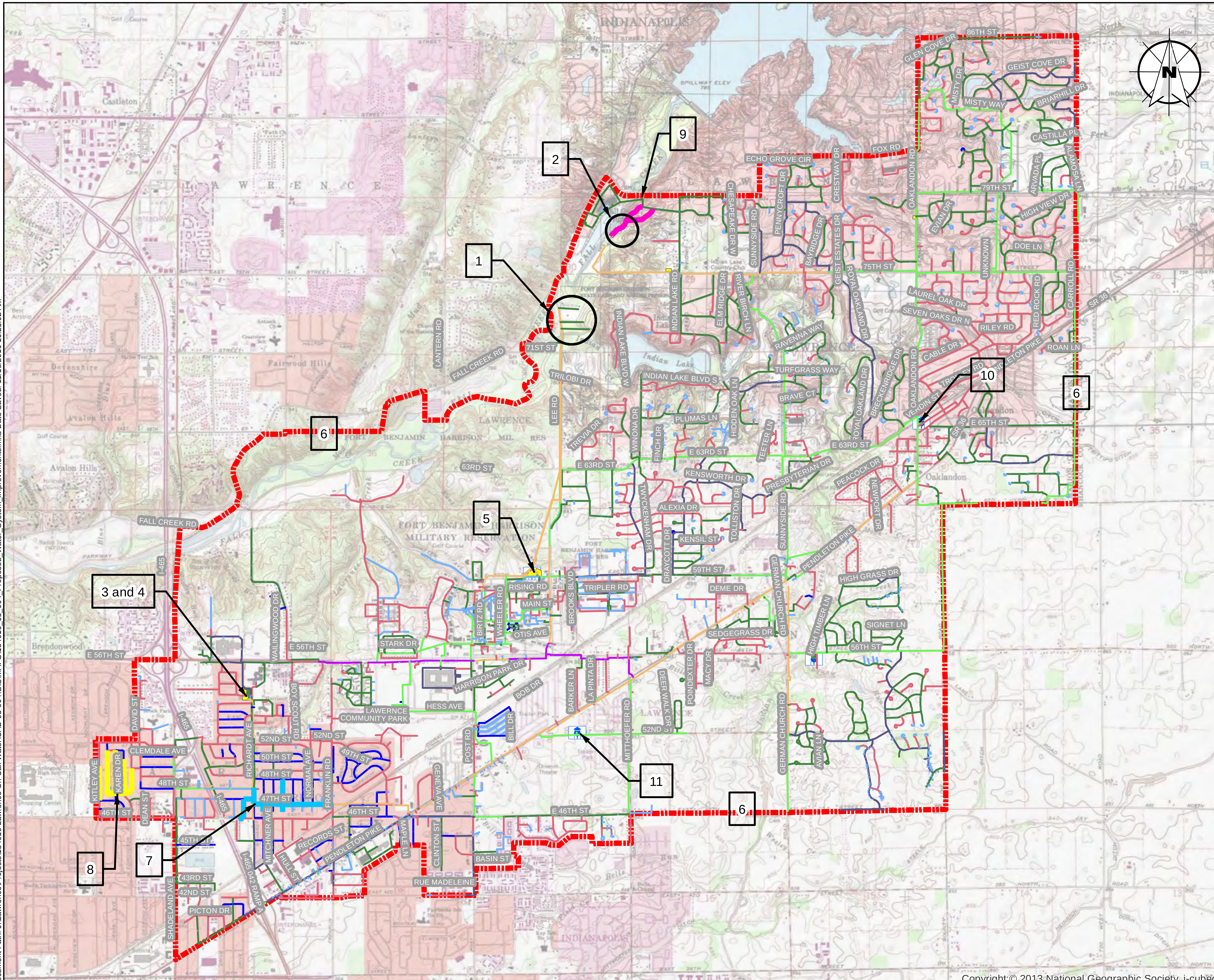
Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

November 2016
184616-03-004

Revised January 2017

WESSLER ENGINEERING
More than a Project™

Document Path: J:\Lawrence\Projects\184616 Lawrence On-Call Water\CAD 03-004\GIS\MAPS\184616_03_004_Proposed_Water_System_Improvements.mxd Date Saved: 11/10/2016 10:23:02 AM



WESSLER ENGINEERING

More than a Project™

LEGEND

Water Mains (Diameter, Inches)

- Less than 3
- 4
- 6
- 8
- 10
- 12
- 16
- 20
- Corporate Limits
- Water Treatment Plant
- Water Storage Tanks

PROJECT AREAS

1. Fort Harrison Well Field Standby Power Generator
2. Indian Lake Well Field Standby Power Generator
3. Richardt WTP Phase IA
4. Richardt WTP Phase II
5. Fort Harrison WTP Improvements
6. Water System Telemetry and SCADA Improvements
7. Downtown (E 47th St, between N Sadler Dr. and N Franklin Rd.) Water Main Project
8. N Kitley Ave, Leone Dr, Karen Dr. Area Water Main Project
9. Sumac Drive Water Main Project Water Main Project
10. Oaklandon St. Tank Rehabilitaiton
11. 52nd St. Tank Rehabilitation

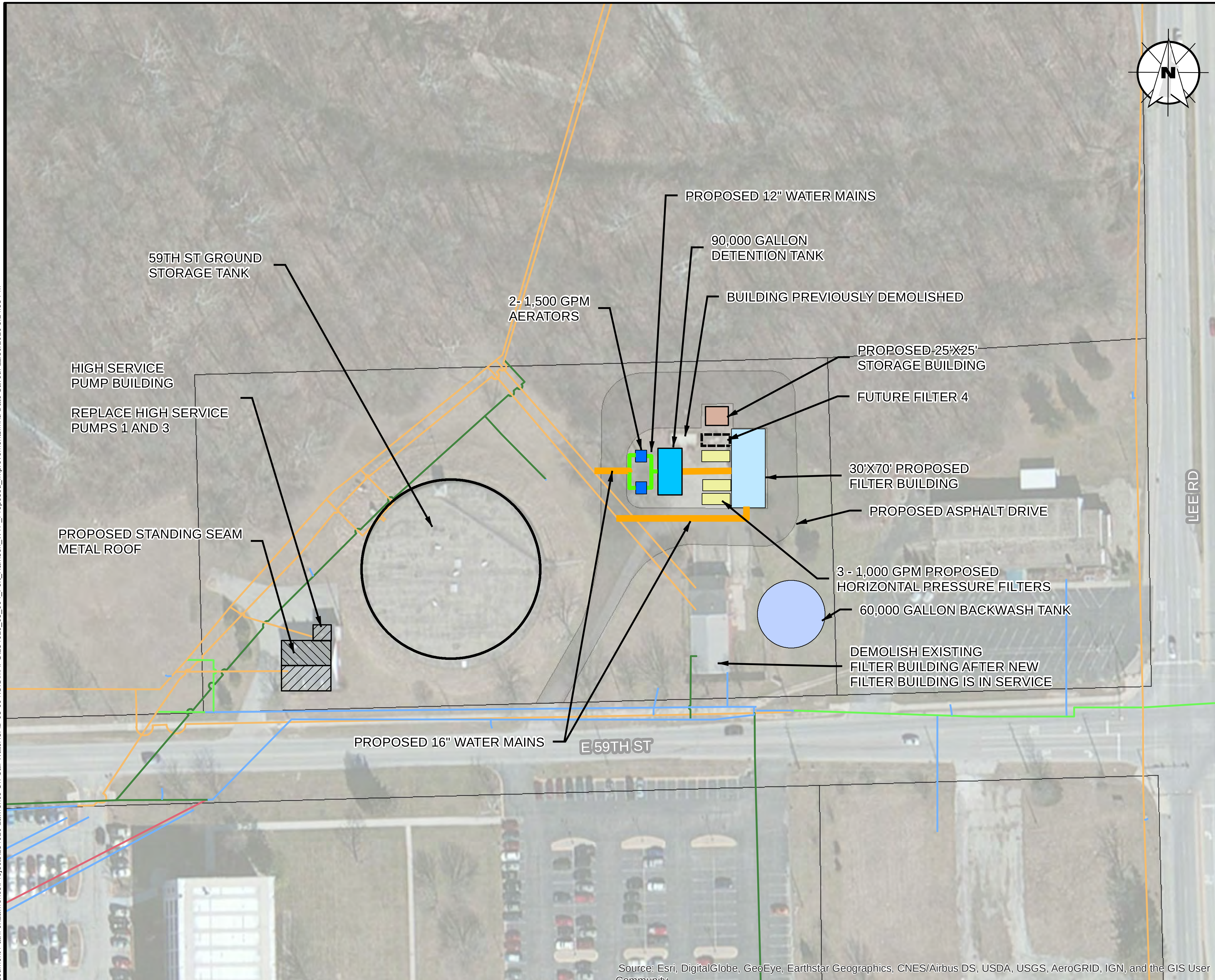
0 1,500 3,000 6,000 FT

EXHIBIT A-6

Proposed Water System Improvements

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

November 2016
184616-03-004



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WESSLER ENGINEERING

More than a Project™

LEGEND

Water Mains (Diameter, Inches)

- Less than 3
- 4
- 6
- 8
- 10
- 12
- 16
- 20
- Parcels

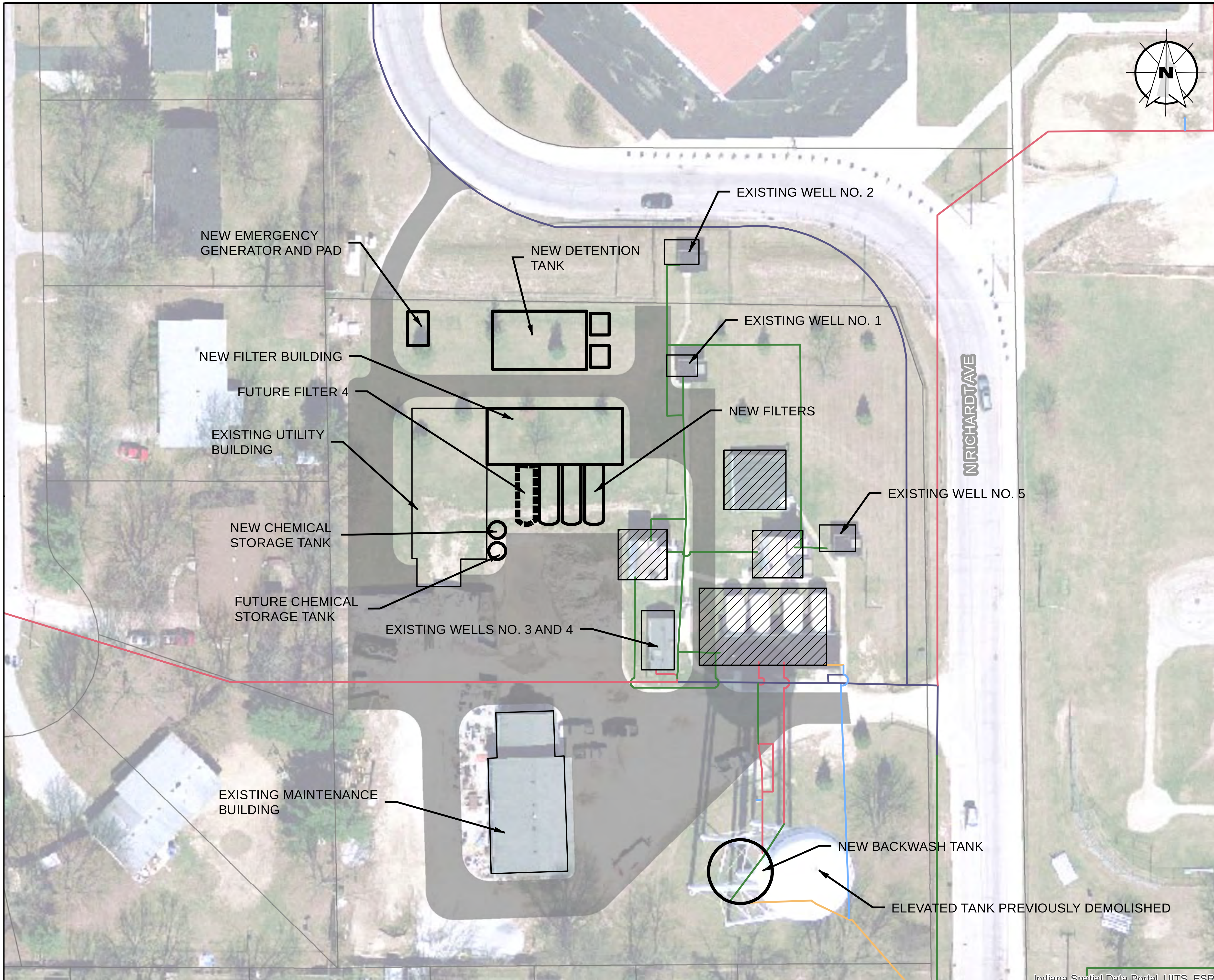
0 40 80 160 FT

EXHIBIT A-7

Fort Harrison Water Treatment Plant Proposed Improvements

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

November 2016
184616-03-004



WESSLER
ENGINEERING
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LEGEND

Existing Water Mains (Diameter, Inches)

- Less than 3
- 4
- 6
- 8
- 10
- 12
- 16
- 20
- WTP Improvements
- Existing Structures
- New Pavement
- Parcels
- Demolition

0 20 40 80 FT

EXHIBIT A-8
Richardt Water Treatment Plant Proposed Improvements

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

November 2016
184616-03-004

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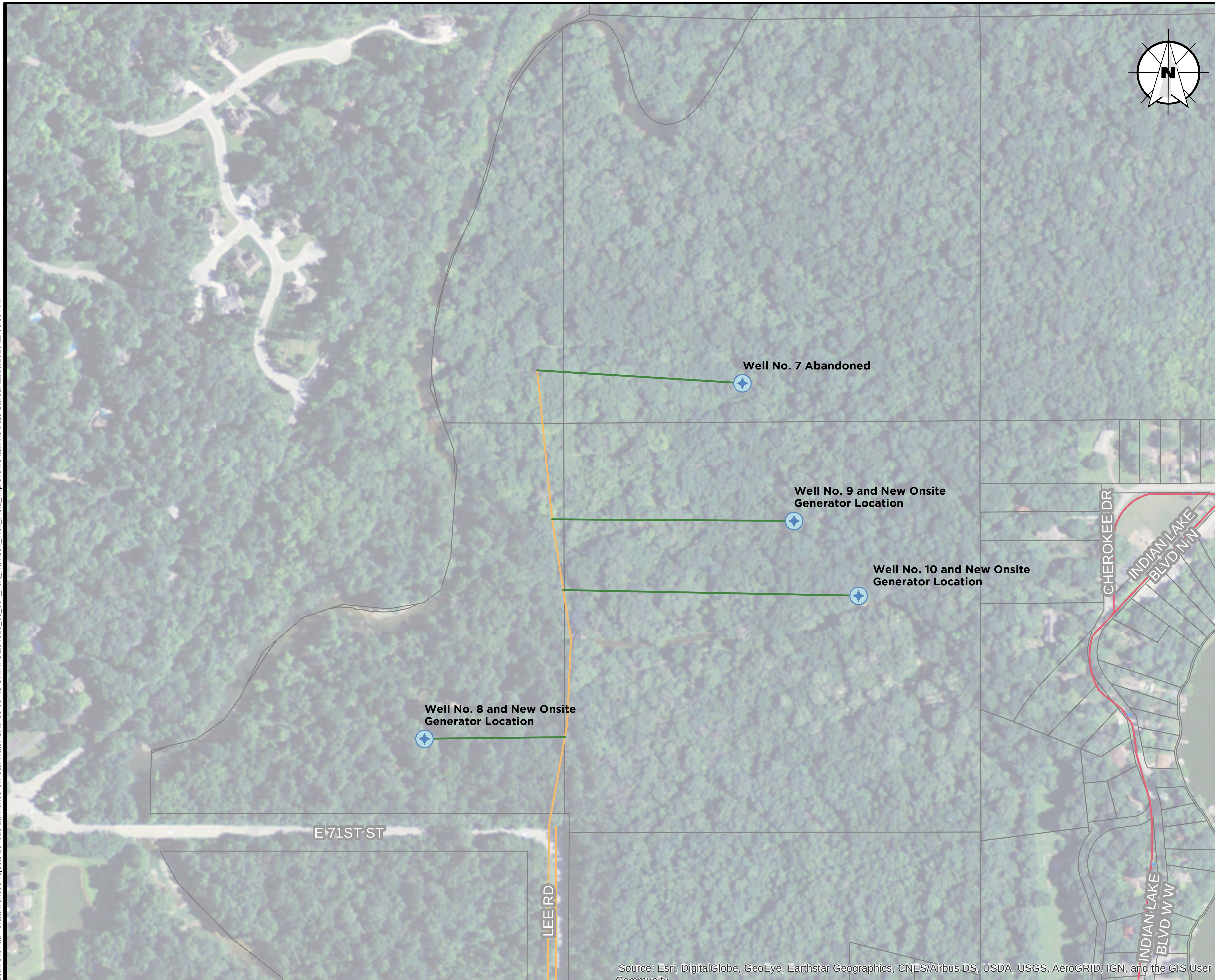


WESSLER ENGINEERING
More than a Project™

LEGEND

Water Mains (Diameter, Inches)

- Less than 3
- 4
- 6
- 8
- 10
- 12
- 16
- 20
- Parcels
- Existing Wells

0 150 300 600 FT

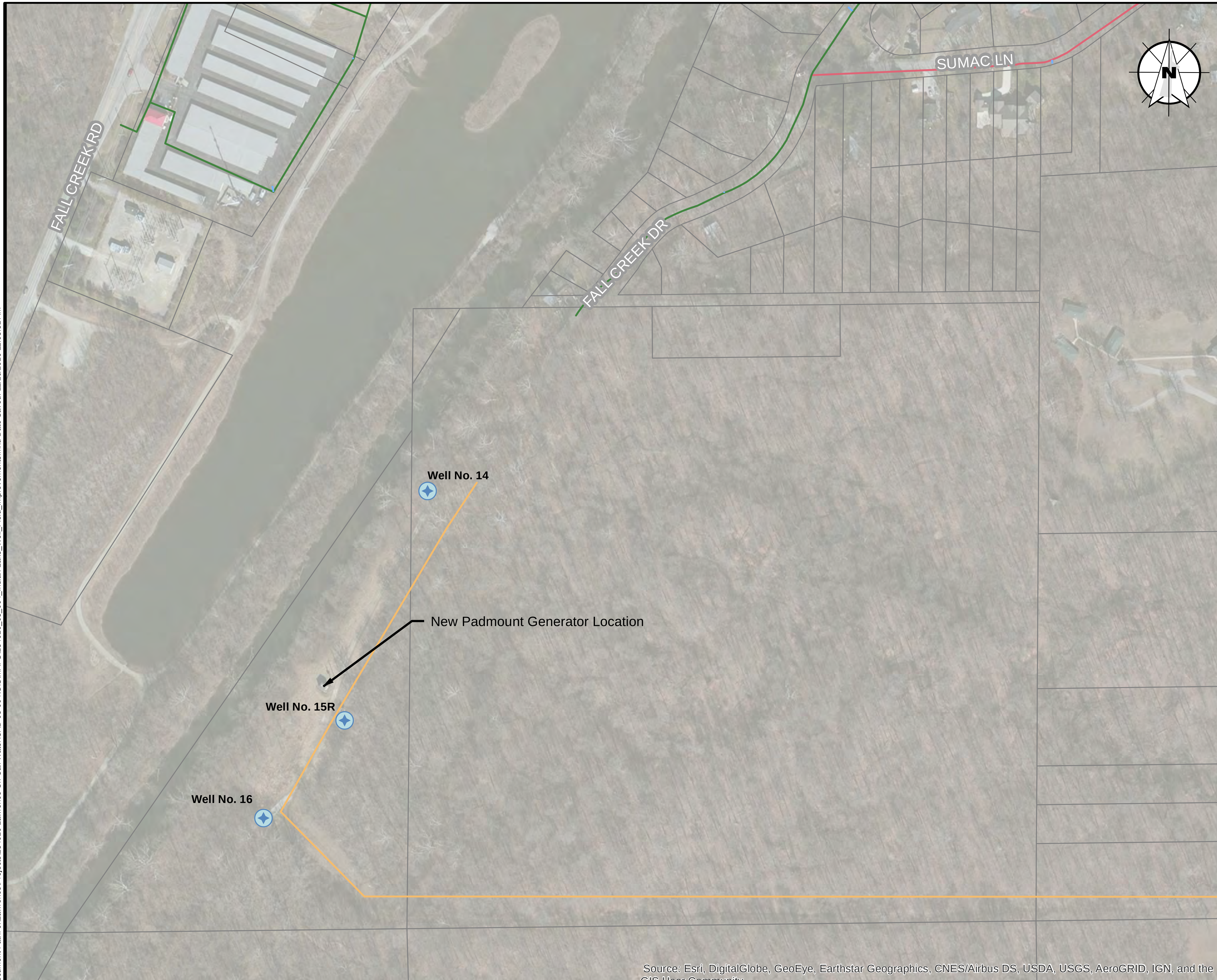
EXHIBIT A-9

Fort Harrison Well Field Improvements

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

November 2016
184616-03-004

Document Path: J:\Lawrence\Projects\184616 Lawrence On-Call Water\CAD 03-004\GIS\MAPS\184616_03_004_Fort_Harrison_Well_Field_Improvements.mxd Date Saved: 11/10/2016 11:03:50 AM



WESSLER
ENGINEERING
More than a Project™

LEGEND

Water Mains (Diameter, Inches)

- Less than 3
- 4
- 6
- 8
- 10
- 12
- 16
- 20
- Parcels
- Existing Wells

0 100 200 400 FT

EXHIBIT A-10

Indian Lake
Well Field Improvements

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

November 2016
184616-03-004

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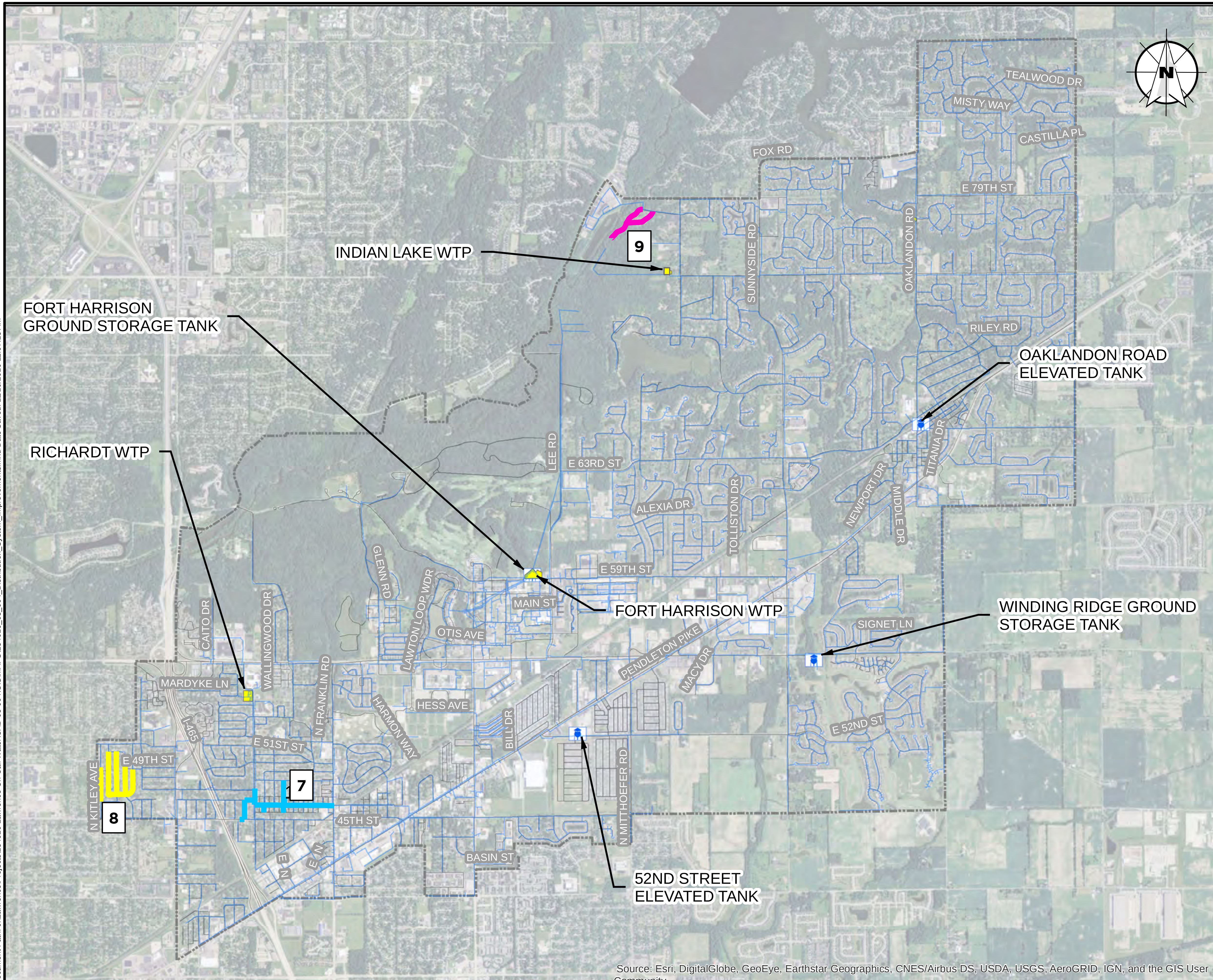

WESSLER ENGINEERING
More than a Project™

LEGEND

PROJECT AREAS

- 7 - Downtown (E 47th St, between N Sadler Dr and N Franklin Rd)
- 8 - N Kitley Ave, Leone Dr, Karen Dr Area
- 9 - Sumac Drive
- Water Mains
- Corporate Limits
- Water Treatment Plant
- Water Storage Tanks
- Roadway

EXHIBIT A-11

Distribution System Improvements

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

November 2016
184616-03-004

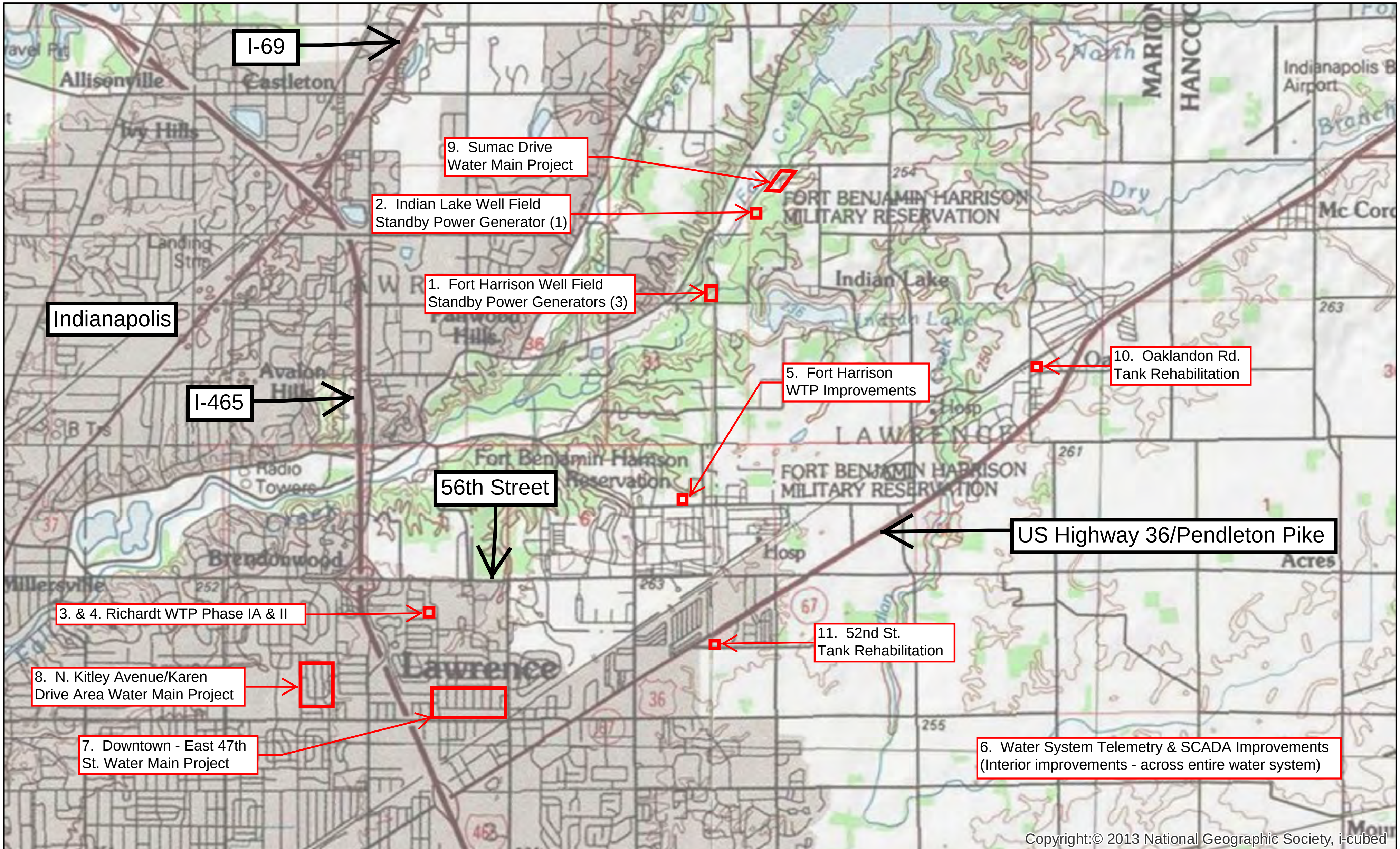

EXHIBIT A-12 USGS TOPOGRAPHIC MAP

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

N

0 2,500 5,000 10,000 FT

November 2016
184616-03-004

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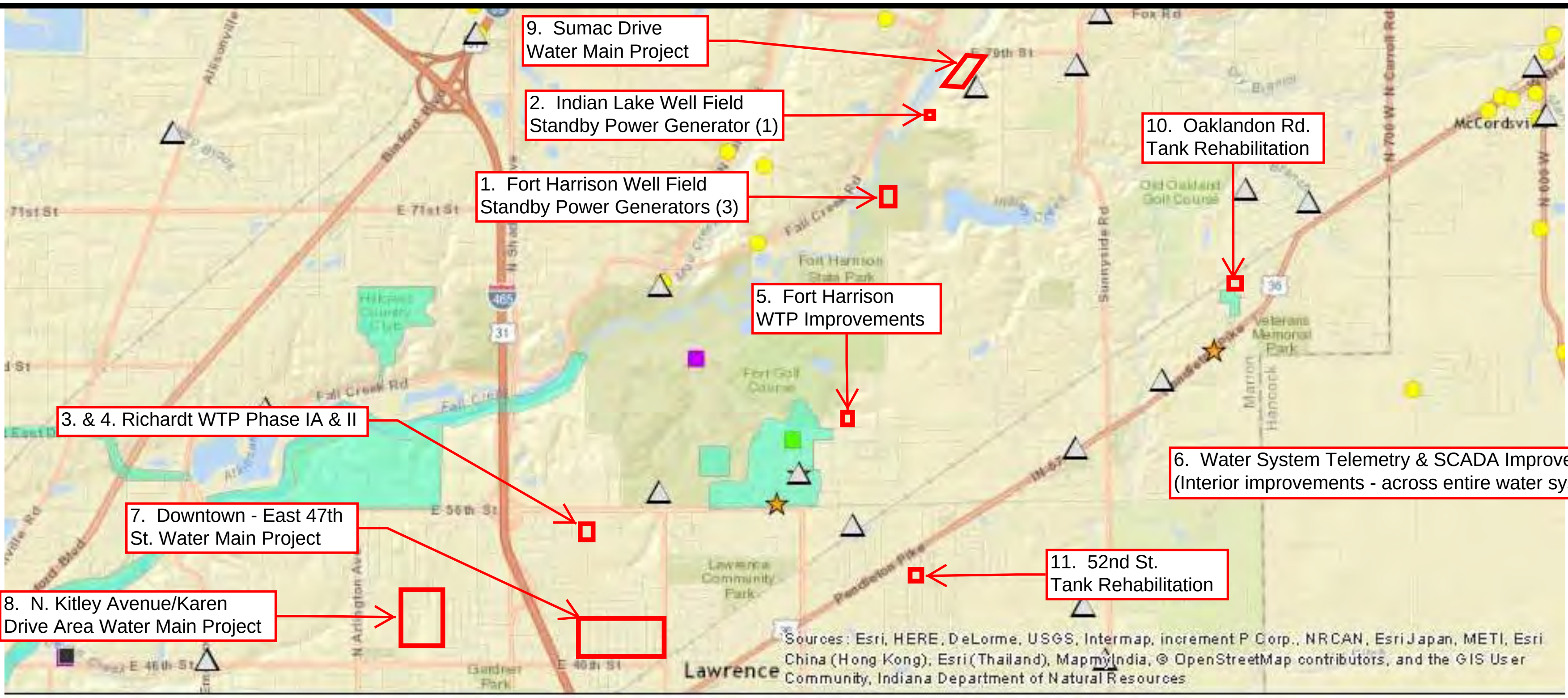

Map Coordinate System:
WGS_1984_Web_Mercator_Auxiliary_Sphere

1:81,639
Relative Scale

DNR Indiana Dept. of Natural Resources
Geographic Information Systems

Author:

△	Cemeteries	●	Unknown	■	Unknown
●	Outstanding	■	Outstanding	★	National Register Sites
●	Notable	■	Notable	■	Historic Districts
●	Contributing	■	Contributing		World Street Map
●	Non-Contributing	■	Non-Contributing		
●	Demolished	■	Demolished		

EXHIBIT A-13: SHAARDGIS MAP

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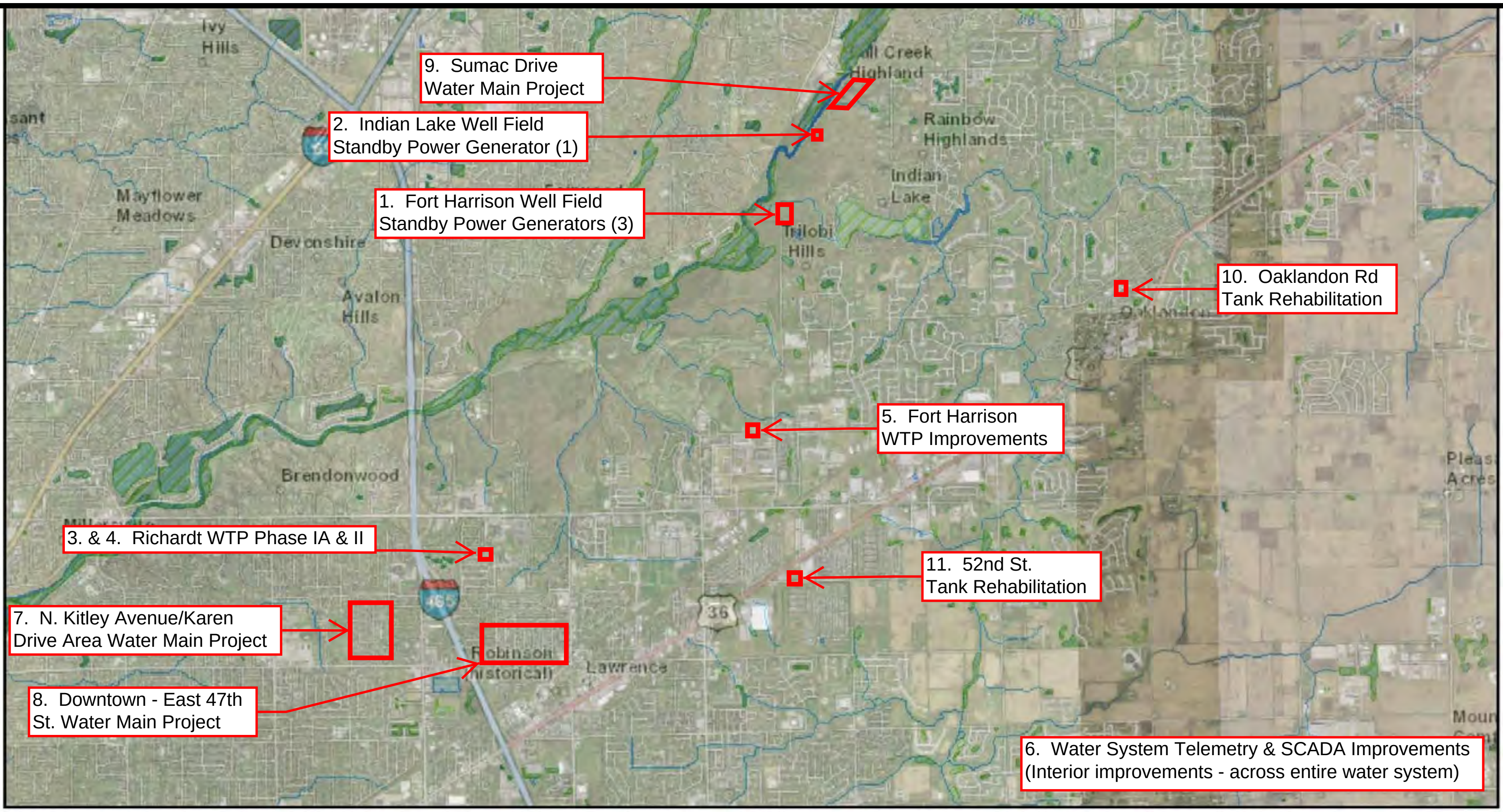
Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana
November 2016
184616.03.004



Legend

2012 Orthophotos (State boundary)

2011 Orthophotos (State boundary)

Wetlands NWI (USFWS)

Wetlands Project Metadata NWI (USFS)

Lakes (NHD)

Rivers (NHD)

1:64,000

0 0.5 1 2 mi

0 0.75 1.5 3 km

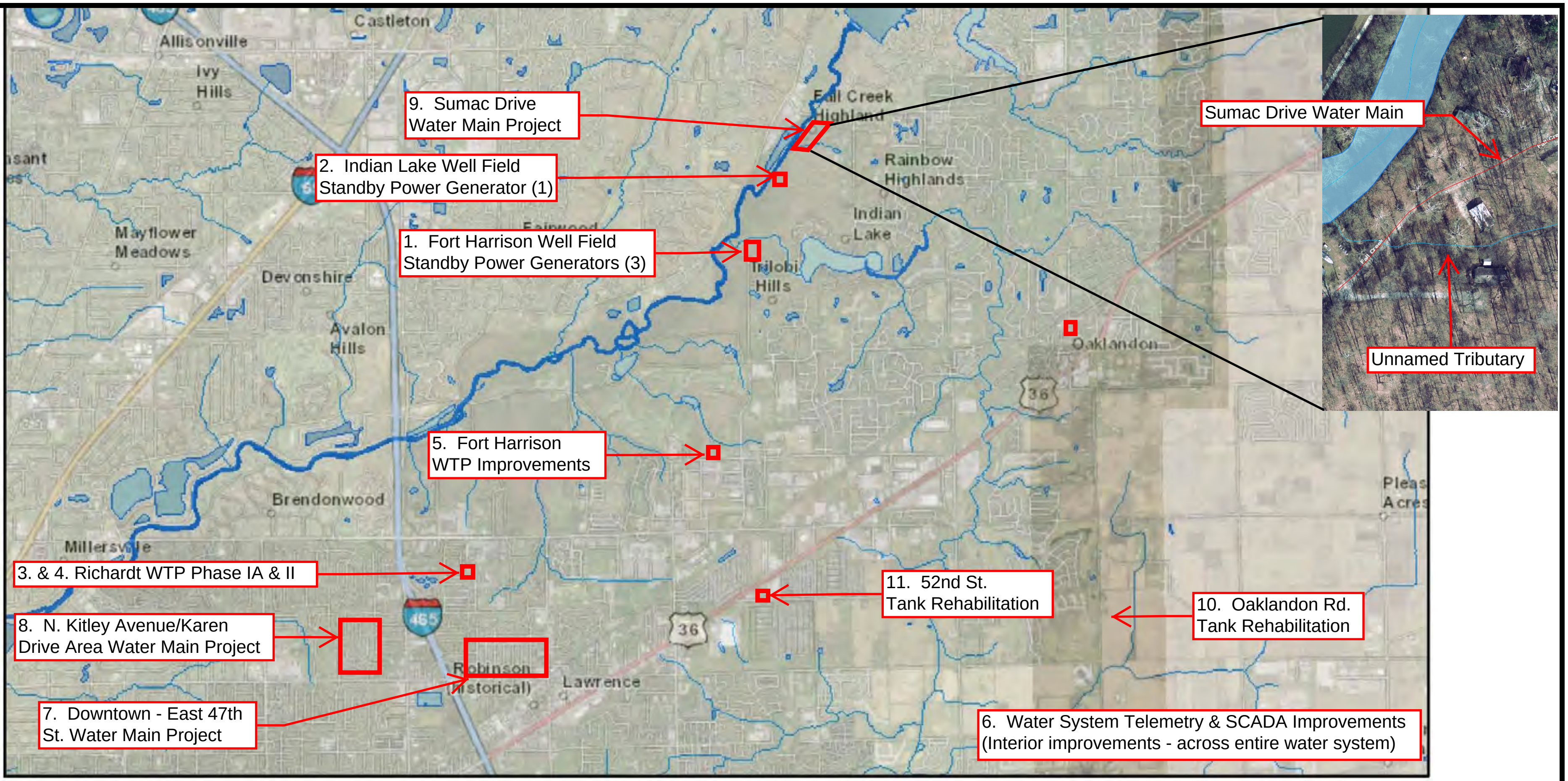
U.S. Geological Survey
U.S. Fish and Wildlife Service (USFWS) National Standards and Support

EXHIBIT A-14: WETLANDS MAP

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana
November 2016

184616.03.004

WESSLER ENGINEERING
More than a Project™



Legend

- 2012 Orthophotos (State boundary)
- 2011 Orthophotos (State boundary)
- Lakes (NHD)
- Rivers (NHD)
- Streams (NHD)

1:64,000

0 0.5 1 2 mi

0 0.75 1.5 3 km

U.S. Geological Survey
Indiana Department of Transportation (INDOT), U.S. Census Bureau (USCB),

N

WESSLER ENGINEERING
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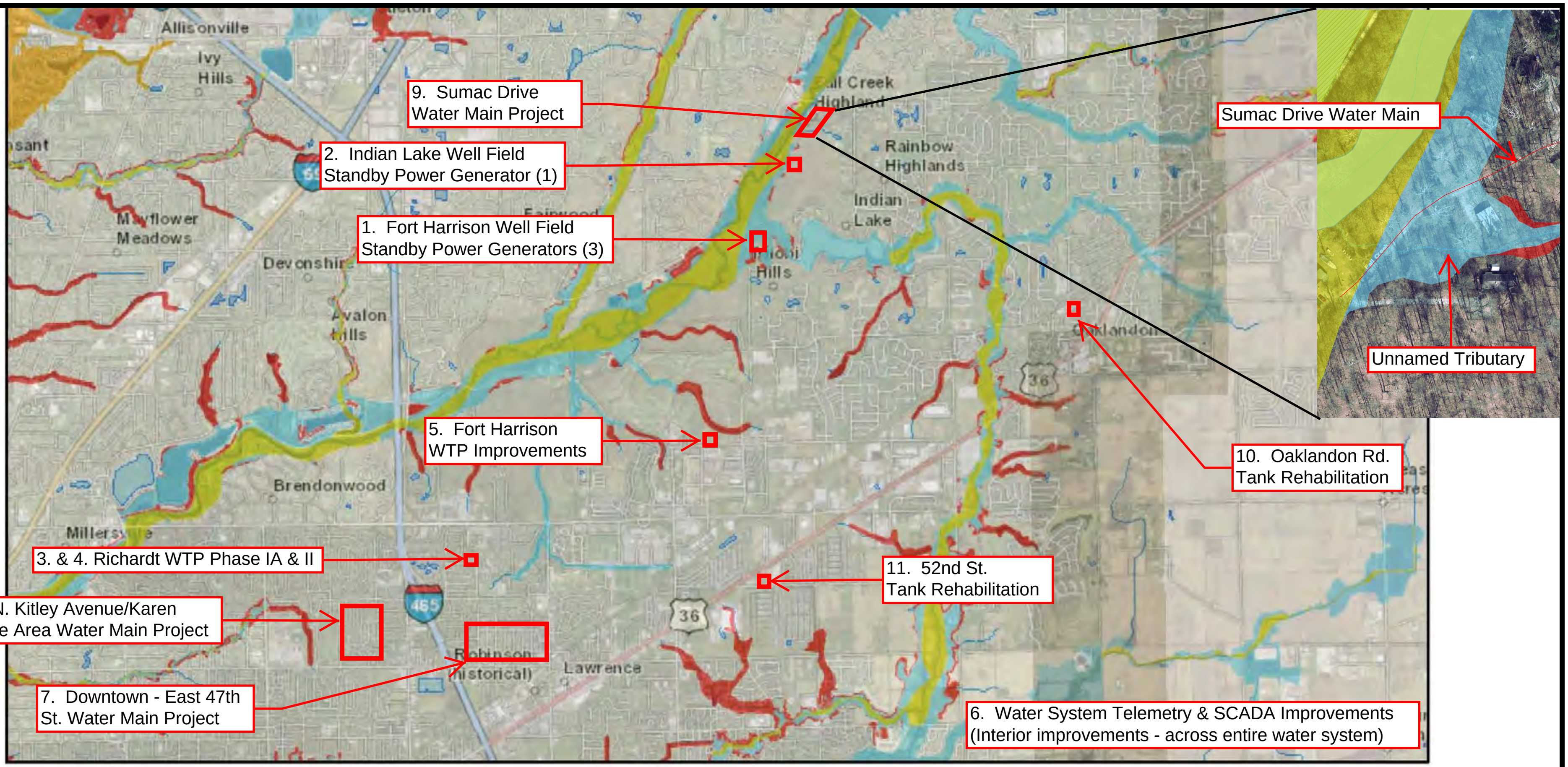
EXHIBIT A-15: SURFACE WATER MAP

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana
November 2016
184616.03.004



Legend

2012 Orthophotos (State boundary)

2011 Orthophotos (State boundary)

Floodplains - FIRM (June 2016)

Floodway

1% Annual Chance Flood Hazard

0.2% Annual Chance, Protected by Levee

0.2% Annual Chance Flood Hazard

1:64,000

0 0.5 1 2 mi

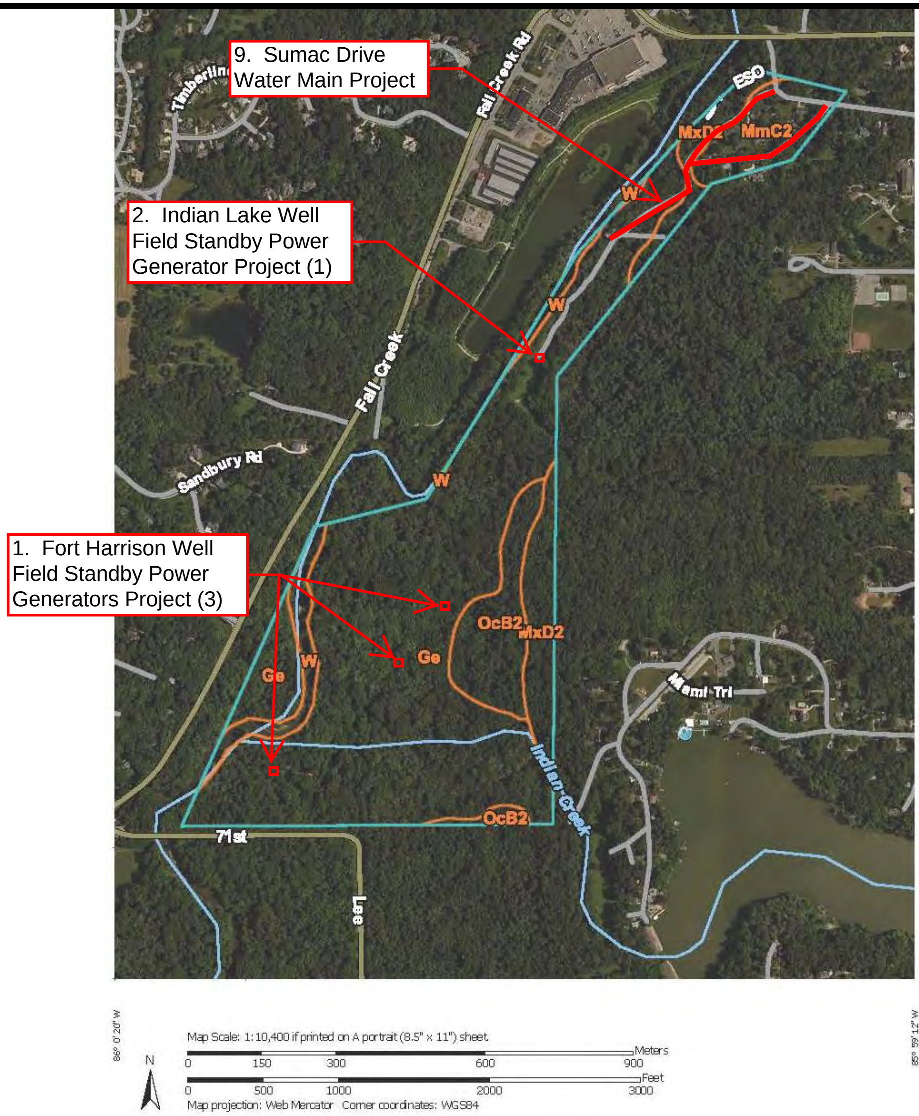
0 0.75 1.5 3 km

U.S. Geological Survey
Indiana Department of Transportation (INDOT), U.S. Census Bureau (USCB),

WESSLER ENGINEERING
More than a Project™

EXHIBIT A-16: FLOODPLAINS MAP

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana
November 2016
184616.03.004



Map Unit Legend

Marion County, Indiana (IN097)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ge	Gessie silt loam, 0 to 2 percent slopes, frequently flooded	96.3	71.7%
MmC2	Miami silt loam, 6 to 12 percent slopes, eroded	8.5	6.3%
MxD2	Miami complex, 12 to 18 percent slopes, eroded	12.1	9.0%
OcB2	Ockley silt loam, 2 to 6 percent slopes, eroded	11.5	8.6%
W	Water	5.9	4.4%
Totals for Area of Interest		**134.3**	**100.0%**

EXHIBIT A-17: SOIL SURVEY MAP

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Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana
November 2016
184616.03.004

Map Unit Legend

Marion County, Indiana (IN097)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Br	Brookston silty clay loam, 0 to 2 percent slopes	2.0	3.2%
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	59.0	96.8%
Totals for Area of Interest		**61.0**	**100.0%**

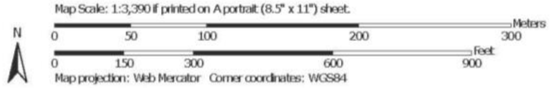

EXHIBIT A-17: SOIL SURVEY MAP

WESSLER ENGINEERING
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Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana
November 2016

184616.03.004

Map Unit Legend

Marion County, Indiana (IN097)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Br	Brookston silty clay loam, 0 to 2 percent slopes	0.1	18.8%
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	0.5	81.2%
Totals for Area of Interest		**0.6**	**100.0%**

EXHIBIT A-17: SOIL SURVEY MAP

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Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana
November 2016

184616.03.004

3. & 4. Richardt WTP Phase IA & Phase II Projects

Map Unit Legend

Marion County, Indiana (IN097)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Br	Brookston silty clay loam, 0 to 2 percent slopes	2.6	73.9%
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	0.9	26.1%
Totals for Area of Interest		3.5	100.0%

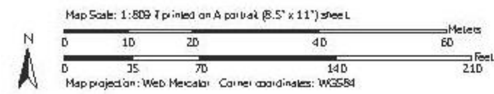

EXHIBIT A-17: SOIL SURVEY MAP

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana
November 2016

184616.03.004

WESSLER ENGINEERING
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Map Unit Legend

Map Scale: 1:5,360 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84

Marion County, Indiana (IN097)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Br	Brookston silty clay loam, 0 to 2 percent slopes	2.9	6.5%
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	41.3	93.5%
Totals for Area of Interest		**44.2**	**100.0%**

EXHIBIT A-17: SOIL SURVEY MAP

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana
November 2016

184616.03.004

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Map Scale: 1:728 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 35 70 140 210

Map projection: Web Mercator Corner coordinates: WGS84

Marion County, Indiana (IN097)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
MmB2	Miami silt loam, 2 to 6 percent slopes, eroded	1.7	73.6%
MmC2	Miami silt loam, 6 to 12 percent slopes, eroded	0.6	26.4%
Totals for Area of Interest		**2.3**	**100.0%**

EXHIBIT A-17: SOIL SURVEY MAP

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana
November 2016

184616.03.004

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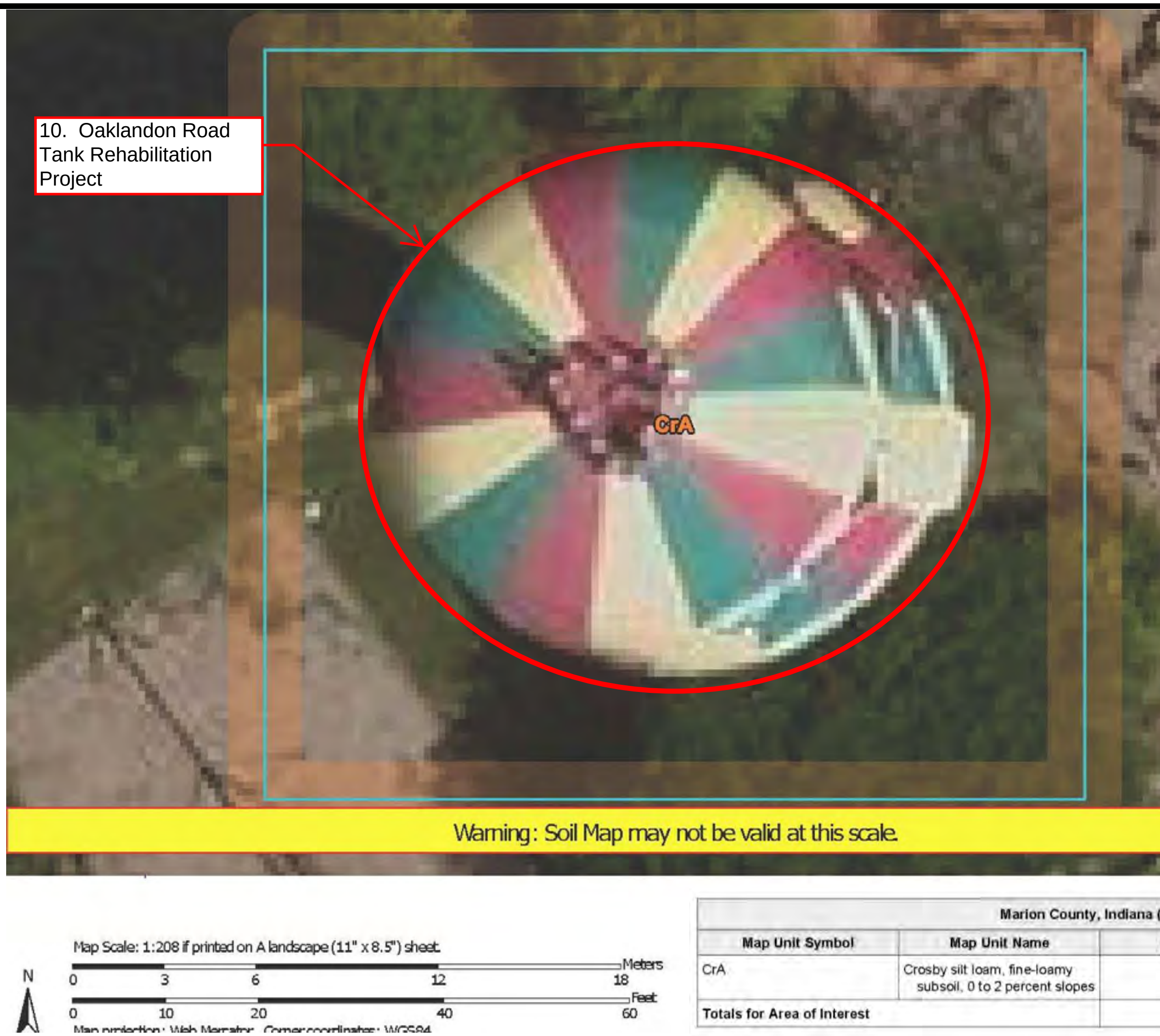

Marion County, Indiana (IN097)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	0.2	100.0%
Totals for Area of Interest		0.2	100.0%

EXHIBIT A-17: SOIL SURVEY MAP

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana
November 2016

184616.03.004

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MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Marion County, Indiana
Survey Area Data: Version 20, Sep 10, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 27, 2014—Aug 28, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

APPENDIX B

Cost Estimates

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Table B-1 - Engineer's Opinion of Probable Costs

Project No. 184616.03.004 **Asset Management and Capital Improvements Plan**
Preliminary Cost Estimate **Alternative WS-1**
Lawrence Utilities

I. Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Electrical (power service and distribution, lighting, and motor starter)	2	EA	$ 35,000	$ 70,000
2	Indian Lake Well Field Generator	1	LSUM	$ 170,000	$ 170,000
3	Fort Harrison Well Field Generators	1	LSUM	$ 330,000	$ 330,000
4	Replace Well Pumps and Motors	3	EA	$ 40,000	$ 120,000
5	SCADA Equipment- Indian Lake Well Field	1	LSUM	$ 40,000	$ 40,000
6	SCADA Programming & Startup Support- Indian Lake Well Field	1	LSUM	$ 30,000	$ 30,000
7	SCADA Equipment- Fort Harrison Well Field	3	EA	$ 25,000	$ 75,000
8	SCADA Programming & Startup Support- Fort Harrison Well Field	3	EA	$ 20,000	$ 60,000
9	Mob./Demob./Bonds/Insurance	1	LSUM	$ 50,000	$ 50,000
10	Final Cleanup & Restoration	1	LSUM	$ 50,000	$ 50,000
				Subtotal	$ 995,000
				10% Contingency	$ 100,000
				Total Probable Construction Costs	**$ 1,095,000**

II. Non-Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Survey, Design, Bid, Construction Administration, and Inspection	1	LSUM	$ 273,750	$ 273,750
				Total Probable Non-Construction Costs	**$ 274,000**

Total Probable Project Costs	**$ 1,369,000**

Note:

All probable construction costs are based upon 2016 dollars. Construction materials and costs have been volatile in recent years. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, materials, or contractors' methods of pricing. The cost estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.

Table B-2 - Engineer's Opinion of Probable Costs

Project No. 184616.03.004 — **Asset Management and Capital Improvements Plan**

Preliminary Cost Estimate — **Alternative WS-2**

Lawrence Utilities

I. Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Electrical	1	LSUM	$ 35,000	$ 35,000
2	Fort Harrison Well Field Generators	1	LSUM	$ 330,000	$ 330,000
3	Richardt Well Pump and Motor Replacement	3	EA	$ 40,000	$ 120,000
4	Mob./Demob./Bonds/Insurance	1	LSUM	$ 27,000	$ 27,000
5	Final Cleanup & Restoration	1	LSUM	$ 27,000	$ 27,000
				Subtotal	$ 539,000
				10% Contingency	$ 54,000
				Total Probable Construction Costs	**$ 593,000**

II. Non-Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Survey, Design, Bid, Construction Administration, and Inspection	1	LSUM	$ 148,250	$ 148,250
				Total Probable Non-Construction Costs	**$ 148,000**

Total Probable Project Costs	**$ 741,000**

Note:

All probable construction costs are based upon 2016 dollars. Construction materials and costs have been volatile in recent years. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, materials, or contractors' methods of pricing. The cost estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.

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Table B-3 - Engineer's Opinion of Probable Costs

Project No. 184616.03.004 — **Asset Management and Capital Improvements Plan**

Preliminary Cost Estimate — **Alternative WT-1A**

Lawrence Utilities

I. Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Phase IA Filter Rehabilitation (new media, hatches, air valves)	4	EA	$ 35,500	$ 142,000
2	Existing Facility Demolition	1	LSUM	$ 160,000	$ 160,000
3	Excavation/Backfill	1	LSUM	$ 150,000	$ 150,000
4	Detention Tank - 90,000 gallon	1	LSUM	$ 180,000	$ 180,000
5	Backwash Holding Tank - 60,000 gallon	1	LSUM	$ 115,000	$ 115,000
6	Aerator - 1,500 gpm	2	EA	$ 68,000	$ 136,000
7	Filter - 1,000 gpm	3	EA	$ 300,000	$ 900,000
8	High Service Pump - 1,000 gpm	3	EA	$ 30,000	$ 90,000
9	Process Piping	1	LSUM	$ 250,000	$ 250,000
10	Chemical Feed Piping and Equipment	1	LSUM	$ 80,000	$ 80,000
11	Chlorine Analyzers	1	LSUM	$ 40,000	$ 40,000
12	Fluoride Feed System	1	LSUM	$ 7,500	$ 7,500
13	Turbidimeter	1	LSUM	$ 12,000	$ 12,000
14	Level and Pressure Instruments	1	LSUM	$ 30,000	$ 30,000
15	Lab & Control Room Furnishings	1	LSUM	$ 25,000	$ 25,000
16	Plumbing	1	LSUM	$ 40,000	$ 40,000
17	HVAC	1	LSUM	$ 75,000	$ 75,000
18	Electrical (MCC, transformers, lighting panels, conduit, and wire)	1	LSUM	$ 250,000	$ 250,000
19	SCADA Equipment	1	LSUM	$ 140,000	$ 140,000
20	SCADA Programming & Startup Support	1	LSUM	$ 140,000	$ 140,000
21	Meters	1	LSUM	$ 35,000	$ 35,000
22	Generator - 500 kW Diesel	1	LSUM	$ 160,000	$ 160,000
23	Doors & Windows	1	LSUM	$ 20,000	$ 20,000
24	Building - 30'x72'	2,200	SQ FT	$ 190	$ 418,000
25	Fencing/Gates	1	LSUM	$ 40,000	$ 40,000
26	Building Specialties	1	LSUM	$ 30,000	$ 30,000
27	Miscellaneous Metals	1	LSUM	$ 40,000	$ 40,000
28	Detention Tank Transfer Valves	1	LSUM	$ 15,000	$ 15,000
29	Pump Crane & Clearwell Hoist	1	LSUM	$ 20,000	$ 20,000
30	Well Motor VFD's	4	EA	$ 20,000	$ 80,000
31	Coatings - Filters and Piping	1	LSUM	$ 70,000	$ 70,000
32	Concrete Sidewalk	1	LSUM	$ 16,000	$ 16,000
33	Stone Drives	1	LSUM	$ 12,000	$ 12,000
34	Dewatering	1	LSUM	$ 17,000	$ 17,000
35	Site Grading, Seeding, & Landscaping	1	LSUM	$ 15,000	$ 15,000
36	Site Asphalt	1	LSUM	$ 180,000	$ 180,000
37	Storm Drainage	1	LSUM	$ 55,000	$ 55,000
38	Well 4 Rehabilitation	1	LSUM	$ 25,000	$ 25,000
39	Well House Rehabilitation	1	LSUM	$ 140,000	$ 140,000
40	Mob./Demob./Bonds/Insurance	1	LSUM	$ 138,000	$ 138,000
41	Final Cleanup & Restoration	1	LSUM	$ 92,000	$ 92,000
				Subtotal	$ 4,580,500
				10% Contingency	$ 458,000
				Total Probable Construction Costs	**$ 5,038,500**

II. Non-Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Study	1	LSUM	$ 15,000	$ 15,000
2	Well Field Safe Yield Analysis	1	LSUM	$ 15,000	$ 15,000
3	Survey, Design, Bid, Construction Administration, and Inspection	1	LSUM	$ 756,000	$ 756,000
	Total Probable Non-Construction Costs				**$ 786,000**

Total Probable Project Costs	**$ 5,824,500**

Note:

All probable construction costs are based upon 2016 dollars. Construction materials and costs have been volatile in recent years. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, materials, or contractors' methods of pricing. The cost estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.

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Table B-4 - Engineer's Opinion of Probable Costs

Project No. 184616.03.004 — **Asset Management and Capital Improvements Plan**

Preliminary Cost Estimate — **Alternative WT-1B**

Lawrence Utilities

I. Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Existing Building Demolition	1	LSUM	$ 150,000	$ 150,000
2	Excavation/Backfill	1	LSUM	$ 170,000	$ 170,000
3	Detention Tank - 90,000 gallon	1	LSUM	$ 180,000	$ 180,000
4	Aerator - 1,500 gpm	2	EA	$ 68,000	$ 136,000
5	Horizontal Pressure Filter - 1,000 gpm	3	EA	$ 310,000	$ 930,000
6	Backwash Holding Tank - 60,000 gallon	1	LSUM	$ 125,000	$ 125,000
7	High Service Pumps 1 & 3 Replacement - 1,200 gpm	2	EA	$ 30,000	$ 60,000
8	Process Piping	1	LSUM	$ 185,000	$ 185,000
9	Chemical Feed Piping & Equipment	1	LSUM	$ 90,000	$ 90,000
10	Chemical Feed Analyzers	1	LSUM	$ 30,000	$ 30,000
11	Fluoride Chemical Feed System	1	LSUM	$ 7,500	$ 7,500
12	Lab Equipment	1	LSUM	$ 30,000	$ 30,000
13	Plumbing	1	LSUM	$ 50,000	$ 50,000
14	HVAC	1	LSUM	$ 85,000	$ 85,000
15	Electrical (MCC, conduit, wire, and lighting)	1	LSUM	$ 140,000	$ 140,000
16	SCADA Equipment (Does not incl. Wells- See WS-1)	1	LSUM	$ 150,000	$ 150,000
17	SCADA Programming & Startup Support (Does not incl. Wells- See WS-1)	1	LSUM	$ 100,000	$ 100,000
18	Doors & Windows	1	LSUM	$ 30,000	$ 30,000
19	Filter Building	2,200	SQ FT	$ 200	$ 440,000
20	Storage Building	500	SQ FT	$ 150	$ 75,000
21	New Pump Building Standing Seam Metal Roof	1	LSUM	$ 50,000	$ 50,000
22	Micellaneous Metals	1	LSUM	$ 40,000	$ 40,000
23	Gantry Crane	1	LSUM	$ 20,000	$ 20,000
24	Coatings - Filters & Piping	1	LSUM	$ 80,000	$ 80,000
25	Asphalt Paving	1	LSUM	$ 110,000	$ 110,000
26	Dewatering	1	LSUM	$ 20,000	$ 20,000
27	Site Grading, Seeding, & Landscaping	1	LSUM	$ 20,000	$ 20,000
28	3 MG Storage Reservoir Rehabilitation	1	LSUM	$ 750,000	$ 750,000
29	Mob./Demob./Bonds/Insurance	1	LSUM	$ 125,000	$ 125,000
30	Final Cleanup & Restoration	1	LSUM	$ 85,000	$ 85,000
				Subtotal	$ 4,463,500
				10% Contingency	$ 446,000
				Total Probable Construction Costs	**$ 4,909,500**

II. Non-Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Survey, Design, Bid, Construction Administration, and Inspection	1	LSUM	$ 1,228,000	$ 1,228,000
				Total Probable Non-Construction Costs	**$ 1,228,000**

Total Probable Project Costs	**$ 6,137,500**

Note:

All probable construction costs are based upon 2016 dollars. Construction materials and costs have been volatile in recent years. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, materials, or contractors' methods of pricing. The cost estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.

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Table B-5 - Engineer's Opinion of Probable Costs

Project No. 184616.03.004 | **Asset Management and Capital Improvements Plan**
Preliminary Cost Estimate | **Alternative WT-1C**
Lawrence Utilities

I. Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Electrical (Conduit and wire for SCADA)	1	LSUM	$ 60,000	$ 60,000
2	SCADA Equipment	1	LSUM	$ 100,000	$ 100,000
3	SCADA Programming & Startup Support	1	LSUM	$ 100,000	$ 100,000
4	Mob./Demob./Bonds/Insurance	1	LSUM	$ 14,000	$ 14,000
				Subtotal	$ 274,000
				10% Contingency	$ 27,000
				Total Probable Construction Costs	**$ 301,000**

II. Non-Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Survey, Design, Bid, Construction Administration, and Inspection	1	LSUM	$ 76,000	$ 76,000
				Total Probable Non-Construction Costs	**$ 76,000**

Total Probable Project Costs	**$ 377,000**

Note:

All probable construction costs are based upon 2016 dollars. Construction materials and costs have been volatile in recent years. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, materials, or contractors' methods of pricing. The cost estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.

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Table B-6 - Engineer's Opinion of Probable Costs

Project No. **184616.03.004** — **Asset Management and Capital Improvements Plan**

Preliminary Cost Estimate — **Alternative WT-2**

Lawrence Utilities

I. Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Existing Facility Demolition	1	LSUM	$ 160,000	$ 160,000
2	Excavation/Backfill	1	LSUM	$ 200,000	$ 200,000
3	Detention Tank - 112,500 gallon	1	LSUM	$ 225,000	$ 225,000
4	Backwash Holding Tank - 95,000 gallon	1	LSUM	$ 150,000	$ 150,000
5	Aerator - 2,000 gpm	2	EA	$ 75,000	$ 150,000
6	Filter - 1,250 gpm	3	EA	$ 325,000	$ 975,000
7	High Service Pump - 1,250 gpm	3	EA	$ 30,000	$ 90,000
8	Well Pump and Motor	3	EA	$ 40,000	$ 120,000
9	Process Piping	1	LSUM	$ 250,000	$ 250,000
10	Chemical Feed Piping and Equipment	1	LSUM	$ 80,000	$ 80,000
11	Chlorine Analyzers	1	LSUM	$ 40,000	$ 40,000
12	Fluoride Feed System	1	LSUM	$ 7,500	$ 7,500
13	Turbidimeter	1	LSUM	$ 12,000	$ 12,000
14	Level and Pressure Instruments	1	LSUM	$ 30,000	$ 30,000
15	Lab & Control Room Furnishings	1	LSUM	$ 25,000	$ 25,000
16	Plumbing	1	LSUM	$ 40,000	$ 40,000
17	HVAC	1	LSUM	$ 75,000	$ 75,000
18	Electrical (MCC, transformers, lighting panels, conduit, and wire)	1	LSUM	$ 250,000	$ 250,000
19	SCADA Equipment	1	LSUM	$ 140,000	$ 140,000
20	SCADA Programming & Startup Support	1	LSUM	$ 140,000	$ 140,000
21	Meters	1	LSUM	$ 35,000	$ 35,000
22	Generator	1	LSUM	$ 180,000	$ 180,000
23	Doors & Windows	1	LSUM	$ 20,000	$ 20,000
24	Building - 30'x72'	2,200	SQ FT	$ 190	$ 418,000
25	Fencing/Gates	1	LSUM	$ 40,000	$ 40,000
26	Building Specialties	1	LSUM	$ 30,000	$ 30,000
27	Miscellaneous Metals	1	LSUM	$ 40,000	$ 40,000
28	Detention Tank Transfer Valves	1	LSUM	$ 15,000	$ 15,000
29	Pump Crane & Clearwell Hoist	1	LSUM	$ 20,000	$ 20,000
30	Well Motor VFD's	4	EA	$ 25,000	$ 100,000
31	Coatings - Filters and Piping	1	LSUM	$ 70,000	$ 70,000
32	Concrete Sidewalk	1	LSUM	$ 16,000	$ 16,000
33	Stone Drives	1	LSUM	$ 12,000	$ 12,000
34	Dewatering	1	LSUM	$ 17,000	$ 17,000
35	Site Grading, Seeding, & Landscaping	1	LSUM	$ 15,000	$ 15,000
36	Site Asphalt	1	LSUM	$ 180,000	$ 180,000
37	Storm Drainage	1	LSUM	$ 55,000	$ 55,000
38	Well 4 Rehabilitation	1	LSUM	$ 25,000	$ 25,000
39	Well House Rehabilitation	1	LSUM	$ 140,000	$ 140,000
40	Abandon Indian Lake Wells	1	LSUM	$ 40,000	$ 40,000
41	Mob./Demob./Bonds/Insurance	1	LSUM	$ 147,000	$ 147,000
42	Final Cleanup & Restoration	1	LSUM	$ 98,000	$ 98,000
				Subtotal	$ 4,872,500
				10% Contingency	$ 487,000
				Total Probable Construction Costs	**$ 5,359,500**

II. Non-Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Study	1	LSUM	$ 15,000	$ 15,000
2	Well Field Safe Yield Analysis	1	LSUM	$ 15,000	$ 15,000
3	Survey, Design, Bid, Construction Administration, and Inspection	1	LSUM	$ 804,000	$ 804,000
				Total Probable Non-Construction Costs	**$ 834,000**

Total Probable Project Costs	**$ 6,193,500**

Note:

All probable construction costs are based upon 2016 dollars. Construction materials and costs have been volatile in recent years. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, materials, or contractors' methods of pricing. The cost estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.

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Table B-7 - Engineer's Opinion of Probable Costs

Project No. 184616.03.004 — **Asset Management and Capital Improvements Plan**

Preliminary Cost Estimate — **Alternative ST-1**

Lawrence Utilities

I. Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Oaklandon Rd. Tank Rehabilitation	1	LSUM	$ 365,000	$ 365,000
2	Electrical (Conduit and wire for SCADA)	1	LSUM	$ 20,000	$ 20,000
3	SCADA Equipment	1	LSUM	$ 25,000	$ 25,000
4	SCADA Programming & Startup Support	1	LSUM	$ 20,000	$ 20,000
				Subtotal	$ 430,000
				10% Contingency	$ 43,000
				Total Probable Construction Costs	**$ 473,000**

II. Non-Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Tank Inspection	1	LSUM	$ 7,500	$ 7,500
2	Survey, Design, Bid, Construction Administration, and Inspection	1	LSUM	$ 119,000	$ 119,000
				Total Probable Non-Construction Costs	**$ 127,000**

Total Probable Project Costs	**$ 600,000**

Note:

All probable construction costs are based upon 2016 dollars. Construction materials and costs have been volatile in recent years. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, materials, or contractors' methods of pricing. The cost estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.

More than a Project™

Table B-8 - Engineer's Opinion of Probable Costs

Project No. 184616.03.004 | **Asset Management and Capital Improvements Plan**
Preliminary Cost Estimate | **Alternative ST-2**
Lawrence Utilities

I. Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	52nd St. Tank Rehabilitation	1	LSUM	$ 275,000	$ 275,000
2	Electrical (Conduit and wire for SCADA)	1	LSUM	$ 20,000	$ 20,000
3	SCADA Equipment	1	LSUM	$ 25,000	$ 25,000
4	SCADA Programming & Startup Support	1	LSUM	$ 20,000	$ 20,000
				Subtotal	$ 340,000
				10% Contingency	$ 34,000
				Total Probable Construction Costs	**$ 374,000**

II. Non-Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Tank Inspection	1	LSUM	$ 7,500	$ 7,500
2	Survey, Design, Bid, Construction Administration, and Inspection	1	LSUM	$ 94,000	$ 94,000
				Total Probable Non-Construction Costs	**$ 102,000**

Total Probable Project Costs	**$ 476,000**

Note:

All probable construction costs are based upon 2016 dollars. Construction materials and costs have been volatile in recent years. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, materials, or contractors' methods of pricing. The cost estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.

Table B-9 - Engineer's Opinion of Probable Costs

Project No. 184616.03.004 — **Asset Management and Capital Improvements Plan**

Preliminary Cost Estimate — **Alternative DS-1**

Lawrence Utilities

I. Line D1A - N Sadler Dr (between W 46th St and E 47th St)

Item	Description	Quantity	Unit	Unit Price	Total Price
1	6" C900 PVC Water Main (Open Cut)	655	LFT	$ 55	$ 36,025
2	H-3 Hydrant Assembly	1	EA	$ 5,500	$ 5,500
3	6" Gate Valve & Box	1	EA	$ 1,700	$ 1,700
4	6" Connect to Existing Main	1	EA	$ 4,000	$ 4,000
5	3/4" Water Service Reconnect	16	EA	$ 1,800	$ 28,800
6	Pavement Repair	200	LFT	$ 85	$ 17,000
7	Mob./Demob./Bonds/Insurance	1	LSUM	$ 10,000	$ 10,000
8	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$ 10,000	$ 10,000
				Subtotal	$ 114,000
				10% Contingency	$ 11,000
				Total Probable Construction Costs	**$ 125,000**

II. Line D1B - E 46th St (between N Sadler Dr and N Hartman Dr)

Item	Description	Quantity	Unit	Unit Price	Total Price
1	6" C900 PVC Water Main (Open Cut)	180	LFT	$ 55	$ 9,900
2	6" Gate Valve & Box	1	EA	$ 1,700	$ 1,700
3	6" Connect to Existing Main	1	EA	$ 4,000	$ 4,000
4	3/4" Water Service Reconnect	6	EA	$ 1,800	$ 10,800
5	Pavement Repair	75	LFT	$ 85	$ 6,375
6	Mob./Demob./Bonds/Insurance	1	LSUM	$ 3,000	$ 3,000
7	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$ 3,000	$ 3,000
				Subtotal	$ 39,000
				10% Contingency	$ 4,000
				Total Probable Construction Costs	**$ 43,000**

III. Line D1C - E 47th St (between N Sadler Dr and N Richardt Ave)

Item	Description	Quantity	Unit	Unit Price	Total Price
1	6" C900 PVC Water Main (Open Cut)	300	LFT	$ 55	$ 16,500
2	H-3 Hydrant Assembly	1	EA	$ 5,500	$ 5,500
3	6" Gate Valve & Box	1	EA	$ 1,700	$ 1,700
4	6" Connect to Existing Main	1	EA	$ 4,000	$ 4,000
5	3/4" Water Service Reconnect	1	EA	$ 1,800	$ 1,800
6	Pavement Repair	50	LFT	$ 85	$ 4,250
7	Mob./Demob./Bonds/Insurance	1	LSUM	$ 4,000	$ 4,000
8	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$ 4,000	$ 4,000
				Subtotal	$ 42,000
				10% Contingency	$ 4,000
				Total Probable Construction Costs	**$ 46,000**

IV. Line D1D - N Richardt Ave (between E 47th St and E 48th St)

Item	Description	Quantity	Unit	Unit Price	Total Price
1	8" C900 PVC Water Main (Open Cut)	550	LFT	$ 80	$ 44,000
2	8" Gate Valve & Box	1	EA	$ 2,500	$ 2,500
3	8" Connect to Existing Main	2	EA	$ 5,500	$ 11,000
4	3/4" Water Service Reconnect	12	EA	$ 1,800	$ 21,600
5	Pavement Repair	550	LFT	$ 85	$ 46,750
6	Mob./Demob./Bonds/Insurance	1	LSUM	$ 13,000	$ 13,000
7	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$ 13,000	$ 13,000
				Subtotal	$ 152,000
				10% Contingency	$ 15,000
				Total Probable Construction Costs	**$ 167,000**

V. Line D1E - E 47th St (between N Richardt Ave and N Franklin Rd)

Item	Description	Quantity	Unit	Unit Price	Total Price
1	6" RJ C900 PVC Water Main (HDD)	2,650	LFT	$ 75	$ 198,750
2	H-3 Hydrant Assembly	6	EA	$ 5,500	$ 33,000
3	6" Gate Valve & Box	4	EA	$ 1,700	$ 6,800
4	6" Connect to Existing Main	15	EA	$ 4,000	$ 60,000
5	3/4" Water Service Reconnect	30	EA	$ 1,800	$ 54,000
6	Pavement Repair	700	LFT	$ 85	$ 59,500
7	Mob./Demob./Bonds/Insurance	1	LSUM	$ 40,000	$ 40,000
8	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$ 40,000	$ 40,000
				Subtotal	$ 493,000
				10% Contingency	$ 49,000
				Total Probable Construction Costs	**$ 542,000**

VI. Line D1F - Longworth Ave (south of E 47th St)

Item	Description	Quantity	Unit	Unit Price	Total Price
1	4" RJ C900 PVC Water Main (HDD)	270	LFT	$ 70	$ 18,900
2	4" Connect to Existing Main	1	EA	$ 3,500	$ 3,500
3	3/4" Water Service Reconnect	8	EA	$ 1,800	$ 14,400
4	Concrete Sidewalk Repair	40	LFT	$ 35	$ 1,400
5	Pavement Repair	25	LFT	$ 85	$ 2,125
6	Mob./Demob./Bonds/Insurance	1	LSUM	$ 5,000	$ 5,000
7	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$ 5,000	$ 5,000
				Subtotal	$ 51,000
				10% Contingency	$ 5,000
				Total Probable Construction Costs	**$ 56,000**

VII. Line D1G - Payton Ave (south of E 47th St)

Item	Description	Quantity	Unit	Unit Price		Total Price	
1	4" RJ C900 PVC Water Main (HDD)	260	LFT	$	70	$	18,200
2	4" Connect to Existing Main	1	EA	$	3,500	$	3,500
3	3/4" Water Service Reconnect	10	EA	$	1,800	$	18,000
4	Pavement Repair	75	LFT	$	85	$	6,375
5	Mob./Demob./Bonds/Insurance	1	LSUM	$	6,000	$	6,000
6	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$	6,000	$	6,000
					Subtotal	$	59,000
					10% Contingency	$	6,000
					Total Probable Construction Costs	**$**	**65,000**

VIII. Line D1H - Payton Ave (between E 47th St and E 48th St)

Item	Description	Quantity	Unit	Unit Price		Total Price	
1	6" RJ C900 PVC Water Main (HDD)	820	LFT	$	75	$	61,500
2	6" Connect to Existing Main	2	EA	$	4,000	$	8,000
3	3/4" Water Service Reconnect	26	EA	$	1,800	$	46,800
4	Abandon Parallel Water Main	1	LSUM	$	3,500	$	3,500
5	Pavement Repair	160	LFT	$	85	$	13,600
6	Mob./Demob./Bonds/Insurance	1	LSUM	$	14,000	$	14,000
7	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$	14,000	$	14,000
					Subtotal	$	162,000
					10% Contingency	$	16,000
					Total Probable Construction Costs	**$**	**178,000**

Total Probable Project Construction Costs	**$**	**1,222,000**

IX. Non-Construction Costs

Item	Description	Quantity	Unit	Unit Price		Total Price	
1	Survey, Design, Bid, Construction Administration, and Inspection	1	LSUM	$	306,000	**$**	**306,000**

Total Probable ProjectCosts	**$**	**1,528,000**

Note:

All probable construction costs are based upon 2016 dollars. Construction materials and costs have been volatile in recent years. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, materials, or contractors' methods of pricing. The cost estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.

Assumptions:

1.) Hydrant spacing based on existing hydrant locations.

2.) Assumes all tie overs to existing mains will be done via tapping sleeves, reducing the number of valves needed.

3.) Remaining valve placement based on location of existing valves.

4.) Assumes that all 2-inch mains will be upsized to 4-inch mains.

5.) Number of services based on GIS parcel data.

Table B-10 - Engineer's Opinion of Probable Costs

Project No. **184616.03.004** **Asset Management and Capital Improvements Plan**
Preliminary Cost Estimate **Alternative DS-2**
Lawrence Utilities

I. Line D2A - N Kitley Ave (between Brookhaven Dr and E 49th St)

Item	Description	Quantity	Unit	Unit Price		Total Price	
1	6" C900 PVC Water Main (Open Cut)	1,200	LFT	$	55	$	66,000
2	H-3 Hydrant Assembly	2	EA	$	5,500	$	11,000
3	6" Gate Valve & Box	1	EA	$	1,700	$	1,700
4	4" Connect to Existing Main	1	EA	$	3,500	$	3,500
5	6" Connect to Existing Main	1	EA	$	4,000	$	4,000
6	3/4" Water Service Reconnect	38	EA	$	1,800	$	68,400
7	Pavement Repair	630	LFT	$	85	$	53,550
8	Concrete Sidewalk Repair	20	LFT	$	35	$	700
9	Concrete Curb & Gutter Repair	20	LFT	$	75	$	1,500
10	Mob./Demob./Bonds/Insurance	1	LSUM	$	22,000	$	22,000
11	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$	22,000	$	22,000
					Subtotal	$	255,000
					10% Contingency	$	26,000
					Total Probable Construction Costs	**$**	**281,000**

II. Line D2B - Katherine Dr (between N Kenyon Dr and Karen Dr)

Item	Description	Quantity	Unit	Unit Price		Total Price	
1	6" C900 PVC Water Main (Open Cut)	1,750	LFT	$	55	$	96,250
2	H-3 Hydrant Assembly	3	EA	$	5,500	$	16,500
3	6" Gate Valve & Box	2	EA	$	1,700	$	3,400
4	6" Connect to Existing Main	3	EA	$	4,000	$	12,000
5	3/4" Water Service Reconnect	54	EA	$	1,800	$	97,200
6	Pavement Repair	700	LFT	$	85	$	59,500
7	Concrete Sidewalk Repair	20	LFT	$	35	$	700
8	Concrete Curb & Gutter Repair	20	LFT	$	75	$	1,500
9	Mob./Demob./Bonds/Insurance	1	LSUM	$	30,000	$	30,000
10	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$	30,000	$	30,000
					Subtotal	$	348,000
					10% Contingency	$	35,000
					Total Probable Construction Costs	**$**	**383,000**

III. Line D2C - N Kenyon Dr (between Leone Dr and Karen Dr)

Item	Description	Quantity	Unit	Unit Price		Total Price	
1	6" C900 PVC Water Main (Open Cut)	1,480	LFT	$	55	$	81,400
2	H-3 Hydrant Assembly	2	EA	$	5,500	$	11,000
3	6" Gate Valve & Box	1	EA	$	1,700	$	1,700
4	6" Connect to Existing Main	2	EA	$	4,000	$	8,000
5	3/4" Water Service Reconnect	46	EA	$	1,800	$	82,800
6	Pavement Repair	520	LFT	$	85	$	44,200
7	Concrete Sidewalk Repair	20	LFT	$	35	$	700
8	Concrete Curb & Gutter Repair	20	LFT	$	75	$	1,500
9	Mob./Demob./Bonds/Insurance	1	LSUM	$	24,000	$	24,000
10	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$	24,000	$	24,000
					Subtotal	$	280,000
					10% Contingency	$	28,000
					Total Probable Construction Costs	**$**	**308,000**

IV. Line D2D - Karen Dr (between Leone Dr and E 49th St)

Item	Description	Quantity	Unit	Unit Price		Total Price	
1	6" C900 PVC Water Main (Open Cut)	1,200	LFT	$	55	$	66,000
2	H-3 Hydrant Assembly	2	EA	$	5,500	$	11,000
3	6" Gate Valve & Box	1	EA	$	1,700	$	1,700
4	6" Connect to Existing Main	2	EA	$	4,000	$	8,000
5	3/4" Water Service Reconnect	34	EA	$	1,800	$	61,200
6	Pavement Repair	415	LFT	$	85	$	35,275
7	Concrete Sidewalk Repair	35	LFT	$	35	$	1,225
8	Concrete Curb & Gutter Repair	20	LFT	$	75	$	1,500
9	Mob./Demob./Bonds/Insurance	1	LSUM	$	20,000	$	20,000
10	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$	20,000	$	20,000
					Subtotal	$	226,000
					10% Contingency	$	23,000
					Total Probable Construction Costs	**$**	**249,000**

V. Line D2E - Leone Dr (between N Kenyon Dr and E 49th St)

Item	Description	Quantity	Unit	Unit Price		Total Price	
1	6" C900 PVC Water Main (Open Cut)	1,320	LFT	$	55	$	72,600
2	H-3 Hydrant Assembly	1	EA	$	5,500	$	5,500
3	6" Gate Valve & Box	1	EA	$	1,700	$	1,700
4	4" Connect to Existing Main	1	EA	$	3,500	$	3,500
5	6" Connect to Existing Main	4	EA	$	4,000	$	16,000
6	3/4" Water Service Reconnect	30	EA	$	1,800	$	54,000
7	Pavement Repair	400	LFT	$	85	$	34,000
8	Concrete Sidewalk Repair	40	LFT	$	35	$	1,400
9	Concrete Curb & Gutter Repair	20	LFT	$	75	$	1,500
10	Mob./Demob./Bonds/Insurance	1	LSUM	$	20,000	$	20,000
11	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$	20,000	$	20,000
					Subtotal	$	231,000
					10% Contingency	$	23,000
					Total Probable Construction Costs	**$**	**254,000**

Total Probable Project Construction Costs	**$**	**1,475,000**

VI. Non-Construction Costs

Item	Description	Quantity	Unit	Unit Price		Total Price	
1	Survey, Design, Bid, Construction Administration, and Inspection	1	LSUM	$	369,000	**$**	**369,000**

Total Probable ProjectCosts	**$**	**1,844,000**

Note:

All probable construction costs are based upon 2016 dollars. Construction materials and costs have been volatile in recent years. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, materials, or contractors' methods of pricing. The cost estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.

Assumptions:

1.) Hydrant spacing based on existing hydrant locations.
2.) Assumes all tie overs to existing mains will be done via tapping sleeves, reducing the number of valves needed.
3.) Remaining valve placement based on location of existing valves.
4.) Assumes that all 2-inch mains will be upsized to 4-inch mains.
5.) Number of services based on GIS parcel data.

Table B-11 - Engineer's Opinion of Probable Costs

Project No. **184616.03.004** **Asset Management and Capital Improvements Plan**

Preliminary Cost Estimate **Alternative DS-3**

Lawrence Utilities

I. Line D8A - Sumac Ln (between Hermosa Dr and Fall Creek Dr)

Item	Description	Quantity	Unit	Unit Price	Total Price
1	6" C900 PVC Water Main (Open Cut)	1,100	LFT	$ 55	$ 60,500
2	H-3 Hydrant Assembly	1	EA	$ 5,500	$ 5,500
3	8" Connect to Existing Main	2	EA	$ 5,500	$ 11,000
4	3/4" Water Service Reconnect	7	EA	$ 1,800	$ 12,600
5	Pavement Repair	100	EA	$ 85	$ 8,500
6	Mob./Demob./Bonds/Insurance	1	LSUM	$ 10,000	$ 10,000
7	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$ 10,000	$ 10,000
				Subtotal	$ 119,000
				10% Contingency	$ 12,000
				Total Probable Construction Costs	**$ 131,000**

II. Line D8B - Fall Creek Dr (south of Hermosa Dr)

Item	Description	Quantity	Unit	Unit Price	Total Price
1	8" C900 PVC Water Main (Open Cut)	1,500	LFT	$ 80	$ 120,000
2	H-3 Hydrant Assembly	3	EA	$ 5,500	$ 16,500
3	8" Gate Valve & Box	1	EA	$ 2,500	$ 2,500
4	8" Connect to Existing Main	1	EA	$ 5,500	$ 5,500
5	3/4" Water Service Reconnect	14	EA	$ 1,800	$ 25,200
6	Pavement Repair	140	LFT	$ 85	$ 11,900
7	Mob./Demob./Bonds/Insurance	1	LSUM	$ 20,000	$ 20,000
8	Erosion Control, Final Cleanup, and Restoration	1	LSUM	$ 20,000	$ 20,000
				Subtotal	$ 222,000
				10% Contingency	$ 22,000
				Total Probable Construction Costs	**$ 244,000**

Total Probable Project Construction Costs	**$ 375,000**

III. Non-Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Survey, Design, Bid, Construction Administration, and Inspection	1	LSUM	$ 94,000	**$ 94,000**

Total Probable ProjectCosts	**$ 469,000**

Note:

All probable construction costs are based upon 2016 dollars. Construction materials and costs have been volatile in recent years. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, materials, or contractors' methods of pricing. The cost estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.

Assumptions:

1.) Hydrant spacing based on existing hydrant locations.
2.) Assumes all tie overs to existing mains will be done via tapping sleeves, reducing the number of valves needed.
3.) Remaining valve placement based on location of existing valves.
4.) Assumes that all 2-inch mains will be upsized to 4-inch mains.
5.) Number of services based on GIS parcel data.

More than a Project™

Table B-12 - Engineer's Opinion of Probable Costs

Project No. 184616.03.004 — **Asset Management and Capital Improvements Plan**

Preliminary Cost Estimate — **Alternative DS-4**

Lawrence Utilities

I. Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Electrical (Conduit and wire for SCADA)	1	LSUM	$ 20,000	$ 20,000
2	SCADA Equipment	1	LSUM	$ 35,000	$ 35,000
3	SCADA Programming & Startup Support	1	LSUM	$ 30,000	$ 30,000
4	Mob./Demob./Bonds/Insurance	1	LSUM	$ 5,000	$ 5,000
				Subtotal	$ 90,000
				10% Contingency	$ 9,000
				Total Probable Construction Costs	**$ 99,000**

II. Non-Construction Costs

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Survey, Design, Bid, Construction Administration, and Inspection	1	LSUM	$ 25,000	$ 25,000
				Total Probable Non-Construction Costs	**$ 25,000**

Total Probable Project Costs	**$ 124,000**

Note:

All probable construction costs are based upon 2016 dollars. Construction materials and costs have been volatile in recent years. In providing these cost estimates, Wessler Engineering has no control over the costs of labor, equipment, materials, or contractors' methods of pricing. The cost estimates are provided on the basis of the Engineer's qualifications and experience. Wessler Engineering makes no warranty, expressed or implied, as to the accuracy of such cost estimates as compared to bids or actual costs.

APPENDIX C

Reference Data

Tested 11/2/16

Indian Lake

	Well 14	Well 15	Well 16
Iron	1.29	1.77	1.15
Manganese	0.146	0.237	0.177
Ammonia	0.16	0.80	0.21
pH	7.84	7.53	7.45
Temp	66.4	69.6	69.1
Turbidity	1.70	2.89	2.94
Fluoride	0.21	0.15	0.40

Richardt

Well 1	Well 2	Well 3
2.01	1.56	1.45
0.090	0.085	0.064
0.34	0.52	0.54
7.42	7.71	7.34
60.6	64.8	60.2
2.66	2.53	2.77
0.45	0.54	0.67

Fort

Well 8	Well 9	Well 10
1.69	0.52	0.08
0.184	0.144	0.03
0.20	0.04	0.03
7.65	7.65	7.57
64.9	66.0	67.8
0.44	3.02	0.58
0.23	0.16	0.22

Lawrence Utilities LLC
Purification Dept.

Average Value mg/l

Raw Well Water

Well #	Rich St.1	Rich St.2	Rich St.3&4	FT8	FT9	FT10	FT7	IL 15	IL14	IL 16
Analyte	Value mg/l	Value mg/l	Value mg/l	Value mg/l	Value mg/l	Value mg/l	Value mg/l	Value mg/l	Value mg/l	Value mg/l
Turbidity	5.80			16	2.2	0.83	11.0		12.0	
Alkalinity	289	284	307	271	282	231	260	264	245	264
pH	7.53	7.46	7.42	7.09	7.33	7.47	7.42	7.45	7.45	6.8
Calcium	84	85	83	80	100	89	100	87	82	106
Total Hardness	344	337	360		338	306	352	324	312	322
Odor	musty		musty		musty	stale	lit sulfur	sulfur	musty	
Chloride	44.5	40.5	48	64.1	39	50	53	26	32	
Fluoride	0.53	0.545	0.47	0.25	0.23	0.20	0.19	0.35	0.39	
Nitrite		<0.04	<.08			0.02	<.06	<.02	<.08	
Nitrate		<0.04	<.08	nd	0.2	0.915	0.08	<.02	<.08	
Sulfate	44	42	40		36.5	44.5	58.0	56	53	
Ammonia	0.84	0.8	1.2	.28	0.055	0.05	0.27	0.30	0.30	
Silica	14.2	14.2	14.5		10.25	7.6	9.60	12.3	13.0	
Conductivity	669	715	795	786	580	700	750	650	680	
Magnesium	35.3	35	42.5	24.2	29	26.5	30	30	30	
VOCs										
SVOCs										
Potassium	1.39	1.5	1.45		1.7	2.15	1.80	1.90	1.70	
Arsenic	0.0019	0.0021	0.0018	nd	0.0005	0.001	0.0010	0.0022	0.00	
Barium	0.50	0.2045	0.215	0.155	0.048	0.055	0.114	0.156	0.15	
Cadmium	0.00	<0.0005	0.0001	nd	0.0003	0.0002	0.0000	0.0005	0.00	
Copper	0.02	<0.02	<.02		0.015	0.015	0.03	<.02	0.01	
Iron	1.26	1.395	1.41	1.39	0.3	0.145	1.12	1.14	1.02	0.43
Lead	0.00	0.0029	<.001		0.001	0.001	0.001	<.001	<.001	0.061
Manganese	0.05	0.055	0.0375	0.091	0.15	0.065	0.18	0.11	0.11	
Selenium	0.00	0	0.0004	nd	0.0017	0.002	0.0010	<.003	<.001	
Sodium	27	26	29		9.6	24.5	22.0	19.0	18.0	
TOC										

Bacteriology:

Plate Count	6		11		0	0	0	0	0	0
Coliform	0/0		0/0		0/0	0/0	0/0	0/0	0/0	0/0

INDIANAPOLIS WATER COMPANY
Purification Dept. Laboratory

Date: March 14, 2001

Sample Description: Lawrence Richardt Well #5 *NEW WELL*

Sample Number: L-20453

Collected By: Paul Johnson

Date: March 14, 2001

Analyte	Value	Test Date	Analyte	Value	Test Date
Alkalinity	284	3/14/01	Potassium	1.4	3/14/01
pH	7.44	3/14/01	Sodium	28	3/14/01
Calcium	82	3/14/01	Ammonia	0.92	3/14/01
Magnesium	36	3/14/01	Arsenic	0.0052	3/19/01
Total Hardness(calc)	353	3/14/01	Barium	0.222	4/5/01
Total Hardness	352	3/14/01	Cadmium	<.0005	4/4/01
Turbidity			Copper	<.02	3/15/01
Odor	Strong Sulfur	3/14/01	Iron	5.02	3/15/01
Chloride	49	3/14/01	Lead	<.001	3/15/01
Bromide	<.04	3/14/01	Manganese	0.05	3/15/01
Fluoride	0.64	3/14/01	Mercury	<.0005	3/22/01
Nitrite	<.04	3/14/01	Antimony	<.002	4/30/01
Nitrate	<.04	3/14/01	Selenium	<.003	3/20/01
Sulfate	49	3/14/01	Chromium	<.0015	5/1/01
Silica	13.9	3/14/01	Nickel	<.01	5/3/01
Conductance	710	3/15/01	Thallium	<.001	5/4/01
			Zinc	0.006	5/1/01
			Beryllium	<.001	5/1/01
SVOCs					

Bacteriology:

Plate Count	6				
Coliform	0/0				

H:\IWCSERV\MONTHLY WELL SAMPLING\LAWRENCE WATER\Lr 5\MAR 2001\8/14/01\1:15 PM\SBE

LAWRENCE, INDIANA

WELL & PUMP RECORDS

PEERLESS-MIDWEST, INC.
17707 Sun Park Drive
Westfield, Indiana 46074
(317) 896-2987

www.peerlessmidwest.com

PEERLESS-MIDWEST Incorporated
17707 Sun Park Drive
Westfield, Indiana 46074
Phone: (317) 896-2987
Fax: (317) 896-3748
www.peerlessmidwest.com

"When It Comes to Water Supply Contracting and Hydrogeological Services... We're PEERLESS!"

July 6th, 2010

Mr. Claude Jones
City of Lawrence Indiana Utilities
9201 Harrison Park Ct
Lawrence, IN 46216

Re: 2010 Maintenance Tests on Wells and Pumps

Dear Mr. Jones:

Enclosed with this letter please find an up-to-date record book with Inspection Sheets, Performance Test Data, Histories, Pump Curves, and Installation Reports for your record keeping purposes. The recent results for Fort Ben Harrison Wells # 7, 8, 9, 10, and IL #14 are included at this time, but if additional wells/pumps are tested in the future, we will help you add them at that time.

We have also enclosed a copy of the invoice for your review, and the original invoice has been sent to your accounts payable department for processing as usual.

F.B.H. Well #7 was cleaned in 1988, 2002, and 2006. The 2006 Conventional cleaning brought the SC from 19.4 to 25.1.

This years testing showed that the specific capacity has fallen to 80-82% of original, with a Specific Capacity (S.C) around 13 , and the well is now only capable of around 525 gpm before entering your "Critical Zone". Although industry standards would certainly suggest thorough rehabilitation, because it only fell off a little from last year, it may worth monitoring for another year or investing elsewhere.

F.B.H. Pump #7 was replaced with a new Floway in 2006. It is operating right on its curve and does not need to be pulled for mechanical repairs.

F.B.H Well #8 In March 2009 the well had a SC of 39.57; it was DD Surged and increased to 41.91 gpm/ft; then in November it was reported to have maintained around 45 gpm/ft. We pumped the well at 1200 gpm with a S.C. of 52.26 and at 1815 gpm to have a S.C. of 33.07. Although declining at greater flow conditions, we do not believe rehabilitation work is required.

F.B.H Pump #8 was originally installed in 2004 and was overhauled in 2009. It appears to be running very similar to its post-overhaul performance characteristics, and should not require inspection at this time.

F.B.H Well #9 was drilled in 1968 and had an original S.C. of 89.3 gpm/ft. The Well had been let go for a while, then chemically cleaned in 1999, 2003, 2004, 2007, & 2008. The 2007 and 2008 cleanings were able to provide a maximum specific capacity of around 26 gpm/ft.

Due to electrical complications we were unable to run for an extended time period, however our tests report that the S.C. remains around 24-32 gpm/ft. This well is substantially off from its peak production potential, has been falling very rapidly over the last 10 years, and we recommend that you budget for it's rehabilitation in the near future.

F.B.H Pump #9 was last overhauled in 2008. The pump performance appears off by around 35%, but this may be due to iron plugging within the bowls; as shown by the 2008, 2009, and 2010 decline under flowing conditions, but not at Deadhead. Additionally, something is causing the pump to turn off; possibly signifying an electrical performance issue that requires addressing.

F.B.H Well #10 when last cleaned in 2006, at 600 gpm the well had a specific capacity of 30.3 gpm/ft. This year, at 680 gpm the well had a specific capacity of 18.46 gpm/ft drawdown. It appears that the well is beginning to fall-off very at a rapid rate, and should be addressed at this time.

F.B.H Pump #10 is currently only capable of providing 680 gpm at 9 psi. The pump is showing significant performance decline, and should also be addressed with the recommended Well Work.

Indian Lakes Well #14 (Old #9) is currently 76% off of its original Specific Capacity of 102.1 gpm/ft. As shown on the "Specific Capacity vs. Time" graph, the rapid decline of this wells performance could be a major concern.

Indian Lakes Pump #14 appears to be operating near its rated performance, and does not require pulling for overhaul based solely on mechanical performance.

To Summarize: Fort Ben #10 requires well rehabilitation at this time, and Wells IL#14 and F.B.H #7 show signs of concern. The Fort Ben #9 Pump has electrical issues, plugging within the bowl assembly, and declined well performance.

It is our hope that we can meet on Friday July 9th to go over these results and discuss some of your options, however if you have any questions please contact me at 694-4891. We appreciate the opportunity to provide our services to you, and the City of Lawrence.

Thank You,
Peerless-Midwest, Inc.

Eric J. Williams
Project Manager

Peerless Midwest Inc. *Water Supply Contractors*

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254 9650

WELL & PUMP SERVICE INSPECTION REPORT

Owner Lawrence Utilities City Lawrence State IN

Location Fort Benjamin Harrion Well Field

Well No. FB#7 Date Drilled 1981 Dia. 36" Depth 91' Type Well GWW

Screen ID. N/A Screen Length N/A Depth to Top of Screen N/A Type Screen SSWW

Dates of Cleaning 1988, 2002, 2006(Reline/C&T)

Phone Office# 317-542-0511 Cell# 317-501-7840 Person to Contact Claude Jones

	DATE	STATIC	G.P.M.	PUMPING LEVEL	PRESSURE	SPECIFIC CAPACITY
ORIGINAL	1981	11'	2076	41'		69.2
AFTER LAST CLEANING	2006	19.33'	776	50.22'		25.1
AFTER LAST TEST						
AT PUMP'S RATED FLOW						
AT SYSTEM OPERATING PSI						

Test Completed Through Meter ___ Flange or Thread Size ___ Confined Space Entry? ___

Motor HP 60 Make U.S. Volts 460 RPM 1770 Phase 3

Gear Drive None HP - Ratio - RPM Meter Required ___

Pump Mfg. J-Line/Floway Serial No. 20689-06 Airline Length Probe

Rated Capacity: 520 GPM 278' TDH Operating Pressure 93#

Total Setting 66' Size of Packing ___ Date Installed 2006

Dates of Overhaul 2002

THE FOLLOWING IS TO BE PERFORMED DURING EACH INSPECTION

Is Check Valve Leaking? ___ Change Motor Oil & Grease ___ Repack Pump ___ Grease Pump ___

Pump is Presently Developing ___ GPM ___ TDH Projected Curve Capacity 520 **GPM ___ TDH**

Shut Off Pressure ___ PSI Rated Shut Off Head ___ ft. Calculated Shut Off Head ___ ft.

Electrical Data (With Pump in Operation) ___ V ___ / ___ / ___ Amps 76.3 Full Load Amps

Location of Power Lines ___ Can Electrical Box be Locked Out? ___

Distance from Top of pump pedestal to grade 18" Materials Needed to Clean Well ___

Need a Smeal to Raise Pump ___ Remarks ___

Maintenance: 8x6 reducing 90 valve, rigid hose, 50' lay flat hose, have to remove downflow meter to test.

Inspected By ___ Date Inspected ___

PEERLESS-MIDWEST Incorporated

PUMP TEST FORM

JOB # ________ DATE June 23 & 24, 2010

OWNER Lawrence Utilities

Annual Maintenance

WELL Fort Ben #7 WELL DIAMETER 36" WELL DEPTH 91'

NORMAL I93 PSI SWL 12.29' PROBE

Time	Pumping Level (ft)	Drawdown (ft)	PSI	Orifice Size	Inches	GPM	Specific Capacity	TDH	Amps
			139	6x4		0		333.4	
1:45			134			145			48 45 48
									48 45 48
1:50	25.58	13.29			5		10.91	335.12	
2:00			129		15	250			49 51 47
2:05	33.46	21.17					11.81	331.45	
2:10			109		40	401			53 54 55
2:15	43.50	31.21					12.85		
2:20			95		63	525			58 55 58
2:25	50.21	37.92					13.84	257.4	

Need 8x6 reducing 90, valve 50' rigid hose, 50' lay flat hose, have to remove downflow meter to test
VFD - When online pumped at 93 PSI & 50.33' PW1 (hz unknown)

BY:

ORTMAN DRILLING & WATER SERVICES
WELL & PUMP MAINTENANCE INSPECTION REPORT

OWNER: Lawrence Utilities
INSPECTION DATE: 19-Oct-09
'ESS: 9201 Harrison Part Ct, Indpls, IN 46216
INSPECTED BY: Tim B.
CONTACT: Claude Jones
OFFICE: 317) 542-0511
FAX: 317.715.2619
CONTACT LOC: Administration Bldg
PLANT:
CELL: 317) 501-7840

WELL NO./NAME: 7 DIA: 36" DEPTH: 91' TYPE: GWW YEAR DRILLED:
WELL LOC: Fort Harrison well field
SCREEN: SSWW I.D.: N/A LENGTH: N/A DEPTH TO TOP: N/A
PUMP HOUSE: Yes DATES CLEANED: 4/1/1998
PUMP MFG: MODEL: 10MCA6 IMPELLAR Open ☐ Closed Turns Off Bottom ☐ Installed:
RATED CAPACITY: GPM @ TDH SHUT-OFF PSI: OPERATING PSI:
TOTAL SETTING: 64' 10" AIRLINE OR TUBE: 3/4" Poly PACKING: x x RINGS
METER/BRAND: Size: Test Outlet Size: Type: DATES REPAIRED:
MOTOR MFG.: US Electric HP: 60 RPM: 1770 VOLTAGE: 460 PHASE: 3
LINE VOLTAGE: 460 F.L. AMPS: 76.3 NRR: Yes DATES REPAIRED:

NORM. OPERATING FLOW:
NORM. OPERATING PRESSURE:
LINE VOLT: L1-2 535 L2-3 535 L3-1 533
ELECTRIC CONNECTIONS: Good
'SURE GAUGE: Yes
FLOW METER: N/A
EXERCISE VALVES: Yes
VALVES FULLY OPEN/SHUT: Open
CHECK VALVES HOLD: Yes
CONTROL VALVES FUNCTION: N/A
NOISE, VIBRATION OR HEAT: None
LEAKS OR CRACKS: None
REPACK & GREASE PUMP: Adj Packing
CHANGE MOTOR OIL: 3.5 QTS & GREASE:
WATER COLOR OR ODOR: None
SAND CONTENT: None

COMMENTS: Broke suction at end of step 2

EQUIPMENT USED FOR TESTING: 8" x 6" orifice, 8" x 6" reducing 90, valve,2- 25' rigid hose, 1- 50' lay flat hose
Have to remove down flow meter to test

	DATE	SWL	GPM	PWL	DD	PSI	TDH	AMPS	Spec Cap
ORIGINAL									
LAST CLEANING									
LAST TEST									
SHUT-OFF	10/19/2009	19.67'				140	343.07'	46, 49, 48	
STEP 1			500	57.92'	38.25'	92	270.44'	58, 65, 57	13.07
:P 2			700	Broke	Suction				
STEP 3			900						
STEP 4			1200						
OPEN									

PEERLESS-MIDWEST, INC.
17707 SUN PARK DRIVE / WESTFIELD, IN 46074
PHONE: 317/896-2987 FAX: 317/896-3748

City of Lawrence Utilities

HISTORY OF WELL FORT BENJAMIN # 7 (Former #11)

1981 August 27th, Well Drilled by Layne Northern. 36"x91' with 20' of 18" Cook WW .125 slot screen. Static 11', pumped 2076 gpm with a 41' pwl and a specific capacity of **69.2 gpm/ft.**

1988 Well Rehabilitated by others

2002 Well Cleaned and Pump Overhauled by others.

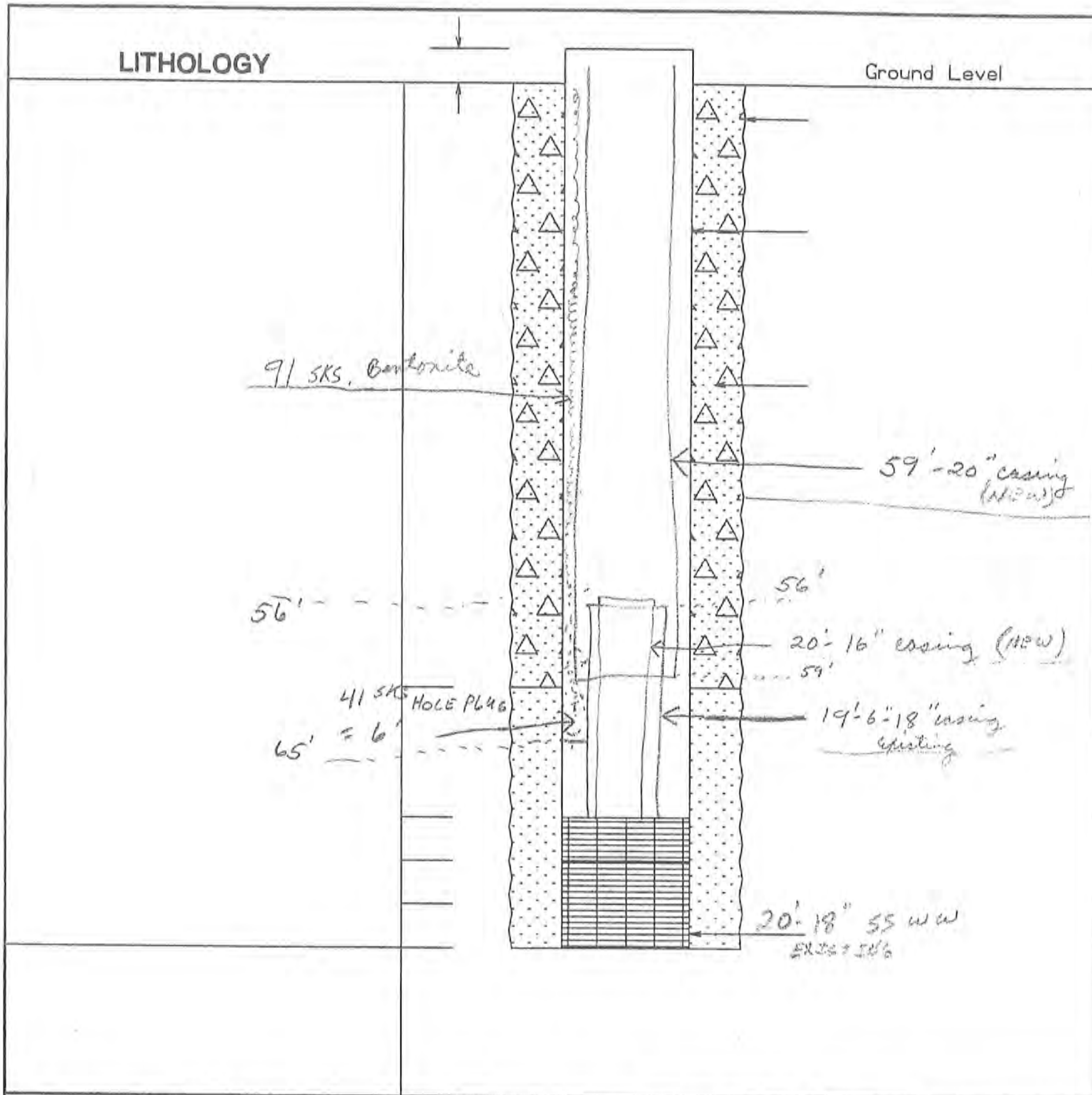
2004 Well Cleaned and Pump Overhauled by others.

2006 Well Relined and Cleaned. When complete, static of 19.33' well pumped 776 gpm with a 50.22' pwl and a specific capacity of 25.1 gpm/ft. **Well is 64% off original** Specific Capacity. New 10JKHM-6 Stage Pump Installed, rated 520 gpm @ 278' TDH.

2009 Performance Tested by Others. Pump performance good. Specific Capacity down to 13.07 @ 500 gpm, **Well is 81.1% off** original Specific Capacity.

2010 Performance Tested by Peerless-Midwest, Inc. Pump performance is good. Well Static up to 12.29', specific capacity of 13.48 @ 525 gpm. Well is **80.5% off** original specific capacity.

JTH



City LAWRENCE State IN

Well Location Fort Benjamin Harrison Well Field - Otter Rd. & 71st St.

County MARION Twp. ______ T___ R___ ¼ ¼ ¼

Test Rate 931 GPM

Static Water Level 19'-4" Ft.

Pumping Level 58'-6" Ft.

Specific Capacity 23.7 GPM/Ft. D.D.

Driller OTHERS

Date Drilled 1981 Job No. 20689

Well No. 7 (11)

GPS
N 39° 51.334'
W 094° 47.941

PEERLESS-MIDWEST, INC.
55860 Russell Industrial Pkwy., Mishawaka, IN 46545
Water Supply Contractors

20689 (0)

City	: Lawrence	County	: Marion
State	: Indiana	Twp. (T/R)	: Lawrence (T17N/R5E)
Location	:	1/4,1/4,1/4,Sec.#	:
		UTM Coordinates	: NAD 27 ZONE 16
Note: Well Relined by Peerless-Midwest, Inc.			: 4415594N, 585492E

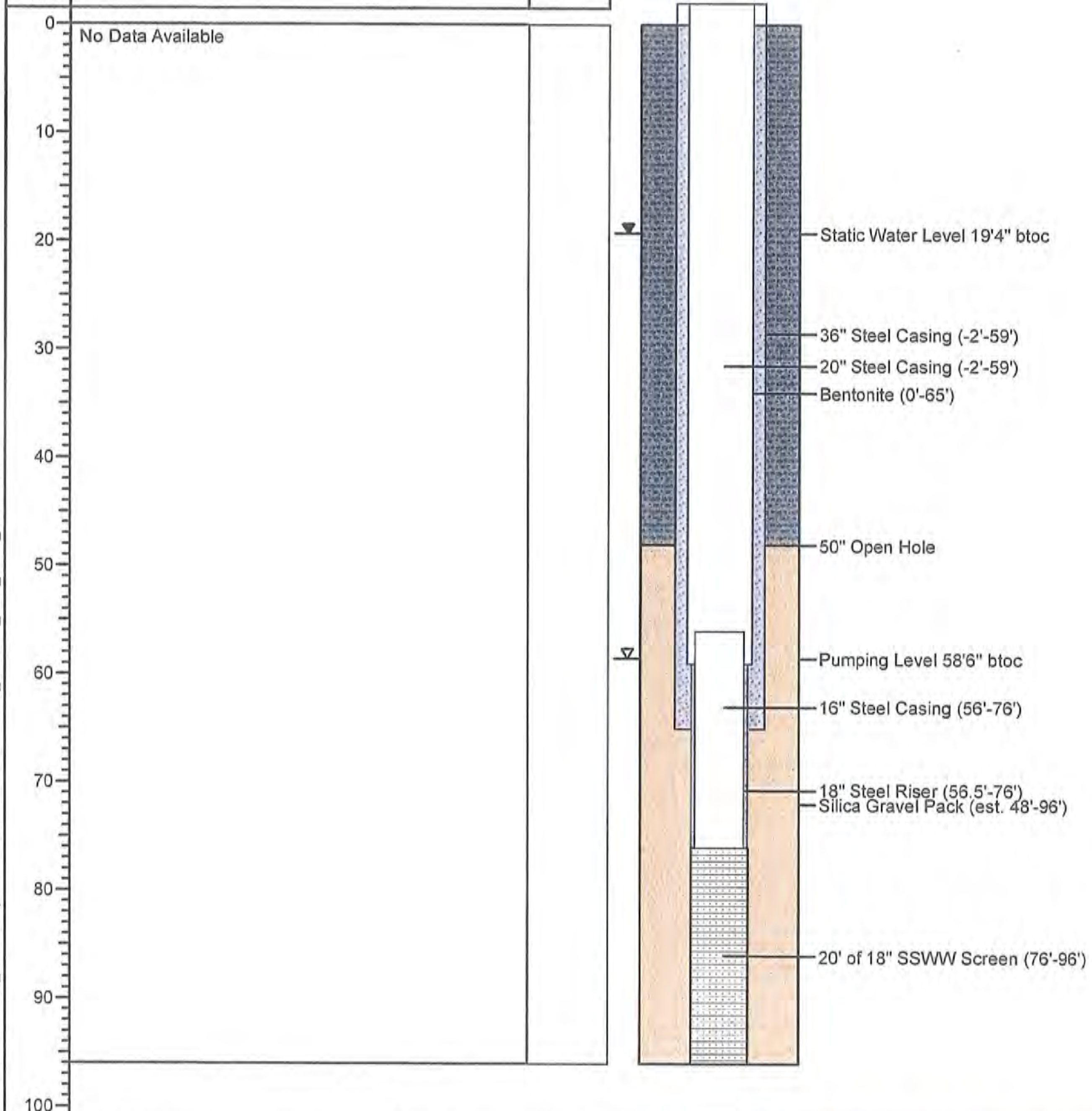
Test Rate	: 931 gpm
Static Water Level	: 19'4" btoc
Pumping Level	: 58'6" btoc
Specific Capacity	: 23.7 gpm/ft
Length of Test (hrs)	:

Drilling Method	: Reverse Circulation
Driller	: Others
Date Drilled	: 1981
Date Relined	: 06/20/06

Depth in Feet

LITHOLOGY

Well: 7
Elev.:



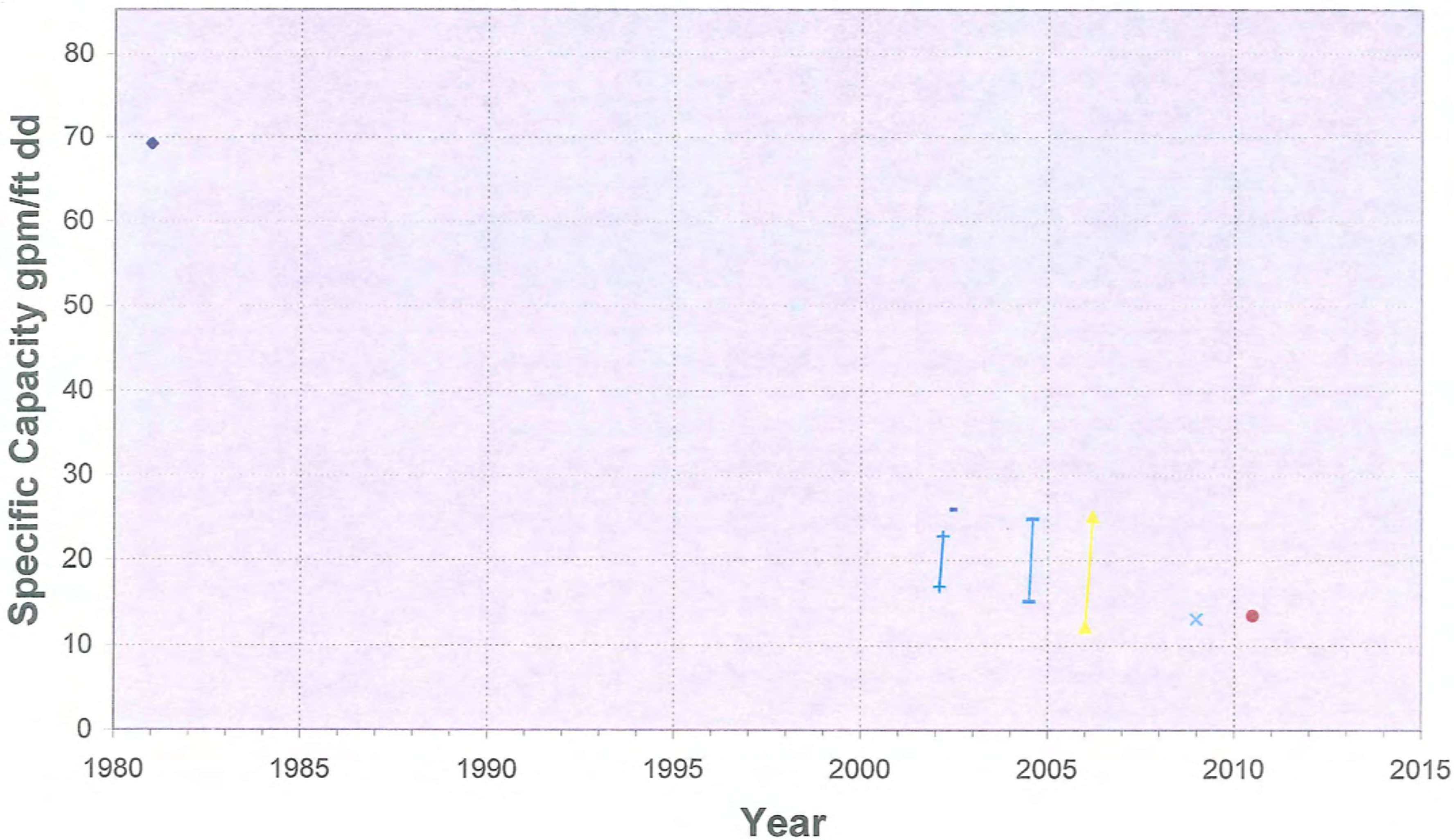
01-18-2011 J:\JOB FILES\K-M\Lawrence_IN\Fort Benjamin Harrison Wellfield\FB-7\20689_Lawrence_FB#7_Reline_062006.bor

Lawrence, IN
Fort Benjamin Well Field
Well 7

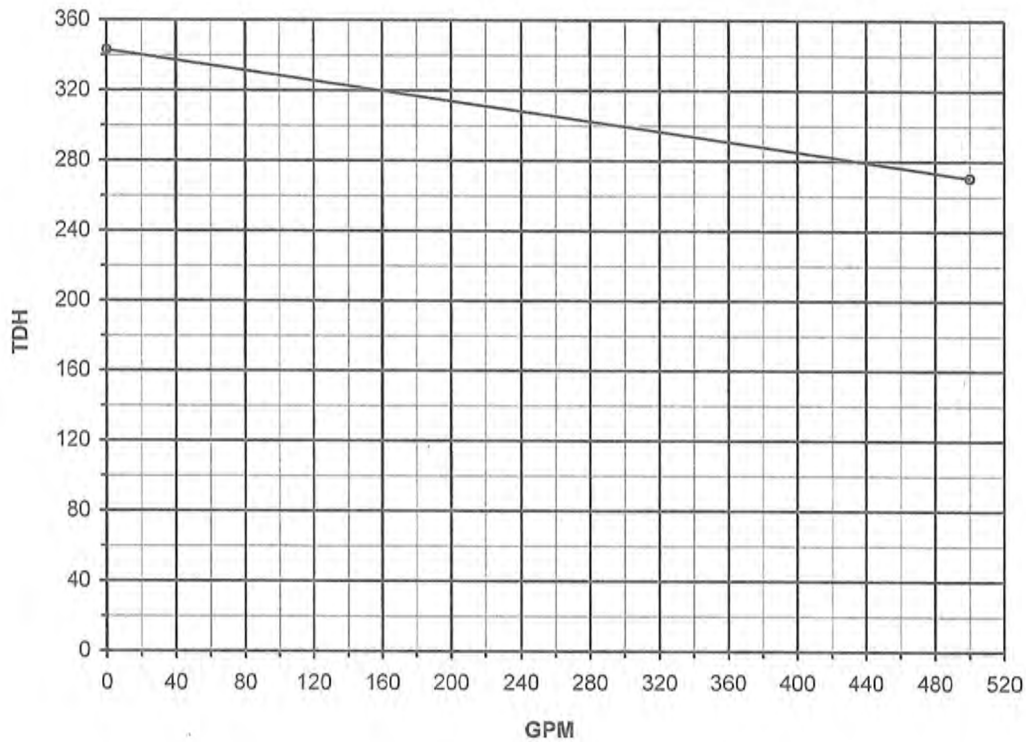
PEERLESS MIDWEST INC.

Peerless-Midwest Incorporated

City of Lawrence, IN
F.B.H. #7 Well Specific Capacity vs Time
June, 29th 2010



PROJECT	WELL	DATE	STATIC (FT)	FILE
City of Lawrence, Indiana	7	10/19/09	19.67	City of Lawrence Well 7 (101909) Step Test



	GPM	DD (FT)	SC	PSI	TDH (FT)	AMPS
Deadhead	0			140	343.07	46, 49, 48
Step 1	500	38.25	13.07	92	270.44	58, 65, 57
Step 2	700	Broke	Suction			
Step 3						
Step 4						
Step 5						

Fort #11

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

Well Rehabilitation Summary

Lawrence Utilities, LLC - Ft. Ben Well # 11

Date:	5/20/04	Diameter:	36" x 18"	Pump Mfg:	L & B
Client:	Lawrence Util, LLC	Depth:	94'	Serial No:	94666
City:	Lawrence	Type:	GWW	Capacity:	520 gpm
State:	Indiana	Screen: dia:	18"	TDH:	276'
Well No:	11	depth to top:	74'		
Location:	Ft. Ben Well Field	length:	20'		

	Year	Static Water (ft)	GPM	Pumping Level (ft)	Draw Down (ft)	Specific Capacity
Drilled	1981	19	2076	49	33	62.9
Last Rehabilitation	1/7/02	18	757	51.2	33.2	22.8
Test Before	5/20/04	21	482	53	32	15.1
Test After	5/25/04	21	597	45	24	24.8

Notes:

Date	GPM	Pumping Level (ft)	Discharge Pres (#)	Specific Capacity	Treatment TDH (ft)	AMPS
5/20/2004	shutoff		150			
*	482	53	80	15		
	543	57	60	15		
	Vortex		40			
					Surge acid	
	557	57	80	15.4		
5/21/2004					Surge acid	
	603	55	80	17.7		
5/24/2004					Surge bleach and tripoly	
	616	51	80	20.5		
5/25/2004					Surge bleach and tripoly	
	shutoff		156		381	43-43-44
	422	36	120	28.1	313	56-58-55
	543	41	100	27.1	272	60-61-60
*	597	45	80	24.8	230	63-62-61
	659	49	60	23.8	187	64-64-62
	704	53	40	22	146	65-64-62

* GPM taken after discharge of chemicals and a 30 minute minimum pumping test.

Chemical	Amount Used		Chemical	Amount Used		Foreman
Tri-poly Phosph	1200	lbs	Neutralizer		lbs	
Muriatic Acid	660	gals	Liq Chlo Bleach	165	gals	Greg Procell
HTH		lbs				

Now No. 7

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 65
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

Well Rehabilitation Summary

Lawrence Utilities - Ft. Ben # 11

Date:	01/07/02	Diameter:	36"	Pump Mfg:	L&B
Client:	Lawrence Utilities	Depth:	94'	Serial No:	94666
City:	Lawrence	Type:	GWW	Capacity:	520
State:	Indiana	Screen: dia:	18"	TDH:	276'
Well No:	Ft. Ben # 11	depth to top:	74'		
Location:	Ft. Harrison Wellfield	length:	20'		

	Year	Static Water (ft)	GPM	Pumping Level (ft)	Draw Down (ft)	Specific Capacity
Drilled	1961	19	2076	49	33	62.9
Last Rehabil 04/03/98	04/03/98	16.1	904	34.2	18.1	49.9
Test Before	01/02/02	18	570	51.6	33.6	16.9
Test After	01/07/02	18	757	51.2	33.2	22.8

Date	GPM	Pumping Level (ft)	Discharge Pres (#)	Specific Capacity	Treatment
01/02/02	413	42.6	110	16.8	
	570	51.6	70	16.9	
					Surge acid
	647	56	70	17	
					Surge 50# bicarb, let set overnight
01/03/02	622	54	70	17.3	
					Surge acid
	670	47	70	23.1	
					Surge 100# bicarb, let set overngt.
01/04/02	682	44	70	26.2	
					Surge bleach & 200# tripoly
	659	39	70	31.3	
					Surge bleach & 200# tripoly
	659	38	70	32.9	
01/07/02					Surge bleach
Shutoff			158		383' 43-43-44
	394	30	120	32.6	307' 54-54-56
	521	38.5	100	25.4	269' 59-57-59
	610	44.2	80	23.2	229' 61-60-63
	757	51.2	40	22.8	144' 63-64-63

* GPM taken after discharge of chemicals and a 30 minute minimum pumping test.

Chemical	Amount Used		Chemical	Amount Used	
Tri poly Phosph	400	lbs	Neutralizer	150	lbs
Muriatic Acid	550	gals	Liq Chlo Bleach	110	gals
HTH		lbs			

Bill Claytor
Foreman

Note: Volume and specific capacity did not recover as in prior years.

BASTIN LOGAN WATER SERVICES INC.

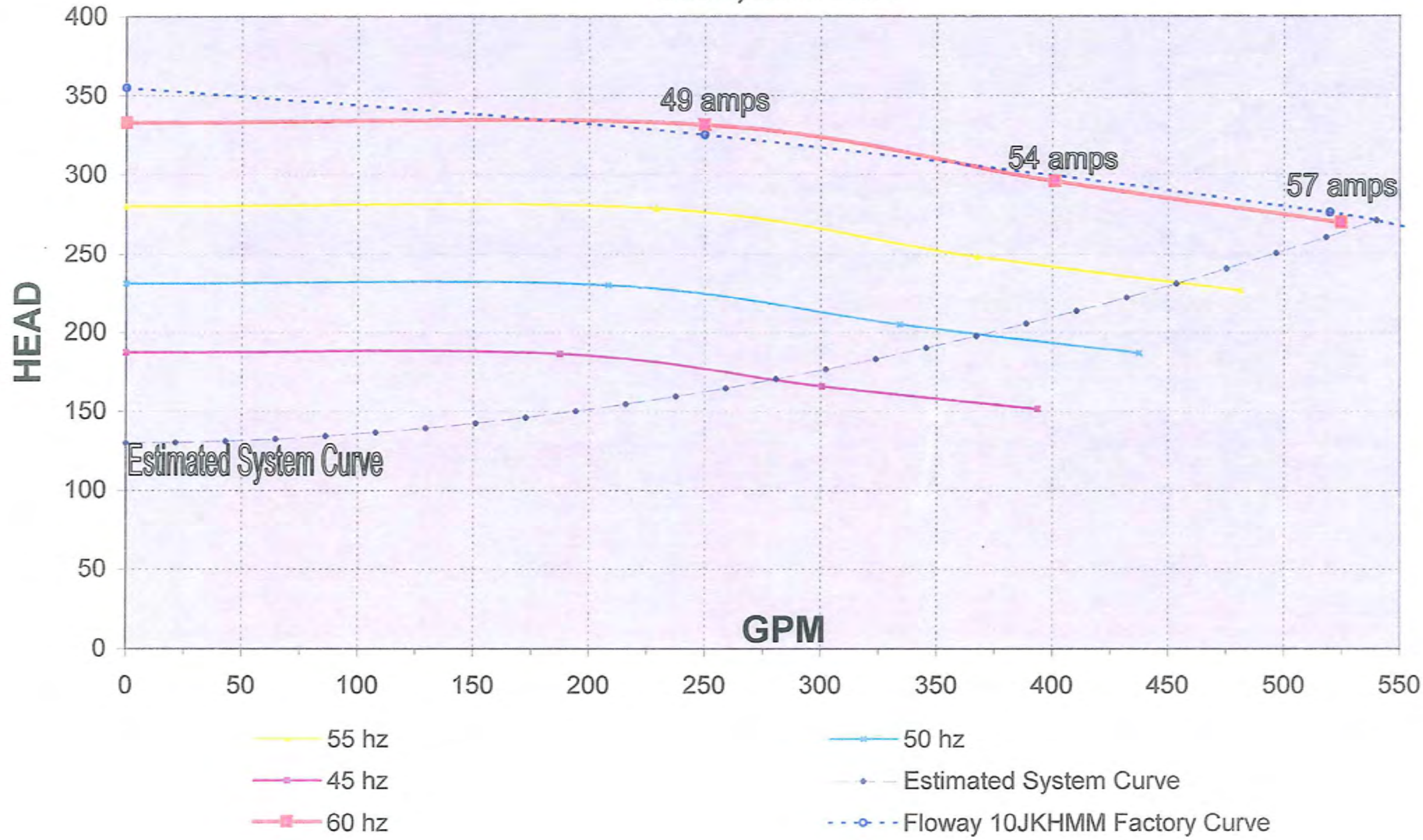
237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 4613[illegible]
(317) [illegible]-4577
FAX (317) 738-8285

New No. 7

City of Lawrence - Ft. Ben Well # 11						
Static Water Level 18.5'			Flow Test			03/21/02
GALLONS PER MINUTE	PUMPING LEVEL (ft)	DRAW DOWN (ft)	SPECIFIC CAPACITY	P S I (#)	TDH (ft)	AMPS
Shutoff				158	383	44-43-43
440	30.00	11.50	38.3	120	307	55-54-54
498	34.20	15.70	31.7	110	288	57-57-57
557	37.10	18.60	29.9	100	268	59-60-59
647	39.70	22.20	30.5	80	225	62-60-62
726	44.10	25.60	28.4	60	183	64-62-64
777	47.80	29.50	26.5	40	140	64-63-65
844	51.00	32.50	26.0	20	97	62-63-64

Peerless-Midwest Incorporated

City of Lawrence, IN
FB#7 Calculated VFD Pump Performance
June, 29th 2010



Peerless Midwest Inc. *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-9650

COPY

PUMP INSTALLATION REPORT

Sales Order No. 20689　　Date 6/28/2006

Pump Mfg. J-Line/Floway　Serial No. 20689-06　Well No. FB #7 (former #11)

Owner Lawrence Utilities LLC　City Lawrence　State IN

Location of Well Fort Benjamin Harrison Well Field - Lee Rd. & 71st St.

MOTOR Make U.S.　Type RU　Frame 364TP　Serial No. R-6233-04-877 R2138338M

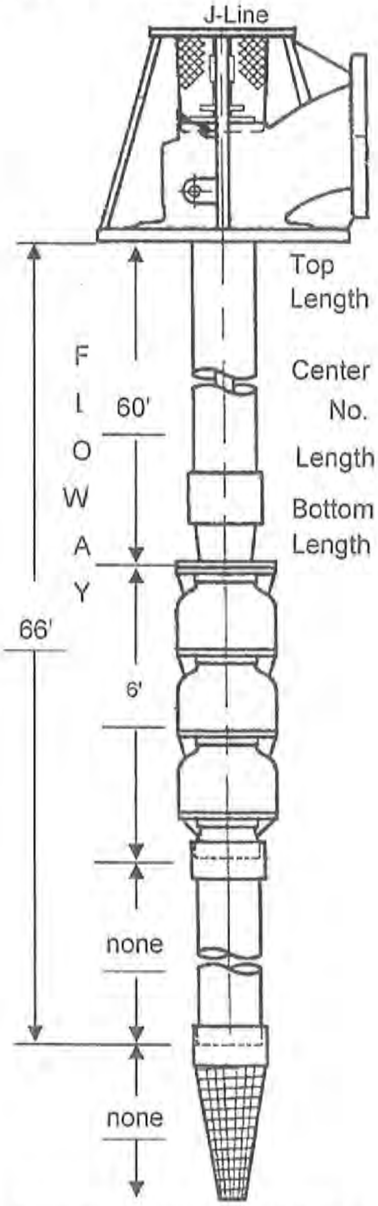
HP 60　Volts 460　Line Voltage 460　Phase 3　RPM 1770　Non-Reverse Ratchet Yes

GEAR DRIVE Make ____　Serial No. ____　Gear Ratio ____

Was motor and/or gear drive taken to a repair shop at this time? Motor Yes　Where TMS

Gear ____　Where ____

ENGINE Make ____　Model ____　Serial No. ____



Top Length 5'

Center No. 5

Length 10

Bottom Length 5'

PUMP HEAD Type J-Line

Discharge Pipe Size 8"

Located above / below ____ Ground flanged / threaded ____

Separate Base Plate? Yes

Head Shaft Length ____

Dia. 1½"　Coupled above ____ below x

Stuffing Box Size 1½"

MOTOR SHAFT

Dia. 1½"　Length combo

Thread size in head ____　Keyway ⅜"

PUMP BOWL Dia. 10　Type JKHM*

Imp. No. ____　Open ____　Enc. ____

\# of Stages 6　Bowls:CL ____　Brz ____

Wear Rings No

Length Shaft ____　Dia. 1½"

COLUMN Pipe Size 8" Sch 80

Flanged ____　Coupled X

Special Paint? ____

Oil Lube ____　Water Lube X

Shaft Size ____　SS X or CS ____

Tubing Size ____　Stl ____ or Br ____

SUCTION PIPE Size none

Length ____　Special Paint ____

Threads on Bottom? ____

Strainer No　Size ____

Rubber Bumper? No

Well Seal? No

*(1) 10JKH & (4) 10JKM full imp. & (1) 10 JKM trimmed to 6.903"

WELL INFORMATION All measurements from top of pump foundation

X Gravel Wall

____ Tubular

Inside Dia. 20" x 16" x 18"　Depth 93.58'　Static 18'　Type ____ Rock

Air Line Length ____　Strapped to Column? Yes

Type Airline X Plastic　____ Copper Tubing　____ Steel Pipe

PUMPING TEST-Pumped ____ GPM at ____ ft. Pumping Level with ____ lbs. Discharge Pressure after ____ hours. Specific Capacity ____

SPECIAL EQUIPMENT OR PULLING INSTRUCTIONS

R/O

Power Lines Underground

REMARKS Rated 520 GPM @ 278' TDH

Installer Leonard Flora

Now No. 7

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

Pump Installation Report

City of Lawrence Ft. Ben Well # 11

Date:	03/21/03	City	Lawrence, Indiana
Project No.	2226-1	Pulling Equipment	Hydrascrane
Well Pump Loc.	Oil Lee Rd & 71st St	Over Head Power Lines	No

Electric Motor Information

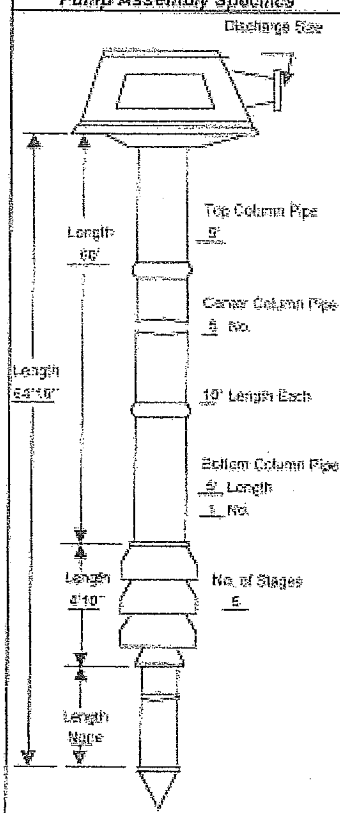
Manufacturer	US	Type	RU	Frame	364TP
Motor Shaft Dia.	1 1/2"	Mtr. Shaft Lgt.	36 1/8"	Service Factor	1.15
Keyway	3/8"	Clutch Diameter	1 1/2"	Volts	460
RPM	1776	Upper Bearing	Oil 7220M	FL Amps	75.2
Ratcheting	yes	Lower Bearing	Grease 6211J	Line Voltage	460
OD of Motor	31 1/4"				

Motor Shaft Threads	
Right Hand	
Left Hand	yes
T.P.I.	

S/N	R6233-04-077821503389
HP	60
Phase	3
Motor Repair	no
SPC	no

Recmd. Lat. Set.		Min. Setting		Max. Setting	

Pump Assembly Specifics



Right Angle Drive Information

Brand Name	None	S/N		Gear Ratio	
Aux Eng Sized Name		Mod. No		S/N	

Pump Information

Pump Head

Pump Head Mfr.	Layne		
Discharge Head Type	TF812		
Discharge Line Size	8"		
Location	Above	X	Grade
	Below		
Column To Head	FLGD	X	Threaded
Base Plate	yes		
Pump Top Shaft Lgt.	62"		
Diameter	1 1/2"		
Pk Sz. At Hd.	1 1/2"		

Column Pipe

Coupling	C.I.	X
	S.T.	
Spiders	Drop - In	
	Screw - In	
Col. Pipe Size	8"	
Flanged		No
Special Paint		no

Shaft size 1 1/2" SS
Tubing Size STLX BRZ
New Pipe 55'

Bowl Assembly

Design GPM	520	@ TDH	276
Bowl Assembly Type	10MDS6		
Shell Diameter	9 1/2"		
Shell Material	C.I.	X	BZ.
Impeller Shaft Diameter	1 1/2"		
Shaft Length			
Bowl Shaft Mat.	S.S.	X	Chrm

Minimum Submergence Above The Eye Of The Bottom Of Impeller	

Suction Pipe

Suction Size	None	Threads On Btm.	None
Length		Special Paint	

Flow Test

SWL	10'	Op. Pressure	50#
GPM	647	PL	39.7'
D.D.	22.2'	Spec. Cap.	30.5
Amps	92-89-82		

Well Data

Depth	93.7'	Type Well	G.W.W.	X	Screen Diameter	17"
Inside Dia.	35"		Tube		Screen Length	30
Tower Height					Screen Open Size	

Misc. Data

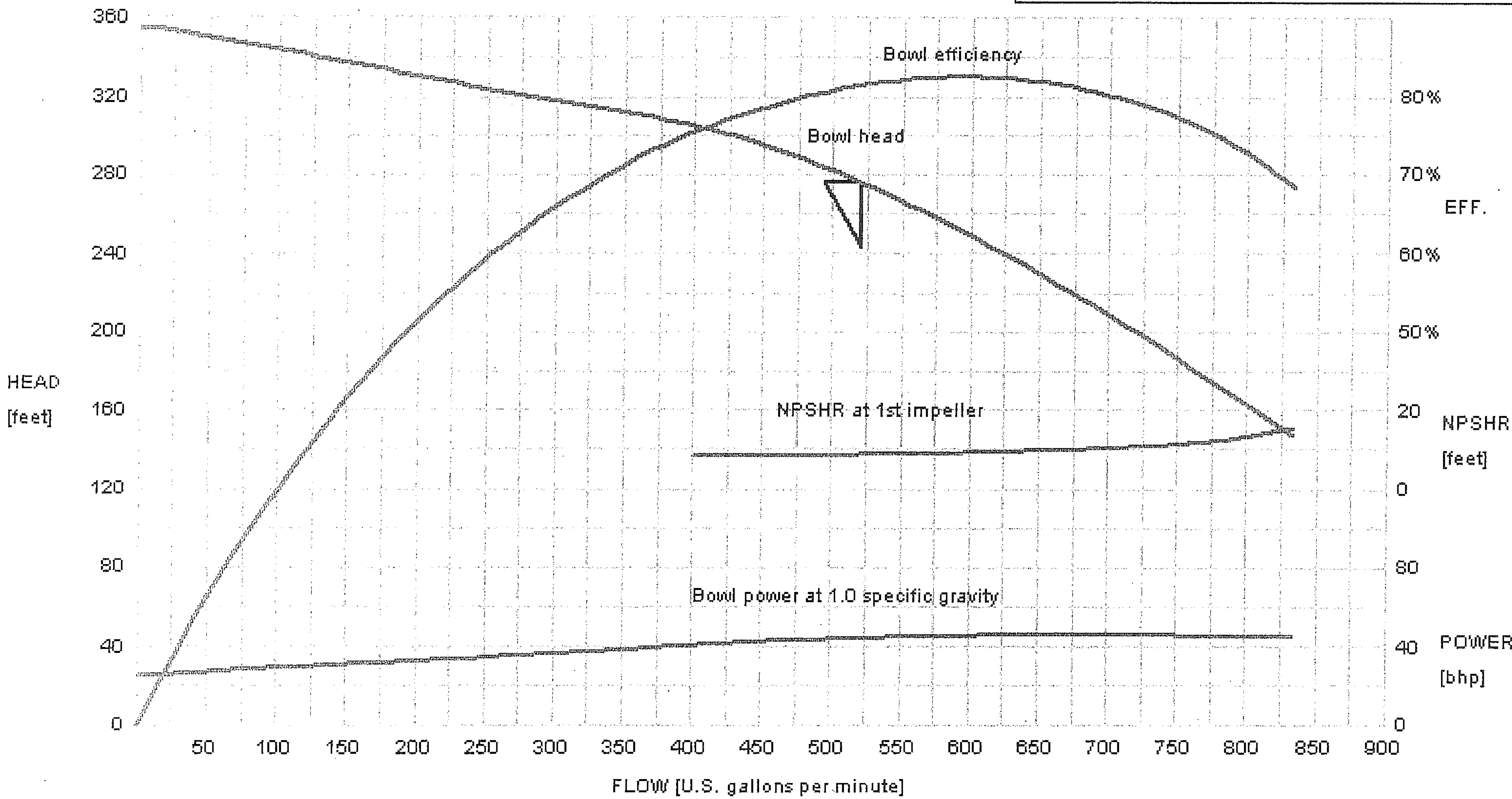
Pump Repaired Last	1995-1996
Well Repaired Last	Apr-98
Pump Off Site	

Installer

Bill Clayton, Greg Pruett,
David Dennison and Kevin Dennison

The head a[illegible]ver may be different than shown in a[illegible]cordance with Hydraulic Institute standards.

Lawrence Utilities LLC
Well Fort Benjamin Harrison #7
Lawrence, Indiana



Rated 520 GPM @ 276' TDH
(1) 10 JKH & (4) 10 JKM Full Diameter Impellers &
(1) 10 JKM Impeller Trimmed to 6.903"

FLOWAY PUMPS
FRESNO, CALIFORNIA
A WEIR COMPANY

TYPE:	10JKH/M/M
NO. OF STAGES:	6
R.P.M.:	1770
PUMP SERIAL NO.:	No Tag

DWG. NO. Pr[illegible]sed

DWN. BY: RDC

DATE: [illegible]23/2006

Now
No. 7

J-LINE

TURBINE PUMP CURVE

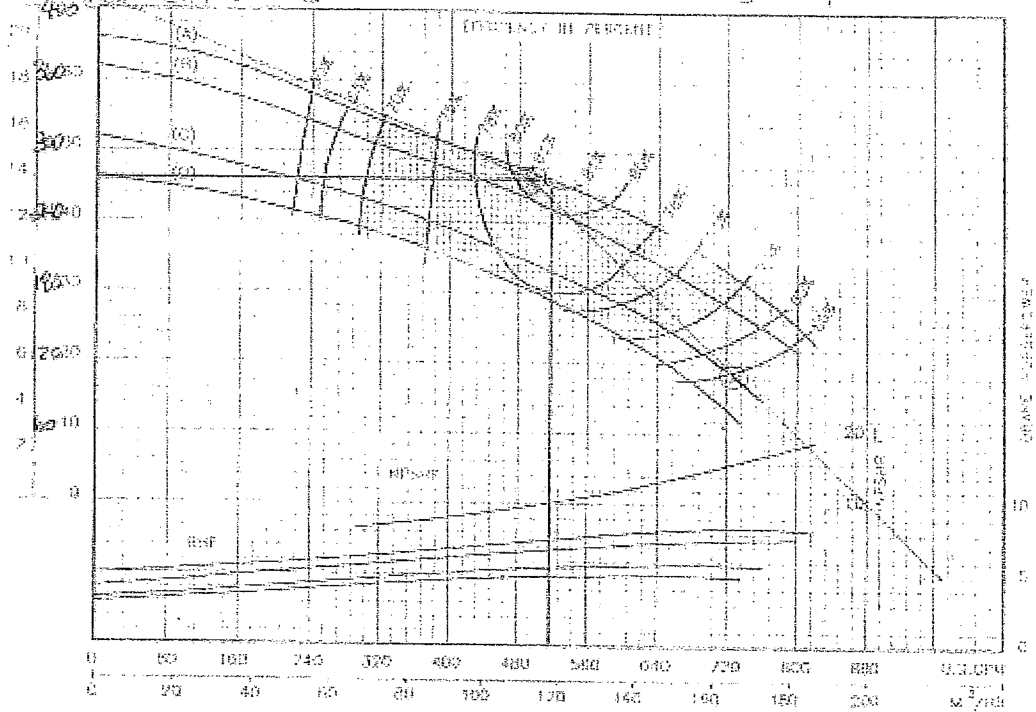
Ft. Ben Well #1 JANUARY 1985

6 Stages

Max BHP 51

620 GPM @ 296'

10MC 1760 RPM 3-04



CAPACITY

IMPELLER DATA

Impeller Number	3097	TRIM. (A)	7.688" X 20°
Material	BRONZE	(B)	7.500" X 20°
Type	CLOSED	(C)	7.125" X 20°
Thrust Factor	K=6.60	(D)	6.875" X 20°
Eye Area	11.74 sq. in		
Weight	8.50 lb		

Minimum submergence above eye of bottom impeller 24 in.

EFFICIENCY CORRECTION

Number of Bowls	1	2	3	4
Change as follows	-5	-2	-1	0

Change [illegible]

BOWL DATA

Bowl Number	3098 C.I./ENAM	
Bowl Dia	9.500"max 9.250"min	
Max No Stages	33	
One Stage Weight	230	lb.
Add'l Stage Weight	55	lb
Std Shaft Dia	1.500	in
Std Lateral	0.625	in
Discharge Size	6 - 8	in
Suction Size	6 - 8	in
Max Sphere Size	0.625	in
Max Operation [illegible]	505 (special)	

Performance is based on pumping clear fresh water at a temperature not over 85° F and free of gases and abrasives, and with bowls thoroughly [illegible]

Peerless Midwest Inc. *Water Supply Contractors*

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254 9650

WELL & PUMP SERVICE INSPECTION REPORT

Owner Lawrence Utilities City Lawrence State IN

Location Fort Benjamin Harrion Well Field

Well No. FB#8 Date Drilled 2004 Dia. 16" Depth 105.3' Type Well GWW

Screen ID. 16" Screen Length 25' Depth to Top of Screen 81' Type Screen SSWW

Dates of Cleaning 2009

Phone Office# 317-542-0511 Cell# 317-501-7840 Person to Contact Claude Jones

	DATE	STATIC	G.P.M.	PUMPING LEVEL	PRESSURE	SPECIFIC CAPACITY
ORIGINAL						
AFTER LAST CLEANING	2009					41.9
AFTER LAST TEST						
AT PUMP'S RATED FLOW						
AT SYSTEM OPERATING PSI						

Test Completed Through Meter ___ Flange or Thread Size 10" Confined Space Entry? Yes

Motor HP 100 Make U.S. Volts 460 RPM 1785 Phase 3

Gear Drive None HP - Ratio - RPM Meter Required ___

Pump Mfg. Simmons Serial No. 227-040 Airline Length Poly

Rated Capacity: 1200 GPM 275' TDH Operating Pressure 92#

Total Setting 75' 3" Size of Packing 3/8" Date Installed 2004

Dates of Overhaul 2009

THE FOLLOWING IS TO BE PERFORMED DURING EACH INSPECTION

Is Check Valve Leaking? ___ Change Motor Oil & Grease ___ Repack Pump ___ Grease Pump ___

Pump is Presently Developing ___ **GPM** ___ **TDH** **Projected Curve Capacity** 1200 **GPM** ___ **TDH**

Shut Off Pressure ___ PSI Rated Shut Off Head 350 ft. Calculated Shut Off Head ___ ft.

Electrical Data (With Pump in Operation) ___ V / / Amps 114 Full Load Amps

Location of Power Lines O.K. Can Electrical Box be Locked Out? ___

Distance from Top of pump pedestal to grade ___ Materials Needed to Clean Well ___

Need a Smeal to Raise Pump ___ Remarks ___

Maintenance: 10x6 flanged reducer, 6" 90, 10' of 6" hard hose, 50' soft hose.

Inspected By ___ Date Inspected ___

PEERLESS-MIDWEST
Incorporated

PUMP TEST FORM

JOB # ____________ DATE ____________

OWNER Lawrence Utilities

Annual Maintenance Test

WELL Fort Ben 8 WELL DIAMETER 16" WELL DEPTH 105.3'

NORMAL PSI - 92 SWL 16.37 PROBE X

Time	Pumping Level (ft)	Drawdown (ft)	PSI	Orifice Size	Inches	GPM	Specific Capacity	TDH	Amps
						0	N/A		
9:06			130						
9:06	36.75		130	6x5	33	703		337.05	88/95/92
9:15									91.67
9:30			99	12x9	11	1200			106/114/111
				12x9	11	1200			
				12x9	11	1200			
				12x9	11	1200			
9:35	39.33	22.96	99	12x9	11	1200	52.26	268.02	110.33
9:40			38	12x9	26				111/118/115
			38	12x9	26	1815			
			38	12x9	26	1815			
			38	12x9	26	1815			
9:45	71.25	54.88	38	12x9	26	1815	33.07	159.03	114.67
						Max			

Need 10x6 flanged reducer, 6" 90, valve, 10' rigid hose, 60' lay flat hose, 10x8 oriface, splash tarp.

BY:

RTMAN
Drilling & Water Services
Research - Design - Construction - Maintenance
241 N. 300 W. • Kokomo, IN 46901 • 765-459-4125 FAX 765-459-8750

April 29, 2009

Mr. Claude Jones
Lawrence Utilities
9201 Harrison Park Court
Indianapolis, IN 46216
317) 542-0511 fax 317.715.2619

Re: Chemical rehabilitation of well # 8

Please find enclosed your copies of the reports generated by the recent chemical rehabilitation well # 8. The reports can be summarized as follows:

Prior to treatment the well had a Specific Capacity of 39.57 Gallon per Foot while being pumped at a rate of 1512 Gallons per Minute. The pump was able to generate 59 PSI at this pumping rate for a total TDH of 194.5'. At open valve the pump could produce 1850 GPM @ 95.8' TDH.

During the treatment we removed a good deal of sand from the formation while using our double disc surge blocks. This wasn't a surprise as this well was installed using the cable tool method and development was provided by over pumping the well, which does not do a good job of removing the fines from the natural formation material.

Following the treatment the well has a SC of 41.91 GPF while being pumped at 1512 GPM. This is an increase of 5% in the wells capacity. The treatment did in fact open up the formation and improve capacity of the well.

As you know the pump was rebuilt in our facility to bring it back within factory tolerances. It currently can produce 68 PSI while pumping 1512 GPM for a total TDH of 209.41! That is an increase of 7% in efficiency and should show a savings in electrical power by running less in time to produce the same amount of water. Currently at open valve the pump can generate 1965 GPM @ 96.9' TDH.

Should you have any questions regarding this report, please contact us at your convenience. We appreciate working with you on this project.

Respectfully,

Tony Alley

Tony Alley
Sales Manager
Ortman Drilling & Water Services
317) 402-7942
talley@ortmandrilling.com

PEERLESS-MIDWEST, INC.
17707 SUN PARK DRIVE / WESTFIELD, IN 46074
PHONE: 317/896-2987 FAX: 317/896-3748

City of Lawrence Utilities

HISTORY OF WELL FORT BENJAMIN # 8

2004 Well Drilled by Others. 16" Cable Tool to 104' bgl. Casing extends 11' above ground. 70' with 23-25' of 16" PS SSWW .075 slot well screen. Simmons SJ12M Bowl Assembly installed.

2009 Pump Pulled and Overhauled, well DD Surge Rehabilitated by others. When complete, well had a specific capacity of 41.91 @ 1512 gpm. Pump provided 209.41' TDH at 1512 gpm and 1965 gpm at 96.9' TDH.

2010 Performance Tested by Peerless-Midwest, Inc. Pump performance is good. Pumped 1200 gpm with a specific capacity of 52.26 gpm/ft and 1815 gpm with a specific capacity of 33.07 gpm/ft.

Record of Water Well

Indiana Department of Natural Resources

Reference Number	*Driving directions to well*	*Date completed*
376655		Nov 07, 2003

Owner-Contractor	*Name*	*Address*	*Telephone*
Owner	LAWRENCE UTILITIES		(317) 542-0511
Driller	DEAN WELL DRILLING, INC	1440 WEST HANNA AVE INDIANAPOLIS, IN	(317) 787-4146
Operator	JOHN AUFDERHEIDE	License: 231	
Company	WITTMAN HYDRO PLANNING ASSOC	320 W 8TH ST SHOWERS PLAZA,STE 201 BLOOMINGTON IN	(812) 333-9399

Construction Details

Well	*Use:* OTHER	*Drilling method:* Rotary	*Pump type:*
	Depth: 85.0	*Pump setting depth:* 0.0	*Water quality:* CLEAR
Casing	*Length:* 75.0	*Material:* PVC	*Diameter:* 2.0
Screen	*Length:* 10.0	*Material:* PVC	*Diameter:* 2.0 *Slot size:* .040

Well Capacity Test	*Type of test:*	*Test rate:* 0.0 gpm for 0.0 hrs.	*BailTest rate:* gpm for hrs.
	Drawdown: 0.0 ft.	*Static water level:* 9.0 ft.	*Bailer Drawdown* ft.
Grouting Information	*Material:* BENT		*Depth:* from 0.0 to 65.0
	Installation Method: PUMP		*Number of bags used:* 4.0
Well Abandonment	*Sealing material:*		*Depth:* from 0 to 0
	Installation Method:		*Number of bags used:*

Administrative

County: Marion — *Township:* 17N *Range:* 5E

Section: SE of the SWof the SE of Section 30 — *Topo map:* Fishers

Grant Number:

Field located by: DRILLER — *on:* May 24, 2004

Courthouse location by: — *on:*

Location accepted w/o verification by: — *on:*

Subdivision name: — *Lot number:*

Ft W of EL:	*Ft N of SL:* 375.0	*Ft E of WL:* 3750.0	*Ft S of NL:*
Ground elevation: 810.0	*Depth to bedrock:* 87.0	*Bedrock elevation:*	*Aquifer elevation:* 723.0
UTM Easting: 585451.0		*UTM Northing:* 4415216.0	

Well Log

Top	Bottom	Formation
0.0	7.0	SANDY BROWN CLAY
7.0	23.0	MEDIUM SAND & GRAVEL
23.0	24.0	GUMMY OLIVE BROWN CLAY
24.0	84.0	MD S&G W CLAY STIPPS
84.0	87.0	GUMMY REDDISH BROWN CLAY
87.0	91.0	LIMESTONE

Comments SEE MAP; DATUM NAD 27, SOURCE GPS;TW-5;FORT HARRISON WELL FIELD EXPANSION;

Record of Water Well

Indiana Department of Natural Resources

Reference Number
376654

Driving directions to well

Date completed
Nov 06, 2003

Owner-Contractor	*Name*	*Address*	*Telephone*
Owner	LAWRENCE UTILITIES		(317) 542-0511
Driller	DEAN WELL DRILLING, INC	1440 WEST HANNA AVE INDIANAPOLIS, IN	(317) 787-4146
Operator	JOHN AUFDERHEIDE	License: 231	
Company	WITTMAN HYDRO PLANNING ASSOC	320 W 8TH ST SHOWERS PLAZA STE 201 BLOOMINGTON IN	(812) 333-9399

Construction Details

Well	*Use:* OTHER	*Drilling method:* Rotary	*Pump type:*
	Depth: 86.0	*Pump setting depth:* 0.0	*Water quality:* CLEAR
Casing	*Length:* 76.0	*Material:* PVC	*Diameter:* 2.0
Screen	*Length:* 10.0	*Material:* PVC	*Diameter:* 2.0 *Slot size:* .040

Well Capacity Test
Type of test: AIR
Drawdown: 0.0 ft.
Test rate: 0.0 gpm for 0.0 hrs.
Static water level: 7.5 ft.
BailTest rate: gpm for hrs.
Bailer Drawdown ft.

Grouting Information
Material: CRUSHED BENT
Installation Method: POUR
Depth: from 0.0 to 25.0
Number of bags used: 8.0

Well Abandonment
Sealing material:
Installation Method:
Depth: from 0 to 0
Number of bags used:

Administrative
County: Marion
Township: 17N *Range:* 5E
Section: SE of the SWof the SE of Section 30
Topo map: Fishers
Grant Number:
Field located by: DRILLER *on:* May 24, 2004
Courthouse location by: *on:*
Location accepted w/o verification by: *on:*
Subdivision name: *Lot number:*
Ft W of EL: *Ft N of SL:* 150.0 *Ft E of WL:* 3400.0 *Ft S of NL:*
Ground elevation: 760.0 *Depth to bedrock:* *Bedrock elevation:* *Aquifer elevation:* 655.0
UTM Easting: 585349.0 *UTM Northing:* 4415152.0

Well Log

Top	Bottom	Formation
0.0	7.0	SANDY BROWN CLAY
7.0	38.0	MD-CRS SAND & GRAVEL
38.0	40.0	SANDY BROWN CLAY
40.0	54.0	MD-CRS SAND & GRAVEL
54.0	57.0	SANDY BROWN CLAY
57.0	62.0	MD-CRS SAND & GRAVEL
62.0	63.0	SANDY BROWN CLAY
63.0	64.0	MD SAND & GRAVEL
64.0	65.0	SANDY BROWN CLAY
65.0	88.0	CRS SAND & GRAVEL
88.0	102.0	SANDY BROWN CLAY
102.0	105.0	GUMMY BROWN CLAY

Comments
SEE MAP;DATUM NAD27, SOURCE GPS;FORT HARRISON WELL FIELD EXPANSION; TW-4'

RTMAN
Drilling & Water Services
Research - Design - Construction - Maintenance
241 N. 300 W. • Kokomo, IN 46901 • 765-459-4125 FAX 765-459-8750

Well Survey Analysis

Owner
Lawrence Utilities

Contact Person
Claude Jones

City/State
Lawrence, IN

Phone Number
317) 542-0511

Date
3/19/2009

Well Location
Fort Harrison

Well Number
8

Casing extends 11' above ground level.

Ground Level

Casing Joints		
Depth		Condition
3'		Good
9'		Good
43'		Good
81'		Good

Depth 81
top of screen

Is screen same size as casing
Yes

Depth 104'

SS Bottom

Static Level	19'
Tape made	yes
Well cleared	yes
Job Number	ASA0905

Special Notes

Drain back is at 9' below top of casing.

RTMAN
Drilling & Water Services
Research - Design - Construction - Maintenance
241 N. 300 W. • Kokomo, IN 46901 · 765-459-4125 FAX 765-459-8750

Owner	City of Lawrence
Contact Person	Claude Jones
City/State	Lawrence, IN
Phone Number	317) 542-0511
Date	4/30/2009
Well Location	Fort Harrison
Well Number	8

Casing extends 11' above ground level.

Ground Level

Depth NA
top of upper grout

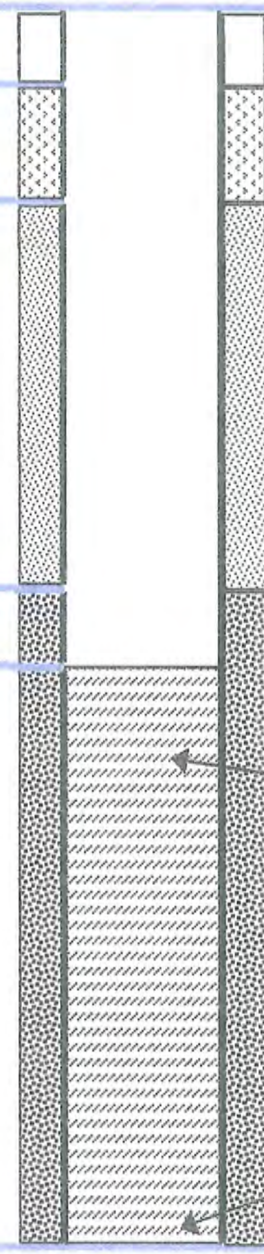
Depth NA
top of lower grout

Depth
top of gravel pack

Depth 81
top of screen

Depth 104'

Bottom



Bore Hole Diameter
inches

Upper Grout Material

Lower Grout Material

Casing
inches diameter wall thickness

Screen
23' feet in length 16" inches diameter inches slot size

Silica Gravel Wall
tons Size # Mfr.

Bottom of screen
SS Plate

Not to Scale
Please note that all depths measured from ground level are not to scale.

Static Level	19'
Type of Rig	Cable Tool
Driller	
Date Completed	
Pumped G.P.M. at feet pumping level after hours	
Special Notes	

BASTIN LOGAN WATER SERVICES INC.

237 W Monroe St
PO Box 55
Franklin, IN 46131
(317) 738-4577
Fax (317) 738-9295

Well Formation Log

Fort Harrison Well Field - Permanent Well # 8

[ ] TEST		DATE	2/3/2004		PROJECT NO.		2516-F
		Well No	8	City	Lawrence	Section	30
[X] PERMANENT	Zone 16	UTM	E585258	County	Marion	Township	17N
	NAD 27	UTM	N4415222	Civil Twsp	Lawrence	Range	5E

OWNER: Lawrence Utilities, LLC

LAND DESCRIPTION: SW 1/4 of SE 1/4

Street or Road:

FORMATION	From Natural Ground Level: Depth to top of stratum(ft)	Depth to bot of stratum(ft)	Thickness of stratum(ft)	Static Water level (ft)
Brown sandy clay	0	7	7	8.05
Fine, medium and coarse sand and gravel	7	17	10	
Gray clay with boulders	17	18	1	
Fine and medium and coarse sand and gravel	18	27	9	
Gritty gray clay with gravel	27	36	9	
Fine and medium and coarse sand and gravel	36	40	4	
Fine and medium & coarse sand & gravel (some silt)	40	50	10	
Fine medium and coarse sand and gravel	50	70	20	
Fine and medium and coarse sand w/ some gravel	70	75	5	
Fine and medium and coarse sand and gravel	75	80	5	
Fine, medium & coarse sand w/ fine to medium grvl	80	85	5	
Fine medium and coarse sand, some gravel	85	95	10	

Hole 24" dia. Drilled by Cable tool

Rotary Hole Grouted with Bentonite slurry seal 10' to 30'

Casing 16" OD from 2' above grade to 70' below grade. Weight 62.5#/ft

Screen 16" P.S. set from 70' to 95' feet

Make Johnson Type HI-Q SSWW Slot .075"

Pumping Test GPM drawdown to feet after hours pumping.

Driller: Delford Dunn

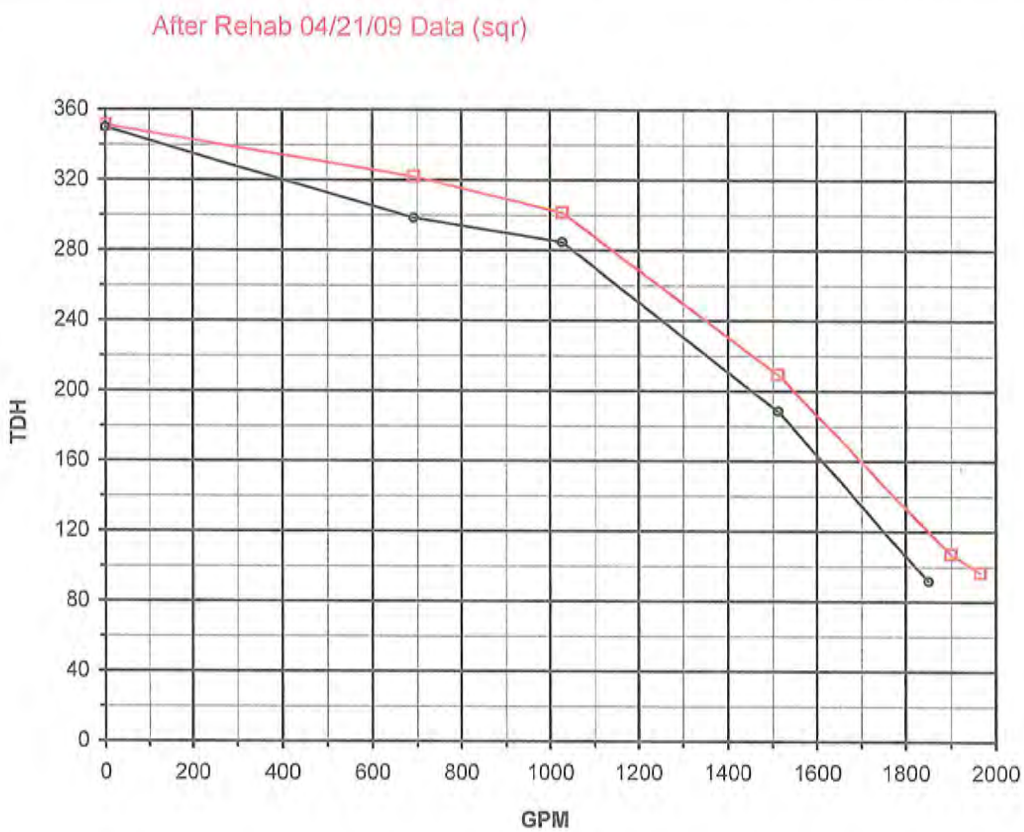
- 25 x 10.44 = 261 gallons (x3)

- 783 gallons clean water
- 10% solution of acetic acid (5 gallons) 4/66
- add granular sulfamic to pH < 2 (1.30/16) est .20

16" casing = 10.44 gallons / ft of water
static = 8
87' of water = 908.28 gallons in well

RTMAN
Drilling & Water Services
Research - Design - Construction - Maintenance
241 N. 300 W. • Kokomo, IN 46901 • 765-459-4125 FAX 765-459-8750

PROJECT	WELL	DATE	STATIC (FT)	FILE
City of Lawrence, Indiana	8	10/20/09	21.92	City of Lawrence Well 8 (102009) Step Test



	GPM	DD (FT)	SC	PSI	TDH (FT)	AMPS
Deadhead	0			142	349.94	73, 79, 77
Step 1	692	4.08	169.61	118	298.58	95, 105, 101
Step 2	1027	27.16	37.81	102	284.70	112, 123, 116
Step 3	1512	35.00	43.20	57	188.59	117, 128, 121
Step 4	1850	46.91	39.44	10	91.93	119, 132, 120
Step 5						

ORTMAN DRILLING & WATER SERVICES
WELL & PUMP MAINTENANCE INSPECTION REPORT

OWNER: Lawrence Utilities | INSPECTION DATE: 20-Oct-09
RESS: 9201 Harrison Part Ct, Indpls, IN 46216 | INSPECTED BY: Tim B.
CONTACT: Claude Jones | OFFICE: 317) 542-0511 | FAX: 317.715.2619
CONTACT LOC: Administration Bldg | PLANT: | CELL: 317) 501-7840

WELL NO./NAME: 8 | DIA: 16" | DEPTH: 104' | TYPE: GWW | YEAR DRILLED:
WELL LOC: Fort Harrison well field
SCREEN: SSWW | I.D.: 16" | LENGTH: 23' | DEPTH TO TOP: 81'
PUMP HOUSE: No | DATES CLEANED: 4/26/2009
PUMP MFG: Simmons | MODEL: SJ12M | IMPELLAR: Open [ ] Closed Turns Off Bottom [X] | Installed:
RATED CAPACITY: GPM @ TDH | SHUT-OFF PSI: | OPERATING PSI:
TOTAL SETTING: 75' 6" | AIRLINE OR TUBE: 3/4" poly | PACKING: x x RINGS
METER/BRAND: | Size: | Test Outlet Size: | Type: | DATES REPAIRED:
MOTOR MFG.: US Electric | HP: 100 | RPM: 1785 | VOLTAGE: 460 | PHASE: 3
LINE VOLTAGE: | F.L. AMPS: | NRR: | DATES REPAIRED:

NORM. OPERATING FLOW: | NORM. OPERATING PRESSURE:
LINE VOLT: L1-2 518 L2-3 520 L3-1 520 | ELECTRIC CONNECTIONS: Good
SURE GAUGE: Yes | FLOW METER: N/A
EXERCISE VALVES: Yes | VALVES FULLY OPEN/SHUT: Open
CHECK VALVES HOLD: Yes | CONTROL VALVES FUNCTION: N/A
NOISE, VIBRATION OR HEAT: None | LEAKS OR CRACKS: None
REPACK & GREASE PUMP: Adj Packing | CHANGE MOTOR OIL: Yes | QTS & GREASE: 5
WATER COLOR OR ODOR: None | SAND CONTENT: None

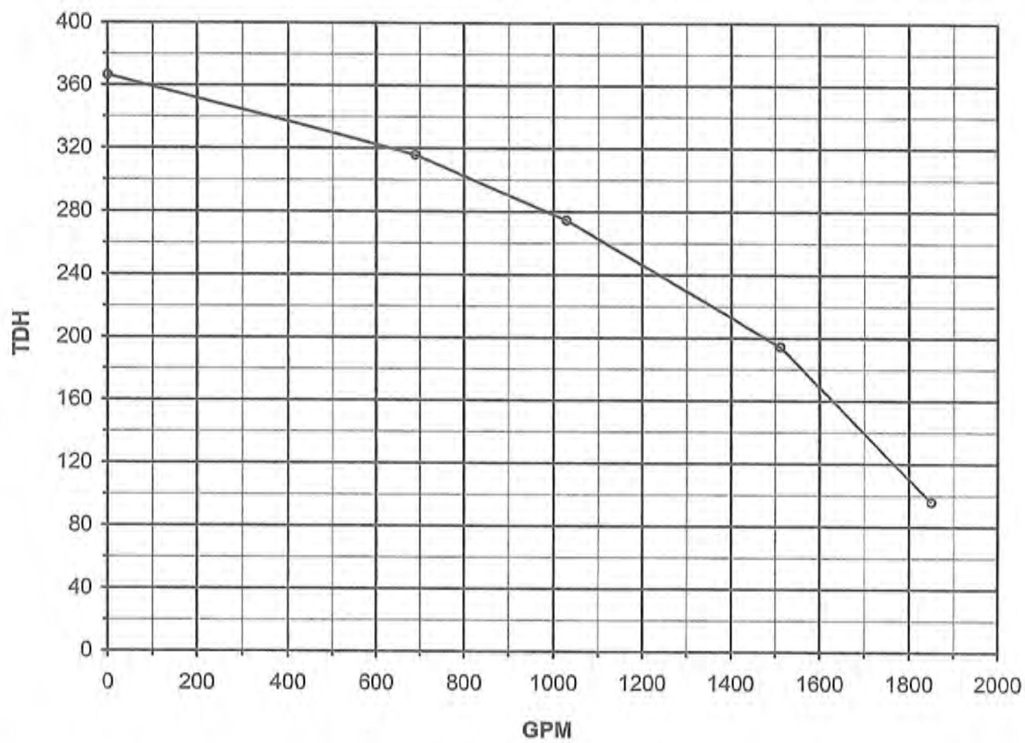
COMMENTS:

EQUIPMENT USED FOR TESTING: 10" x 6" flanged adapter, 6" x 6" 90, 6" valve, 10' rigid hose, 60' soft hose
10" x 8" orifice and splash pad

	DATE	SWL	GPM	PWL	DD	PSI	TDH	AMPS	Spec Cap
ORIGINAL									
LAST CLEANING									
LAST TEST	4/21/2009	16' 3"	1512	52' 4"	36' 1"	68	209.41'	126, 128, 128	41.91
SHUT-OFF	10/20/2009	21.92'				142	349.94'	73, 79,77	
STEP 1			692	26'	4.08'	118	298.58'	95, 105, 101	169.61
STEP 2			1027	49.08'	27.16'	102	284.7'	112, 123, 116	37.81
STEP 3			1512	51.92'	35'	57	188.59'	117, 128, 121	43.2
STEP 4			1850	68.83'	46.91'	10	91.93	119, 132, 120	39.44
OPEN									

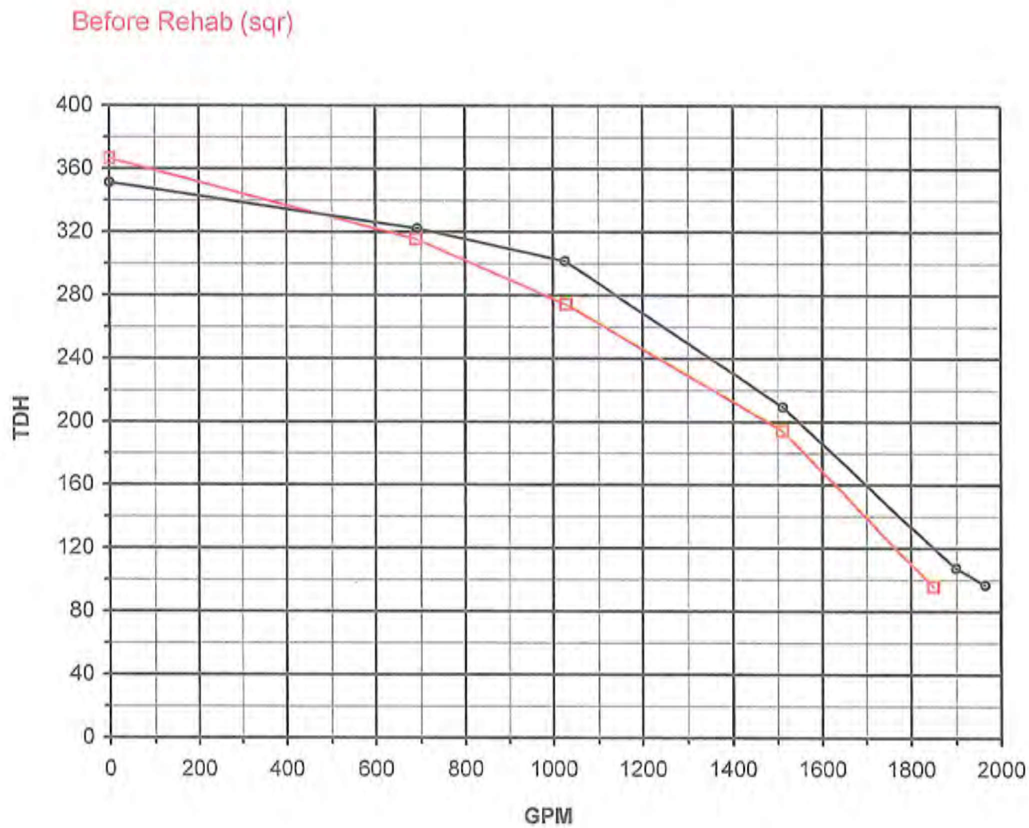
RTMAN
Drilling & Water Services
Research - Design - Construction - Maintenance
241 N. 300 W. • Kokomo, IN 46901 • 765-459-4125 FAX 765-459-8750

PROJECT	WELL	DATE	STATIC (FT)	FILE
City of Lawrence, Indiana	8 (Before Rehab)	03/18/09	20 (Measured 12' Above Grade)	City of Lawrence Well 8 BR (031809) Step Test



	GPM	DD (FT)	SC	PSI	TDH (FT)	AMPS
Deadhead	0			150	366.50	67.9, 77.4, 78.2
Step 1	690	18.42	37.46	120	315.62	86.8, 98.7, 98.3
Step 2	1029	28.13	36.58	98	274.51	100.5, 112.8, 112.6
Step 3	1512	38.21	39.57	59	194.50	105.7, 117.5, 117.3
Step 4	1850	48.08	38.48	12	95.80	100.4, 112.9, 113.2

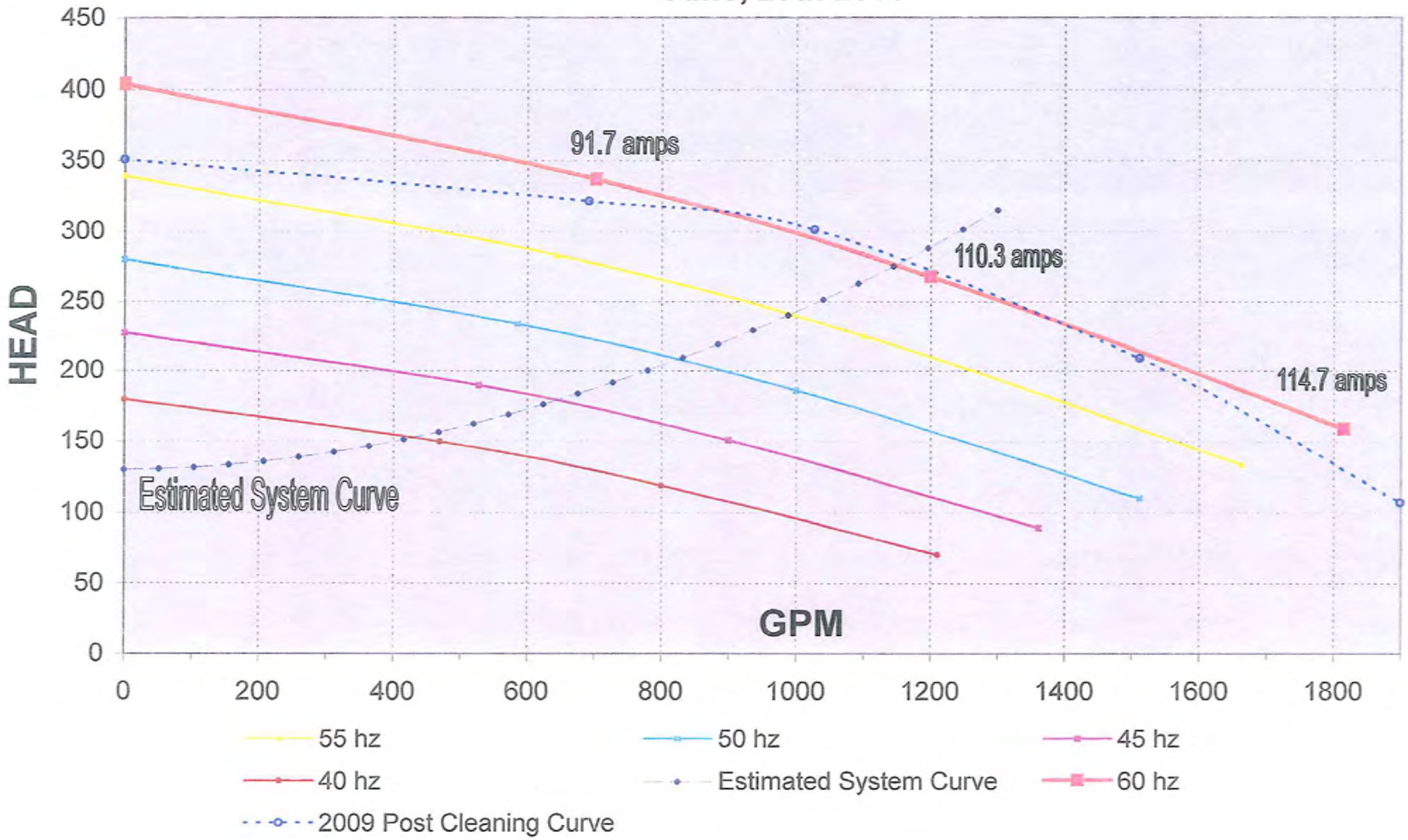
PROJECT	WELL	DATE	STATIC (FT)	FILE
City of Lawrence, Indiana	8 (After Rehab)	04/21/09	16.25 (Measured 12' Above Grade)	City of Lawrence Well 8 AR (042109) Step Test



	GPM	DD (FT)	SC	PSI	TDH (FT)	AMPS
Deadhead	0			145	351.20	75, 79, 77
Step 1	692	17.25	40.12	125	322.25	96, 100, 97
Step 2	1027	24.25	42.35	113	301.53	108, 114, 111
Step 3	1512	36.08	41.91	68	209.41	126, 128, 128
Step 4	1899	45.08	42.13	20	107.53	118, 122, 119
Step 5	1965	46.00	42.72	15	96.90	117, 121, 118

Peerless-Midwest Incorporated

City of Lawrence, IN
FB#8 Calculated VFD Pump Performance
June, 29th 2010



RTMAN
Drilling & Water Services
Research - Design - Construction - Maintenance
241 N. 300 W. • Kokomo, IN 46901 • 765-459-4125 FAX 765-459-8750

Pump Installation Report

Well # 8

Owner	Lawrence Utilities	Phone Number	317) 542-0511	Job Number	ASA0905
Contact Person	Claude Jones	Date	4/21/2009	Pulling Equipment	Big crane
City/State	Lawrence, IN	Well Location	Fort Harrison	Overhead Power Lin	No

Electric Motor Information

Manufacturer	US Electric	Type	RUSI	*Motor Shaft Top Threads*	
Motor Shaft Diameter	1.5"	Motor Shaft Length	3' 8"	Right Hand	
				Left Hand	
Keyway	3/8"	Clutch Diam.		T.P.I.	
RPM	1785	Upper Bearing			
NRR	Yes	Lower Bearing			
CD of Motor		Grease Type			
Oil Capacity					

Frame	404TP
Service Factor	1.15
Volts	460
FL Amps	114
Line Voltage	
S/N	H0100V2SL6
HP	100
Phase	3
Motor Repair	Mar-09

Recommended Lat. Set		Min. Setting	
Turns Off Bottom		Max. Setting	

Right Angle Drive Information

Brand Name		S/N		Gear Ratio	
Rotation				Model No.	
S/N					

Pump Information

Pump Head

Pump Head Mfr.	Simmons
Discharge Hd. Type	Fabricated
Discharge Hd. Size	10"
Discharge Location	
Feet Above Grade	
Column To Head	Flange
Base Plate	Yes
Pump Top Shaft Length	5' 8.5"
Shaft Diameter	1.5"
Pin Size At Head	1.5"
T.P.I.	

Column Pipe

Coupling	Steel
Spiders	Drop-In
Col. Pipe Size	10"
Flanged	No
Special Paint	No
Shaft Diameter	1.5"
Shaft Material	S.S.
Sleeve Diameter	1 11/16"
Sleeve Material	S.S.

Bowl Assembly

Design GPM		at tdh	
Bowl Assem. Type	Bolt		
Bowl Diameter	12"		
Bowl Material	C.I.		
Impeller Shaft Diam.	1 11/16"		
Shaft Length			
Bowl Shaft Material	S.S.		

Suction Type

Suction Size	8"		
Threads on Bottom	Yes		
Length		Special Paint	N
Strainer			
Str. Diameter			
Str. Length			

Minimum Submergence Above The Eye Of The Bottom Of Impeller	
Pump Mfr.	Simmons SJ 12M

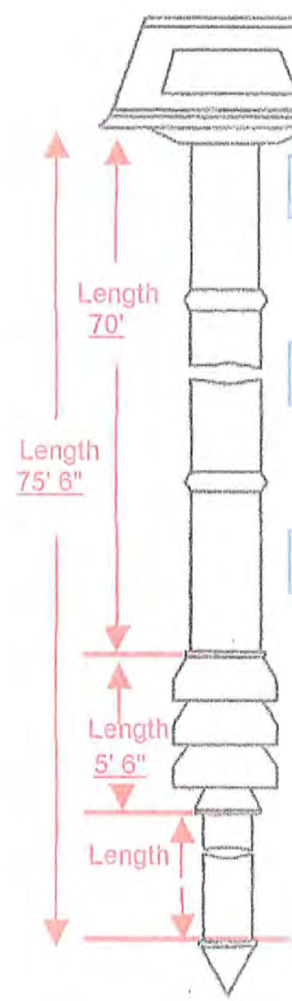
Well Data

Depth		Type of Well		Screen Open Size
Inside Diam.		Screen Diameter		
Tower Height		Screen Length		

Misc. Data

Print Updated	4/29/2009	Special Notes
Pump Repaired Last	Apr-09	
Well Cleaned Last	1-Mar-09	
Pump Off Size	10"	
Installer	Nathan D./ Tim B.	

Pump Assembly Specifics



Top Column Pipe
Length 5'

Center Column Pipe
6 at 10' each

Bottom Column Pipe
1 at 5' each

No. of Stages
4

BASTIN LOGAN WATER SERVICES INC.
237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

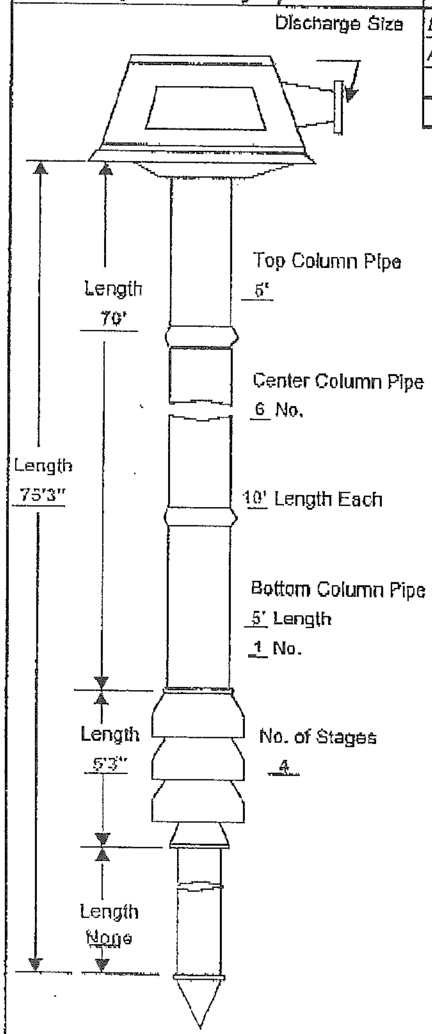
Pump Installation Report

City of Lawrence, Indiana Ft. Harrison Well # 8

Date:	8/4/2004	City, State	Lawrence, IN
Project No.	2516-F	Pulling Equipment	Hydrocrane
Well Pump Loc.	Well # 8 Ft. Harrison	Over Head Power Lines	No

Manufacturer	US	Type	RUS1	Motor Shaft Threads		Frame	404TP	S/N	H00100V25LG
Motor. Shaft Dia.	1 1/2"	Mtr. Shaft. Lgt.	44"	Right Hand		ServiceFactor	1.15	HP	100
Keyway	3/8"	Clutch Diameter	1 1/2"	Left Hand	X	Volts	460	Phase	3
RPM	1785	Upper Bearing	7222-BEM	T.P.I.	10	FL Amps	114	Motor Repair	New
Ratcheting	yes	Lower Bearing	6212-J			Line Voltage	480	SRC	no
CD of Motor	37"								

Pump Assembly Specifics



Right Angle Drive Information

Brand Name	None	S/N		Gear Ratio	
Aux Eng Brand Name	None	Mod. No.		S/N	

Pump Information

Pump Head

Pump Head Mfr.	Simmons		
Discharge Head Type	Simmons SPC10		
Discharge Line Size	10"		
Location	Above	X	Grade
	Below		
ColumnTo Head	FLGD	Threaded	X
Base Plate	yes		
Pump Top Shaft Lgt.	68 1/2"		
Diameter	1 1/2"		
Pin Sz. At Hd.	1 1/2"	T.P.I.	8
Pump Brand	Simmons	Serial Number	2279 043

Column Pipe

Coupling	C.I.	
	S.T.	X
Spiders	Drop - In	
	Screw - In	X
Col. Pipe Size	10"	
Flanged	Screwed	X
Special Paint		no
Water lube		yes
Shaft size	1 1/2"	

Bowl Assembly

Design GPM	1,200	@ TDH	275'
Bowl Assembly Type	SJ12M		
Shell Diameter	12"		
Shell Material	C.I.	X	BZ.
Impeller Shaft Diameter	1 11/16"		
Stickup	12"		
Pinsize	1 1/2"	TPI	8
Strainer size	None		

Suction Pipe

Suction Size	None	Threads On Btm.	
Length		Special Paint	

Flow Test

SWL	19.7'	Op. Pressure	
GPM		PL	
D.D.		Spec. Cap.	
Amps			

Well Data

Depth	105.3'	Type Well	G.P.	X	Screen Diameter	16"
Inside Diameter	16"		Tube		Screen Length	25'
Tower Height	11'				Screen Open Size	.060"

Misc. Data

Pump Repaired Last	New
Well Cleaned Last	New
Pump Off Size	10" tee

Installer(s): Greg Procell, Curt Berry and Rick Lux

Peerless Midwest Inc. *Water Supply Contractors*

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254 9650

WELL & PUMP SERVICE INSPECTION REPORT

Owner Lawrence Utilities City Lawrence State IN

Location Fort Benjamin Harrion Well Field

Well No. FB#9 Date Drilled 1968 Dia. 18" Depth 111.5' Type Well GWW

Screen ID. 18" Screen Length 20' Depth to Top of Screen 91.5' Type Screen SSWW

Dates of Cleaning 1999, 2003, 2004, 2007, 2008

Phone Office# 317-542-0511 Cell# 317-501-7840 Person to Contact Claude Jones

	DATE	STATIC	G.P.M.	PUMPING LEVEL	PRESSURE	SPECIFIC CAPACITY
ORIGINAL	1968					89.3
AFTER LAST CLEANING						
AFTER LAST TEST						
AT PUMP'S RATED FLOW						
AT SYSTEM OPERATING PSI						

Test Completed Through Meter ___ Flange or Thread Size 6" Confined Space Entry? No

Motor HP 60 Make G.E. Volts 230/460 RPM 1765 Phase 3

Gear Drive None HP - Ratio - RPM Meter Required ___

Pump Mfg. Floway Serial No. 60173 Airline Length 71'

Rated Capacity: 700 GPM 272' TDH Operating Pressure 99#

Total Setting 74' 5" Size of Packing 3/8" Date Installed ___

Dates of Overhaul 2008

THE FOLLOWING IS TO BE PERFORMED DURING EACH INSPECTION

Is Check Valve Leaking? ___ Change Motor Oil & Grease ___ Repack Pump ___ Grease Pump ___

Pump is Presently Developing ___ GPM ___ TDH Projected Curve Capacity 700 GPM ___ TDH

Shut Off Pressure ___ PSI Rated Shut Off Head ___ ft. Calculated Shut Off Head ___ ft.

Electrical Data (With Pump in Operation) ___ V / / Amps ___ Full Load Amps

Location of Power Lines ___ Can Electrical Box be Locked Out? ___

Distance from Top of pump pedestal to grade ___ Materials Needed to Clean Well ___

Need a Smeal to Raise Pump ___ Remarks ___

Maintenance: 8x6 redujcing 90, valve, 50' hard hose, 50' soft hose, have to remove flow meter to test.

Inspected By ___ Date Inspected ___

PEERLESS-MIDWEST Incorporated

PUMP TEST FORM

JOB # ______________ DATE 6/29/2010

OWNER Lawrence Utilities

Annual Maintenance Test

WELL Fort Ben 9 WELL DIAMETER 18" WELL DEPTH 110'

NORMAL PSI - 99 SWL 12.33' PROBE X

Time	Pumping Level (ft)	Drawdown (ft)	PSI	Orifice Size	Inches	GPM	Specific Capacity	TDH	Amps
						0	N/A		
11:20									
			102	6x5	5	280			45/43/18
			102	6x5	5	280			
			102	6x5	5	280			
11:25	12.13	24.46	102	6x5	5	280	23.08	260.1	
11:30									
				6x5	16.5	503			57/57/54
				6x5	16.5	503			
				6x5	16.5	503			
11:35	20.25	32.58	82	6x5	16.5	503	24.84		
11:50			45	6x5					
			45	6x5		754			74/75/73
			45	6x5					
			45	6x5					
12:30	23.00	35.33	45	6x5			32.78		
						Max			

8x6 reducing 90, valve, 50' rigid hose, 50' lay flat hose, have to remove flow meter to test

BY: VFD is not working right (old motor)

ORTMAN DRILLING & WATER SERVICES
WELL & PUMP MAINTENANCE INSPECTION REPORT

OWNER: Lawrence Utilities — INSPECTION DATE: 19-Oct-09

'RESS: 9201 Harrison Part Ct, Indpls, IN 46216 — INSPECTED BY: Tim B.

CONTACT: Claude Jones — OFFICE: 317) 542-0511 — FAX: 317.715.2619

CONTACT LOC: Administration Bldg — PLANT: — CELL: 317) 501-7840

WELL NO./NAME: 9 — DIA: 18" — DEPTH: 111.5' — TYPE: GWW — YEAR DRILLED:

WELL LOC: Fort Harrison well field

SCREEN: SSWW — I.D.: 18" — LENGTH: 20' — DEPTH TO TOP: 91.5'

PUMP HOUSE: Yes — DATES CLEANED:

PUMP MFG: Layne — MODEL: — IMPELLAR Open ☐ Closed ☐ Turns Off Bottom — Installed:

RATED CAPACITY: 700 GPM @ 272' TDH — SHUT-OFF PSI: 140 — OPERATING PSI:

TOTAL SETTING: 74' 8" — AIRLINE OR TUBE: 3/4" poly — PACKING ___ X ___ X ___ RINGS

METER/BRAND: — Size: — Test Outlet Size: — Type: — DATES REPAIRED:

MOTOR MFG.: GE — HP: 60 — RPM: 1765 — VOLTAGE: 460 — PHASE: 3

LINE VOLTAGE: 460 — F.L. AMPS: 73 — NRR: yes — DATES REPAIRED:

NORM. OPERATING FLOW: — NORM. OPERATING PRESSURE:

LINE VOLT L1-2: 544 L2-3: 542 L3-1: 545 — ELECTRIC CONNECTIONS: Good

SURE GAUGE: Yes — FLOW METER: N/A

EXERCISE VALVES: Yes — VALVES FULLY OPEN/SHUT: Open

CHECK VALVES HOLD: Yes — CONTROL VALVES FUNCTION: N/A

NOISE, VIBRATION OR HEAT: None — LEAKS OR CRACKS: None

REPACK & GREASE PUMP: Adj Packing — CHANGE MOTOR OIL: 3.5 QTS & GREASE:

WATER COLOR OR ODOR: None — SAND CONTENT: None

COMMENTS:

EQUIPMENT USED FOR TESTING: 8" x 6" orifice, 8" x 6" reducing 90, valve,2- 25' rigid hose, 1- 50' lay flat hose
Have to remove down flow meter to test

	DATE	SWL	GPM	PWL	DD	PSI	TDH	AMPS	Spec Cap
ORIGINAL									
LAST CLEANING									
LAST TEST	5/2/2005	17'	822	37'	20'	70	199'	62, 68, 60	41
SHUT-OFF	10/19/2009	20.25'				110	274.35'	45, 48, 49	
STEP 1			578	40'	19.75'	82	229.42'	75, 74, 73	29.27
:P 2			776	44'	23.75'	58	177.98'	87, 81, 84	32.67
STEP 3			822	52.58'	32.33'	44	154.22'	83, 81, 82	25.43
STEP 4			882	59.33'	39.08'	32	133.25'	86, 81, 82	22.57
OPEN			1012	67'	46.75'	4	76.24'	85, 80, 82	21.65

PEERLESS-MIDWEST, INC.
17707 SUN PARK DRIVE / WESTFIELD, IN 46074
PHONE: 317/896-2987 FAX: 317/896-3748

City of Lawrence Utilities

HISTORY OF WELL FORT BENJAMIN # 9

1968 Well drilled by others, 90' of 18" casing, 20' of 18" OD screen. Static water level of 9', the well pumped 1,875 gpm with a 30' pumping water level, for a specific capacity of 89.3 gpm/ft.

6/99 Well treated for iron bacteria, chemically cleaned and developed by others. After work completed, static 18.8', pumped 1113 GPM with a pumping level of 36.8' for a specific capacity of 61.8 GPF.

3/03 Well treated for iron bacteria, chemically cleaned and developed by others. After work completed, static 18', pumped 671 GPM with a pumping level of 30' for a specific capacity of 55.9 GPF.

5/04 Well treated for iron bacteria, chemically cleaned and developed by others. After work completed, static 23', pumped 736 GPM with a pumping level of 38.5' for a specific capacity of 47.5 GPF.

2005 Performance Tested by Others. Pumped 822 gpm at 199' TDH with a specific capacity of 41 gpm/ft

7/07 Well treated for iron bacteria, chemically cleaned and developed. After work completed, static 21.5', pumped 1016 GPM with a pumping level of 59.5' for a specific capacity of 26.73 GPF.

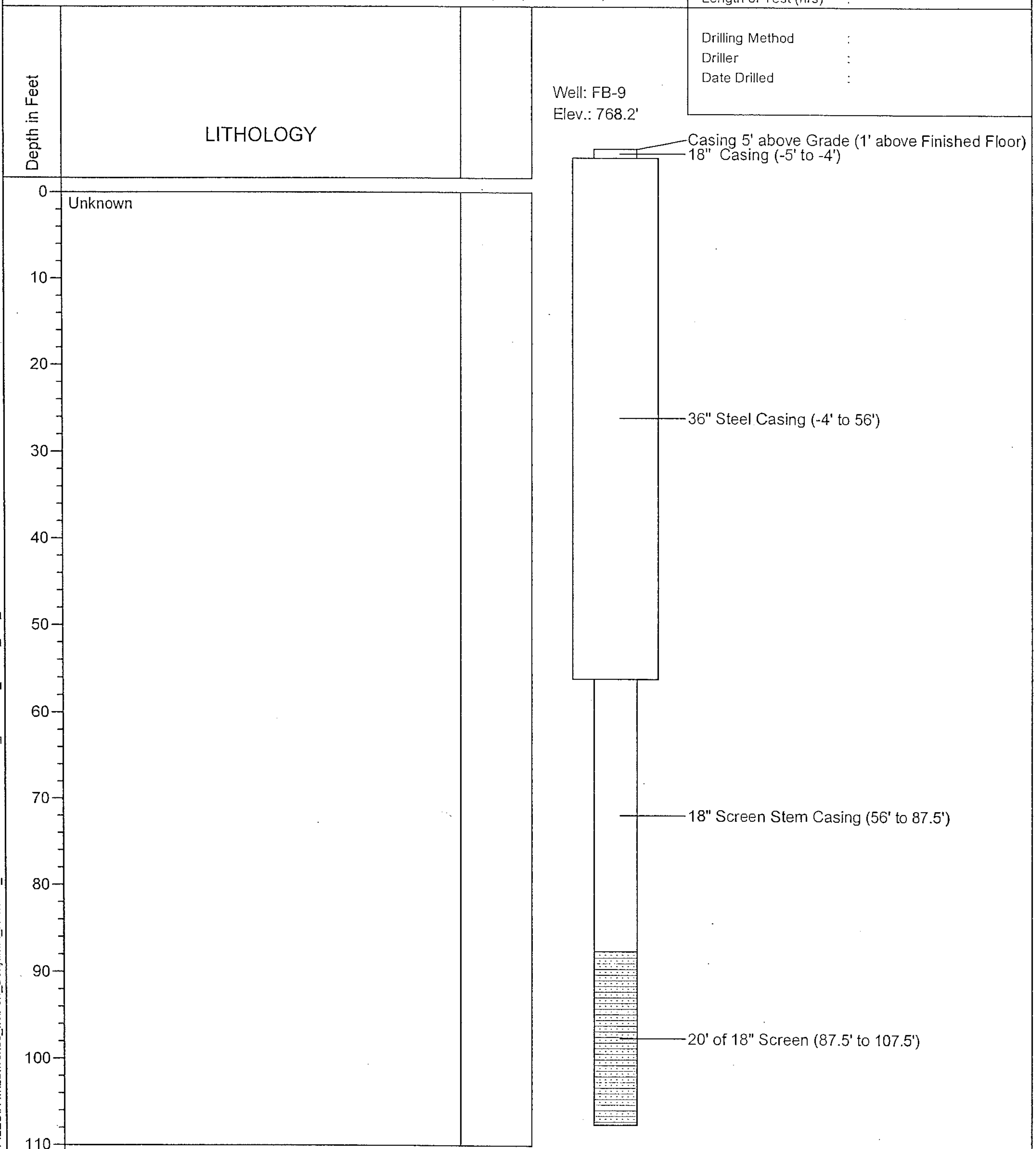
11/08 Well treated for iron bacteria, chemically cleaned and developed. After work completed, static 24.37', pumped 1016 GPM with a pumping level of 59.71' for a specific capacity of 26.36 GPF.

2010 Performance Tested by Peerless-Midwest, Inc. Pump performance is falling rapidly under operating conditions, Pump Plugged?. Pumped 503 gpm with a specific capacity of 24.84 gpm/ft and 754 gpm with a specific capacity reading of 32.78 gpm/ft.

City	: Lawrence	County	: Marion
State	: Indiana	Twp. (T/R)	: Lawrence (T17N, R5E)
Location	: Fort Benjamen Harrison Well Field	1/4,1/4,1/4,Sec.#	: NW,SE,SE,30
		UTM Coordinates	: NAD 27 ZONE 16 4,415,570 N 585,681 E

Test Rate	:
Static Water Level	:
Pumping Level	:
Specific Capacity	:
Length of Test (hrs)	:

Drilling Method	:
Driller	:
Date Drilled	:



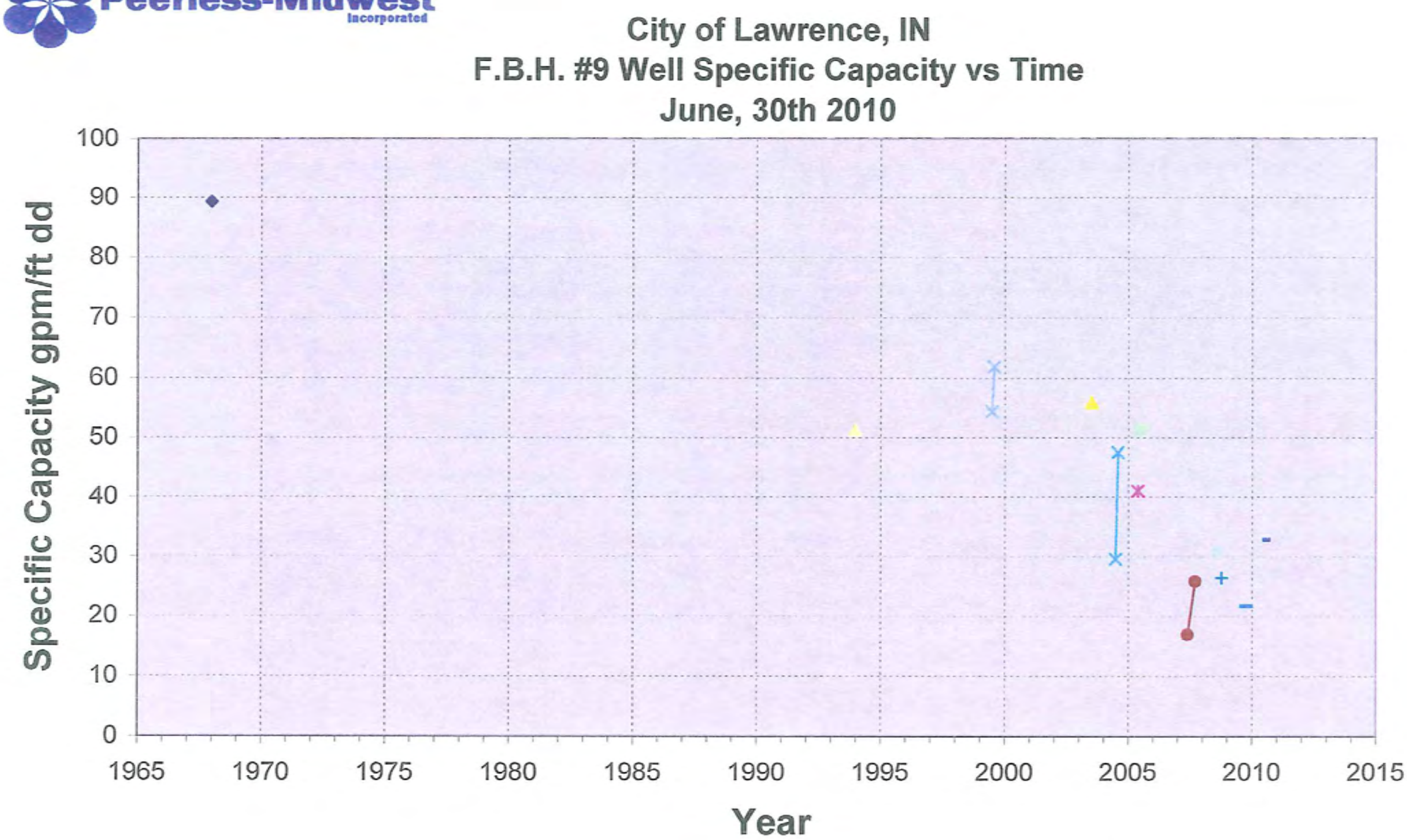
Lawrence Utilities
Lawrence, Indiana

Job Number 21502

PEERLESS-MIDWEST
Mishawaka, IN Ionia, MI
Westfield, IN Wixom, MI
Water Supply Contractors
& Hydrogeologists
www.pmidwest.com

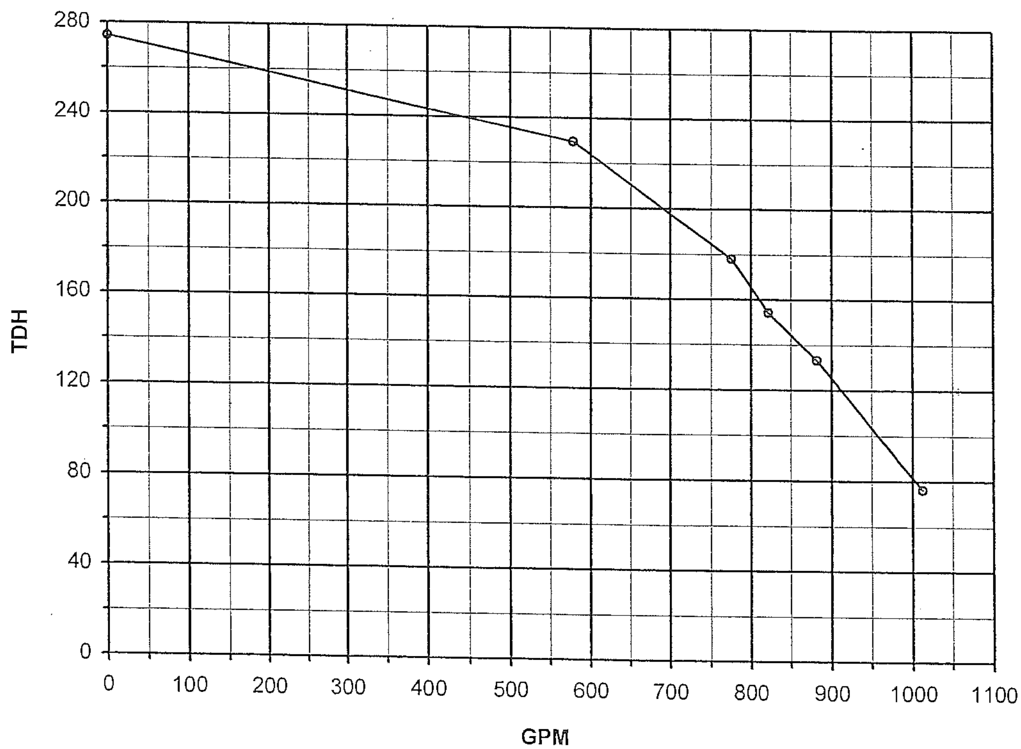
08-11-2008 S:\JOB FILES\K-M\Lawrence_IN\Fort_Benjamin_Harrison_Wellfield\FB-9\Well\21502_lawrence_utilities_well_fb1.bor

Peerless-Midwest Incorporated



ORTMAN
Drilling & Water Services
Research - Design - Construction - Maintenance
241 N. 300 W. • Kokomo, IN 46901 • 765-459-4125 FAX 765-459-8750

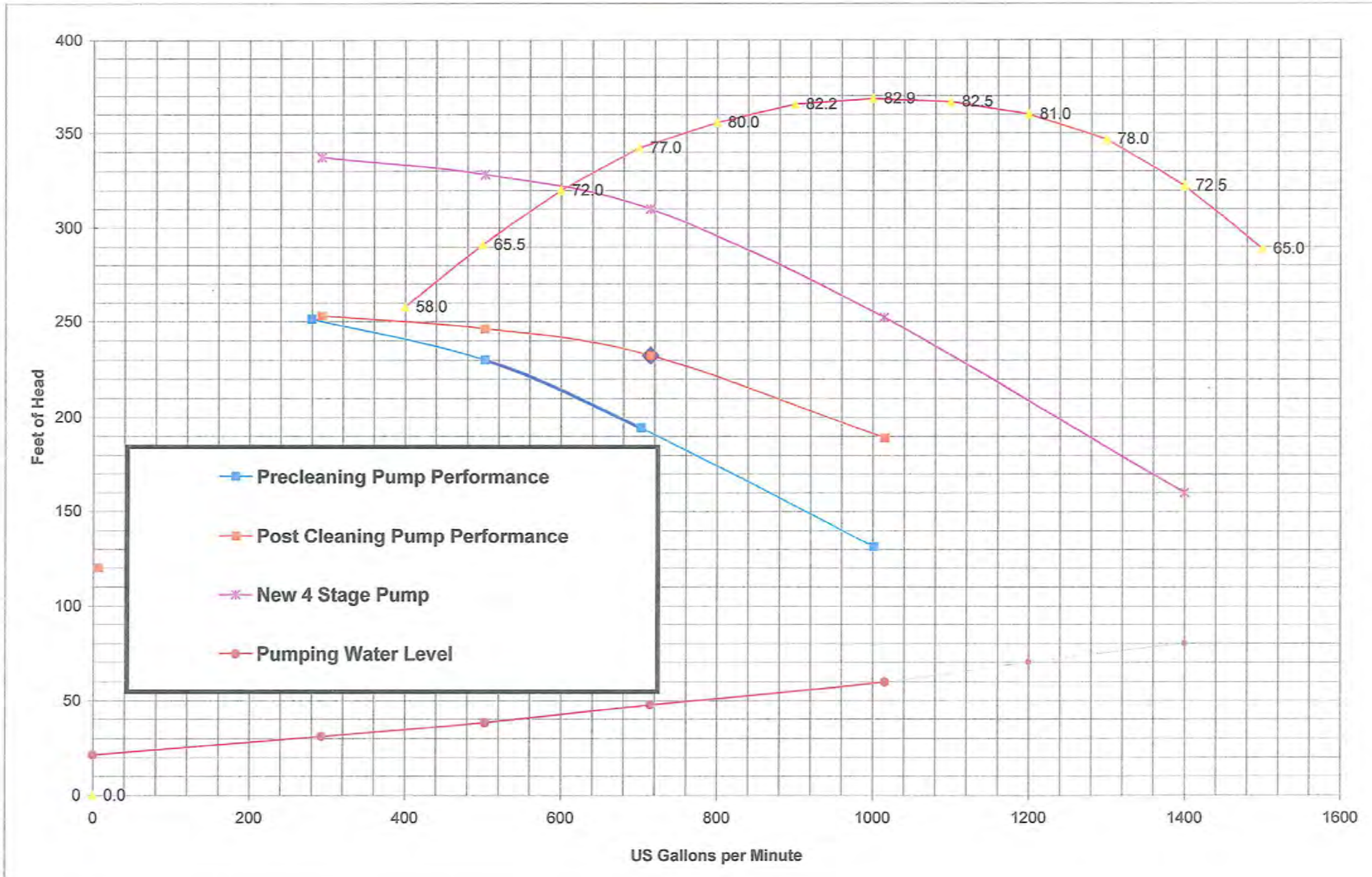
PROJECT	WELL	DATE	STATIC (FT)	FILE
City of Lawrence, Indiana	9	10/19/09	20.25	City of Lawrence Well 9 (101909) Step Test



	GPM	DD (FT)	SC	PSI	TDH (FT)	AMPS
Deadhead	0			110	274.35	45, 48, 49
Step 1	578	19.75	29.27	82	229.42	75, 74, 73
Step 2	776	23.75	32.67	58	177.98	87, 81, 84
Step 3	822	32.33	25.43	44	154.22	83, 81, 81
Step 4	882	39.08	22.57	32	133.25	86, 81, 82
Step 5	1012	46.75	21.65	4	76.24	85, 80, 82

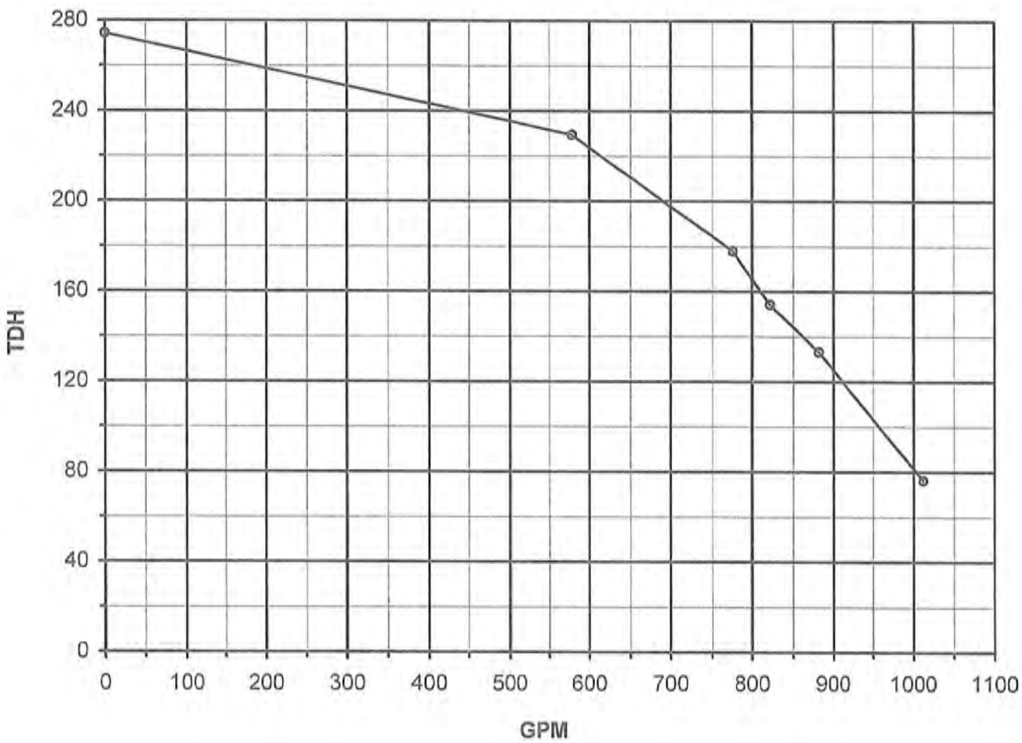
Owner: City Of Lawrence
Pump Mfg. Floway
SN: #9
Date: 11/19/08

Peerless-Midwest, Inc. *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, IN 46545 / 574-254-9050
505 Apple Tree Drive / Ionia, MI 18864 / 616-527-0050
17707 Sun Park Drive / Westfield, IN 46074 / 317-896-2987



RTMAN
Drilling & Water Services
Research - Design - Construction - Maintenance
241 N. 300 W. • Kokomo, IN 46901 • 765-459-4125 FAX 765-459-8750

PROJECT	WELL	DATE	STATIC (FT)	FILE
City of Lawrence, Indiana	9	10/19/09	20.25	City of Lawrence Well 9 (101909) Step Test



	GPM	DD (FT)	SC	PSI	TDH (FT)	AMPS
Deadhead	0			110	274.35	45, 48, 49
Step 1	578	19.75	29.27	82	229.42	75, 74, 73
Step 2	776	23.75	32.67	58	177.98	87, 81, 84
Step 3	822	32.33	25.43	44	154.22	83, 81, 81
Step 4	882	39.08	22.57	32	133.25	86, 81, 82
Step 5	1012	46.75	21.65	4	76.24	85, 80, 82

PEERLESS-MIDWEST Incorporated

PUMP TEST FORM

JOB # 22832 DATE 11/19/2008

OWNER Lawrence, IN

WELL FB 9 WELL DIAMETER 36" X 18" WELL DEPTH 111.5'

NORMAL I 83# SWL 24.37 AIRLINE OR PROBE

58 HZ

Time	Pumping Level (ft)	Drawdown	PSI	Orifice Size	Inches	GPM	Specific Capacity	TDH	Amps
1:34	29.66	5.29	96	6 X 5	5.5	293	55.39		
1:37	30.85	6.48				293	45.22		
1:40	31.15	6.78				293	43.22		
1:43	31.13	6.76				293	43.34		
1:46	31.13	6.76				293	43.34	252.89	
1:50	38.04	13.67	90		16.5	503	36.80		
1:53	38.23	13.86					36.29		
1:56	38.23	13.86					36.29		
1:59	38.15	13.78					36.50		
2:02	38.15	13.78					36.50	246.05	
3:21	46.39	22.02	80		34	715	32.47		64.2
3:24	46.89	22.52					31.75		66.1
3:27	47.58	23.21					30.81		63.4
3:30	47.58	23.21					30.81	232.38	
3:35	58.52	34.15	56		70	1016	27.20		75.5
3:38	59.63	35.26					26.42		77.2
3:41	59.71	35.34					26.36		73.8
3:44	59.71	35.34					26.36	189.07	

BY: Gerald Flora

Peerless Midwest Inc. Water Supply Contractors

17707 Sun Park Drive / Westfield, Indiana 46074 / 317-896-2987 / Fax 317-896-3748

PUMPING TEST DATA REPORT

Job No. 21502 Owner Lawrence Utilities Page 1 of 1

Location Fort Ben

Pumping Test Performed on Well # FB-9 Date: 7/9/2007

Readings Measured on: Pumping Well # ______ Observation Well # ______

Hydrogeologist ______ Project Manager JTH

Static Water Level 21.5' Readings Made By: Wetted Tape

Measured From Blk. Poly Which is 20" Above Ground Level Elev. of Elevated Well House

Orifice Size ______ Inches ______ PSI 64

Date	Time	GPM	Water Level (ft)	Date	Time	GPM	Water Level (ft)	Date	Time	GPM	Water Level (ft)
7/9/07	2:10	280	31.58	7/10/07	12:32	1016	52.42				
	2:18	1016	61.33		12:35		57.42				
	2:21		61.67		12:38		58.83				
	2:24		61.08		12:41	Adjust Valve	59.25				
	2:27		60.88		12:44		59.54				
	2:35		60.54		12:47		59.44				
					12:50		59.50				
					12:53		59.54				
					12:54	Backed off to 82 PSI					
					1:05	776	49.75				
					1:15		49.67				

Readings Taken By:

Fort Ha[illegible]

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

Well Rehabilitation Summary

Lawrence Utilities, LLC - Ft. Ben Well # 9

Date:	5/17/04	Diameter:	36" x 18"	Pump Mfg:	L & B
Client:	Lawrence Util, LLC	Depth:	111.6'	Serial No:	60173
City:	Lawrence	Type:	GWW	Capacity:	700 gpm
State:	Indiana	Screen: dia:	18"	TDH:	272'
Well No:	# 9	depth to top:	91.6'		
Location:	Ft. Ben Well Field	length:	20'		

	Year	Static Water (ft)	GPM	Pumping Level (ft)	Draw Down (ft)	Specific Capacity
Drilled	9/5/68	9	1875	30	21	89.3
Last Rehabilitation	3/24/03	18	671	30	12	55.9
Test Before	5/17/04	23	413	37	14	29.5
Test After	5/19/04	23	736	38.5	15.5	47.5

Notes:

Date	GPM	Pumping Level (ft)	Discharge Pres (#)	Specific Capacity	Treatment TDH (ft)	AMPS
5/17/2004	shutoff		135			
*	413	37	80	29.5		
	482	39	60	30.1		
	570	42	20	30		
					Surge acid	
	624	47	60	26		
5/18/2004					Surge acid	
	840	45	60	38		
5/19/2004					Surge bleach and tripoly	
	shutoff		140		326	37-35-38
	635	34.7	100	54.2	266	61-61-61
	693	36.6	90	50.9	245	63-65-64
*	736	38.5	80	47.4	223	64-67-64
	777	40.1	70	44.6	202	66-68-66
	816	42.5	60	41.8		

* GPM taken after discharge of chemicals and a 30 minute minimum pumping test.

Chemical	Amount Used		Chemical	Amount Used		Foreman
Tri-poly Phosph	800	lbs	Neutralizer		lbs	
Muriatic Acid	660	gals	Liq Chlo Bleach	110	gals	Greg Procell
HTH		lbs				

For P# 9

INDIANAPOLIS WATER COMPANY
Purification Dept. Laboratory

Date: January 22, 2001

Sample Description: Lawrence Fort Harrison Well #9

Sample Number: L-20043

Collected By: K. W.   Date: January 22, 2001

Analyte	Value	Test Date	Analyte	Value	Test Date
Turbidity			Potassium	1.8	1/22/01
Alkalinity	150	1/22/01	Arsenic	<.001	1/31/01
pH	7.39	1/22/01	Barium	0.061	2/7/01
Calcium	98	1/22/01			
Total Hardness	350	1/22/01			
			Cadmium	<.0005	1/29/01
Odor	Musty	1/22/01	Copper	<.02	1/23/01
Chloride	38	1/22/01	Iron	0.32	1/23/01
Fluoride	0.23	1/22/01	Lead	<.001	1/31/01
Nitrite	<.02	1/22/01	Manganese	0.16	1/23/01
Nitrate	0.36	1/22/01			
Sulfate	34	1/22/01			
Ammonia	0.1	1/22/01	Selenium	<.003	1/24/01
Silica	10.2	1/22/01			
Conductivity	660	1/23/01	Sodium	20	1/22/01
Magnesium	28	1/22/01			
VOCs					
SVOCs			TOC		

Bacteriology:

Plate Count	1				
Coliform	0/0				

EB #9

BASTIN LOGAN WATER SERVICES INC

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

WELL REHABILITATION SUMMARY DATE June 1999

CLIENT Fort Harrison CITY Lawrence STATE Indiana

WELL NO. #9 LOCATION Fort Ben Well Field

DIA 36x18 DEPTH 111'6" TYPE GWW SCREEN: DIA. 18" LENGTH 20' DEPTH TO TOP 91'6"

PUMP MFG. L & B SERIAL NO. 60173 CAPACITY 500 TDH 212'

	YEAR	STATIC WATER LEVEL	GPM	PUMPING LEVEL	DRAW DOWN	SPECIFIC CAPACITY
Drilled	9-5-68	9'	1875	30'	21'	89.2
Last Test	11-7-94	19.25'	988	38.5'	19.25'	51.3
Test Before	6-2-99	18'	1000	36.3'	18.3'	54.6
Test After	6-10-99	18.8'	1113	36.8'	18'	61.8

DATE	GPM	PUMPING LEVEL	DISCHARGE PRESSURE	SPECIFIC CAPACITY	TREATMENT	
6-2-99	Shut off		110#		272'	43-43-41
	466	26.3'	87#	56.1	227'	57-57-55
	590	28.7'	77#	55.1	207'	61-62-66
	731	31'	66#	56.2	183'	66-67-66
	812	32.9'	56#	54.4	162'	67-67-67
	889	34.3	45#	54.5	138'	67-67-67
	936	35.2'	35#	54.4	116'	66-68-65
	1000	36.3	25#	54.6	94'	66-68-65
					pull pump	
6-3-99					TV well, airlift & reset pump	
6-7-99					Surge acid	
	1050	36.3'	20#	57.3		
					Surge bleach & tripoly	
	1050	36.3'	20#	57.3		
6-8-99					Surge acid	
	1085	36.4'	20#	58.9		
6-9-99					Take 10' off pump surge acid	
	1085	36.6'	20#	60.9		
6-10-99					Surge bleach & tripoly	
	Shut off		96#		241'	40-39-41
	500	25.3'	80#	76.9	210'	53-50-53
	653	28.6'	70#	66.6	191'	58-56-58
	822	31.4'	60#	65.2	170	63-60-62
	909	33.1'	50#	63.5	149'	65-61-64
	982	34.3'	40#	62.9	127'	65-62-64
	1050	35.6'	30#	62.5	105'	64-66-63
	1113	36.8'	20#	61.8	89'	63-60-62
	1163	37.7'	10#	61.5	61'	61-59-61

*GPM taken after discharge of chemicals and a 30 min. minimum pumping test.

Tri-poly Phos. 600 lbs. Muriatic Acid 880 Gal. HTH ______ lbs.
Neutralizer ______ lbs. Liq. Chlorine Bleach 55 Gal.

Greg Procell - Jim Parsley - FOREMAN

Ft#9

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

TELECOMMUNICATION INFORMATION PAGE

PLEASE DELIVER TO FOLLOWING TO: Paul Johnson - Ft. Ben #9

FROM: JEFF BASTIN DATE: 6-16-99

TOTAL PAGES INCLUDING THIS PAGE 2

If you do not receive legible copies, please phone 317-738-4577 or FAX 317-738-9295

COMMENTS: Please note cleaning report. Someone needs to look at the column pipe I have here. We have sandblasted it! All of it is pitted & should be replaced if you don't want to replace it in 2 or 3 years. There is a 5' bottom column + 2-10' pieces that should be replaced regardless. Specific capacity was improved about 15%. Not bad for a well 30 years old that has probably never been cleaned before.

Regards,
JB

Peerless Midwest Inc. *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-965

PUMP INSTALLATION REPORT

Sales Order No. 22832 Date 11/19/2008

Pump Mfg. Floway Serial No. ______ Well No. FB #9

Owner Lawrence Utilities City Lawrence State IN

Location of Well ______

MOTOR Make General Elect. Type K Frame C364TP16 Serial No. FRJ606316

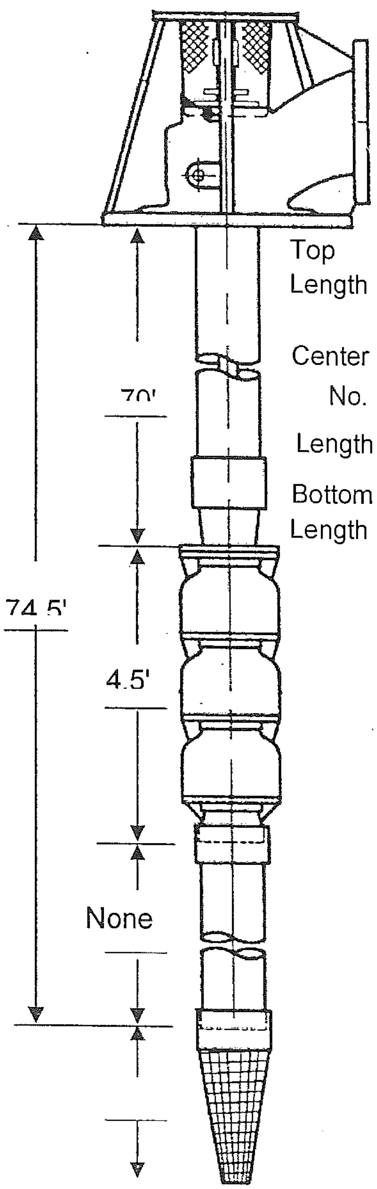
HP 60 Volts 230/460 Line Voltage 460 Phase 3 RPM 1765 Non-Reverse Ratchet Yes

GEAR DRIVE Make ______ Serial No. ______ Gear Ratio ______

Was motor and/or gear drive taken to a repair shop at this time? Motor ____ Where ______

Amps: 146/73 Gear ____ Where ______

ENGINE Make ______ Model ______ Serial No. ______



PUMP HEAD Type L/S

Discharge Pipe Size 8"

Located above X / below ____ Ground flanged X / threaded ____

Separate Base Plate? Yes

Head Shaft Length 63.5"

Dia. 1.5 Coupled above X / below ____

Stuffing Box Size ______

MOTOR SHAFT

Dia. 1 3/16 Length 41"

Thread size in head ____ Keyway ____

PUMP BOWL Dia. 12" Type JKM

Imp. No. ____ Open ____ Enc. ____

# of Stages 3 Bowls:CL ____ Brz ____

Wear Rings ______

Length Shaft ______ Dia. ______

COLUMN Pipe Size 8"

Flanged ____ Coupled ____

Special Paint? ______

Oil Lube ____ Water Lube X

Shaft Size 1 3/16 SS X or CS ____

Tubing Size ____ Stl ____ or Br ____

SUCTION PIPE Size No

Length ____ Special Paint ____

Threads on Bottom? ______

Strainer ____ Size ____

Rubber Bumper? ______

Well Seal? ______

WELL INFORMATION All measurements from top of pump foundation

X Gravel Wall
____ Tubular

Inside Dia. 36" X 18" Depth 111.5' Static 24.37' Type ____ Rock

Air Line Length 71' Strapped to Column? Yes

Type Airline 3/4 Poly Plastic ____ Copper Tubing ____ Steel Pipe

PUMPING TEST-Pumped 715 GPM at 47.58' ft. Pumping Level

with 80 lbs. Discharge Pressure after 1/4 hours. Specific Capacity 30.8

SPECIAL EQUIPMENT OR PULLING INSTRUCTIONS

______

Power Lines ______

REMARKS ______

Installer Gerald Flora

Peerless Midwest Inc. *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-965

PUMP INSTALLATION REPORT

Sales Order No. 19627 Date 6/13/2005

Pump Mfg. Simmons/Floway Serial No. 5023-940 / 5789-01 Well No. 9

Owner City of Lawrence Utilities City Lawrence State IN

Location of Well Indian Lake Well Field

MOTOR Make US Type RUE Frame 404TP Serial No. W12W814R017R9

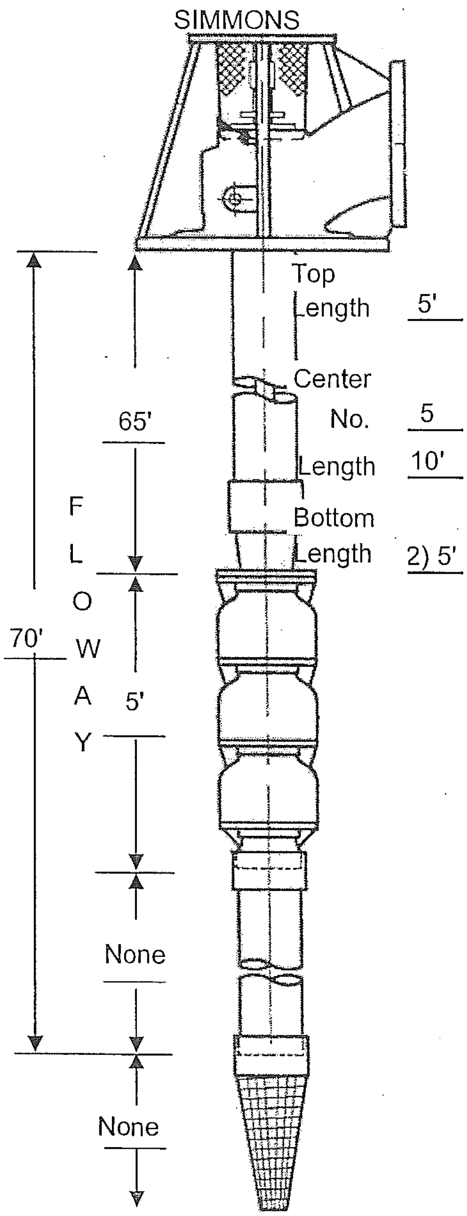
HP 100 Volts 460 Line Voltage 460 Phase 3 RPM 1780 Non-Reverse Ratchet ____

GEAR DRIVE Make ____ Serial No. ____ Gear Ratio a

Was motor and/or gear drive taken to a repair shop at this time? Motor Yes Where TMS

Gear ____ Where ____

ENGINE Make ____ Model ____ Serial No. ____



PUMP HEAD Type Simmons

Discharge Pipe Size 8"

Located above X / below ____ Ground flanged X / threaded ____

Separate Base Plate? No

Head Shaft Length Combo 107½"

Dia. 1½" Coupled above ____ below X

Stuffing Box Size 1½"

MOTOR SHAFT

Dia. 1½" Length Combo 107½"

Thread size in head ____ Keyway ____

PUMP BOWL Dia. 12 Type JKH

Imp. No. * Open ____ Enc. X

\# of Stages 4 Bowls:CL X Brz ____

Wear Rings No

Length Shaft ____ Dia. ____

COLUMN Pipe Size 8"

Flanged ____ Coupled X

Special Paint? No

Oil Lube ____ Water Lube X

Shaft Size ____ SS X or CS ____

Tubing Size ____ Stl ____ or Br ____

SUCTION PIPE Size None

Length - Special Paint -

Threads on Bottom? -

Strainer - Size -

Rubber Bumper? -

Well Seal? -

*All Imp. Trimmed to 8.481"

WELL INFORMATION All measurements from top of pump foundation

____ Gravel Wall
X Tubular

Inside Dia. 16" Depth 90.25' Static 15.54' Type ____ Rock

Air Line Length - Strapped to Column? -

Type Airline - Plastic - Copper Tubing - Steel Pipe

PUMPING TEST-Pumped 1000 GPM at 35.08' ft. Pumping Level with 122 lbs. Discharge Pressure after ____ hours. Specific Capacity 51.2

SPECIAL EQUIPMENT OR PULLING INSTRUCTIONS

Power Lines ____

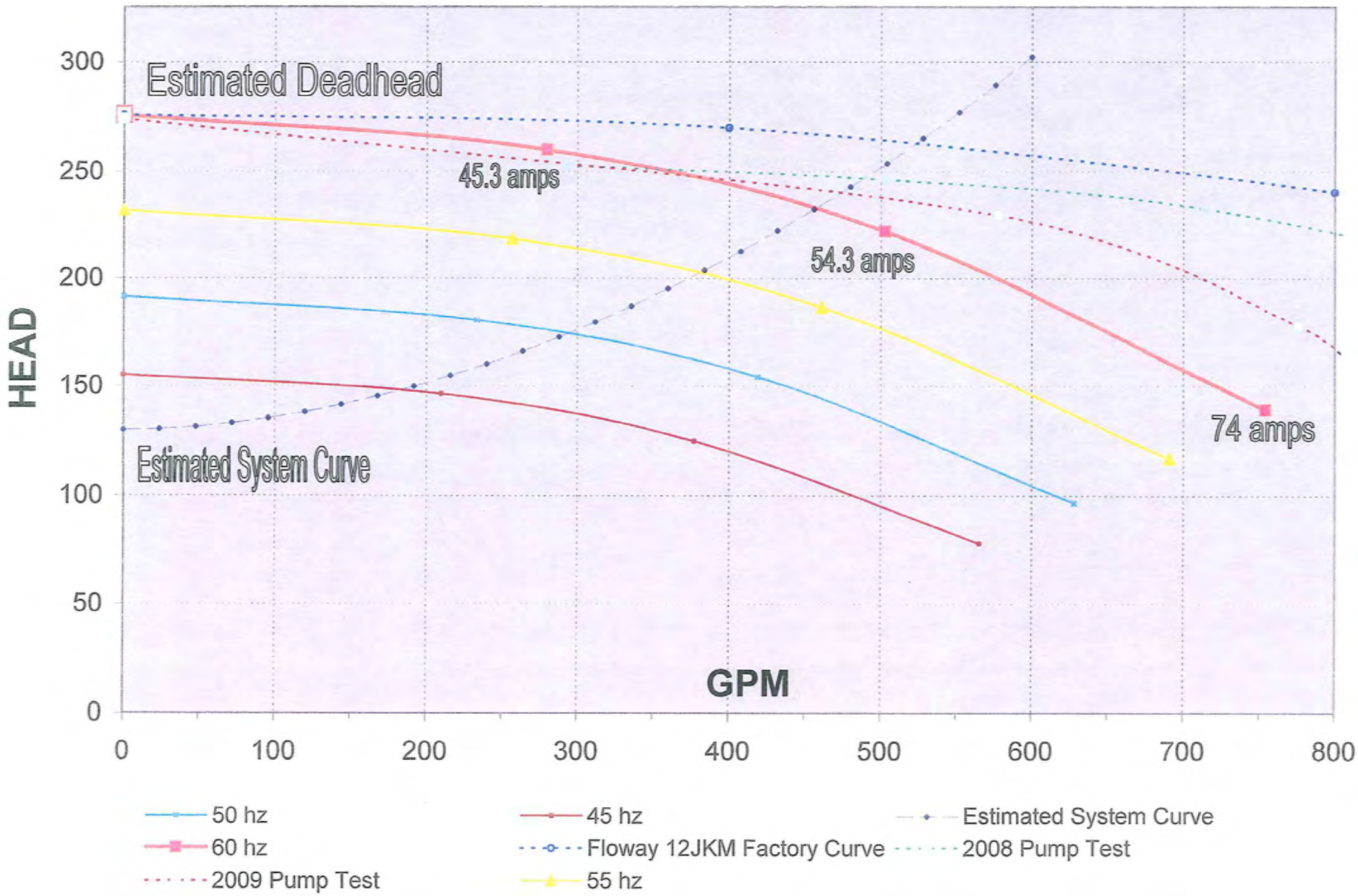
REMARKS Rated for 1400 GPM @ 226' TDH.

File #19627 (B)

Installer Gerald Flora

Peerless-Midwest Incorporated

City of Lawrence, IN
FB#9 Calculated VFD Pump Performance
June, 29th 2010



PEERLESS-MIDWEST Incorporated
17707 Sun Park Drive
Westfield, Indiana 46074
Phone: (317) 896-2987
Fax: (317) 896-3748
www.peerlessmidwest.com

"When it Comes to
Water Supply Contracting and
Hydrogeological Services...
We're PEERLESS!"

November 2nd 2010

Claude Jones
City of Lawrence Utilities
9105 E 56th St Suite 2100
Indianapolis, IN 46216

Re: Fort Ben #10 Rehabilitation and Pump Replacement

Mr. Jones,

Peerless Midwest, Inc. is pleased to report upon the successful completion of the work necessary to clean and rehabilitate Fort Ben #10. Along with this letter you will find updated Pump Installation Report, Pump Performance Curve Data, Well History Page, and a Well Performance Chart

Well FB #10 Rehabilitation and Analysis

This well was drilled new in 1975 and had a specific capacity of 41.1 gpm/ft at that time. The well was cleaned and relined in 2006 to have a maximum specific capacity of 29 gpm/ft.

When we begun the cleaning, the well was capable of providing 680 gpm with a specific capacity of 18.46. When the rehabilitation work was complete, at 651 gpm the well tested to have a pumping water level of 43.29' and a specific capacity of 28.05 gpm/ft.

This cleaning was able to provide 52% increased specific capacity, and is performing very near to its performance after the relining. We highly recommend testing the well performance in 2011, to insure that the specific capacity remains in the 20's.

The 1050 gpm pump was replaced completely with a new 6 stage 11" bowl assembly rated 650 gpm at 372' TDH at 1800 rpm. With the new design, the pump will be able to operate at a slower speed and provide your desired capacity utilizing a far more efficient process.

Peerless-Midwest thanks you for the opportunity to perform this work and we hope it has been completed to your satisfaction. If you have any questions about any of this information or would like to discuss it further, please contact me directly.

Very Truly Yours,

PEERLESS-MIDWEST, INC.

Eric J. Williams

PEERLESS-MIDWEST, INC.
17707 SUN PARK DRIVE / WESTFIELD, IN 46074
PHONE: 317/896-2987 FAX: 317/896-3748

City of Lawrence Utilities

HISTORY OF WELL FORT BENJAMIN # 10

1975 Well Drilled by Others. Static of 7', well pumped 2075 gpm with 54' pwl for a SC of 44.1 gpm/ft.

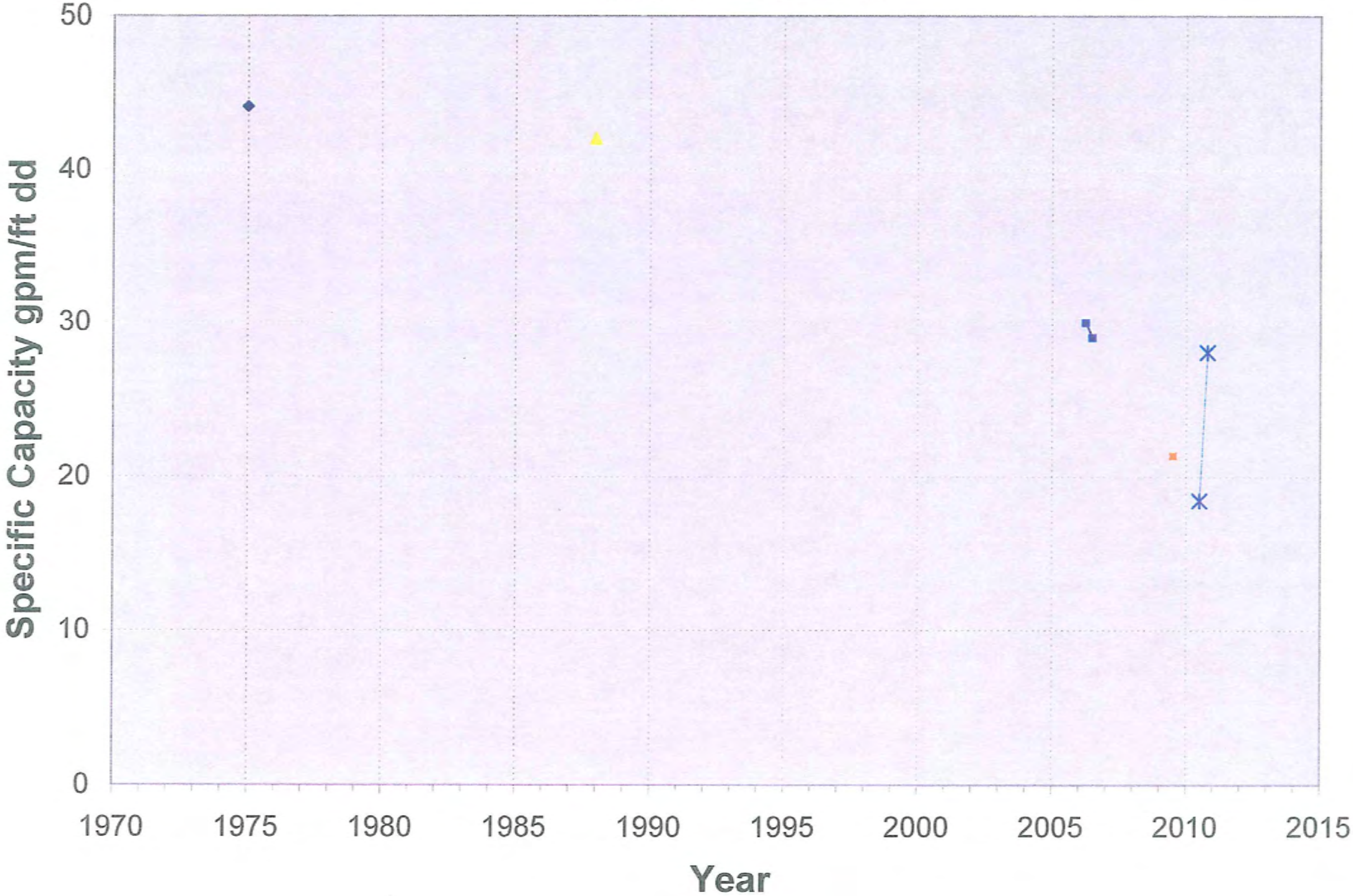
2006 Well Cleaned, relined, and pump overhauled. When complete, static of 14' well pumped 1210 gpm with a 55.72' pwl and a specific capacity of 29 gpm/ft.

2009 Performance tested at 600 gpm with a specific capacity of 21.37; and 800 gpm at 20.78 gpm/ft.

2010 Well Cleaned with Armour Method. Before cleaning, the well pumped 680 gpm with a specific capacity of 18.46 gpm/ft at 69.9' TDH. After cleaning, the well pumped 651 gpm at 366.7' TDH at 1800 rpm, with a specific capacity of 28.05 gpm/ft.

Peerless-Midwest Incorporated

City of Lawrence, IN
F.B.H. #10 Well Specific Capacity vs Time
October 14th 2010



Peerless-Midwest Incorporated

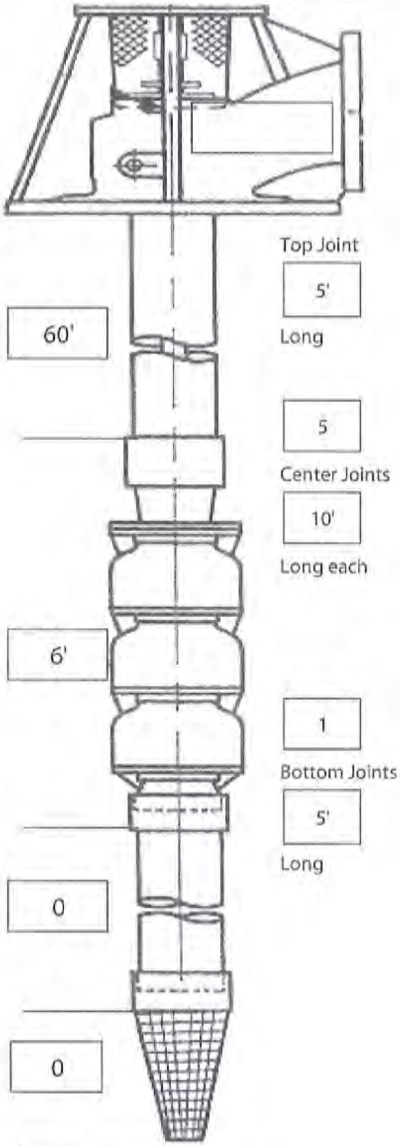
Mishawaka, IN / 574.254.9050
Westfield, IN / 317.896.2987
Ionia, MI / 616.527.0050
Wixom, MI / 248.348.6071

VERTICAL TURBINE PUMP INSTALLATION REPORT

Sales Order No. 24223 | Well No. FB-10 | Date: 10/13/10

Owner Lawrence Utilities | City Lawrence | State IN

Location of Well



Total Setting 66'

MOTOR

Manufacturer	US MOTORS
Horsepower	100
RPM	1780
Phase	3
Voltage	460
Full Load Amps	78.3/75.6/79.
Service Factor	
Serial No.	
Type	
Frame	
Shaft Dia.	1-1/2"
Shaft Length	
NRR	YES
Key Size	
Bolt Circle	

GEAR DRIVE

Manufacturer	
Serial No.	
Gear Ratio	

ENGINE

Manufacturer	
Model	
Serial No.	

SPECIAL/MISCELLANEOUS

Power Lines	
Need RO?	

HEAD

Manufacturer	LAYNE
Type	
Disch Flg Size	8"
Adapter Plate	
Base Plate	YES
Head Shaft Dia.	1-1/2"
Head Shaft Lgt.	100-1/2" co
Shaft Material	SS
Coupled in Head	

COLUMN

Water/Oil Lube	WATER
Pipe Size	8"
Tubing Size/Type	
Shaft Size	1-1/2"
Shaft Material	SS
Coupling Mtl.	SS

PUMPING DATA

Static Water Level	20' 1"
System Pressure	93
GPM @ System PSI	NA
Pumping Level	
Test Duration	

BLOWOFF

Size	
Connection	
Location	

BOWL

Manufacturer	NATIONAL
Model	J11
Size	8"
No. Stages	6
Material	CI/BF
Clm Conn Size	8"
Shft Conn Size	
Constant	

SUCTION

Threaded	
Bell	
Size	
Special Paint	
Strainer	

WELL

Type	RC
Casing Dia.	20" LINED
Depth	84'
Top Hat Size	
Casing Vent	

MONITOR SYSTEMS

Airline/Type	
Airline Length	
Airline Fastened	
Stilling Tube/Mtl	
Tube Length	60' POLY

REMARKS

Pumped 243 gpm at 440.62' TDH and SC of 34.5 gpm/ft

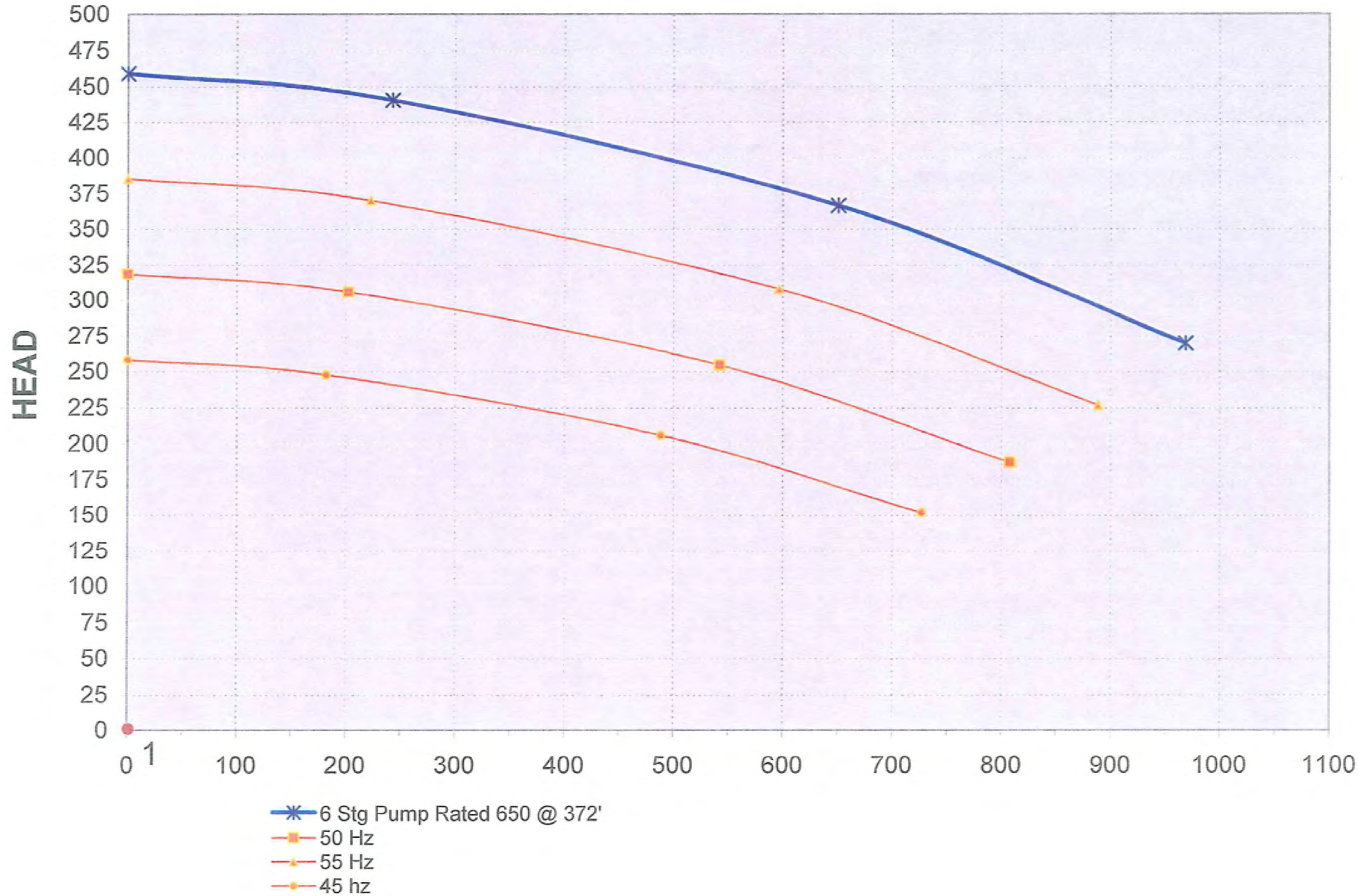
Pumped 651 gpm at 366.7' TDH and SC of 28 gpm/ft

Pumped 969 gpm at 270' TDH and SC of 27.5 gpm/ft Shutoff 458.98'

Installer(s) Leonard Flora

Peerless-Midwest Incorporated

City of Lawrence, Indiana
10-14-2010 FB#10 Pump Curve
and Estimated VFD Pump Performance



Peerless Midwest Inc. *Water Supply Contractors*

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254 9650

WELL & PUMP SERVICE INSPECTION REPORT

Owner Lawrence Utilities City Lawrence State IN

Location Fort Benjamin Harrion Well Field

Well No. FB#10 Date Drilled ____ Dia. 20" Depth 86' Type Well GWW

Screen ID. ____ Screen Length ____ Depth to Top of Screen ____ Type Screen ____

Dates of Cleaning 2006

Phone Office# 317-542-0511 Cell# 317-501-7840 Person to Contact Claude Jones

	DATE	STATIC	G.P.M.	PUMPING LEVEL	PRESSURE	SPECIFIC CAPACITY
ORIGINAL						
AFTER LAST CLEANING	2006					30.3
AFTER LAST TEST						
AT PUMP'S RATED FLOW						
AT SYSTEM OPERATING PSI						

Test Completed Through Meter ____ Flange or Thread Size 6" Confined Space Entry? No

Motor HP 100 Make U.S. Volts 460 RPM 1780 Phase 3

Gear Drive None HP - Ratio - RPM Meter Required ____

Pump Mfg. Layne Serial No. 74736 Airline Length 60'

Rated Capacity: 1050 GPM ____ TDH Operating Pressure 93#

Total Setting 68' 6" Size of Packing ____ Date Installed ____

Dates of Overhaul ____

THE FOLLOWING IS TO BE PERFORMED DURING EACH INSPECTION

Is Check Valve Leaking? ____ Change Motor Oil & Grease ____ Repack Pump ____ Grease Pump ____

Pump is Presently Developing ____ **GPM** ____ **TDH** **Projected Curve Capacity** 1050 **GPM** ____ **TDH**

Shut Off Pressure ____ PSI Rated Shut Off Head ____ ft. Calculated Shut Off Head ____ ft.

Electrical Data (With Pump in Operation) ____ V / / Amps ____ Full Load Amps

Location of Power Lines None Can Electrical Box be Locked Out? ____

Distance from Top of pump pedestal to grade ____ Materials Needed to Clean Well ____

Need a Smeal to Raise Pump ____ Remarks ____

Maintenance: 10x8 reducer, 8x6 reducing 90, 50' hard hose, 50' soft hose.

Inspected By ____ Date Inspected ____

PEERLESS-MIDWEST
Incorporated

PUMP TEST FORM

JOB # ____________ DATE 6/30/2010

OWNER Lawrence Utilities **Annual Maintenance Test**

WELL Fort Ben 10 WELL DIAMETER 20" WELL DEPTH 86'

NORMAL PSI - 93 SWL 12.17 PROBE X

Time	Pumping Level (ft)	Drawdown (ft)	PSI	Orifice Size	Inches	GPM	Specific Capacity	TDH	Amps
			132	6x5		0	N/A	316.9	
				6x5	24.5	600			
9:35			38	6x5					89/90/90
				6x5					
				6x5					
9:40	22.01	9.84		6x5			60.98	109.8	
9:45			9	6x5	31				
			9	6x5	31	680			91/90/90
			9	6x5	31	680			
			9	6x5	31	680			
10:10	49.00	36.83	9	6x5	31	680	18.46	69.8	
						1210			

BY:

ORTMAN DRILLING & WATER SERVICES
WELL & PUMP MAINTENANCE INSPECTION REPORT

OWNER: Lawrence Utilities
INSPECTION DATE: 19-Oct-09
RESS: 9201 Harrison Part Ct, Indpls, IN 46216
INSPECTED BY: Tim B.
CONTACT: Claude Jones
OFFICE: 317) 542-0511
FAX: 317.715.2619
CONTACT LOC: Administration Bldg
PLANT:
CELL: 317) 501-7840

WELL NO./NAME: 10 DIA: 18" DEPTH: 84' TYPE: GWW YEAR DRILLED:
WELL LOC: Fort Harrison well field
SCREEN: SSWW I.D.: 18" LENGTH: 20' DEPTH TO TOP: 64'
PUMP HOUSE: No DATES CLEANED:
PUMP MFG: J-Line MODEL: IMPELLAR Open Closed Turns Off Bottom Installed
RATED CAPACITY: 1050 GPM @ 260' TDH SHUT-OFF PSI: 180 OPERATING PSI:
TOTAL SETTING: AIRLINE OR TUBE: no PACKING: x x RINGS
METER/BRAND: Size: Test Outlet Size: Type: DATES REPAIRED:
MOTOR MFG.: US Electric HP: 100 RPM: 1780 VOLTAGE: 460 PHASE: 3
LINE VOLTAGE: 460 F.L. AMPS: 118 NRR: Yes DATES REPAIRED:

NORM. OPERATING FLOW:
NORM. OPERATING PRESSURE:
LINE VOLT: L1-2 532 L2-3 536 L3-1 534
ELECTRIC CONNECTIONS: Good
SURE GAUGE: Yes
FLOW METER: N/A
EXERCISE VALVES: Yes
VALVES FULLY OPEN/SHUT: Open
CHECK VALVES HOLD: Yes
CONTROL VALVES FUNCTION: N/A
NOISE, VIBRATION OR HEAT: None
LEAKS OR CRACKS: None
REPACK & GREASE PUMP: Adj Packing
CHANGE MOTOR OIL: 4.5 QTS & GREASE:
WATER COLOR OR ODOR: None
SAND CONTENT: None

COMMENTS: Motor oil drain plug plugged with gel, had to dig out drain

EQUIPMENT USED FOR TESTING: 8" x 6" orifice, 10" x 8" reducer, 8" x 6" reducing 90, valve,2- 25' rigid hose, 1- 50' lay flat

	DATE	SWL	GPM	PWL	DD	PSI	TDH	AMPS	Spec Cap
ORIGINAL									
LAST CLEANING									
LAST TEST									
SHUT-OFF	10/19/2009	20'				130	320.3'	69, 68, 65	
STEP 1			600	48.08'	28.08'	64	192.92'	108, 99, 98	21.37
P 2			800	58.5'	38.5	12	86.22'	108, 102, 106	20.78
STEP 3			844	Below	point	0			
STEP 4				of	measure				
OPEN									

ATT. JERRY HILL

Layne-Northern Company
INDIANAPOLIS — MISHAWAKA — LOUISVILLE
Division of LAYNE-WESTERN COMPANY, INC.
A Marley Company

WELL & PUMP INSPECTION REPORT

OWNER Ft. Benjamin Harrison

CITY Indianapolis, Indiana

WELL NO. 10 LOCATION North of Base, Main Well Field

DIA. 36" DEPTH 84' SCREEN I.D. 18" TYPE Layne LENGTH 20' DEPTH TO TOP 64'

DATE DRILLED 1975 DATES OF CLEANING 1988

DATE INSPECTED May, 1988 PERSON TO CONTACT -

CONTACT LOCATION

CAPACITY	DATE	STATIC	GPM	PUMPING LEVEL	PRESSURE	SPECIFIC CAPACITY
ORIGINAL	1968	7'	2075	54'	-	44
AFTER LAST ~~CLEANING~~ XXXXX TEST	1988	18'	1000	42'	45#	42
PRESENT AT LINE PRESSURE	1988	18'	1000	42'	45#	42

TEST WILL BE COMPLETE THROUGH:

AIRLINE LENGTH 70' TOP OF CHECK - METER - FLANGE OR THREAD SIZE -

TOTAL PUMP SETTING 70' MOTOR H.P. 60 PHASE 3 CYCLE 60 VOLTS 460

PUMP MFG. Layne & Bowler SER. NO. 79736

RATED CAPACITY: 500 GPM; 212' TDH; OPERATING PRESSURE 55#

DATE INSTALLED 1975 DATES OF OVERHAUL 1988

IS CHECK VALVE LEAKING? YES - NO X DOES STUFFING BOX HAVE SPRING? YES - NO X SIZE OF PACKING 1 1/2"

THE FOLLOWING IS TO PERFORMED DURING EACH INSPECTION:

CHANGE MOTOR OIL & GREASE X REPACK PUMP X GREASE PUMP X
(Place check mark when completed)

PUMP IS PRESENTLY DEVELOPING: 500 GPM; 248 TDH; SHUT-OFF HEAT - FT.

ELECTRICAL DATA WITH PUMP IN OPERATION: AMPS; - VOLTS; - PHASE -

REMARKS (Note any abnormal condition). -

INSPECTED BY Dean Knight

LNo-23 8/86

PEERLESS-MIDWEST, INC.
17707 SUN PARK DRIVE / WESTFIELD, IN 46074
PHONE: 317/896-2987 FAX: 317/896-3748

City of Lawrence Utilities

HISTORY OF WELL FORT BENJAMIN # 10

1975 Well Drilled by Others. Static of 7', well pumped 2075 gpm with 54' pwl for a SC of 44.1 gpm/ft.

2006 Well Cleaned, relined, and pump overhauled. When complete, static of 14' well pumped 1210 gpm with a 55.72' pwl and a specific capacity of 29 gpm/ft.

2009 Performance Tested to provide 600 gpm with a specific capacity of 21.37 and 800 gpm at 20.78 gpm/ft and 86.22' TDH.

2010 Performance Tested by Peerless-Midwest, Inc. Pumped 680 gpm with a specific capacity of 18.46 gpm/ft at 69.9' TDH. Pump requires pulled and well requires cleaned.

SINGER

Layne NORTHERN COMPANY
INCORPORATED
INDIANAPOLIS • MISHAWAKA • LANSING

☐ TEST
☒ PERMANENT

Job No. 23550

WELL LOG No. 10 CITY Indianapolis County Marion

Owner Ft. Benjamin Harrison Township Lawrence

Section 30-T17N-R5E

Location State Indiana

From Land Description 360' West of Well #7

From Street or Road 500' S.E. Fall Creek - 1000' N. of 71st St.

FORMATION FOUND — DESCRIBE FULLY	FROM NATURAL GROUND LEVEL			
	Depth to Top of Stratum	Depth to Bottom of Stratum	Thickness of Stratum	Static Water Level
Brown Clay	0	5	5	
Yellow Sandy Clay	5	16	11	
Coarse Gravel Yellow	16	20	4	
Coarse Gravel Med. Sand Gray	20	22	2	
Coarse Gravel and Boulders Gray	22	30	8	
Brown Clay with Boulders	30	32	2	
Coarse Gravel and Med. Sand Gray	32	37	5	
Medium Gravel, Medium Sand Gray	37	43	6	
Clay Strip Gray	43	43½	½	
Medium Sand and Gravel Gray	43½	68	24½	
Coarse Gravel Medium Sand Gray	68	82	14	
Coarse Gravel Fine Sand Gray	82	83½	1½	
Bottom gray clay	83½			

Hole 50"x72" Dia Drilled by: Cable Tool ______ Rotary ______ Jetting ______
Reverse Circ. XX Bucket ______ Auger ______

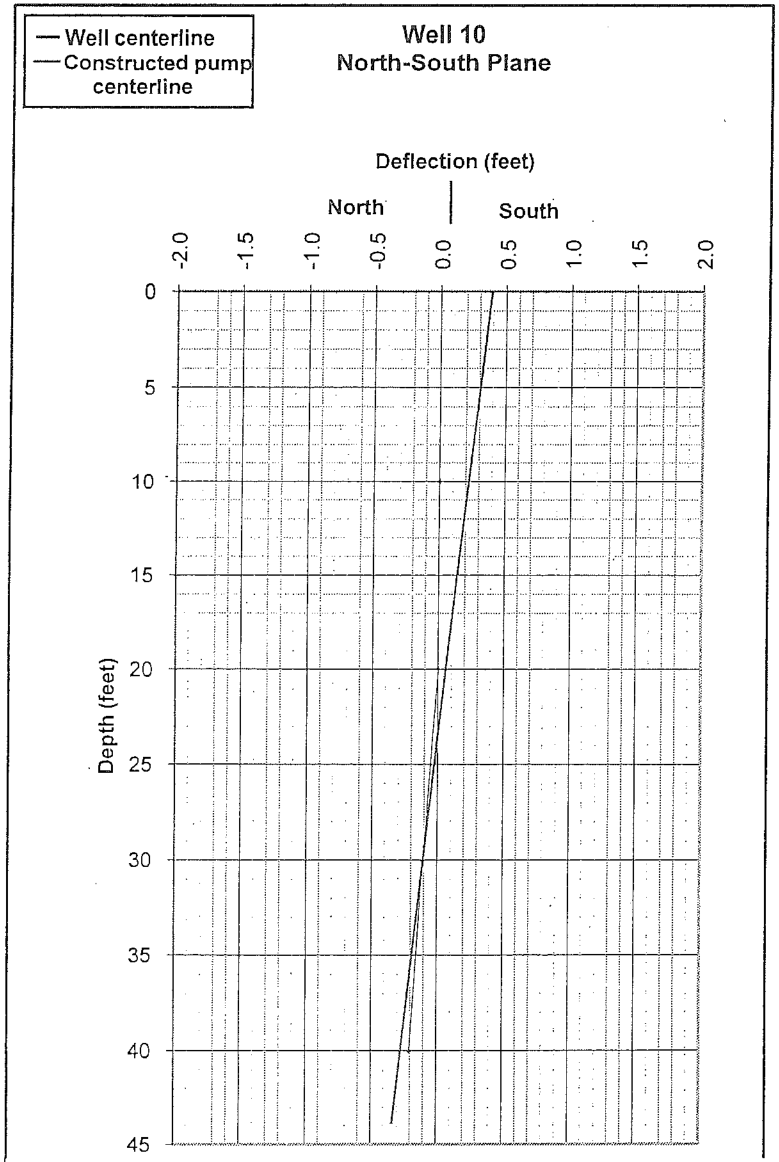
Rotary Hole Grouted: Neat Cement ______ Drilling Mud ______ Other ______

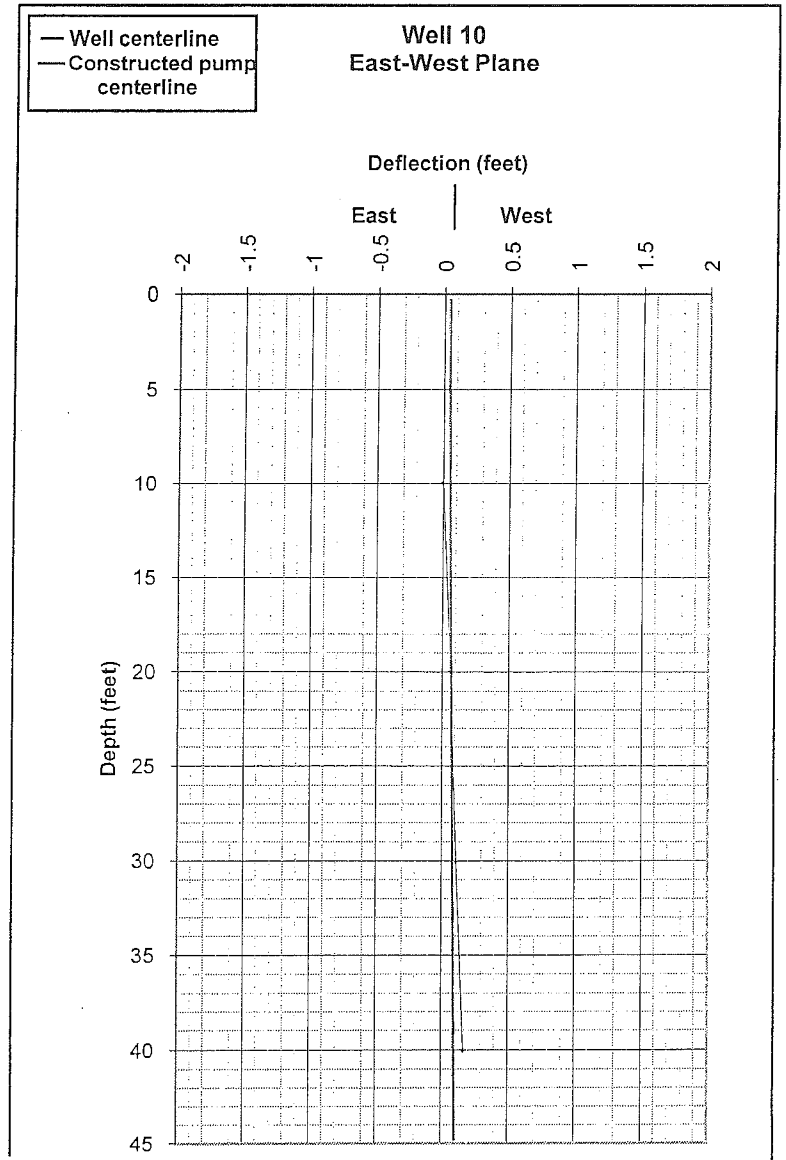
Casing 36 "OD From 9 "above ground to 64 feet below ground. Weight ______ Pounds per foo

Screen 18 " Set from 64 to 84 feet Make Layne Type Shutter Slot 0.080

Pumping test 2075 GPM drawdown to 54 feet after 8 hours pumping

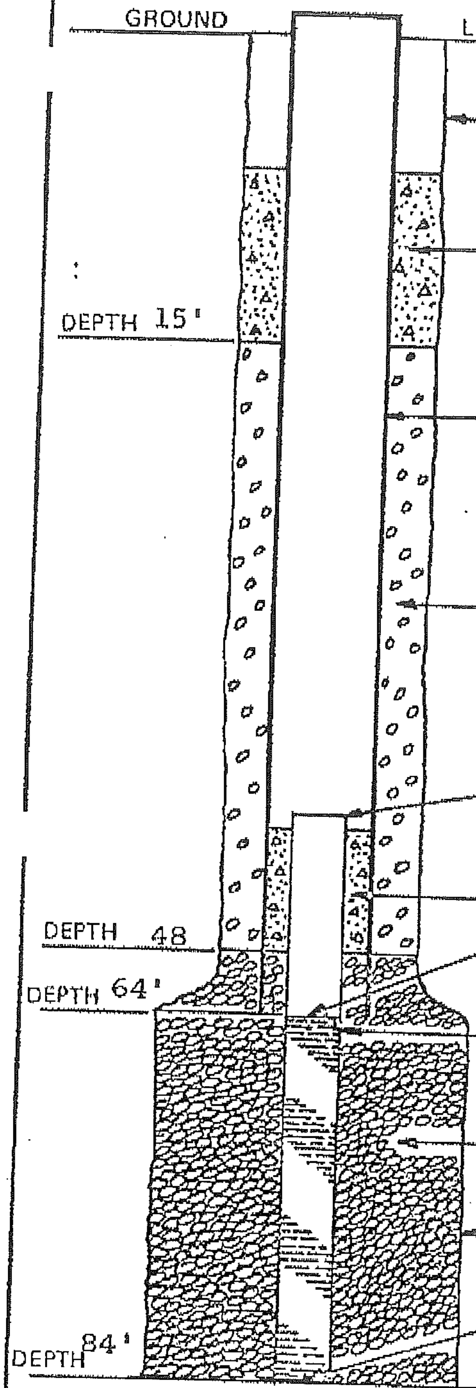
Date Completed 6/3/75





Maximum allowable drift of the well from the vertical shall not exceed two-thirds of the smallest inside diameter of that part of the well being tested per 100 feet of depth. For this well, max. allowable drift equals 0.67 x 16-in / 100 ft = 0.1198 inches/ft. *AWWA Standards for Water Wells, ANSI/AWWA A100-97.*

CASING EXTENDS 9 FEET ABOVE GROUND LEVEL



50 "DIA. HOLE

5 ' CONCRETE SEAL

36 " O.D. STEEL WELL CASING. 0.375 " WALL THICKNESS.

GRAVEL FILL

20 FT. OF 18 IN. DIA. BLANK PIPE

2 ' CONCRETE SEAL

Welded SCREEN CONNECTION

20 FT. OF 18 IN. DIA. SS Layne Shutter SCREEN. OPENING 0.080

SILICA GRAVEL WALL 50 YDS. SIZE # 3

72 " DIA. UNDERREAM HOLE

~~XX~~3/8 Welded PLATE BOTTOM

JOB NO. 23550

DISTRICT Indianapolis

LOCATION: Ft. Harrison

Sec. 30-T17N-R5E

COUNTY Marion

TOWNSHIP Lawrence

SECTION ____ T ____ R ____

STATE Indiana

CASING TALLY

	FT. WELDED	IN. THREADED
BOTTOM		
TOP		
TOTAL		

FILL USED FROM BOTTOM UP

SILICA GRAVEL PACK	48 TO 84	FT.
GRAVEL FILL	15 TO 48	FT.
CONCRETE	TO 15	FT.

STATIC LEVEL 7'

PUMPED 2075 G.P.M. AT 54 FEET PUMPING LEVEL AFTER 8 HOURS

TYPE OF RIG RC DRILLER ____ DATE COMPLETED 6/3/75

NOTE: ALL DEPTHS MEASURED FROM GROUND LEVEL. NOT TO SCALE.

GRAVEL WALL WELL NO. 10 TYPE SC-2-U

FOR: FT. BENJAMIN HARRISON

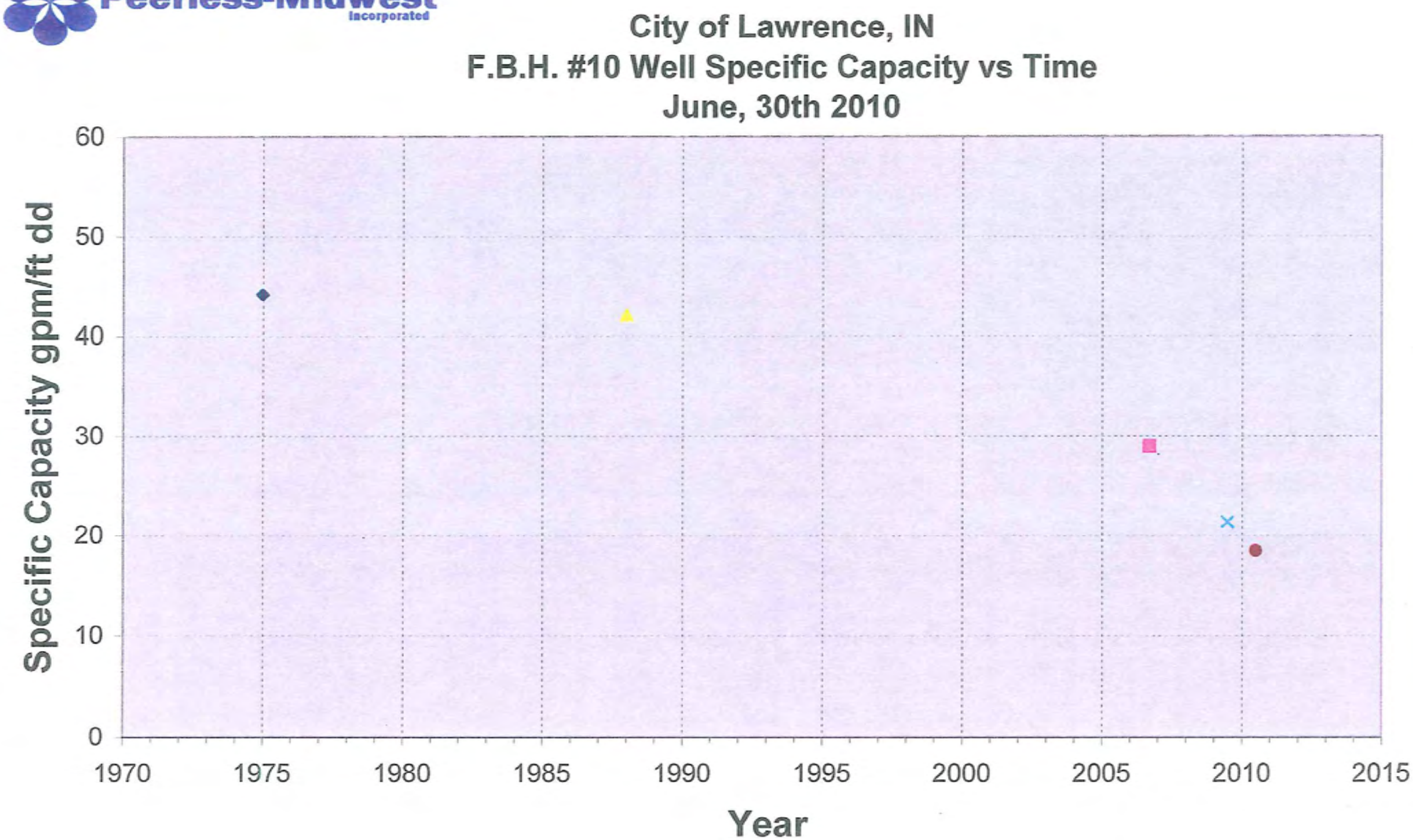
SINGER - LAYNE-NORTHERN DIV.

INDIANAPOLIS, IND. • MISHAWAKA, IND. • LANSING, MICH.

DRAWING NUMBER **SC-2-U**

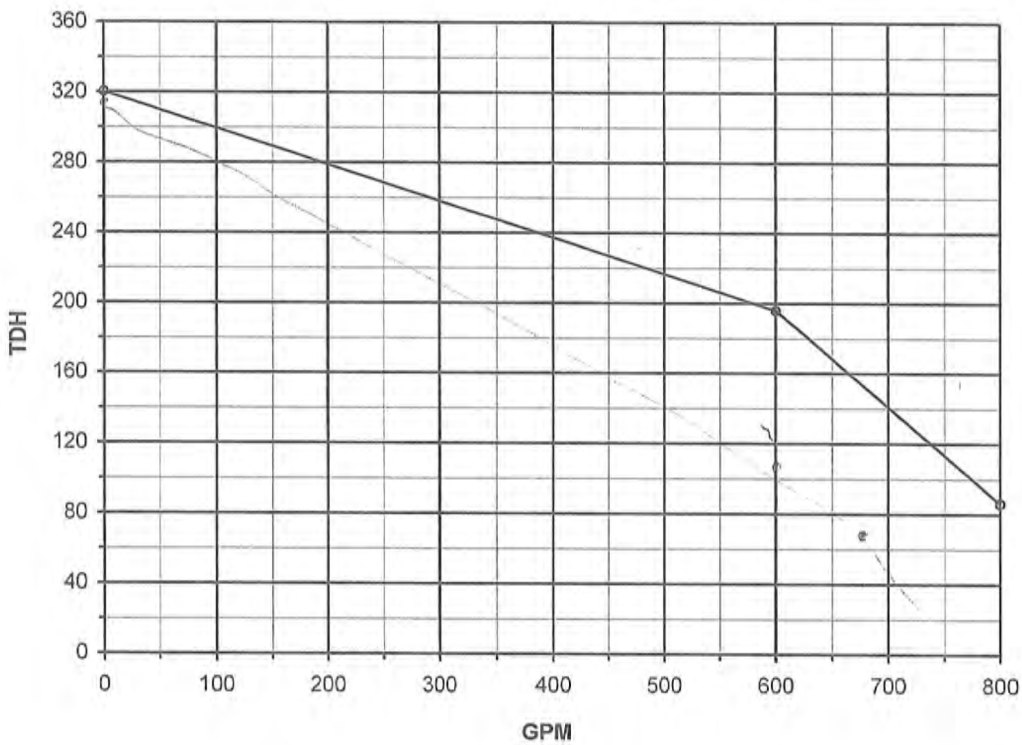
5/73

Peerless-Midwest Incorporated



RTMAN
Drilling & Water Services
Research - Design - Construction - Maintenance
241 N. 300 W. • Kokomo, IN 46901 • 765-459-4125 FAX 765-459-8750

PROJECT	WELL	DATE	STATIC (FT)	FILE
City of Lawrence, Indiana	10	10/19/09	20	City of Lawrence Well 10 (101909) Step Test



	GPM	DD (FT)	SC	PSI	TDH (FT)	AMPS
Deadhead	0			130	320.30	69, 68, 65
Step 1	600	28.08	21.37	64	195.92	108, 99, 98
Step 2	800	38.50	20.78	12	86.22	108, 102, 106
Step 3	844	Below	Point	0		106, 104, 105
Step 4		of	Measure			
Step 5						

Peerless Midwest Inc. *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-9650

PUMPING TEST DATA REPORT

Job No. 20164 Date March 7, 2006

Pumping Test on: Permanent X Temporary ___ Well # FB-10

Owner Lawrence Utilities LLC

Locatior Fort Benjamin Harrison Well Field

Hydrogeologist ___________ Engineer ___________

Static Water Level 14' Readings Made By: Wetted Tape ___ Airline ___ Probe X

Measured From Pump Head Which is 28" Above Building Floor Elev of ___________

Feet of Build Up During Test ___________

Date	Time	GPM	Water Level	Date	Time	GPM	Water Level	Date	Time	GPM	Water Level
3/7/2006	Start	PSI	130#	3/7/2006	Start	PSI	108#	3/7/2006	Start	PSI	73#
	11:25	600	34.79'		11:45	910	44.25'		12:06	1210	55.25'
	11:28	600	33.95'		11:48	910	45.06'		12:09	1210	55.62'
	11:31	600	33.83'		11:51	910	45.14'		12:12	1210	55.68'
	11:34	600	33.81'		11:54	910	45.14'		12:15	1210	55.70'
	11:37	600	33.79'		11:57	910	45.16'		12:18	1210	55.72'
	11:40	600	33.81'		12:00	910	45.14'		12:21	1210	55.75'
	11:43	600	33.77'		12:03	910	45.16'		12:24	1210	55.72'
	Specific	capacity	30.3		Specific	capacity	29.2		Specific	capacity	29.0

Peerless Midwest Inc. *Water Supply Contractors*

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-9650
505 Apple Tree Drive / Ionia, Michigan 48846 / 616-527-0050 / Fax 616-527-5508
17110 Westfield Park Dr., Westfield, IN 46074 / 317-896-2987 / Fax 317-896-3748

WELL CLEANING

Our Job No. 20164 Date Started 3/21/2006

Customer No ______ Date Finished 3/27/2006

Owner Lawrence Utilities LLC City Lawrence State IN

Well No. FB-10 Location Fort Benjamin Harrison Well Field

Dia. 20" x 16" Depth 86' Screen 20' of 16" ssww Type Well GWW

Dates of Cleaning ______

Pump Mfg. J-Line Serial No. 74736 GPM 1050 TDH ______

	Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity
Original Performance	1975	7'	2075	54'		44.1
Test Before Cleaning						
Test After Cleaning	4/7/2006	14'	1210	55.72'	73#	29.0

TREATMENT

Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity	Type Treatment
3/21/2006						double disk surge in 55 gal chlorine for
						overnight soak.
3/22/2006						Surge in overnight soak, neutralize to
						waste, surge in 55 gal. chlorine for soak.
3/27/2006						Surge in soak, neutralize to waste, surge
						in 55 gal. acid, surge, neutralize to waste,
						surge in 55 gal. chlorine, let soak.

CHEMICALS REQUIRED

Sodium Tripolyphosphate ____ lbs. HCL Acid 55 gal. Dry Chlorine ____ lbs. Caustic ____ lbs.

Sodium Bicarbonate 50 lbs. Citric Acid ____ lbs. Potassium Permanganate ____ lbs.

Sodium Hypochlorite 165 gal. Wetting Agent ____ gal. Others sodium metabisulfite

Inhibitor ____ qts. Defoamant ____ qts. Foreman Leonard Flora

Layne-Northern Company
A Division of Layne-Western Company, Inc.
5520 South Harding Street • Indianapolis, Indiana 46217 • 317/786-4343

PRODUCTION TEST OF WELL

DATE 5/19 1988
JOB NO. 42-2917

Owner Ft. Harrison City Lawrence State Indiana

Well No. 10 Location Building 504 also show sketch on back

Measured from Ground Level: Total Depth 84' Inside Dia. 18" Standing Water Level 18'

Type Well: Gravel Wall X Tubular ___ Rock ___ New ___ Old X Cleaned X Gravel Wall Dia. ___

Screen: Length 20' Dia. 18" Slot Size 0.080" Type Shutter Depth of Top 64'

Driven by Electric ( ) Engine ( ) Pump Bowl ___ Stages 4

Length Suction Pipe ___ Well top to bottom of Suction 75'-8"

Orifice Size 6" by 5" Water discharged 50 feet from well into Woods

Well top to bottom of air line 71' Gauge reads feet ( ) pounds ( )

DATE	TIME	INCHES ON ORIFICE	GALLONS PER MINUTE	AIR LINE READING	GROUND TO WATER LEVEL	DISCHARGE PRESSURE	AMPS REMARKS
5/18	SHUT OFF	0	0	18'		120#	48-48-49
		16.5"	506	29'		95#	58-58-59
		36.5"	752	34'		78#	64-66-68
		64.5"	1000	42'		45#	72-72-74

State fully any details on back of this sheet. Water temperature near end of test °F
Tested and Witnessed by:

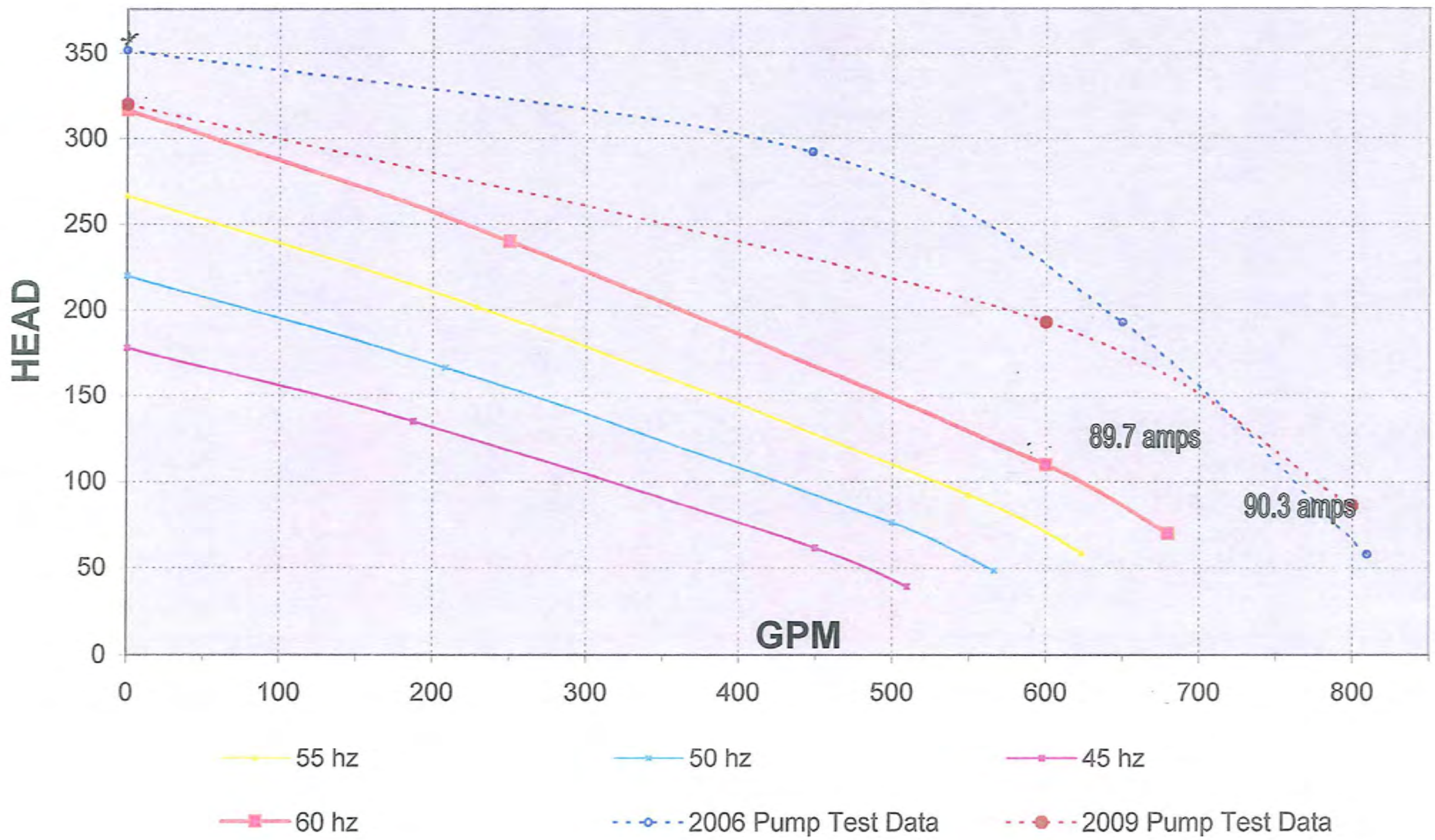
Dean Knight
FOR LAYNE-NORTHERN COMPANY

For Purchaser,

LNo-26

Peerless-Midwest Incorporated

City of Lawrence, IN
FB#10 Calculated VFD Pump Performance
June, 29th 2010



Peerless Midwest Inc. *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-965

COPY

PUMP INSTALLATION REPORT

Sales Order No. 20164 Date 3/6/2006

Pump Mfg. Layne Serial No. 74736 Well No. FB FB-10

Owner Lawrence Utilities LLC City Lawrence State IN

Location of Well Fort Benjamin Harrision Well Filed

MOTOR Make US Type RU Frame 404TP Serial No. Model BF-69

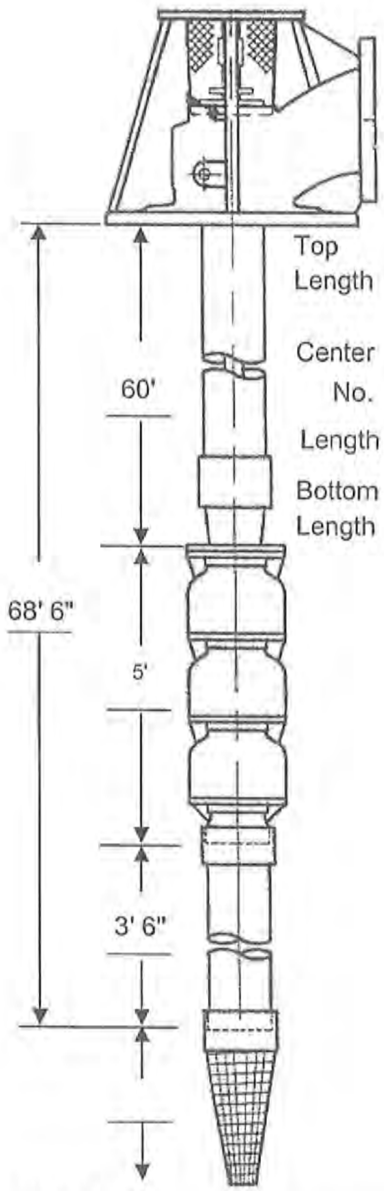
HP 100 Volts 460 Line Voltage 460 Phase 3 RPM 1780 Non-Reverse Ratchet Yes

GEAR DRIVE Make ___ Serial No. ___

Was motor and/or gear drive taken to a repair shop at this time? Motor ___ Where ___

Gear ___ Where ___

ENGINE Make ___ Model ___ Serial No. ___



PUMP HEAD Type Layne

Discharge Pipe Size 8"

Located above X below ___ Ground flanged X threaded ___

Separate Base Plate? Yes

Head Shaft Length Combo 105"

Dia. 1½" Coupled above ___ below X

Stuffing Box Size 1½"

MOTOR SHAFT

Dia. 1½" Length Combo 105"

Thread size in head 1½" Keyway ⅜"

PUMP BOWL Dia. 12" Type ___

Imp. No. ___ Open ___ Enc. ___

# of Stages 4 Bowls:CL ___ Brz ___

Wear Rings ___

Length Shaft ___ Dia. ___

COLUMN Pipe Size 8" Sch 80

Flanged ___ Coupled X

Special Paint? No

Oil Lube ___ Water Lube X

Shaft Size ___ SS ___ or CS ___

Tubing Size ___ Stl ___ or Br ___

SUCTION PIPE Size 8" Sch 80

Length 3' 6" Special Paint No

Threads on Bottom? ___

Strainer No Size ___

Rubber Bumper? ___

Well Seal? ___

WELL INFORMATION All measurements from top of pump foundation

X Gravel Wall
___ Tubular

Inside Dia. 20"x16" screen Depth 86' Static 14' Type ___ Rock

Air Line Length 60' Strapped to Column? Top

Type Airline ___ Plastic X Copper Tubing ___ Steel Pipe

PUMPING TEST-Pumped ___ GPM at ___ ft. Pumping Level with ___ lbs. Discharge Pressure after ___ hours. Specific Capacity ___

SPECIAL EQUIPMENT OR PULLING INSTRUCTIONS

Power Lines None

REMARKS ___

Installer Leonard Flora

Layne NORTHERN COMPANY

INDIANAPOLIS • MISHAWAKA • LOUISVILLE

PUMP INSTALLATION REPORT

File No. ____

Sales Order No. 42-2917

Date May 17, 1988

Pump Mfg. Layne & Bowler — Serial No. 79736 — Well No. 10

Owner Ft. Harrison — City ____ — State Indiana

Location of Well Building 504

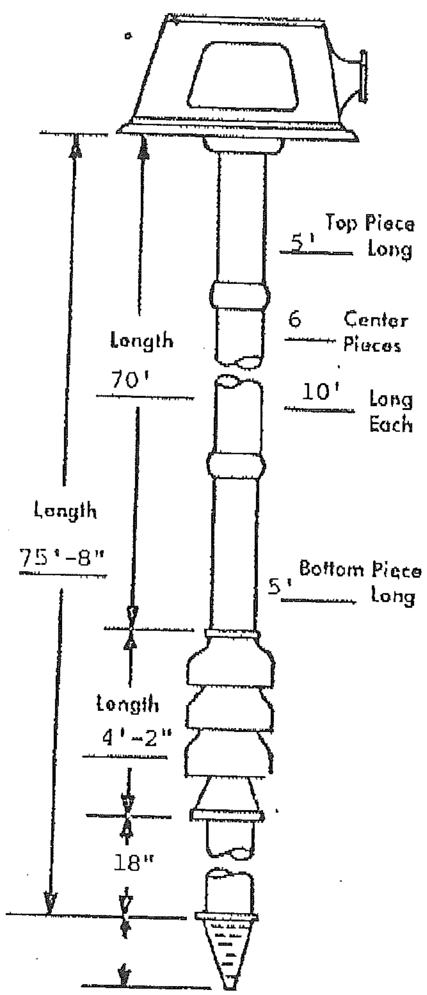
MOTOR: Make U.S. — Type RU — Frame 364TP — Ser. No. R6233-04-877

HP 60 — Volts 460 — Line Voltage 480 — Phase 3 — RPM 1770

Was Motor taken to a repair shop at this time? Yes — Where? Horner

GEAR DRIVE: Make ____ — Serial No. ____ — Gear Ratio ____

ENGINE: Make ____ — Model ____ — Serial No. ____



PUMP HEAD Type TF81B

Discharge Pipe Size 8"

Located Above above/below ground

Flanged x — Threaded ____

Separate Base Plate? ____

Head Shaft Length 6'-2"

Dia. 1" — Coupled above/below ____

MOTOR SHAFT: Dia. 1½" — Length 3'1/8

Thread Size in Head 8 — Keyway 3/8"

PUMP BOWL Type RKEH

Dia. 10" — No. of Stages 4

Bowls - Cast Iron or Bronze? C.I.

Shaft - SS ____ CS ____ Length ____

COLUMN Pipe Size 8"

Flanged ____ — Coupled x

Special Paint? ____

Oil Lube ____ — Water Lube x

Shaft Size 1½" — SS x or CS ____

Tubing Size ____ — Stl ____ or Br ____

SUCTION PIPE Size 8"

Length 18" — Special Paint? ____

Threads on Bottom? Yes

Strainer ____ — Size ____

Rubber Bumper? ____

Well Seal? ____

NOTE – All measurements from top of pump foundation.

WELL INFORMATION

Inside Dia. 18" — Depth 84' — Static 18' — Type: Gravel Wall / Tubular / Rock GWW

Air Line Length 71' — Strapped to Column? Taped

Type Airline ____ — Plastic ____ — Copper Tubing x — Steel Pipe ____

PUMPING TEST - Pumped 1000 GPM at 42' Ft. Pumping Level

with 45 lbs. discharge pressure after 45 Min. hours.

Pump to Waste Outside x — Inside ____ — Size ____ — THD.O. ____

PULLING INSTRUCTIONS

Length of Poles required Crane — Special equipment or pulling instructions Tall Building

Power Lines: ____

REMARKS: ____

LNo-2A

Installer Dean Knight

City of Lawrence Utilities

HISTORY OF WELL #14 / (Formerly #9)

1990 Well drilled by others using the Cable Tool Drilling Method. 62' of 16" .375 casing, 13' of 14" OD .045 slot screen, and 7' of .060 slot screen. Static water level of 7' 7" the well pumped 1,557 gpm with a 22' 10" pumping water level, for a specific capacity of 102.1 gpm/ft.

4/03 Well treated for iron bacteria, chemically cleaned and developed. After work completed, static 15.7', pumped 1247 GPM with a pumping level of 35.6' for a specific capacity of 63.6 GPF.

5/04 Well treated for iron bacteria, chemically cleaned and developed. After work completed, static 18', pumped 1160 GPM with a pumping level of 45.8' for a specific capacity of 41.7 GPF.

5/05 Well treated for iron bacteria, chemically cleaned and developed by Peerless-Midwest, Inc.. After work completed, static 14.16', pumped 1430 GPM with a pumping level of 50.25' for a specific capacity of 39.6 GPF.

6/06 Well treated for iron bacteria, chemically cleaned and developed by Peerless-Midwest, Inc.. After work completed, static 17.5', pumped 1005 GPM with a pumping level of 45.41' for a specific capacity of 36 GPF.

5/07 Well chlorinated and performance tested. After work completed, static 18.25', pumped 750 GPM with a pumping level of 53.42' for a specific capacity of 21.3 GPF.

2008/2009 Ortman DD Surge & Bastin Logan DD Surge. No Data Available.

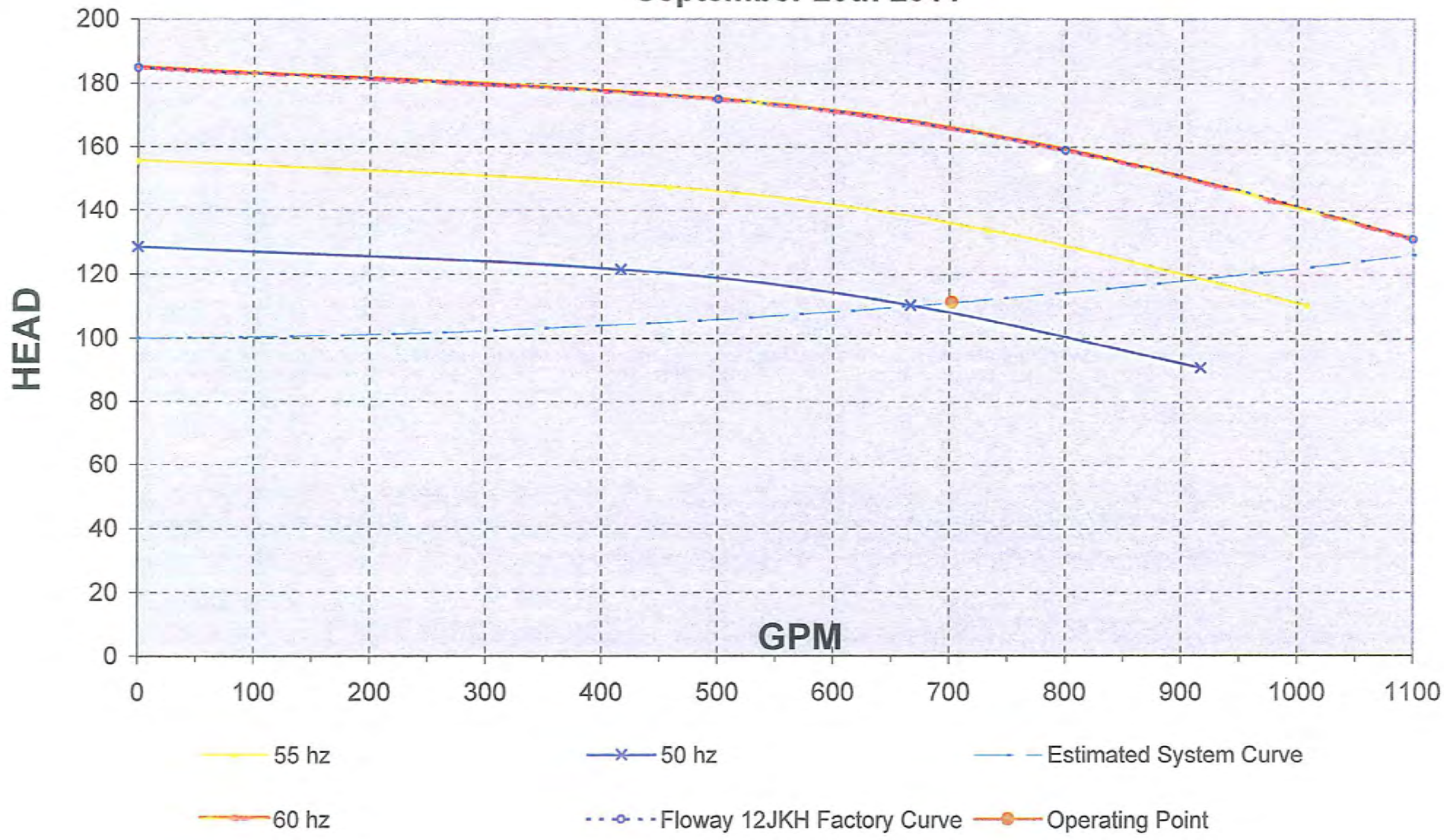
2010 Performance Tested by Peerless-Midwest, Inc. Pumped 1002 gpm with a specific capacity of 24.5 gpm/ft.

2011 Well Cleaned using the Armour Method. Prior to cleaning with a static of 20.17 feet, the well pumped 425 gpm with a pumping water level of 64' and a specific capacity of 9.69. After rehabilitation the well had a static of 16.63'. At 700 gpm the well had a pumping water level of 30.14' and 526% improvement in specific capacity to 50.94 gpm/ft of drawdown.

New Pump and new 40 Hp US Motor installed to provide 700 gpm at 112' TDH at 51.3 Hz and 37.6 Amps.

Peerless-Midwest Incorporated

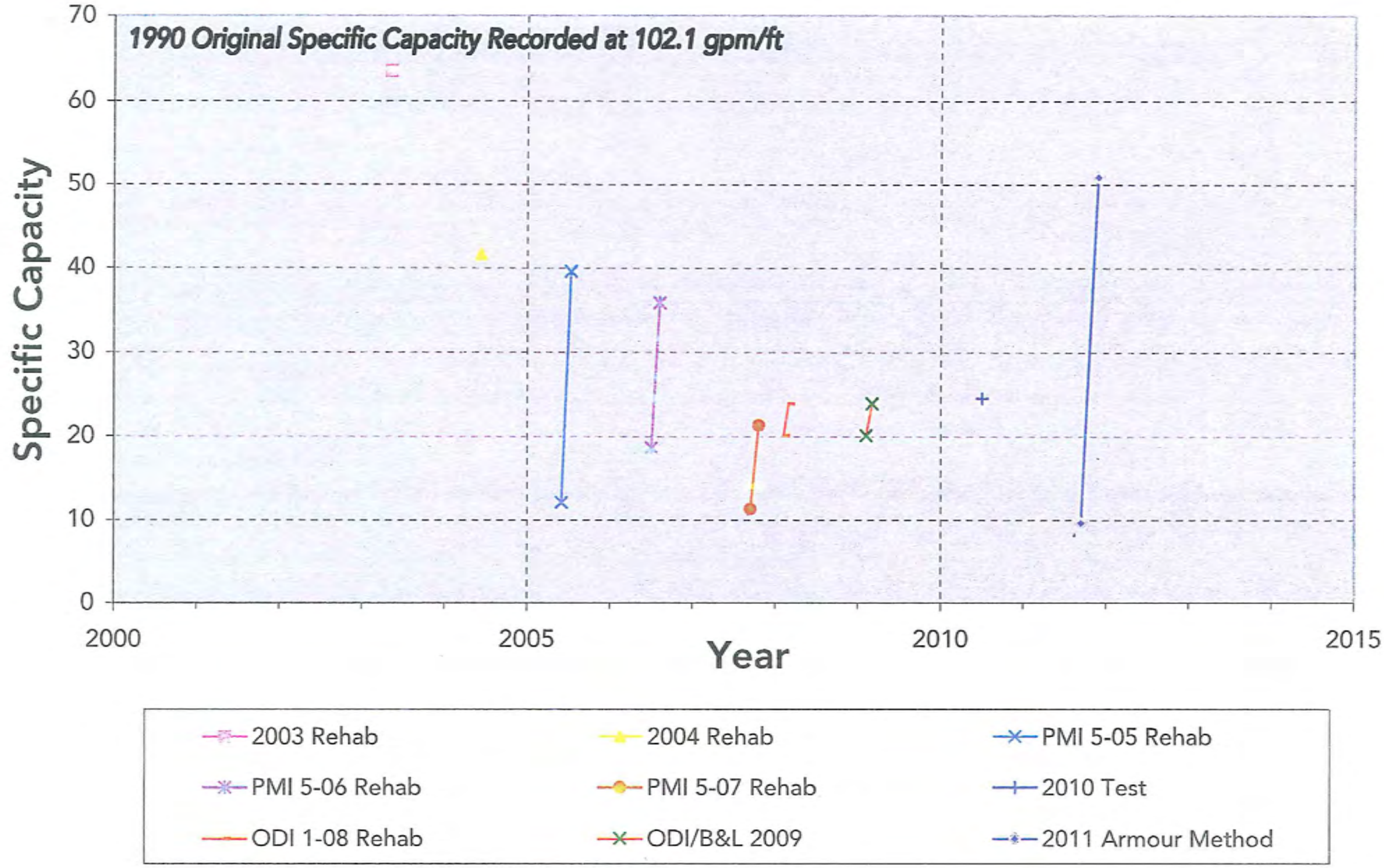
City of Lawrence, IN
IL#14 Calculated VFD Pump Performance
September 23th 2011



5/21/2008	
750	305
702	111.26

PEERLESS MIDWEST INC.

City of Lawrence, IN
IL#14 Well Specific Capacity vs Time



		102.1	
			1990.333
post clean	6/14/2005	39.6	2005.527
preclean	6/1/2006	18.7	2006.5
postclean	6/7/2006	36	2006.6
preclean	5/1/2007	11.3	2007.7
postclean	5/7/2007	21.3	2007.8
preclean	ODI	20.11	2008.1
postclean	ODI	23.88	2008.16
preclean	B&L	20.11	2009.1
postclean	B&L	23.88	2009.17
	6/1/2010	24.5	2010.5
preclean	PMI	9.69	2011.7
postclean	PMI	50.94	2011.9

Peerless Midwest Inc. *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254 9650

WELL & PUMP SERVICE INSPECTION REPORT

Owner Lawrence Utilities City Lawrence State IN

Location Indian Lakes Well Field

Well No. IL#14 Date Drilled 1990 Dia. 16" Depth 91' Type Well Tubular

Screen ID. 14" Screen Length 20' Depth to Top of Screen ______ Type Screen ______

Dates of Cleaning 2003, 2004, 2005, 2006, 2007

Phone Office# 317-542-0511 Cell# 317-501-7840 Person to Contact Claude Jones

	DATE	STATIC	G.P.M.	PUMPING LEVEL	PRESSURE	SPECIFIC CAPACITY
ORIGINAL	1990	7.58'	1557	22.83'		102.1
AFTER LAST CLEANING	2007	18.25'	750	53.42'		21.3
AFTER LAST TEST						
AT PUMP'S RATED FLOW						
AT SYSTEM OPERATING PSI						

Test Completed Through Meter ___ Flange or Thread Size ______ Confined Space Entry? ______

Motor HP 125 Make U.S. Volts 460 RPM 1785 Phase 3

Gear Drive None HP - Ratio - RPM Meter Required ______

Pump Mfg. Simmons/Floway Serial No. 5189-01 Airline Length ______

Rated Capacity: 1400 GPM 226' TDH Operating Pressure ______

Total Setting 70' Size of Packing ______ Date Installed ______

Dates of Overhaul 2005, 2006(motor)

THE FOLLOWING IS TO BE PERFORMED DURING EACH INSPECTION

Is Check Valve Leaking? ______ Change Motor Oil & Grease ______ Repack Pump ______ Grease Pump ______

Pump is Presently Developing ____ **GPM** ____ **TDH** **Projected Curve Capacity** 1400 **GPM** ____ **TDH**

Shut Off Pressure ______ PSI Rated Shut Off Head ______ ft. Calculated Shut Off Head ______ ft.

Electrical Data (With Pump in Operation) ______ V __ / __ / __ Amps ______ Full Load Amps

Location of Power Lines ______ Can Electrical Box be Locked Out? ______

Distance from Top of pump pedestal to grade ______ Materials Needed to Clean Well ______

Need a Smeal to Raise Pump ______ Remarks ______

Maintenance:

Inspected By ______ Date Inspected ______

PEERLESS-MIDWEST Incorporated

PUMP TEST FORM

JOB # ______ DATE 6/30/2010

OWNER Lawrence Utilities — **Annual Maintenance**

WELL IL #14 WELL DIAMETER 16" WELL DEPTH 91'

NORMAL 29 PSI 37.5 hz 29.42' SWL 12.79' PROBE Shut off 135

Time	Pumping Level (ft)	Drawdown (ft)	PSI	Orifice Size	Inches	GPM	Specific Capacity	TDH	Amps
						0		324.6	
1:10			130	6 x 5	10.5	402			63 65 64
1:15	24.50	11.71					34.33	324.8	
1:20			119		33	703			80-82-81
1:25	37.08	24.29					28.94	311.97	
1:35			95		68	1002			95 98 97
	53.67	40.88					24.5	273.12	

8 x 6 , one hard hose, 30' soft hose

BY:

PEERLESS-MIDWEST, INC.
17707 SUN PARK DRIVE / WESTFIELD, IN 46074
PHONE: 317/896-2987 FAX: 317/896-3748

City of Lawrence Utilities

HISTORY OF WELL #14 / (Formerly #9)

1990 Well drilled by others using the Cable Tool Drilling Method. 62' of 16" .375 casing, 13' of 14" OD .045 slot screen, and 7' of .060 slot screen. Static water level of 7' 7" the well pumped 1,557 gpm with a 22' 10" pumping water level, for a specific capacity of 102.1 gpm/ft.

4/03 Well treated for iron bacteria, chemically cleaned and developed. After work completed, static 15.7', pumped 1247 GPM with a pumping level of 35.6' for a specific capacity of 63.6 GPF.

5/04 Well treated for iron bacteria, chemically cleaned and developed. After work completed, static 18', pumped 1160 GPM with a pumping level of 45.8' for a specific capacity of 41.7 GPF.

5/05 Well treated for iron bacteria, chemically cleaned and developed by Peerless-Midwest, Inc.. After work completed, static 14.16', pumped 1430 GPM with a pumping level of 50.25' for a specific capacity of 39.6 GPF.

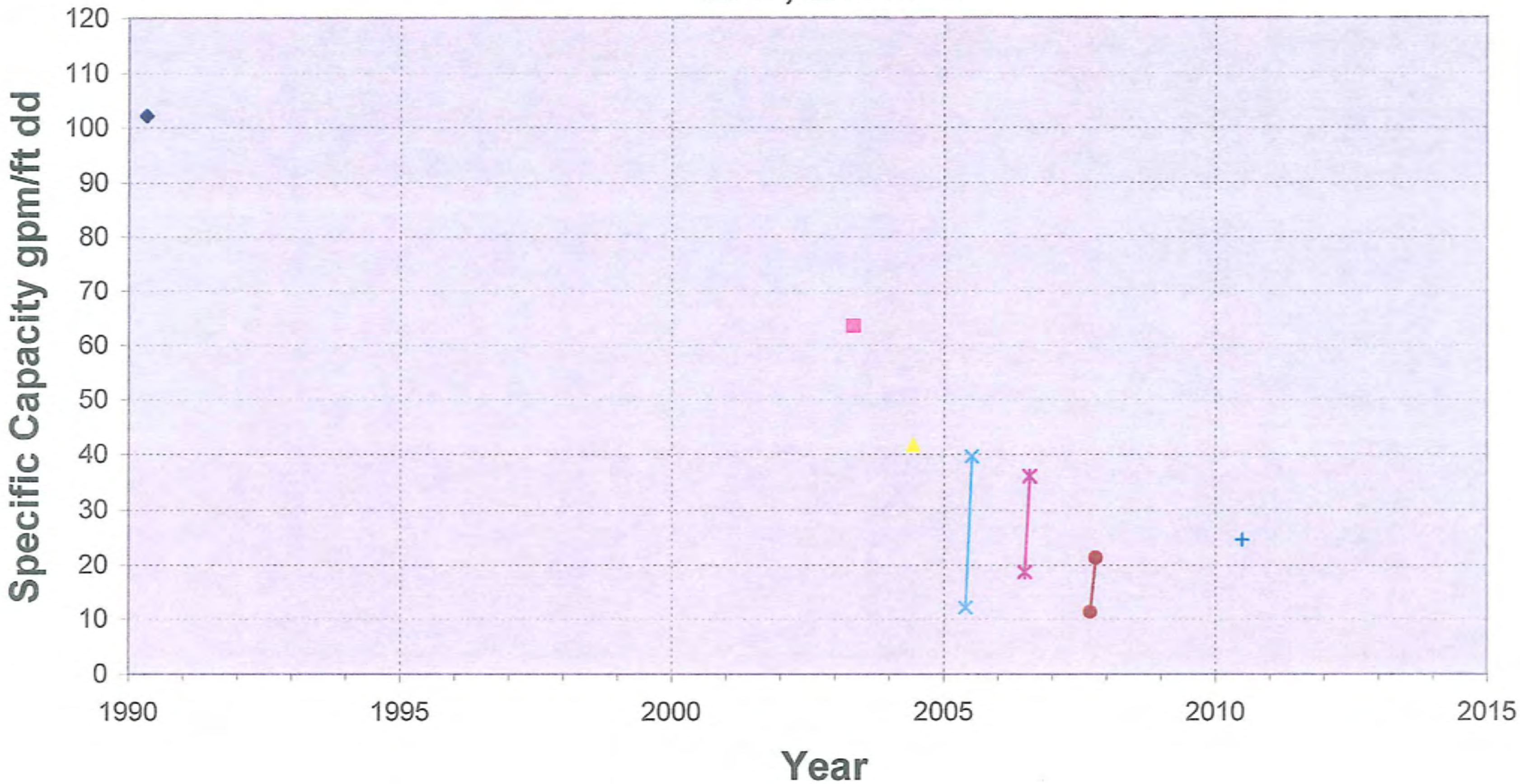
6/06 Well treated for iron bacteria, chemically cleaned and developed by Peerless-Midwest, Inc.. After work completed, static 17.5', pumped 1005 GPM with a pumping level of 45.41' for a specific capacity of 36 GPF.

5/07 Well chlorinated and performance tested. After work completed, static 18.25', pumped 750 GPM with a pumping level of 53.42' for a specific capacity of 21.3 GPF.

2010 Performance Tested by Peerless-Midwest, Inc. Pumped 1002 gpm with a specific capacity of 24.5 gpm/ft.

Peerless-Midwest Incorporated

City of Lawrence, IN
IL#14 Well Specific Capacity vs Time
June, 30th 2010



Peerless Midwest Inc. *Water Supply Contractors*

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-9650
505 Apple Tree Drive / Ionia, Michigan 48846 / 616-527-0050 / Fax 616-527-5508
17707 Sun Park Dr., Westfield, IN 46074 / 317-896-2987 / Fax 317-896-3748

File # 19626(O)

WELL CLEANING

Our Job No. 21524 | Date Started 5/21/2007

Customer No ______ | Date Finished 5/23/2007

Owner Lawrence Utilities | City Lawrence | State IN

Well No. IL-14 Location Indian Lakes Well Field (formerly IL-9)

Dia. 16" w/14" liner Depth 90' Screen 14" - 20' Type Well GW

Dates of Cleaning? Relined, 2005, 2006

Pump Mfg. Simmons/Floway Serial No. 5685-90 GPM 1400 TDH 226'

	Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity
Original Performance						
Test Before Cleaning	5/21/2007	18.25'	510	63.33'	101#	11.3
Test After Cleaning	5/23/2007	18.25'	750	53.42'	109#	21.3

TREATMENT

Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity	Type Treatment
5/21/2007	18.25'	510	63.33'	101#	11.3	Hook up hoses, run overboard test,
						restricted to keep from breaking suction
						Mix 20# HTH, surge in well, soak overnight
5/22/2007	18'	630	56.5'	113#	16.4	Surge HTH, neutralize to waste, clear
						water surge, brief test, mix 15# HTH surge
						in well, neutralize to waste, clear water
5/22/2007	18'	680	54.5'	111#	18.6	surge, brief test, mix 20# HTH surge in
						well, soak overnight
5/23/2007	18.25'	750	53.42'	109#	21.3	Surge HTH, neutralize to waste, clear
						water surge, run overboard flow test
						Ran for 1 hr. - stabilized.

CHEMICALS REQUIRED

Sodium Tripolyphosphat ______ lbs. HCL Acid 55 gal. Dry Chlorine 55 lbs. Caustic ______ lbs.

Sodium Bicarbonate ______ lbs. Citric Acid ______ lbs. Potassium Permanganate ______ lbs.

Sodium Hypochlorite ______ gal. Wetting Agent ______ gal. Others ______

Inhibitor ______ qts. Defoamant ______ qts. Foreman Gary D Flora

Peerless Midwest Inc. *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-9650
505 Apple Tree Drive / Ionia, Michigan 48846 / 616-527-0050 / Fax 616-527-5508
17110 Westfield Park Dr., Westfield, IN 46074 / 317-896-2987 / Fax 317-896-3748

File # 19627

WELL CLEANING

Our Job No. 20724 Date Started 8/22/2006
Customer No ____ Date Finished 6/8/2006
Owner Lawrence Utilities LLC City Lawrence State IN
Well No. 14 Location Indian Lake Well Field (formerly Well No. 9)
Dia. 16" x 14" Depth 90' Screen 14" x 20' Type Well Tubular
Dates of Cleaning 2005
Pump Mfg. Simmons Serial No. 5189-01 GPM 1400 TDH 226'

	Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity
Original Performance	1990	7.58'	1557	22.83		102.1
Test Before Cleaning	5/22/2006	15.33'	524	43.33'	132#	18.7
Test After Cleaning	6/8/2006	17.50'	1005	45.41'	108#	36.0

TREATMENT

Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity	Type Treatment
5/22/2006	15.33'	524	43.33'	132#	18.7	Test, clear water tank surge, surge
						110 gal. acid - let set overnight.
5/23/2006	15.33'	584	42.70'	132#	21.3	Pump off, test, surge 110 gal chlorine
						all day, pump off, soak overnight w/
						chlorine. (no sand - just iron).
5/25/2006	16.83'	596	36.16'	132#	30.8	Pump off chlorine, clear water surge,
						test, work chlorine all day. Soak
						overnight with chlorine.
5/26/2006	16.83'	596	33.25'	132#	36.3	Pump off, test, work all day with
						55 gal chlorine. Soak over weekend
						with chlorine.
5/30/2006	17.50'	602	33.91'	132#	36.7	Pump off, teset. Work chlorine all
5/30/2006	17.50'	1002	58.16'	132#	24.6	day, soak overnight 55 gal. acid.
5/31/2006	17.50'	596	31.50'	133#	42.6	Pump off, test, work acid all day,
5/31/2006	17.50'	1002	49.75'	133#	31.1	let soak overnight. **CON'T on Pg 2**

CHEMICALS REQUIRED - see Page No. 2

Sodium Tripolyphosphate ____ lbs. HCL Acid ____ gal. Dry Chlorine ____ lbs. Caustic ____ lbs.
Sodium Bicarbonate ____ lbs. Citric Acid ____ lbs. Potassium Permanganate ____ lbs.
Sodium Hypochlorite ____ gal. Wetting Agent ____ gal. Others ____
Inhibitor ____ qts. Defoamant ____ qts. Foreman Gerald Flora / Leonard Flora

Peerless Midwest Inc. *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-9650
505 Apple Tree Drive / Ionia, Michigan 48846 / 616-527-0050 / Fax 616-527-5508
17110 Westfield Park Dr., Westfield, IN 46074 / 317-896-2987 / Fax 317-896-3748

File # 19627

WELL CLEANING

Our Job No. 19627 Date Started 5/18/2005
Customer No Date Finished 5/27/2005
Owner Lawrence Utilities LLC City Lawrence State IN
Well No. 9 Location Indian Lake Well Field
Dia. 16" x 14" Depth 90' Screen 14" x 20' Type Well Tubular
Dates of Cleaning
Pump Mfg. Simmons Serial No. 5189-01 GPM 1400 TDH 226'

	Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity
Original Performance						
Test Before Cleaning	5/11/2005	15.84'	570	63'	46#	12.100
Test After Cleaning	6/14/2005	14.16'	1430	50.25'	80#	39.6

TREATMENT

Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity	Type Treatment
5/18/2005	15'		airlift and	double disk	surge	brush screen
5/19/2005	15' 4"					run in 135 gal. acid
			blew over top	after acid soak	and surge	10 gal. aqua clear
						surge set overnight
5/20/2005	15'		16' 6"			surge airlift ran in 55 gal.
						chlorine surge set over weekend
5/23/2005	15' 4"					surge chlorine airlift surge
		had blow	over			out run in 360 gal acid
		after acid	soak and	surge		15 gal. aqua clear surge set overnight
5/24/2005	15' 1"		16' 1"			surge acid airlift surge
						out run in 360 gal acid
						10 gal. aqua clear
						surge set overnight

CHEMICALS REQUIRED

Sodium Tripolyphosphate 50 lbs. HCL Acid 990 gal. Dry Chlorine 20 lbs. Caustic ____ lbs.
Sodium Bicarbonate 300 lbs. Citric Acid ____ lbs. Potassium Permanganate ____ lbs.
Sodium Hypochlorite 55 gal. aqua clear A.E. 45 gal. Others
Inhibitor ____ qts. Defoamant ____ qts. Foreman Gary D. Flora

Peerless Midwest Inc. *Water Supply Contractors*

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-9650
505 Apple Tree Drive / Ionia, Michigan 48846 / 616-527-0050 / Fax 616-527-5508
17110 Westfield Park Dr., Westfield, IN 46074 / 317-896-2987 / Fax 317-896-3748

File #

WELL CLEANING

Our Job No. 19627 Date Started 5/18/2005

Customer No Date Finished 5/27/2005

Owner Lawrence Utilities LLC City Lawrence State IN

Well No. 9 Location Indian Lake Well Field

Dia. 16" x telescoping Depth 90' 10" Screen 14" x 20' Type Well Tubular

Dates of Cleaning

Pump Mfg. Simmons Serial No. 5189-01 GPM 1400 TDH 226'

	Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity
Original Performance						
Test Before Cleaning						
Test After Cleaning						

TREATMENT

Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity	Type Treatment
5/25/2005	14' 10"	after acid	15' 8"			surge acid airlift
		and clear				run in 165 gal acid
		water surge				10 gal. aqua clear surge
			after acid soak	and surge then	clear water surge	set overnight
5/26/2005	4' 10"		15' 9"			surge acid airlift
						clear water surge
						mix 20 lbs. HTH
						50 lbs. p-6 surge
		after clear	water	surging		in set overnight
5/27/2005	15'		15' 11"			surge HTH airlift
						clear water lift and
						surge pull tools
						tear down

CHEMICALS REQUIRED

Sodium Tripolyphosphate ____ lbs. HCL Acid ____ gal. Dry Chlorine ____ lbs. Caustic ____ lbs.

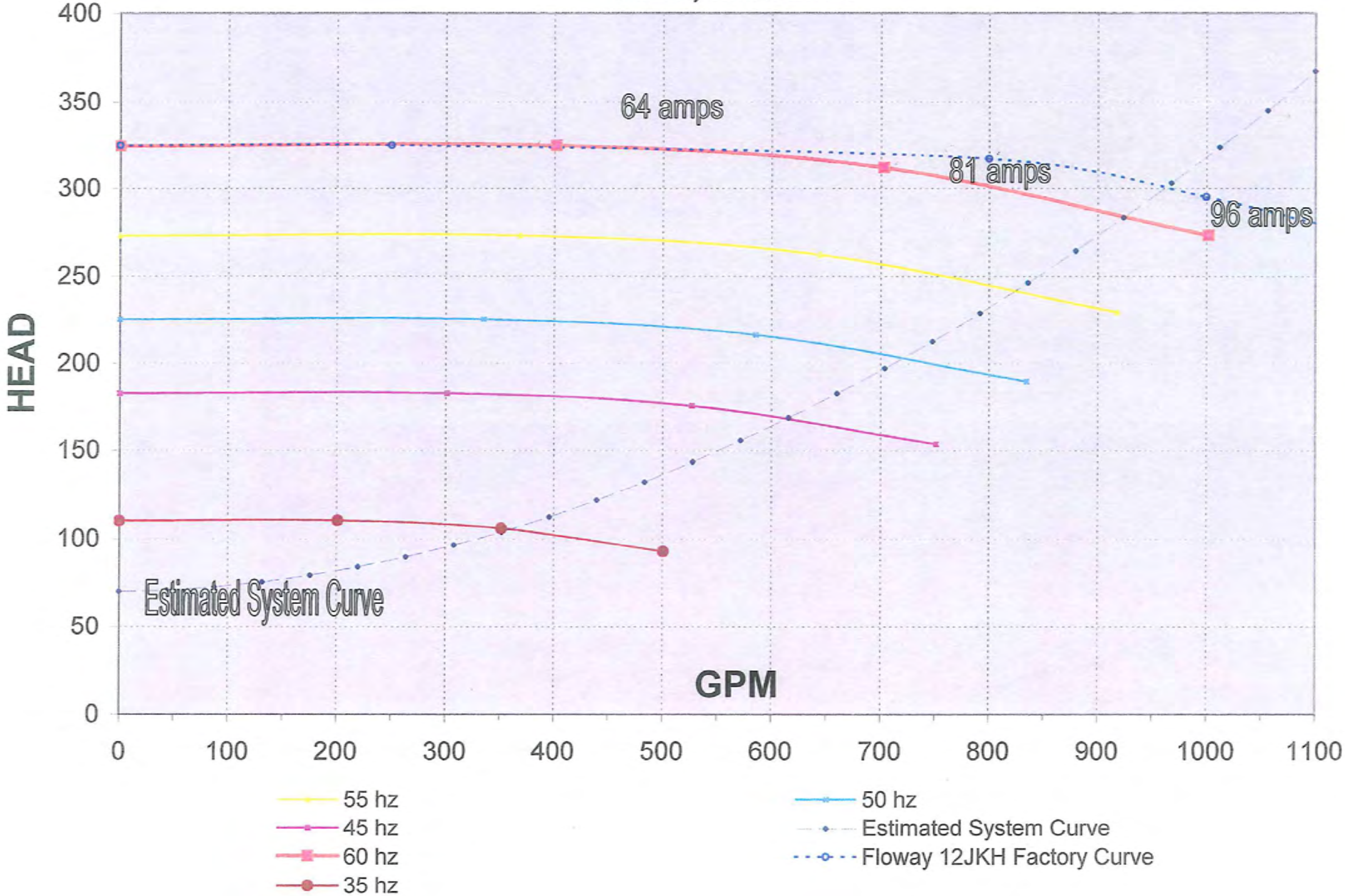
Sodium Bicarbonate ____ lbs. Citric Acid ____ lbs. Potassium Permanganate ____ lbs.

Sodium Hypochlorite ____ gal. Wetting Agent ____ gal. Others ____

Inhibitor ____ qts. Defoamant ____ qts. Foreman Gary D. Flora

Peerless-Midwest Incorporated

City of Lawrence, IN
IL#14 Calculated VFD Pump Performance
June, 29th 2010



Peerless Midwest Inc. *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-965

PUMP INSTALLATION REPORT

COPY

Sales Order No. 20691 Date 7/10/2006

Pump Mfg. Simmons/Floway Serial No. 5189-01 Well No. IL 14 (formerly 9)

Owner Lawrence Utilities City Lawrence State IN

Location of Well Indian Lake Well Field

MOTOR Make US Type RSU 1 Frame 405 TP Serial No. K0682001301-1-001R

HP 125 Volts 460 Line Voltage 460 Phase 3 RPM 1785 Non-Reverse Ratchet Yes

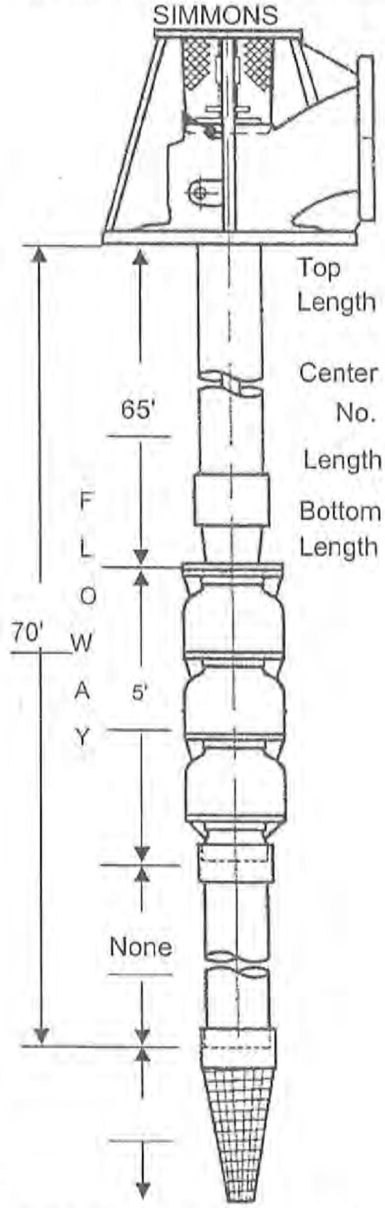
GEAR DRIVE Make ____ Serial No. ____ Gear Ratio ____

Was motor and/or gear drive taken to a repair shop at this time? Motor New Where ____

Gear ____ Where ____

ENGINE Make ____ Model ____ Serial No. ____

SIMMONS



Top Length 5'

Center No. 5

Length 10'

Bottom Length (2) 5'

PUMP HEAD Type Simmons

Discharge Pipe Size 8"

Located above X / below ____ Ground, flanged X / threaded ____

Separate Base Plate? No

Head Shaft Length combo 107½"

Dia. 1½" Coupled above ____ below X

Stuffing Box Size 1½"

MOTOR SHAFT

Dia. 1½" Length combo 107½"

Thread size in head ____ Keyway ____

PUMP BOWL Dia. 12 Type JKH

Imp. No. * Open ____ Enc. X

# of Stages 4 Bowls:CL X Brz ____

Wear Rings No

Length Shaft ____ Dia. ____

COLUMN Pipe Size 8"

Flanged ____ Coupled X

Special Paint? Black

Oil Lube ____ Water Lube X

Shaft Size ____ SS ____ or CS ____

Tubing Size ____ Stl ____ or Br ____

SUCTION PIPE Size None

Length ____ Special Paint ____

Threads on Bottom? ____

Strainer ____ Size ____

Rubber Bumper? ____

Well Seal? ____

* all trimmed to 8.481"

WELL INFORMATION All measurements from top of pump foundation ____ Gravel Wall X Tubular

Inside Dia. 16" Depth 90.25' Static ____ Type ____ Rock

Air Line Length ____ Strapped to Column? ____

Type Airline ____ Plastic ____ Copper Tubing ____ Steel Pipe

PUMPING TEST-Pumped ____ GPM at ____ ft. Pumping Level with ____ lbs. Discharge Pressure after ____ hours. Specific Capacity ____

SPECIAL EQUIPMENT OR PULLING INSTRUCTIONS

Power Lines ____

REMARKS Installed new motor only at this time. Rated 1400 GPM @ 226' TDH.

Installer Gerald Flora

PEERLESS-MIDWEST, INC.
17707 SUN PARK DRIVE / WESTFIELD, IN 46074
PHONE: 317/896-2987 FAX: 317/896-3748

City of Lawrence Utilities

HISTORY OF WELL #14 / (Formerly #9)

1990 Well drilled by others using the Cable Tool Drilling Method. 62' of 16" .375 casing, 13' of 14" OD .045 slot screen, and 7' of .060 slot screen. Static water level of 7' 7" the well pumped 1,557 gpm with a 22' 10" pumping water level, for a specific capacity of 102.1 gpm/ft.

4/03 Well treated for iron bacteria, chemically cleaned and developed. After work completed, static 15.7', pumped 1247 GPM with a pumping level of 35.6' for a specific capacity of 63.6 GPF.

5/04 Well treated for iron bacteria, chemically cleaned and developed. After work completed, static 18', pumped 1160 GPM with a pumping level of 45.8' for a specific capacity of 41.7 GPF.

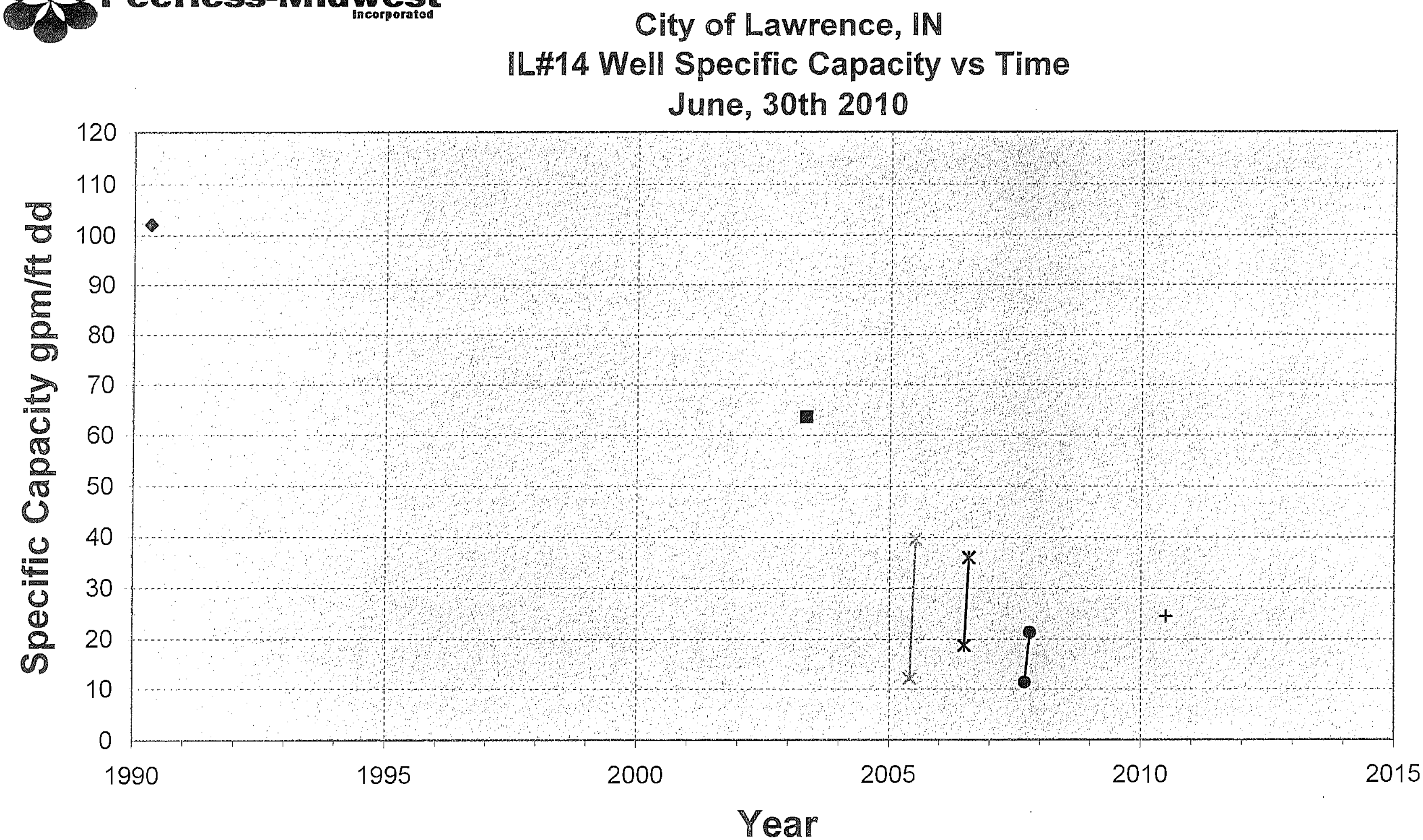
5/05 Well treated for iron bacteria, chemically cleaned and developed by Peerless-Midwest, Inc.. After work completed, static 14.16', pumped 1430 GPM with a pumping level of 50.25' for a specific capacity of 39.6 GPF.

6/06 Well treated for iron bacteria, chemically cleaned and developed by Peerless-Midwest, Inc.. After work completed, static 17.5', pumped 1005 GPM with a pumping level of 45.41' for a specific capacity of 36 GPF.

5/07 Well chlorinated and performance tested. After work completed, static 18.25', pumped 750 GPM with a pumping level of 53.42' for a specific capacity of 21.3 GPF.

2010 Performance Tested by Peerless-Midwest, Inc. Pumped 1002 gpm with a specific capacity of 24.5 gpm/ft.

Peerless-Midwest Incorporated



Peerless Midwest Inc. *Water Supply Contractors*

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-9650
505 Apple Tree Drive / Ionia, Michigan 48846 / 616-527-0050 / Fax 616-527-5508
17707 Sun Park Dr., Westfield, IN 46074 / 317-896-2987 / Fax 317-896-3748

File # 19626(O)

WELL CLEANING

Our Job No. 21524 Date Started 5/21/2007

Customer No ______ Date Finished 5/23/2007

Owner Lawrence Utilities City Lawrence State IN

Well No. IL-14 Location Indian Lakes Well Field (formerly IL-9)

Dia. 16" w/14" liner Depth 90' Screen 14" - 20' Type Well GW

Dates of Cleaning ? Relined, 2005, 2006

Pump Mfg. Simmons/Floway Serial No. 5685-90 GPM 1400 TDH 226'

	Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity
Original Performance						
Test Before Cleaning	5/21/2007	18.25'	510	63.33'	101#	11.3
Test After Cleaning	5/23/2007	18.25'	750	53.42'	109#	21.3

TREATMENT

Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity	Type Treatment
5/21/2007	18.25'	510	63.33'	101#	11.3	Hook up hoses, run overboard test,
						restricted to keep from breaking suction
						Mix 20# HTH, surge in well, soak overnight
5/22/2007	18'	630	56.5'	113#	16.4	Surge HTH, neutralize to waste, clear
						water surge, brief test, mix 15# HTH surge
						in well, neutralize to waste, clear water
5/22/2007	18'	680	54.5'	111#	18.6	surge, brief test, mix 20# HTH surge in
						well, soak overnight
5/23/2007	18.25'	750	53.42'	109#	21.3	Surge HTH, neutralize to waste, clear
						water surge, run overboard flow test
						Ran for 1 hr. - stabilized.

CHEMICALS REQUIRED

Sodium Tripolyphosphat ____ lbs. HCL Acid 55 gal. Dry Chlorine 55 lbs. Caustic ____ lbs.

Sodium Bicarbonate ____ lbs. Citric Acid ____ lbs. Potassium Permanganate ____ lbs.

Sodium Hypochlorite ____ gal. Wetting Agent ____ gal. Others ____

Inhibitor ____ qts. Defoamant ____ qts. Foreman Gary D Flora

Peerless Midwest Inc. *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-9650
505 Apple Tree Drive / Ionia, Michigan 48846 / 616-527-0050 / Fax 616-527-5508
17110 Westfield Park Dr., Westfield, IN 46074 / 317-896-2987 / Fax 317-896-3748

File # 19627

WELL CLEANING

Our Job No. 20724 Date Started 8/22/2006
Customer No ______ Date Finished 6/8/2006
Owner Lawrence Utilities LLC City Lawrence State IN
Well No. 14 Location Indian Lake Well Field (formerly Well No. 9)
Dia. 16" x 14" Depth 90' Screen 14" x 20' Type Well Tubular
Dates of Cleaning 2005
Pump Mfg. Simmons Serial No. 5189-01 GPM 1400 TDH 226'

	Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity
Original Performance	1990	7.58'	1557	22.83		102.1
Test Before Cleaning	5/22/2006	15.33'	524	43.33'	132#	18.7
Test After Cleaning	6/8/2006	17.50'	1005	45.41'	108#	36.0

TREATMENT

Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity	Type Treatment
5/22/2006	15.33'	524	43.33'	132#	18.7	Test, clear water tank surge, surge
						110 gal. acid - let set overnight.
5/23/2006	15.33'	584	42.70'	132#	21.3	Pump off, test, surge 110 gal chlorine
						all day, pump off, soak overnight w/
						chlorine. (no sand - just iron).
5/25/2006	16.83'	596	36.16'	132#	30.8	Pump off chlorine, clear water surge,
						test, work chlorine all day. Soak
						overnight with chlorine.
5/26/2006	16.83'	596	33.25'	132#	36.3	Pump off, test, work all day with
						55 gal chlorine. Soak over weekend
						with chlorine.
5/30/2006	17.50'	602	33.91'	132#	36.7	Pump off, teset. Work chlorine all
5/30/2006	17.50'	1002	58.16'	132#	24.6	day, soak overnight 55 gal. acid.
5/31/2006	17.50'	596	31.50'	133#	42.6	Pump off, test, work acid all day,
5/31/2006	17.50'	1002	49.75'	133#	31.1	let soak overnight. **CON'T on Pg 2**

CHEMICALS REQUIRED - see Page No. 2

Sodium Tripolyphosphate ____ lbs. HCL Acid ____ gal. Dry Chlorine ____ lbs. Caustic ____ lbs.
Sodium Bicarbonate ____ lbs. Citric Acid ____ lbs. Potassium Permanganate ____ lbs.
Sodium Hypochlorite ____ gal. Wetting Agent ____ gal. Others ______
Inhibitor ____ qts. Defoamant ____ qts. Foreman Gerald Flora / Leonard Flora

Peerless Midwest Inc. *Water Supply Contractors*

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-9650
505 Apple Tree Drive / Ionia, Michigan 48846 / 616-527-0050 / Fax 616-527-5508
17110 Westfield Park Dr., Westfield, IN 46074 / 317-896-2987 / Fax 317-896-3748

File # 19627

WELL CLEANING

Our Job No. 19627 Date Started 5/18/2005

Customer No ______ Date Finished 5/27/2005

Owner Lawrence Utilities LLC City Lawrence State IN

Well No. 9 Location Indian Lake Well Field

Dia. 16" x 14" Depth 90' Screen 14" x 20' Type Well Tubular

Dates of Cleaning ______

Pump Mfg. Simmons Serial No. 5189-01 GPM 1400 TDH 226'

	Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity
Original Performance						
Test Before Cleaning	5/11/2005	15.84'	570	63'	46#	12.100
Test After Cleaning	6/14/2005	14.16'	1430	50.25'	80#	39.6

TREATMENT

Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity	Type Treatment
5/18/2005	15'		airlift and	double disk	surge	brush screen
5/19/2005	15' 4"					run in 135 gal. acid
			blew over top	after acid soak	and surge	10 gal. aqua clear
						surge set overnight
5/20/2005	15'		16' 6"			surge airlift ran in 55 gal.
						chlorine surge set over weekend
5/23/2005	15' 4"					surge chlorine airlift surge
		had blow	over			out run in 360 gal acid
		after acid	soak and	surge		15 gal. aqua clear surge set overnight
5/24/2005	15' 1"		16' 1"			surge acid airlift surge
						out run in 360 gal acid
						10 gal. aqua clear
						surge set overnight

CHEMICALS REQUIRED

Sodium Tripolyphosphate 50 lbs. HCL Acid 990 gal. Dry Chlorine 20 lbs. Caustic ____ lbs.

Sodium Bicarbonate 300 lbs. Citric Acid ____ lbs. Potassium Permanganate ____ lbs.

Sodium Hypochlorite 55 gal. aqua clear A.E. 45 gal. Others ______

Inhibitor ____ qts. Defoamant ____ qts. Foreman Gary D. Flora

Peerless Midwest Inc. *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-9650
505 Apple Tree Drive / Ionia, Michigan 48846 / 616-527-0050 / Fax 616-527-5508
17110 Westfield Park Dr., Westfield, IN 46074 / 317-896-2987 / Fax 317-896-3748

File #

WELL CLEANING

Our Job No. 19627 Date Started 5/18/2005
Customer No Date Finished 5/27/2005
Owner Lawrence Utilities LLC City Lawrence State IN
Well No. 9 Location Indian Lake Well Field
Dia. 16" x telescoping Depth 90' 10" Screen 14" x 20' Type Well Tubular
Dates of Cleaning
Pump Mfg. Simmons Serial No. 5189-01 GPM 1400 TDH 226'

	Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity
Original Performance						
Test Before Cleaning						
Test After Cleaning						

TREATMENT

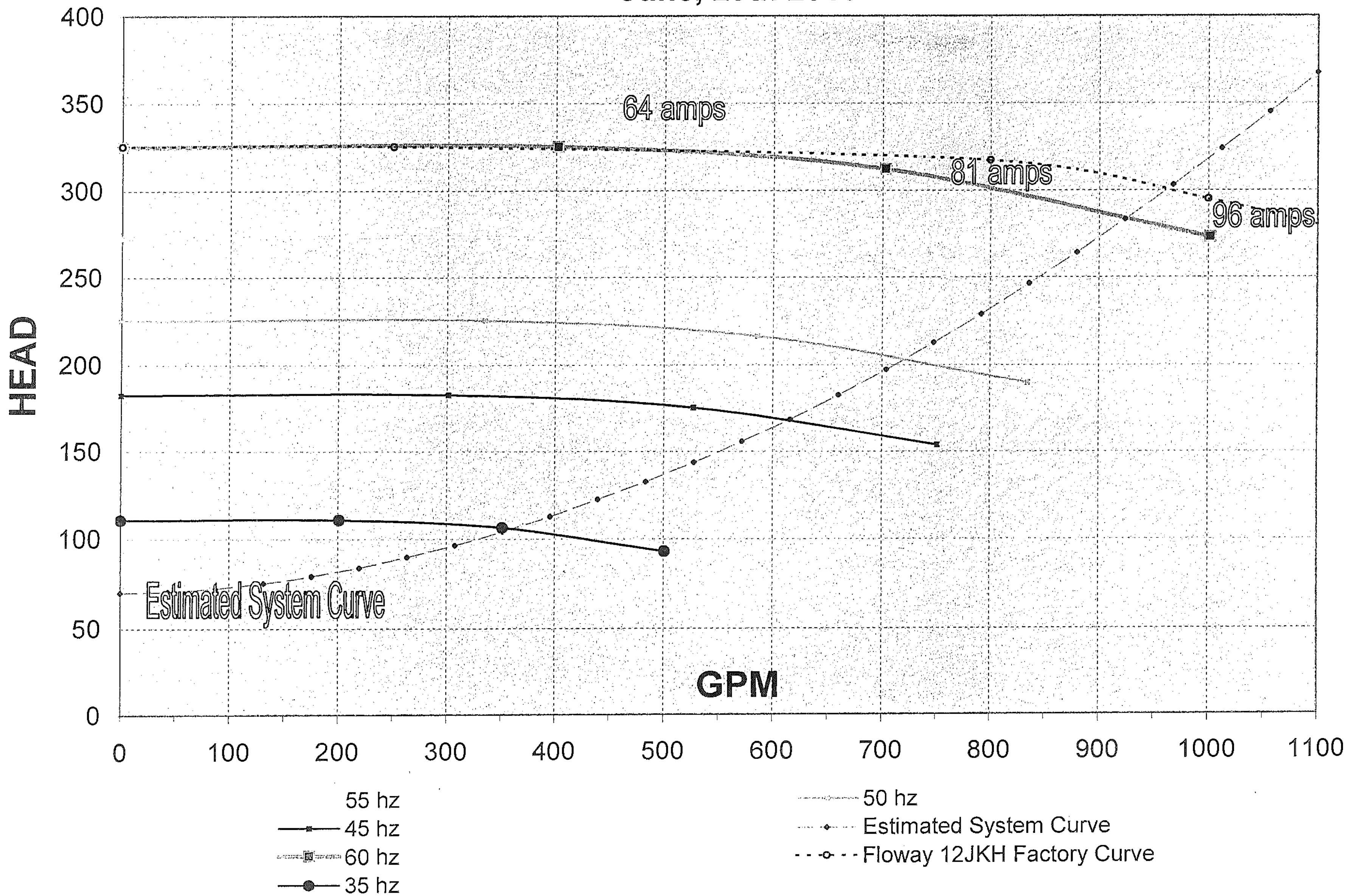
Date	Static	GPM	Pumping Level	Pump Pressure	Specific Capacity	Type Treatment
5/25/2005	14' 10"	after acid	15' 8"			
		and clear				surge acid airlift
		water surge				run in 165 gal acid
						10 gal. aqua clear surge
			after acid soak	and surge then	clear water surge	set overnight
5/26/2005	4' 10"		15' 9"			surge acid airlift
						clear water surge
						mix 20 lbs. HTH
						50 lbs. p-6 surge
		after clear	water	surging		in set overnight
5/27/2005	15'		15' 11"			surge HTH airlift
						clear water lift and
						surge pull tools
						tear down

CHEMICALS REQUIRED

Sodium Tripolyphosphate ____ lbs. HCL Acid ____ gal. Dry Chlorine ____ lbs. Caustic ____ lbs.
Sodium Bicarbonate ____ lbs. Citric Acid ____ lbs. Potassium Permanganate ____ lbs.
Sodium Hypochlorite ____ gal. Wetting Agent ____ gal. Others ____
Inhibitor ____ qts. Defoamant ____ qts. Foreman Gary D. Flora

Peerless-Midwest Incorporated

City of Lawrence, IN
IL#14 Calculated VFD Pump Performance
June, 29th 2010



Peerless Midwest Inc. *Water Supply Contractors*

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-965

PUMP INSTALLATION REPORT

COPY

Sales Order No. 20691 Date 7/10/2006

Pump Mfg. Simmons/Floway Serial No. 5189-01 Well No. IL 14 (formerly 9)

Owner Lawrence Utilities City Lawrence State IN

Location of Well Indian Lake Well Field

MOTOR Make US Type RSU 1 Frame 405 TP Serial No. K0682001301-1-001R

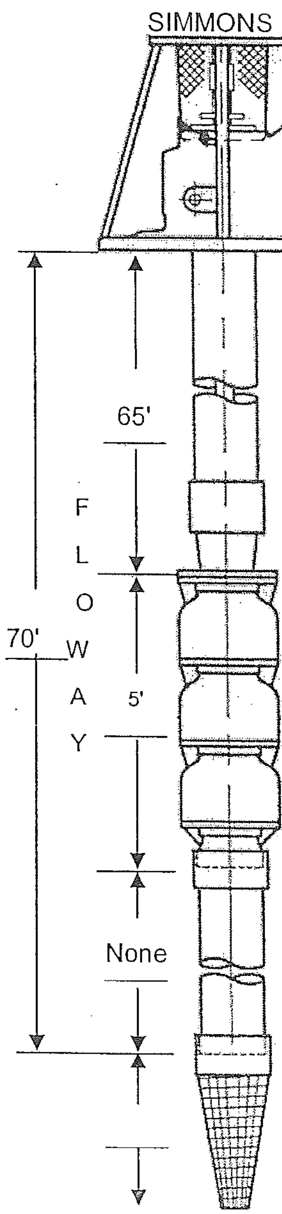
HP 125 Volts 460 Line Voltage 460 Phase 3 RPM 1785 Non-Reverse Ratchet Yes

GEAR DRIVE Make ___ Serial No. ___ Gear Ratio ___

Was motor and/or gear drive taken to a repair shop at this time? Motor New Where ___

Gear ___ Where ___

ENGINE Make ___ Model ___ Serial No. ___



Top Length 5'

Center No. 5

Length 10'

Bottom Length (2) 5'

PUMP HEAD Type Simmons

Discharge Pipe Size 8"

Located above X / below ___ Ground flanged X / threaded ___

Separate Base Plate? No

Head Shaft Length combo 107½"

Dia. 1½" Coupled above ___ below X

Stuffing Box Size 1½"

MOTOR SHAFT

Dia. 1½" Length combo 107½"

Thread size in head ___ Keyway ___

PUMP BOWL Dia. 12 Type JKH

Imp. No. * Open ___ Enc. X

\# of Stages 4 Bowls:CL X Brz ___

Wear Rings No

Length Shaft ___ Dia. ___

COLUMN Pipe Size 8"

Flanged ___ Coupled X

Special Paint? Black

Oil Lube ___ Water Lube X

Shaft Size ___ SS ___ or CS ___

Tubing Size ___ Stl ___ or Br ___

SUCTION PIPE Size None

Length ___ Special Paint ___

Threads on Bottom? ___

Strainer ___ Size ___

Rubber Bumper? ___

Well Seal? ___

* all trimmed to 8.481"

WELL INFORMATION All measurements from top of pump foundation

___ Gravel Wall X Tubular

Inside Dia. 16" Depth 90.25' Static ___ Type ___ Rock

Air Line Length ___ Strapped to Column? ___

Type Airline ___ Plastic ___ Copper Tubing ___ Steel Pipe

PUMPING TEST-Pumped ___ GPM at ___ ft. Pumping Level with ___ lbs. Discharge Pressure after ___ hours. Specific Capacity ___

SPECIAL EQUIPMENT OR PULLING INSTRUCTIONS

Power Lines ___

REMARKS Installed new motor only at this time. Rated 1400 GPM @ 226' TDH.

Installer Gerald Flora

PEERLESS-MIDWEST, INC.
17707 SUN PARK DRIVE / WESTFIELD, IN 46074
PHONE: 317/896-2987 FAX: 317/896-3748

City of Lawrence Utilities

HISTORY OF WELL #15 (Formerly #8)

1988 New Tubular well constructed with 20' of 14" SSWW .070 slot screen and 72' of 16" casing. Static 19' pumped 1002 gpm with a 57' pwl for a specific capacity of **26.36** gpm/ft.

2005 July 21st: Started with a specific capacity of 10.5 gpm/ft. Well Cleaned using DD Surge Method for 9 days, using 150 lbs P-6, 220 gallons sodium hypochlorite, 55 gallons of acid, and 30 gallons of Aquaclear.

20' of 10" x 12" .040 slot 8/14 Carbolite Muni-Pack and 1.5' of 14" Blank Liter Installed.

September 13th Pump installed and tested at 847 gpm at 218' TDH, with a specific capacity of 29.89. Also pumped 1002 gpm at 57' pwl and 193.3' TDH, for a specific capacity of **26.36** gpm/ft dd (same as when new)

2008 Well Replaced

IL#8

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577

TUBULAR WELL PRINT

TOWER HEIGHT ________ ft.

Pipe extends 2 feet above ground level

JOB NO. 797-F

CUSTOMER City of Lawrence

TUBULAR WELL NO. 88-E

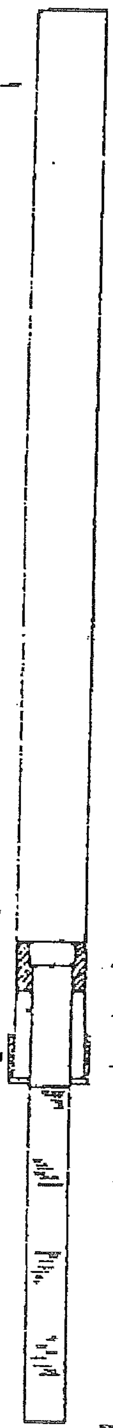
Location from street or road:
Christian Church of Indiana Property

COUNTY Marion

TOWNSHIP Lawrence

SECTION 30 T17N R5E

STATE Indiana



Pipe size 16"

Wall Thickness .375"

Pipe Lengths
20'
10'
10'
10'
10'
8'

Depth 64' 6"

K-packer
~~xxxxxxxxxxxxxxxxxxxxxxxx~~
against pipe

Blank tube size 14¼" O.D.
Length 1'6"

Depth 66'

Steel Drive Shoe

Johnson
Well Screen
Hi-Q
Type S.S.W.W.

Slot size .070"

Depth 86'

Static Level 8'3"

Pumped 1,404 GPM

at 36'3" pumping level

after 24 hours

Drawdown 28'

Specific Capacity 50.14

DRILLER Delford Dunn

DATE COMPLETED December 22, 1988

800

IL#9

BASTIN LOGAN WATER SERVICES INC.

WELL 8

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577

TEST
[X] PERMANENT DATE December 19, 1988 Project No. 797-F

WELL NO. 88-F CITY Lawrence County Marion
Owner Christian Church of Indiana Township Lawrence
Section 30 T17N R5E
State
Location
Land Description 10' North of test hole 88-B
Street or Road

FORMATION	FROM NATURAL GROUND LEVEL Depth to Top of Stratum	Depth to Bottom of Stratum	Thickness of Stratum	Static Water Level
Dark Brown Top Soil	0'	1'	1'	8'3"
Light brown sandy clay	1'	15'	14'	
Fine, coarse sand	15'	27'	12'	
Blueish grey sandy clay	27'	32'	5'	
Fine, coarse muddy sand	32'	41'	9'	
Fine, coarse sand	41'	54'	13'	
Fine, coarse sand w/fine medium gravel	54'	60'	6'	
Fine, coarse sand and gravel	60'	86'	26'	

Hole 16 " Dia. Drilled by: Cable Tools
Rotary Hole Grouted with: Bentonite
Casing 16 " OD from 24 " above grade to 66 ' below grade Weight 62.58#/ft.
Screen 14 O.D. Set from 66' to 86 ' feet Make Johnson Type S.S.W.W. Slot .070" Hi-Q
Pumping Test 1,404 GPM drawdown to 36'3" feet after 24 Hours Pumping

Driller Delford Dunn

IL#9

BASTIN LOGAN WATER SERVICES INC.

WELL 8

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577

TEST

[X] PERMANENT DATE December 19, 1988 Project No. 797-F

WELL NO. 88-F CITY Lawrence County Marion

Owner Christian Church of Indiana Township Lawrence

Section 30 T17N R5E

Location State

Land Description 10' North of test hole 88-B

Street or Road

FORMATION	FROM NATURAL GROUND LEVEL			
	Depth to Top of Stratum	Depth to Bottom of Stratum	Thickness of Stratum	Static Water Level
Dark Brown Top Soil	0'	1'	1'	8'3"
Light brown sandy clay	1'	15'	14'	
Fine, coarse sand	15'	27'	12'	
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Fine, coarse muddy sand	32'	41'	9'	
Fine, coarse sand	41'	54'	13'	
Fine, coarse sand w/fine medium gravel	54'	60'	6'	
Fine, coarse sand and gravel	60'	86'	26'	

Hole 16 " Dia. Drilled by: Cable Tools

Rotary Hole Grouted with: Bentonite

Casing 16 " OD from 24 " above grade to 66 ' below grade Weight 62.58#/ft.

Screen 1440.D. Set from 66' to 86' feet Make Johnson Hi-Q Type S.S.W.W. Slot .070"

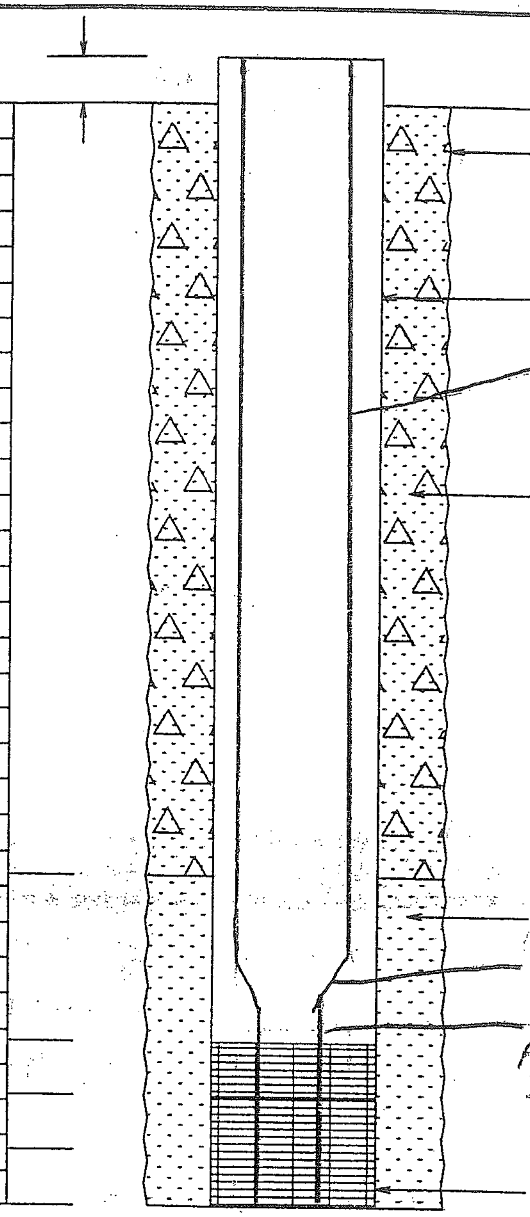
Pumping Test 1,404 GPM drawdown to 36'3" feet after 24 Hours Pumping

Driller Delford Dunn

JTH

LITHOLOGY

(FLOOR LEVEL ELEVATED BUILDING)
Ground Level



14" Liner set To 71' 4"

14" x 12" Reducer

20' of 12" x 10" Pre pack Screen Set To 91' 4"

WHAT SIZE GRAVEL PACK & HOW MUCH USED

HOW MANY BAGS OF DRILLING FLUID WHERE USED

TYPE OF GROUT

NUMBER OF BAGS

City Lawrence State In

Well Location

County Twp. T R ¼ ¼ ¼

Test Rate GPM

Static Water Level Ft.

Pumping Level Ft.

Specific Capacity GPM/Ft. D.D.

Driller

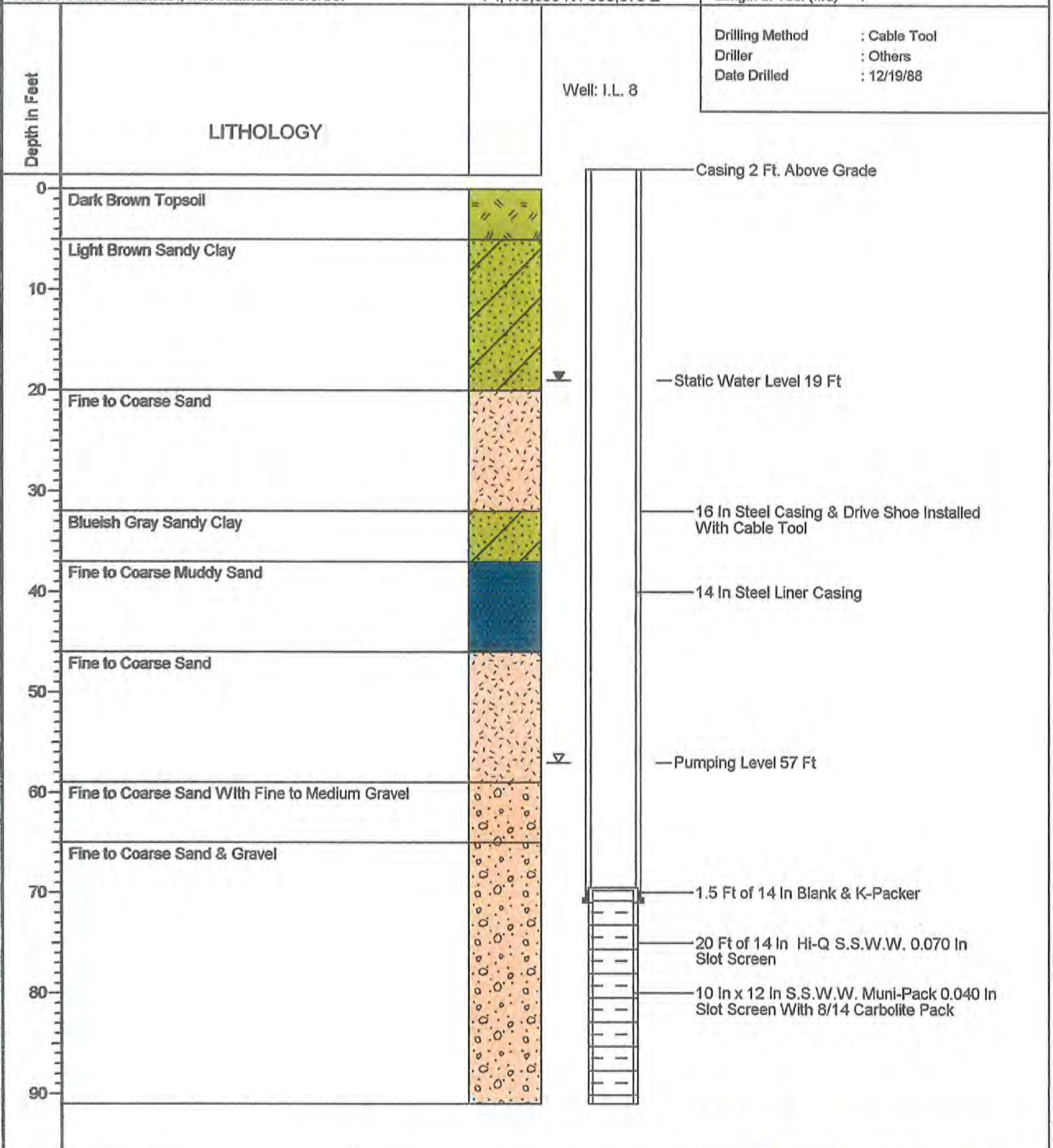
Date Drilled 9/9/05 Job No. 19626

Well No. In Lakes #8
Lawrence In.
19626

PEERLESS-MIDWEST, INC.
55860 Russell Industrial Pkwy. Mishawaka, IN 46545
Water Supply Contractors

19626 Geol

City	: Lawrence	County	: Marion	Test Rate After Reline	: 1,002 GPM
State	: Indiana	Twp. (T/R)	: Lawrence (T15N/R5E)	Static Water Level	: 19 Ft
Location	: 1,000' N of Fall Creek Rd. & 150' E of Access Rd.	1/4,1/4,1/4,Sec.#	: NW,SE,SE,30	Pumping Level	: 57 Ft
		UTM Coordinates	: NAD 27 Zone 16	Specific Capacity	: 26.36 GPM/FT. D.D.
Note: Peerless-Midwest, Inc. Relined on 9/9/05.			: 4,415,698 N / 585,575 E	Length of Test (hrs)	:



Lawrence Utilities LLC
Lawrence, Indiana

Job Number 19626

PEERLESS-MIDWEST
Mishawaka, IN
Ionia, MI Indianapolis, IN
Water Supply Contractors & Hydrogeologists
www.pmidwest.com

01-31-2006 K:\JOB FILES\K-M\Lawrence_IN\Indian_Lake_Wellfield\Well #8\19626_Lawrence_#8_Reline_2006.bor

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

Well Rehabilitation Summary

Lawrence Utilities, LLC - Indian Lake # 8

Date:	5/10/04	Diameter:	16"	Pump Mfg:	Simmons
Client:	Lawrence Util, LLC	Depth:	92.8'	Serial No:	5684-90
City:	Lawrence	Type:	Tubular	Capacity:	1,000 gpm
State:	Indiana	Screen: dia:	16" nominal	TDH:	195'
Well No:	Indian Lake # 8	depth to top:	72.8'		
Location:	Indian Lake Wellfield	length:	20'		

	Year	Static Water (ft)	GPM	Pumping Level (ft)	Draw Down (ft)	Specific Capacity
Drilled	12/22/88	8.25'	1404	36.25	28	50.14
Last Rehabilitation	4/17/02	14.6'	850	39.8	25.2	33.7
Test Before	5/10/04	18'	292	46	28	10.4
Test After	5/12/04	18'	844	47	29	29.1

Notes:

Date	GPM	Pumping Level (ft)	Discharge Pres (#)	Specific Capacity	Treatment TDH (ft)	AMPS
5/10/2004	shutoff		95			
	292	46	80	10.4		
	vortex		70			
5/11/2004					Surge acid	
	840	52	56	24.7		
5/12/2004					Surge bleach and tripoly	
	shutoff		100		249	44-37-36
	466	32.4	80	32.4	218	40-41-55
	622	38.2	75	30.8	212	59-61-61
	704	41.5	70	29.9	204	62-64-65
	757	43.8	65	29.3	195	63-66-67
	844	47	60	29.1	186	65-68-68
	898	49	55	28.9	177	66-69-64

* GPM taken after discharge of chemicals and a 30 minute minimum pumping test.

Chemical	Amount Used	Chemical	Amount Used	Foreman
Tri-poly Phosph	300 lbs	Neutralizer	lbs	
Muriatic Acid	275 gals	Liq Chlo Bleach	55 gals	Greg Procell
HTH	lbs			

BASTIN LOGAN WATER SERVICES INC.

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P.O. BOX 55
FRANKLIN, INDIANA 46131
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Well Rehabilitation Summary

Lawrence Utilities, LLC - Indian Lake # 8

Date:	5/10/04	**Diameter:**	16"	**Pump Mfg:**	Simmons
Client:	Lawrence Util, LLC	**Depth:**	92.8'	**Serial No:**	5684-90
City:	Lawrence	**Type:**	Tubular	**Capacity:**	1,000 gpm
State:	Indiana	**Screen: dia:**	16" nominal	**TDH:**	195'
Well No:	Indian Lake # 8	**depth to top:**	72.8'		
Location:	Indian Lake Wellfield	**length:**	20'		

	Year	Static Water (ft)	GPM	Pumping Level (ft)	Draw Down (ft)	Specific Capacity
Drilled	12/22/88	8.25'	1404	36.25	28	50.14
Last Rehabilitation	4/17/02	14.6'	850	39.8	25.2	33.7
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Notes:

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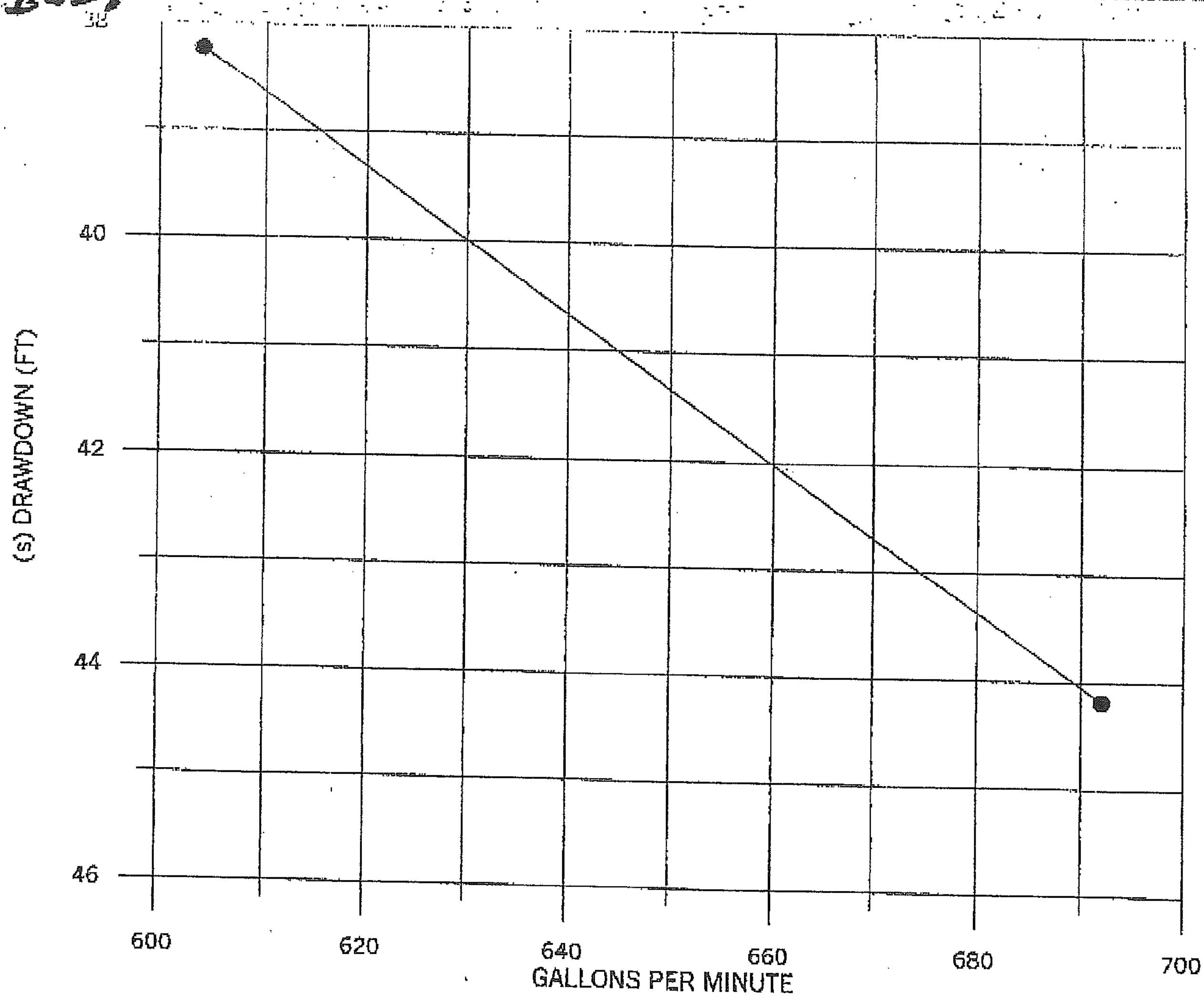
	844	47	60	29.1	186	65-68-68
	898	49	55	28.9	177	66-69-64

* GPM taken after discharge of chemicals and a 30 minute minimum pumping test.

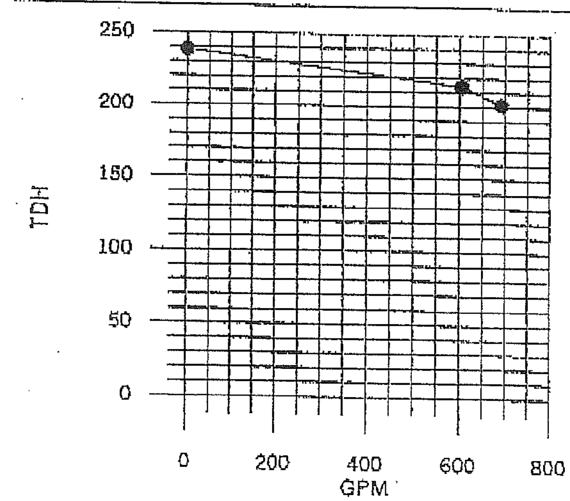
Chemical	Amount Used	Chemical	Amount Used	Foreman
Tri-poly Phosph	300 lbs	Neutralizer	lbs	
Muriatic Acid	275 gals	Liq Chlo Bleach	55 gals	Greg Procell
HTH	lbs			

EL#8



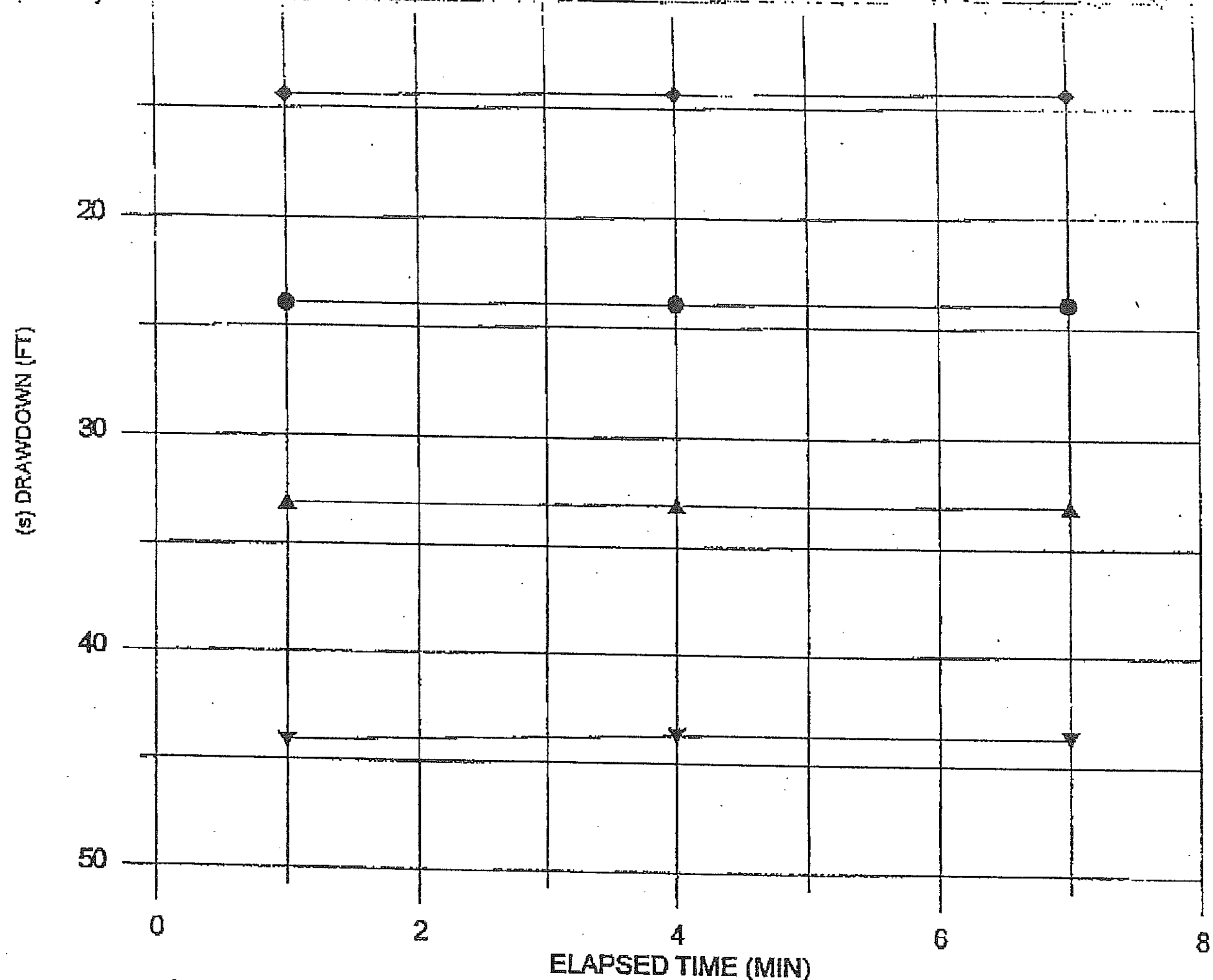
	Q (USGPM)	DRAWDOWN (FT)	SC	PSI	TDH
DEADHEAD				95	238.33
STEP 1	604	38.24	15.79	68	214.2
STEP 2	692	44.18	15.66	60	201.66
STEP 3	BROKE SUCTION				

PROJECT:	LAWRENCE
FILE:	020400
DATE:	2/4/00
WELL NO.:	8
STATIC:	18.88



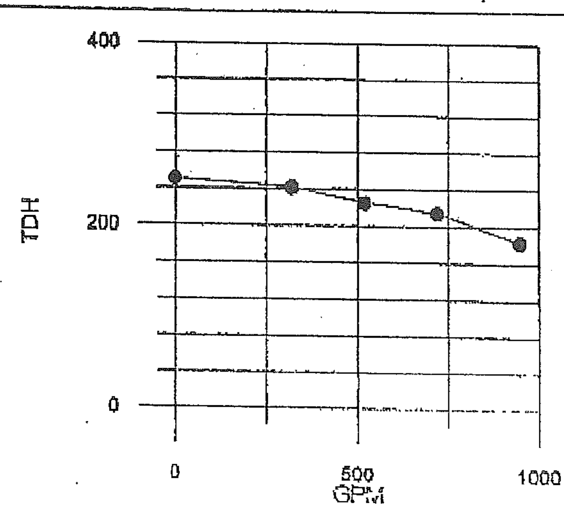
RTMAN DRILLING INC.

IL #8



DEADHEAD		Q (USGPM)	DRAWDOWN (FT)	SC	PSI	TDH
					101	250.23
STEP 1	◆	320	14.35	22.30	91	241.46
STEP 2	●	520	23.91	21.75	80	225.6
STEP 3	▲	720	33.08	21.77	71	214.01
STEP 4	▼	948	43.7	21.69	53	183.03

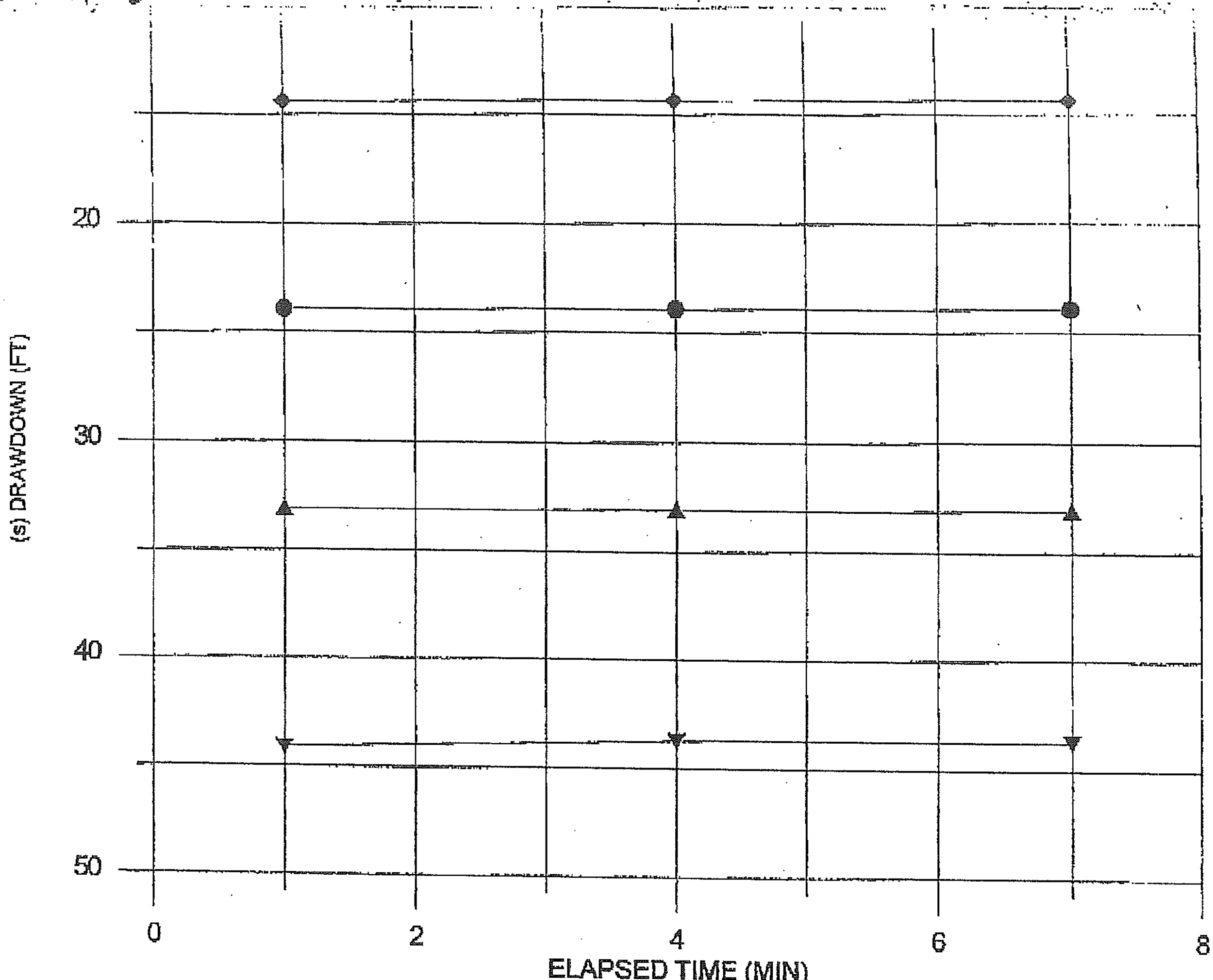
PROJECT:	LAWRENCE
FILE:	030800
DATE:	3/8/00
WELL NO.:	8
STATIC:	16.92
READINGS 19" ABOVE FLOOR	



RTMAN DRILLING INC.

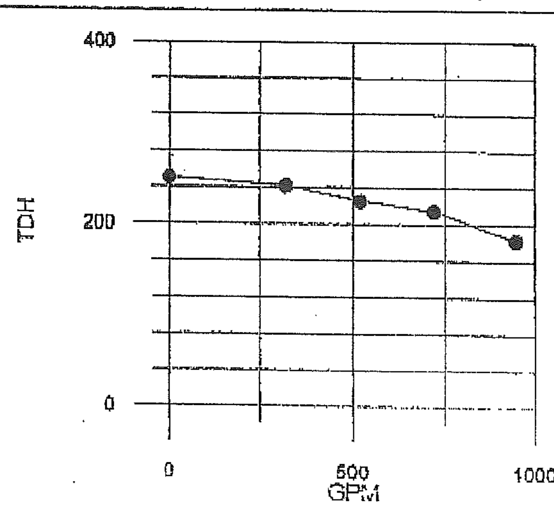
Indian Lake

IL #8



	Q (USGPM)	DRAWDOWN (FT)	SC	PSI	TDH
DEADHEAD				101	250.23
STEP 1	320	14.35	22.30	91	241.46
STEP 2	520	23.91	21.75	80	225.6
STEP 3	720	33.08	21.77	71	214.01
STEP 4	948	43.7	21.69	53	183.03

PROJECT: LAWRENCE
FILE: 030800
DATE: 3/8/00
WELL NO.: 8
STATIC: 16.92
READINGS 19" ABOVE FLOOR



RTMAN DRILLING INC.

Indian Lake

Peerless Midwest Inc, *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-965

PUMP INSTALLATION REPORT

Sales Order No. 19626 — Date 9/9/2005

Pump Mfg. Simmons/Floway — Serial No. 5685-90 — Well No. 8

Owner City of Lawrence — City Lawrence — State IN

Location of Well Indian Lakes Well Filed

MOTOR Make US — Type RU — Frame 365TP — Serial No. ____

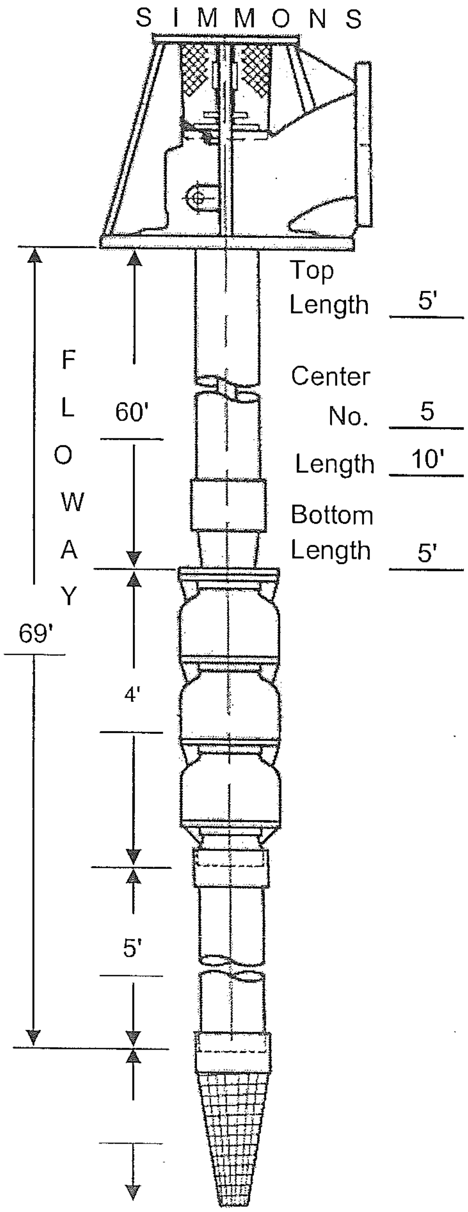
HP 75 — Volts 460 — Line Voltage 460 — Phase 3 — RPM 1775 — Non-Reverse Ratchet ____

GEAR DRIVE Make ____ — Serial No. ____ — Gear Ratio ____

Was motor and/or gear drive taken to a repair shop at this time? Motor New Where ____

Gear ____ Where ____

ENGINE Make ____ — Model ____ — Serial No. ____



PUMP HEAD Type Simmons

Discharge Pipe Size 8"

Located — above X / below ____ Ground — flanged X / threaded ____

Separate Base Plate? Yes

Head Shaft Length 66"

Dia. 1-3/16" Coupled — above ____ / below X

Stuffing Box Size 1-3/16"

MOTOR SHAFT

Dia. 1-3/16" Length H & M

Thread size in head ____ Keyway 1/4

PUMP BOWL Dia. 12" Type JKM

Imp. No. M — Open ____ — Enc. X

\# of Stages ____ Bowls:CL ____ Brz ____

Wear Rings No

Length Shaft ____ Dia. 1-11/16"

COLUMN Pipe Size 8" Sch 80

Flanged ____ Coupled X

Special Paint? No

Oil Lube ____ Water Lube X

Shaft Size 1-3/16" SS X or CS ____

Tubing Size ____ Stl ____ or Br ____

SUCTION PIPE Size 8" Sch 80

Length 5' Special Paint ____

Threads on Bottom? No

Strainer No Size ____

Rubber Bumper? 12" steel center plate

Well Seal? No

2 full impellers
1 trimmed 8.084"

WELL INFORMATION All measurements from top of pump foundation — X Gravel Wall / ____ Tubular

Inside Dia. 16" w/14" liner — Depth 91'4" — Static 22' — Type ____ Rock

Air Line Length 60' — Strapped to Column? Top 5'

Type Airline ____ Plastic — X Copper Tubing — ____ Steel Pipe

PUMPING TEST-Pumped ____ GPM at ____ ft. Pumping Level with ____ lbs. Discharge Pressure after ____ hours. Specific Capacity ____

SPECIAL EQUIPMENT OR PULLING INSTRUCTIONS
RO because of fence & high roof

Power Lines ____

REMARKS ____

Installer Rusty Jones

Peerless Midwest Inc. *Water Supply Contractors*

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-965

PUMP INSTALLATION REPORT

Sales Order No. 19626 — Date 9/9/2005

Pump Mfg. Simmons/Floway — Serial No. 5685-90 — Well No. IL 8

Owner City of Lawrence — City Lawrence — State IN

Location of Well Indian Lakes Well Filed

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HP 75 — Volts 460 — Line Voltage 460 — Phase 3 — RPM 1775 — Non-Reverse Ratchet ____

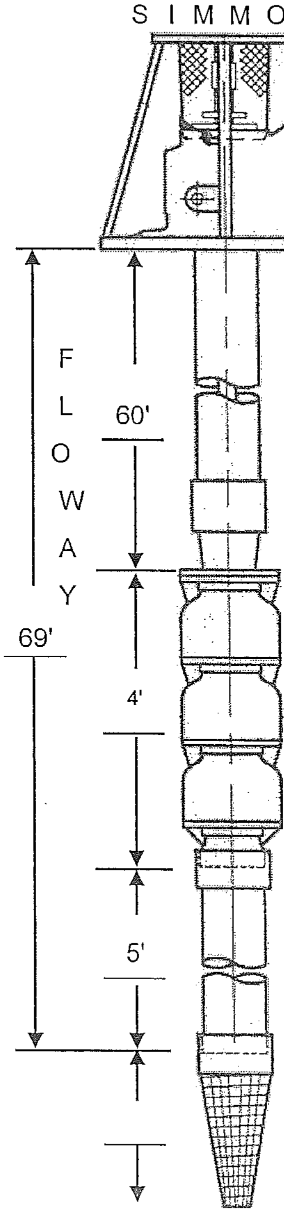
GEAR DRIVE Make ____ Serial No. ____ Gear Ratio ____

Was motor and/or gear drive taken to a repair shop at this time? Motor New Where ____

Gear ____ Where ____

ENGINE Make ____ Model ____ Serial No. ____

S I M M O N S



Top Piece Length 5'

Center Pieces No. 5

Length 10'

Bottom Piece Length 5'

PUMP HEAD Type Simmons

Discharge Pipe Size 8"

Located above X / below ____ Ground flanged X / threaded ____

Separate Base Plate? Yes

Head Shaft Length 66"

Dia. 1-3/16" Coupled above ____ below X

Stuffing Box Size 1-3/16"

MOTOR SHAFT

Dia. 1-3/16" Length H & M

Thread size in head ____ Keyway 1/4

PUMP BOWL Dia. 12" Type JKM

Imp. No. M Open ____ Enc. X

# of Stages ____ Bowls:CL ____ Brz ____

Wear Rings No

Length Shaft ____ Dia. 1-11/16"

COLUMN Pipe Size 8" Sch 80

Flanged ____ Coupled X

Special Paint? No

Oil Lube ____ Water Lube X

Shaft Size 1-3/16" SS X or CS ____

Tubing Size ____ Stl ____ or Br ____

SUCTION PIPE Size 8" Sch 80

Length 5' Special Paint ____

Threads on Bottom? No

Strainer No Size ____

Rubber Bumper? 12" steel center plate

Well Seal? No

WELL INFORMATION All measurements from top of pump foundation — X Gravel Wall — ____ Tubular

Inside Dia. 16" w/14" liner Depth 91'4" Static 22' Type ____ Rock

Air Line Length 60' Strapped to Column? Top 5'

Type Airline ____ Plastic X Copper Tubing ____ Steel Pipe

PUMPING TEST-Pumped ____ GPM at ____ ft. Pumping Level with ____ lbs. Discharge Pressure after ____ hours. Specific Capacity ____

SPECIAL EQUIPMENT OR PULLING INSTRUCTIONS

RO because of fence & high roof

Power Lines ____

REMARKS ____

Installer Rusty Jones

IL #8

PUMP INSTALLATION REPORT

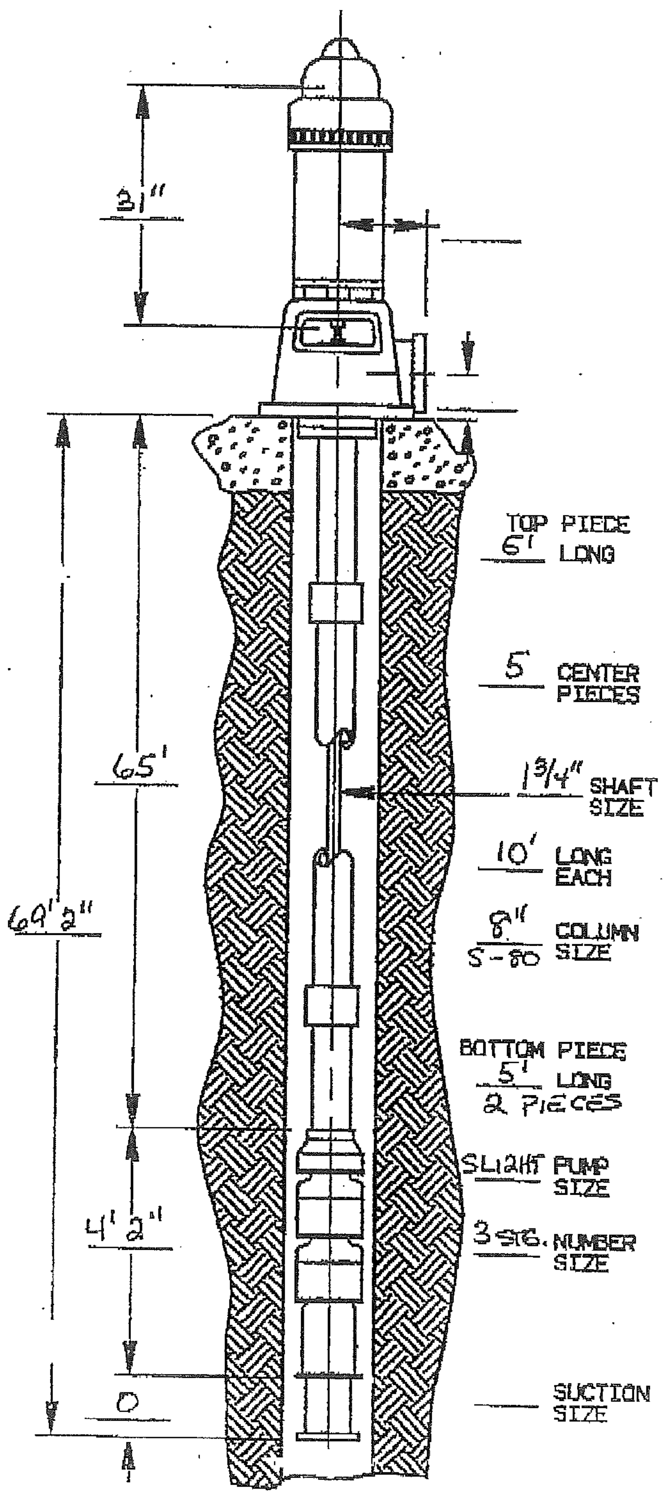
RTMAN DRILLING INC.

"Water Is Our Business" • Since 1922

241 N. - Co. Rd. 300 W. • Kokomo, Indiana 46901 • 765-459-4125 • FAX 765-459-8750

OWNER TWC   LOCATION INDIAN LAKE   DATE

CITY LAWRENCE   STATE IN   WELL NO. 8



MOTOR

MAKE	US	SERIAL#	T03T066040501
HP	60	LINE VOLT	460
VOLT	230/460	PHASE	3
TYPE	RU	AMPS	148.6 / 74.3
FRAME	364 TP	RPM	1775
DIAMETER	1 3/16"	THD-MOTOR	10 TPI
LENGTH	38 1/2"	KEY-WIDTH	1/4"
THD-HEAD	10 TPI	KEY-LENGTH	

DISCHARGE HEAD

MAKE	SPC-8	ABOVE GROUND	X
TYPE		BELOW GROUND	
DISC. SIZE	8"	BASE PLATE	CONCRETE
FLANGE	X	HEAD SHAFT	C [ ] S [X]
LENGTH	5' 6"	SIZE PACKING	3/8"

COLUMN

PIPE SIZE	8"	SPEC. PAINT	SCH. 80
FLANGED		SHAFT SIZE	S 1 3/16 C
COUPLED	X	TUBE SIZE	S B
OIL LUBE		WATER LUBE	X

PUMP

MAKE	Simmons	OPENED	
DIAMETER	SL12HT	ENCLOSED	X
SERIAL #	5685-90	# OF STAGES	3
IMPELLER		BOWLS CAST	X
SHAFT	S [X] C [ ]	BRONZE	X
LENGTH	4' 9 1/2"	WEAR RINGS	X

SUCTION NONE

SIZE		STRAINER	
LENGTH		STEEL	
SPEC. PAINT		PVC	

EQUIPMENT/SPECIAL NOTES

DESIGN POINT 1000 GPM @ 195' TDH

PEERLESS-MIDWEST, INC.
17707 SUN PARK DRIVE / WESTFIELD, IN 46074
PHONE: 317/896-2987 FAX: 317/896-3748

City of Lawrence Utilities

HISTORY OF INDIAN LAKES WELL #16 (Former #12)

2001 18"x87' RC Well Installed with 20' of .060 SSWW – Static 12.3', Pumped 1424 gpm with 45.2' pumping water level (pwl), for a specific capacity of 43.3 gallons per minute per foot of draw down.

2004 March 22nd: Preventative Maintenance performed by others. Well pumped 794 gpm with a 61.9' pwl, for a specific capacity of 16.3 gpm/ft draw down. Well is **62.4 %** off original.

July 12-15th: Well Cleaned using Air Burst Method. Before cleaning, had a specific capacity of 26.1 gpm/ft. When complete, well had a specific capacity gain of *5.7%* to 27.6 gpm/ft. Well remains **36%** off original.

2005 Bottom of well "egged" and cracked, concrete seal set in. Well Cleaned using DD Surge Block Method with 1265 gallons of Hydrochloric Acid, 135 gallons of Sodium Hypochlorite, and 50 gallons of Aquaclear. Before cleaning well had a specific capacity of 28.37 gpm/ft. When complete, well pumped 1397 gpm with a *17%* specific capacity gain to 33.2. Well remains **23.3%** off original, and is now 84' Deep.

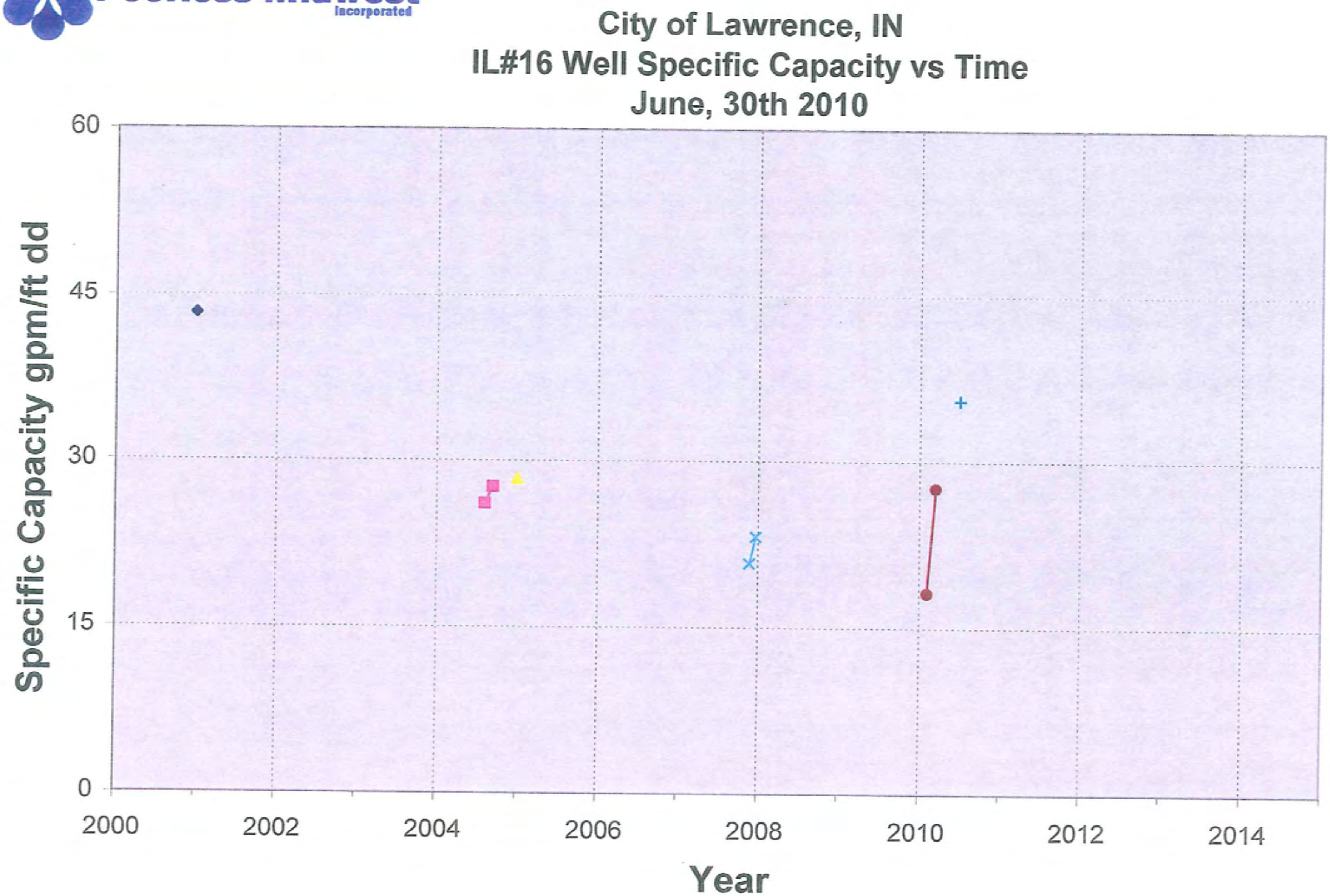
2007 Specific capacity fell to 52% of original. Well Cleaned using DD Surge Block Method with 220 gallons of Hydrochloric Acid, 165 gallons of Sodium Hypochlorite, and 550 gallons of Sodium Bicarbonate. When complete, well pumped 1090 gpm with an *11.9%* specific capacity gain to 23.2 gpm/ft. Well is **46.4%** off original.

2009 Well Cleaned w/ DD Surge Blocks by Others. No details or results available.

2010 Chemical Cleaning using the Armour Method for 3 Weeks. Started with specific of 18.17 gpm/ft. When complete, well pumped 979 gpm with a *52%* specific capacity gain to 27.63 gpm/ft. Well is **36.2%** off original.

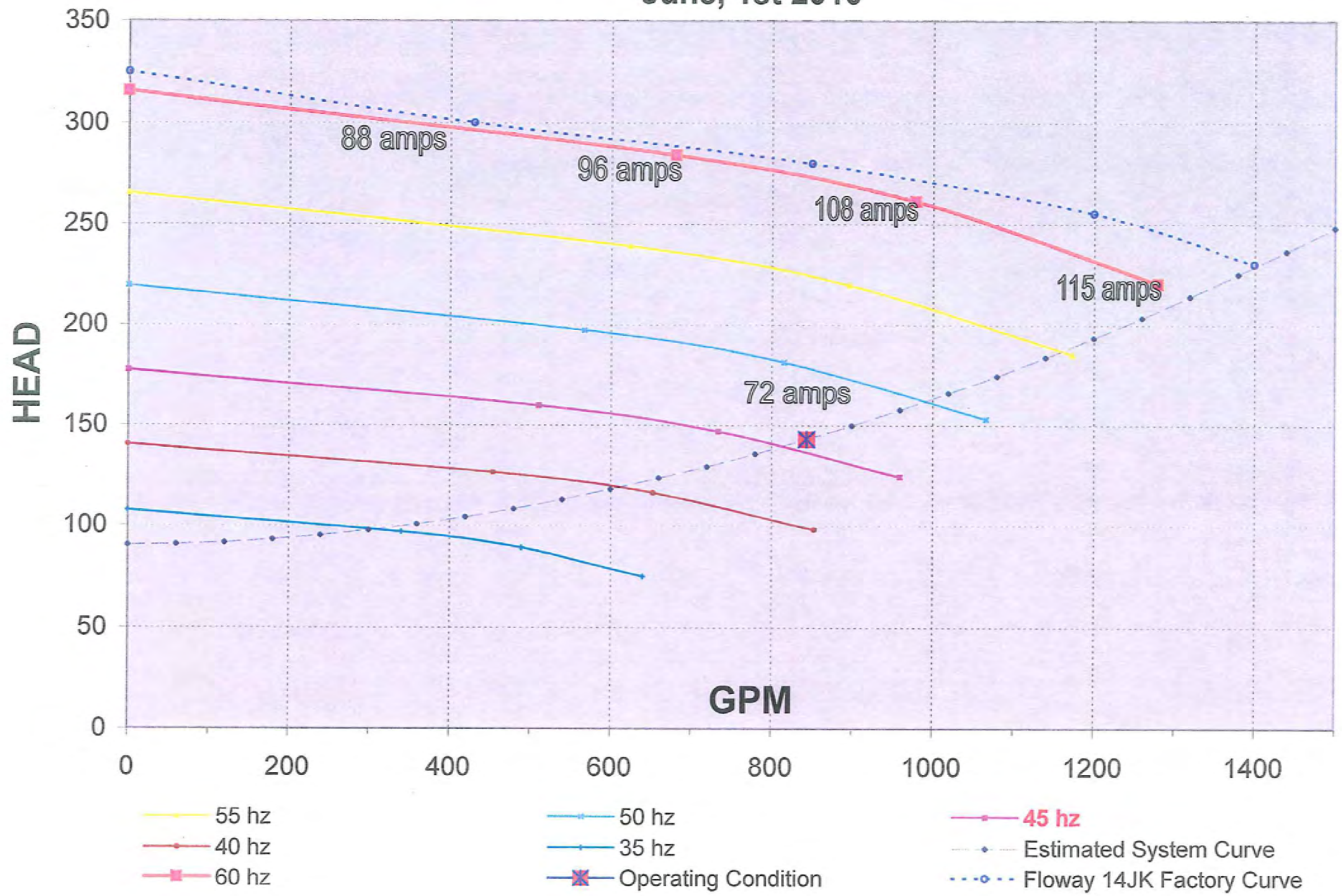
6-11-2010: Owner took a reading 10 days later to confirm sustained results: well pumped 1200 gpm with a specific capacity of 35.5 gpm/ft, a *95.4%* gain from the preclean test. Well is now **18%** below its original Specific capacity of 43.3.

Peerless-Midwest Incorporated



Peerless-Midwest Incorporated

City of Lawrence, IN
IL #16 Calculated VFD Pump Performance
June, 1st 2010



Peerless Midwest Inc. *Water Supply Contractors*
55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254-965

PUMP INSTALLATION REPORT

Sales Order No. 19628 Date 5/11/2005

Pump Mfg. J-Line Serial No. ______ Well No. 12

Owner Lawrence Utilities City Lawrence State IN

Location of Well Indian Lake Well Field

MOTOR Make Marathon Elec. Type TDR Frame 404 TR Serial No. 2002662

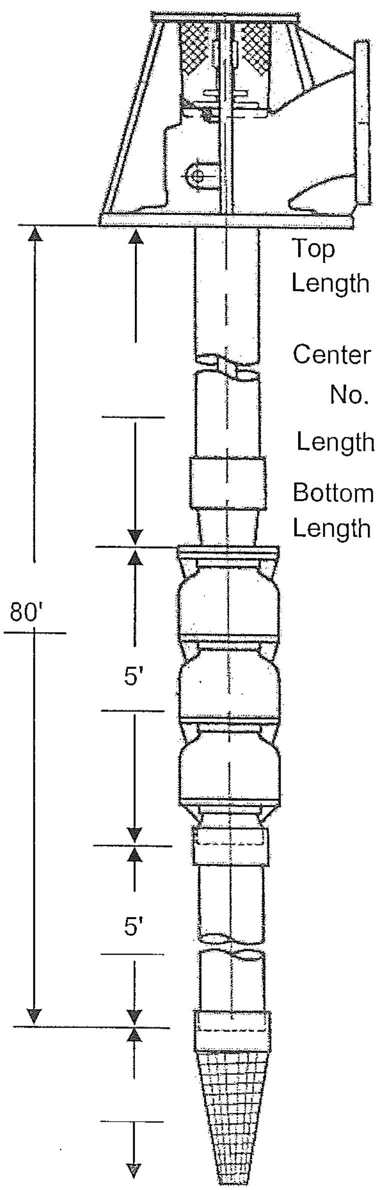
HP 100 Volts 460 Line Voltage ______ Phase 3 RPM 1780 Non-Reverse Ratchet Yes

GEAR DRIVE ______ Serial No. ______ Gear Ratio ______

Was motor and/or gear drive taken to a repair shop at this time? Motor ______ Where ______

Gear ______ Where ______

ENGINE Make ______ Model ______ Serial No. ______



PUMP HEAD Type J-Line

Discharge Pipe Size 10"

Located above X below ___ Ground flanged X threaded ___

Separate Base Plate? No

Head Shaft Length ______

Dia. ______ Coupled above X below ______

Stuffing Box Size ______

MOTOR SHAFT

Dia. ______ Length 43.5"

Thread size in head ______ Keyway ______

PUMP BOWL Dia. 14" Type 14 JKL

Imp. No. ______ Open ______ Enc. ______

# of Stages 3 Bowls:CL X Brz ______

Wear Rings No

Length Shaft ______ Dia. ______

COLUMN Pipe Size 10"

Flanged ______ Coupled X

Special Paint? No

Oil Lube ______ Water Lube X

Shaft Size ______ SS ______ or CS ______

Tubing Size ______ Stl ______ or Br ______

SUCTION PIPE Size 10"

Length 5' Special Paint No

Threads on Bottom? No

Strainer No Size ______

Rubber Bumper? No

Well Seal? No

WELL INFORMATION All measurements from top of pump foundation ______ Gravel Wall ______ Tubular

Inside Dia. ______ Depth ______ Static ______ Type ______ Rock

Air Line Length ______ Strapped to Column? ______

Type Airline ______ Plastic ______ Copper Tubing ______ Steel Pipe

PUMPING TEST-Pumped ______ GPM at ______ ft. Pumping Level

with ______ lbs. Discharge Pressure after ______ hours. Specific Capacity ______

SPECIAL EQUIPMENT OR PULLING INSTRUCTIONS

Power Lines ______

REMARKS New Floway bowl rated 1,400 @ 230 TDH

Installer Gary Flora

ILtr

BASTIN LOGAN WATER SERVICES INC.

237 W. MONROE STREET
P.O. BOX 55
FRANKLIN, INDIANA 46131
(317) 738-4577
FAX (317) 738-9295

Pump Installation Report

Indian Lake # 12

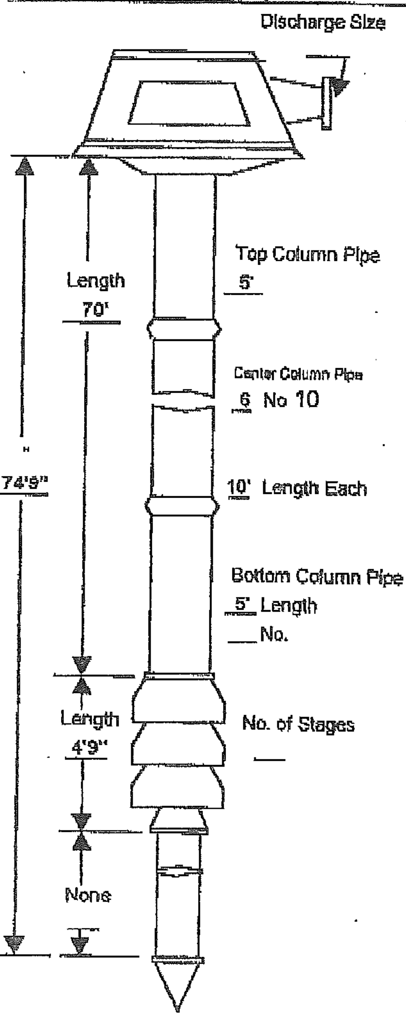
Date:	11/01/01	Pulling Equipment	Hydrocrane
Project No.	2227-F	Over Head Power Lines	No
Well Pump Loc.	In. Lake Well Field		

Electric Motor Infromation

Manufacturer	U.S.	Type	RUS1	Motor Shaft Threads		Frame	404TP	S/N	E08-AA87-MB1
Motor. Shaft Dia.	1 1/2"	Mtr. Shaft. Lgt.	44"	Right Hand		ServiceFactor	1.15	HP	100
Keyway	1/4"	Clutch Diameter	1 1/2"	Left Hand	X	Volts	460	Phase	5
RPM	1785	Upper Bearing	7222-BEM	T.P.I.	8 THD	FL Amps	114	Motor Repair	new
Ratcheting	NRR	Lower Bearing	6212J			Line Voltage	460	SRC	no
CD of Motor	37"								

Recmd. Lst. Set.		Min. Setting		Max. Setting	

Pump Assembly Specifics



Right Angle Drive Information

Brand Name	N/A	S/N		Gear Ratio	
Aux Eng Brand Name		Mod. No.		S/N	

Pump Information

Pump Head

Pump Head Mfr.	J-Line		
Discharge Head Type	TR10C		
Discharge Line Size	10"		
Location	Above	X	Grade
	Below		
ColumnTo Head	FLGD	Threaded	X
Base Plate	yes		
Pump Top Shaft Lgt.	62"		
Diameter	1 1/2"		
Pin Sz. At Hd.	1 1/2"		
12" constant	8 thread LH		

Column Pipe

Coupling	C.I.	
	S.T.	
Spiders	Drop - In	
	Screw - In	
Col. Pipe Size	10"	
Flanged		NO
Special Paint		NO
Shaft size 1 1/2" stainless		

8 Thread LH

Bowl Assembly

Design GPM	1400	@ TDH	230'
Bowl Assembly Type	12HCZ4		
Shell Diameter	10"		
Shell Material	C.I.	X	BZ.
Impeller Shaft Diameter	1 11/16" Pin 1 1/2"		
Shaft Length			
Bowl Shaft Mat.	S.S.	x	C.I.

Suction Pipe

Suction Size	NA	Threads On Btm.	
Length		Special Paint	

Well Data From Pump Head Base

Static	13'	PL	
System OP		Amps	

Minimum Submergence Above The Eye Of The Bottom Of Impeller	

Pump Manufacturer: J-Line

Well Data

Depth	93'7.5"	Type Well	G.P.	X	Screen Diameter	18"
Inside Diameter	18"		Tube		Screen Length	20'
Tower Height	6'7"	Airline materials: Soft copper			Screen Open Size	.06"

Misc. Data

Installer: Greg Procell and Kevin Dennison

Pump Repaired Last	New
Well Cleaned Last	New
Pump Off Size	8"

Well and Pump Maintenance Services

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When it comes to water supply contracting and hydrogeologic services, ***We're Peerless!***

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Pumping equipment repair and overhaul

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Hydrogeologic services

Wellhead protection area delineations

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Your water supply is precious. You've made a substantial investment by drilling wells and purchasing the pumping equipment that suits your needs. Over a period of time, your wells and pumps may no longer perform as designed. Peerless-Midwest can restore your water supply to its original design capacity and insure it is in top operating condition.

Your water supply is one area in which an ounce of prevention is worth a pound of cure. Preventive maintenance will provide significant savings in both cost and downtime.

An annual Specific Capacity Test of your wells along with a pump performance test and a documented maintenance history is your best assurance of maximum well life and minimum cleaning and pump repair expense.

The Peerless-Midwest Annual Testing Program includes data analysis and reporting to insure long service life and efficient operation of wells and pumps.

Well Cleaning and Rehabilitation

IT IS RECOMMENDED THAT A WELL BE CLEANED WHEN ITS SPECIFIC CAPACITY HAS DROPPED TO 80% OF ORIGINAL. IF DELAYED TOO LONG, CLEANING MAY BECOME EXTREMELY DIFFICULT OR EVEN IMPOSSIBLE.

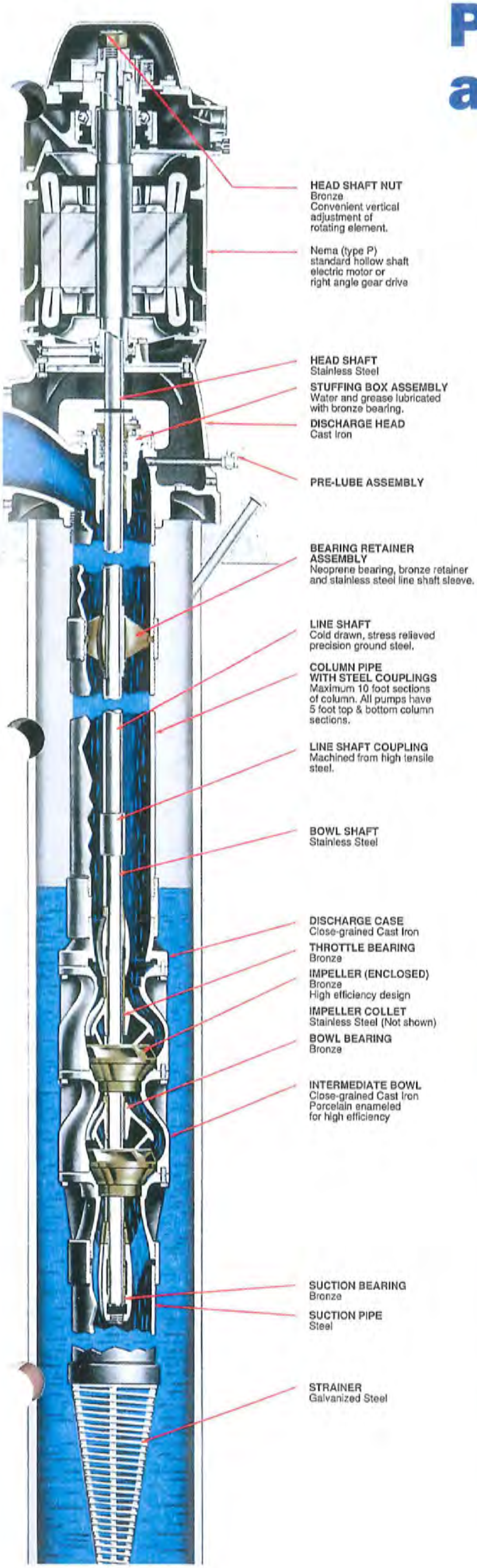
When your well no longer produces as it did originally, chemical cleaning and redevelopment may be needed. Numerous chemicals and methods are available for well cleaning. Because all wells are unique, it is critical that the correct chemicals and methods are chosen.

A Peerless-Midwest professional is able to analyze your pumping data, water quality and well history to determine the proper method of treatment to be used in order to restore your well to its full capabilities.

A variety of cleaning techniques are available to customize the approach for any application:

- **Water Quality Analysis**
- **Conventional Tank Cleaning**
- **High Pressure Jetting**
- **Double Disc Surging**
- **Blasting for Consolidated Formations**

Pump Maintenance and Repair



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55860 Russell Industrial Parkway
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Phone (574) 254-9050
Fax (574) 254-9650
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We're

Ionia Branch:
505 Apple Tree Drive
Ionia, Michigan 48846
Phone (616) 527-0050
Fax (616) 527-5508

PEERLESS-MIDWEST, INC.

Indianapolis Branch:
17110 Westfield Park Road, Suite 3
Westfield, Indiana 46074
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maintenance services,
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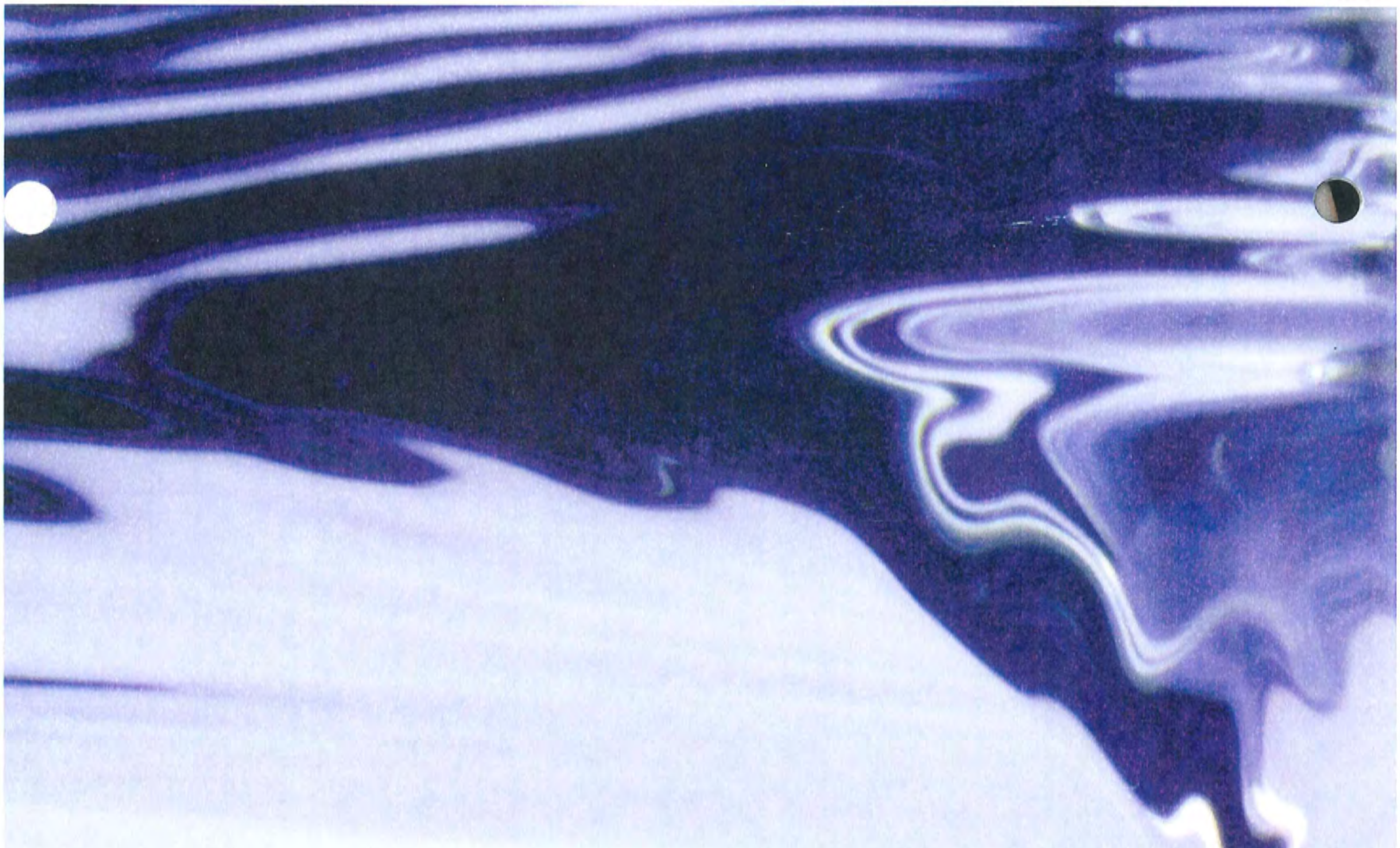

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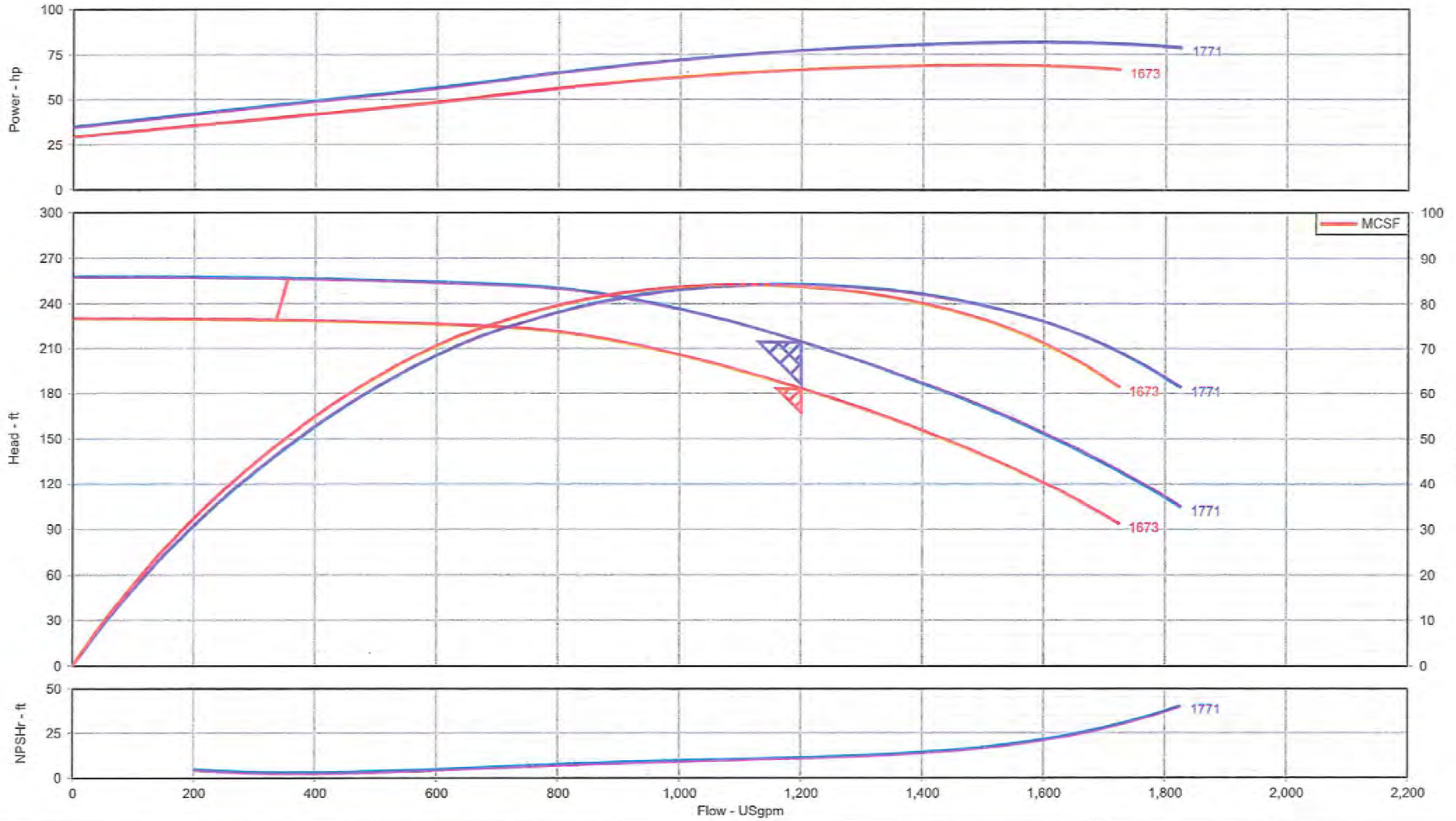
Westfield, Indiana 46074
Phone (317) 896-2987
Fax (317) 896-3748

Muncie Office:
207 North Fir Tree Drive
Muncie, Indiana 47304
Phone (765) 759-8120
Fax (765) 759-8120

Multi-Speed Performance Curve

Pump and bowl (dashed) performance. Bowl adjusted for construction and viscosity.
Pump further adjusted for friction and power losses of lineshaft and thrust bearings. Pump is not adjusted for any static lift.
The duty point represents the head at the bowl.



Customer	: PEERLESS-MIDWEST, INC.	Pump Type	: 12JKH	Quote number	: 73256
Address	: 55860 RUSSELL INDUSTRIAL PARK, MISHAWAKA,, IN 46545	# of Stages	: 3	Customer PO #	:
Location	:	Quantity	: 1	CO #	:
Project	:	Flow	: 1,200.0 USgpm	Item #	: 018
Tag	:	Head	: 214.0 ft	JOL #	:
Bowl/Pump	:	Speed	: 1,770 rpm	Serial #	:
Eff (bowl / pump)	: 84.09 / - %	Fluid Density	: 1.000 / 1.000 SG	Drawing #	:
Power (bowl / pump)	: 77.12 / -	Viscosity	: 1.00 cP	Drawn By	:
NPSH required	: 10.69 ft	Impeller Trim	: 8.72 in	Last Modified	: 01 Feb 2012 1:23 PM

The head and power may be different than that shown in accordance with Hydraulic Institute / API 610 Standards

Additional Notes:

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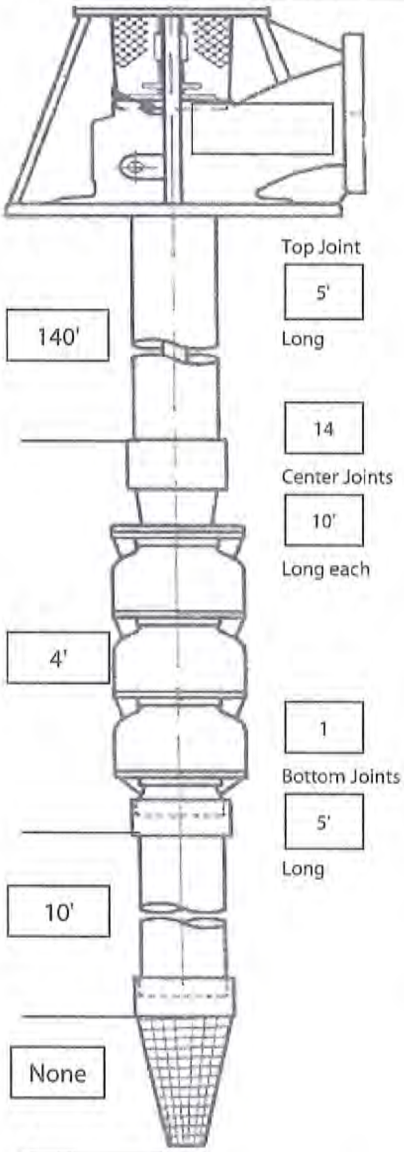
Westfield, IN / 317.896.2987
Ionia, MI / 616.527.0050
Grand Blanc, MI / 248.996.2721

VERTICAL TURBINE PUMP INSTALLATION REPORT

Sales Order No. 25474 | Well No. Richardt 2 | Pump # 70668 | Date: 2/23/2012

Owner: Lawrence Utilities | City: Lawrence | State: IN

Location of Well: Richardt Well Field



Total Setting: 144'

MOTOR		HEAD		BOWL	
Manufacturer	Emerson	Manufacturer	Layne	Manufacturer	Floway
Horsepower	100	Type		Model	12JKH
RPM	1785	Disch Flg Size	8"	Size	12"
Phase	3	Base Plate	Yes	No. Stages	3
Voltage	460	Head Shaft Dia.	1 11/16"	Material	CI
Full Load Amps	114	Head Shaft Lgt.	62"	Clm Conn Size	8"
Svc Factor Amps		Coupled in Head	Yes	Shft Conn Size	1 1/2"
Service Factor	1.15	**COLUMN**		Impeller Trim	1 to 7.852
Serial No.	H0100V25L6	Water/Oil Lube	Water	**SUCTION**	
Type	RUSI	Pipe Size	8"	Threaded	Yes
Frame	404TP	Tubing Size/Type		Bell	
Shaft Dia.		Shaft Size	1 1/2"	Size	8" x 10'
Shaft Length	43 3/8"	Shaft Material	SS	Special Paint	
NRR		Coupling Mtl.	SS	Strainer	
Key Size		**PUMPING DATA**		**WELL**	
Bolt Circle		Static Water Level	127.15'	Type	Rock
CD		System Pressure		Casing Dia.	16" x 186
Motor Overhauled?		Test GPM	1222	Depth	250'
Where		Test PSI	17	Top Hat Size	
GEAR DRIVE		Pumping Level	134.7	Casing Vent	
Manufacturer		Test Duration	15 min.	**MONITOR SYSTEMS**	
Serial No.		Spec Capacity	161.8	Airline/Type	3/4" Poly
Gear Ratio		Volts	460	Airline Length	150'
SPECIAL/MISCELLANEOUS		Amps	76	Airline Fastened	Every 10'
Power Lines		**BLOWOFF**		Stilling Tube/Mtl	
Need RO?		Size/Connection		Tube Length	

REMARKS: Rated 1200 GPM @ 214' TDH

25474(B)

Installer(s): Gerald Flora / Matt Lange

PEERLESS MIDWEST INC.
17707 Sun Park Drive, Westfield, IN 46074 / Phone 317-896-2987 / Fax 317-896-3748

PUMP TEST FORM

JOB # 25474 DATE 2/24/2012 Page 1 of 1

OWNER Lawrence, IN

WELL Richardt 2 WELL DIAMETER 16" WELL DEPTH 250'

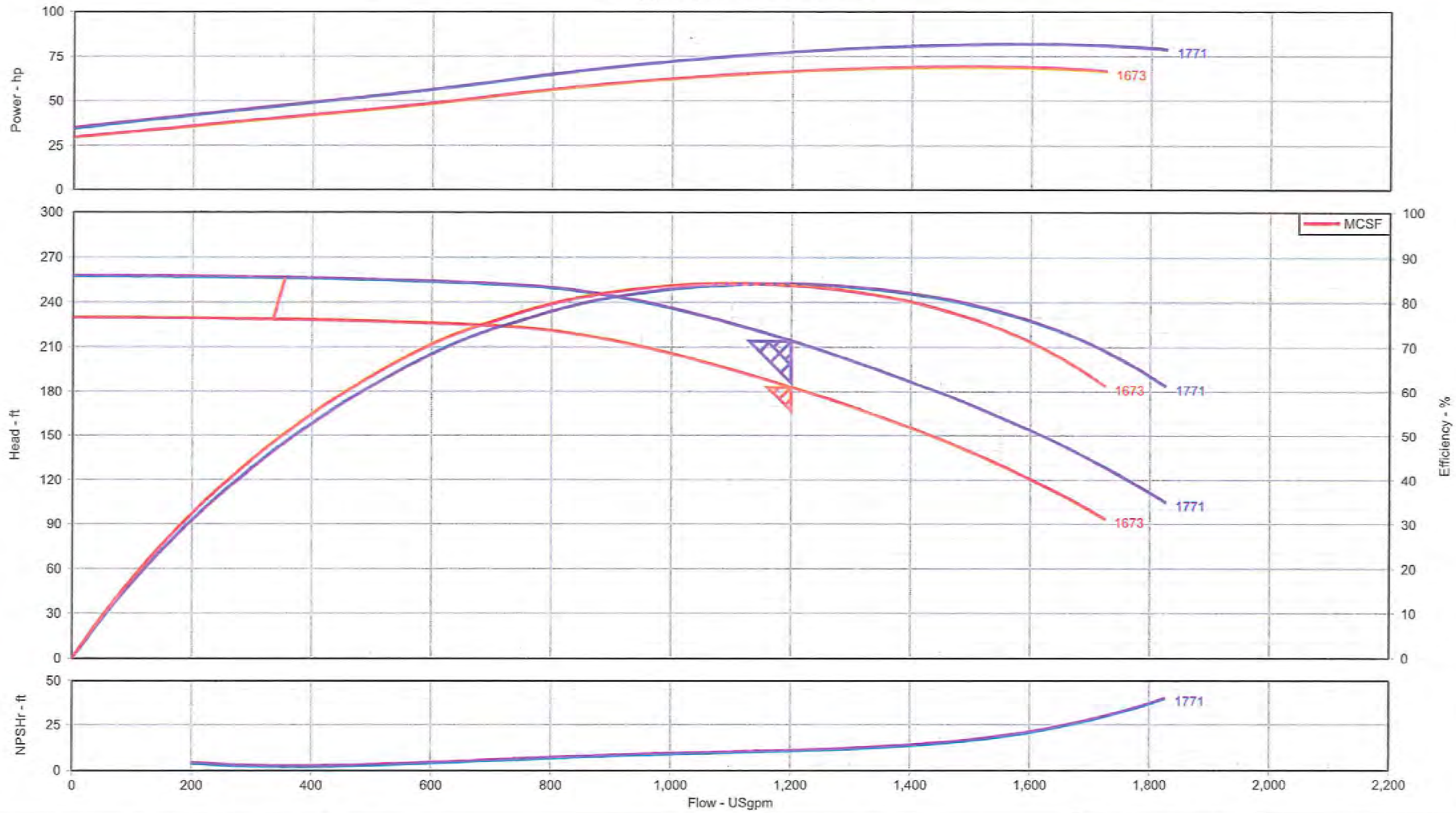
NORMAL PSI SWL 127.15' PROBE

Time	Pumping Level (ft.)	Drawdown (ft.)	PSI	Orifice Size (in.)	Inches	GPM	Specific Capacity	TDH (ft.)	Amps
9:50	133.5'		49	10 x 8	7"	785	123.60		65.4 60.5 66.4
		Pump No. 1 Running							
10:05	135'		49	10 x 8					
		Pump No. 1 Shut off							
10:05	133.1'		41	10 x 8		982			
10:20	132.6'	5.45'	41	10 x 8	11"	982		227.31'	72.8 64.1 70
10:20	134.1'		27	10 x 8		1222			
									79.4 69.4 73
10:35	134.7'		27	10 x 8	17"	1222	161.80	197.07'	
10:35	135.6'		17	10 x 8		1359			
									81.1 71.1 75.9
10:50	136.22'		17	10 x 8	21"	1359	149.80	175.5'	
			Shut Off at 58 psi, 60 Hz						

BY: Leonard Flora
25474 (B)

Multi-Speed Performance Curve

Pump and bowl (dashed) performance. Bowl adjusted for construction and viscosity.
Pump further adjusted for friction and power losses of lineshaft and thrust bearings. Pump is not adjusted for any static lift.
The duty point represents the head at the bowl.



Customer	: PEERLESS-MIDWEST, INC.	Pump Type	: 12JKH	Quote number	: 73256
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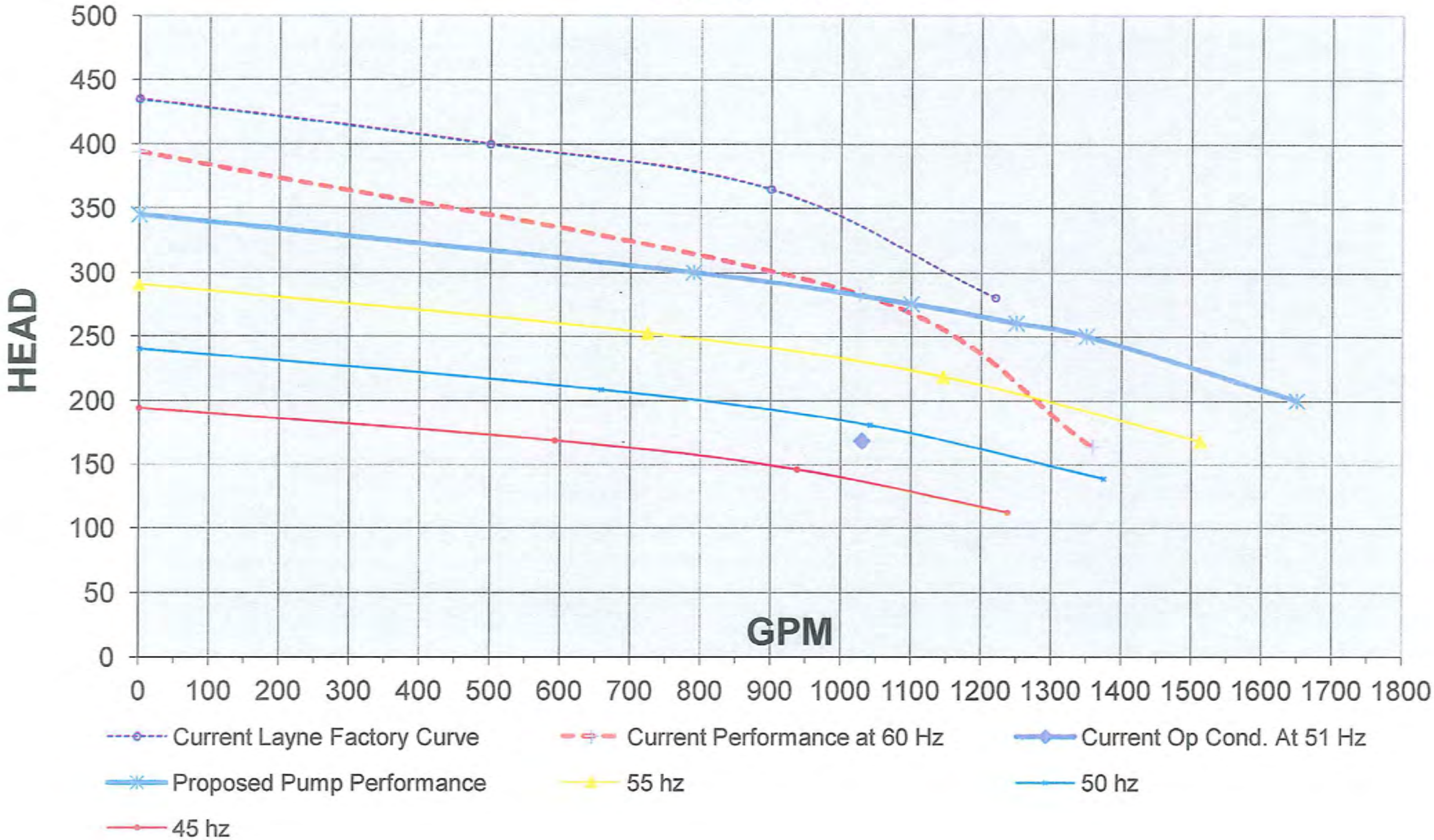
Location	:	Quantity	: 1	CO #	:
Project	:	Flow	: 1,200.0 USgpm	Item #	: 018
Tag	:	Head	: 214.0 ft	JOL #	:
Bowl/Pump	:	Speed	: 1,770 rpm	Serial #	:
Eff (bowl / pump)	: 84.09 / - %	Fluid Density	: 1.000 / 1.000 SG	Drawing #	:
Power (bowl / pump)	: 77.12 / -	Viscosity	: 1.00 cP	Drawn By	:
NPSH required	: 10.69 ft	Impeller Trim	: 8.72 in	Last Modified	: 01 Feb 2012 1:23 PM

The head and power may be different than that shown in accordance with Hydraulic Institute / API 610 Standards

Additional

PEERLESS MIDWEST INC.

City of Lawrence, IN
Richardt #1 Proposed Pump Performance
March 14th 2012



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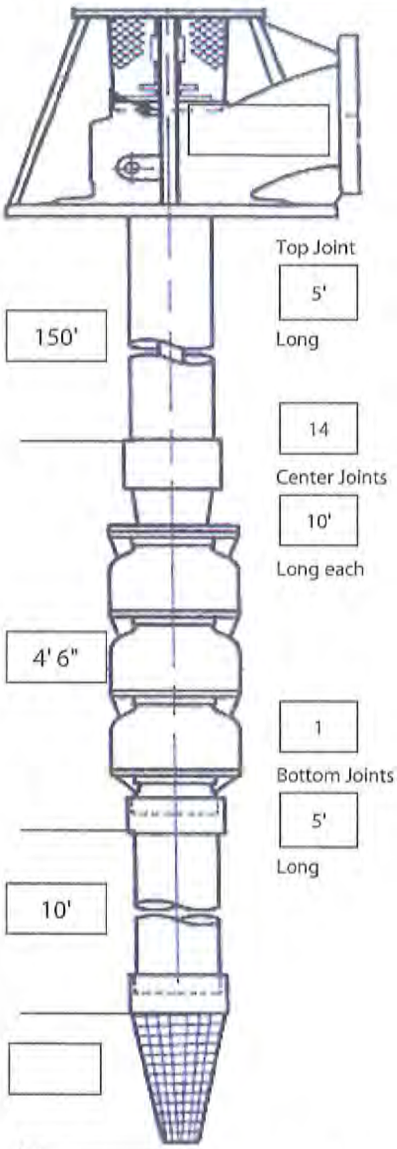
Westfield, IN / 317.896.2987
Ionia, MI / 616.527.0050
Grand Blanc, MI / 248.996.2721

VERTICAL TURBINE PUMP INSTALLATION REPORT

Sales Order No. 25473 Well No. Richardt #1 Pump # ______ Date: 5/25/12

Owner Lawrence Utilities City Lawrence State IN

Location of Well 5400 N Richardt Avenue



MOTOR

Manufacturer	US
Horsepower	125
RPM	1780
Phase	30
Voltage	460
Full Load Amps	87
Svc Factor Amps	95
Service Factor	1.15
Serial No.	1091681
Type	RUE
Frame	405TP WPI
Shaft Dia.	1-11/16"
Shaft Length	105-1/2" C
NRR	YES
Key Size	3/8"
Bolt Circle	10-1/2"
CD	37"
Motor Overhauled?	
Where	

GEAR DRIVE

Manufacturer	
Serial No.	
Gear Ratio	

SPECIAL/MISCELLANEOUS

Power Lines	NO
Need RO?	YES

HEAD

Manufacturer	LAYNE
Type	
Disch Flg Size	8"
Base Plate	YES
Head Shaft Dia.	1-11/16"
Head Shaft Lgt.	105-1/2" C
Coupled in Head	NO

COLUMN

Water/Oil Lube	WATER
Pipe Size	8"
Tubing Size/Type	
Shaft Size	1-11/16"
Shaft Material	SS
Coupling Mtl.	SS

PUMPING DATA

Static Water Level	131'
System Pressure	13
Test GPM	1517
Test PSI	
Pumping Level	138'
Test Duration	
Spec Capacity	216
Volts	460
Amps	103.7

BLOWOFF

Size/Connection	

BOWL

Manufacturer	
Model	
Size	12"
No. Stages	4
Material	
Clm Conn Size	8"
Shft Conn Size	
Impeller Trim	

SUCTION

Threaded	YES
Bell	ON BOWLS
Size	8"
Special Paint	NO
Strainer	NO

WELL

Type	ROCK
Casing Dia.	
Depth	
Top Hat Size	
Casing Vent	

MONITOR SYSTEMS

Airline/Type	3/4" POLY
Airline Length	150'
Airline Fastened	TAPED
Stilling Tube/Mtl	
Tube Length	

Total Setting ______

REMARKS Need 8" roller trip when pulling

Installer(s) Leonad Flora

PEERLESS MIDWEST INC.

17707 Sun Park Drive, Westfield, IN 46074 / Phone 317-896-2987 / Fax 317-896-3748

PUMP TEST FORM

JOB # 25473 DATE 6/5/2012 Page 1 of 1

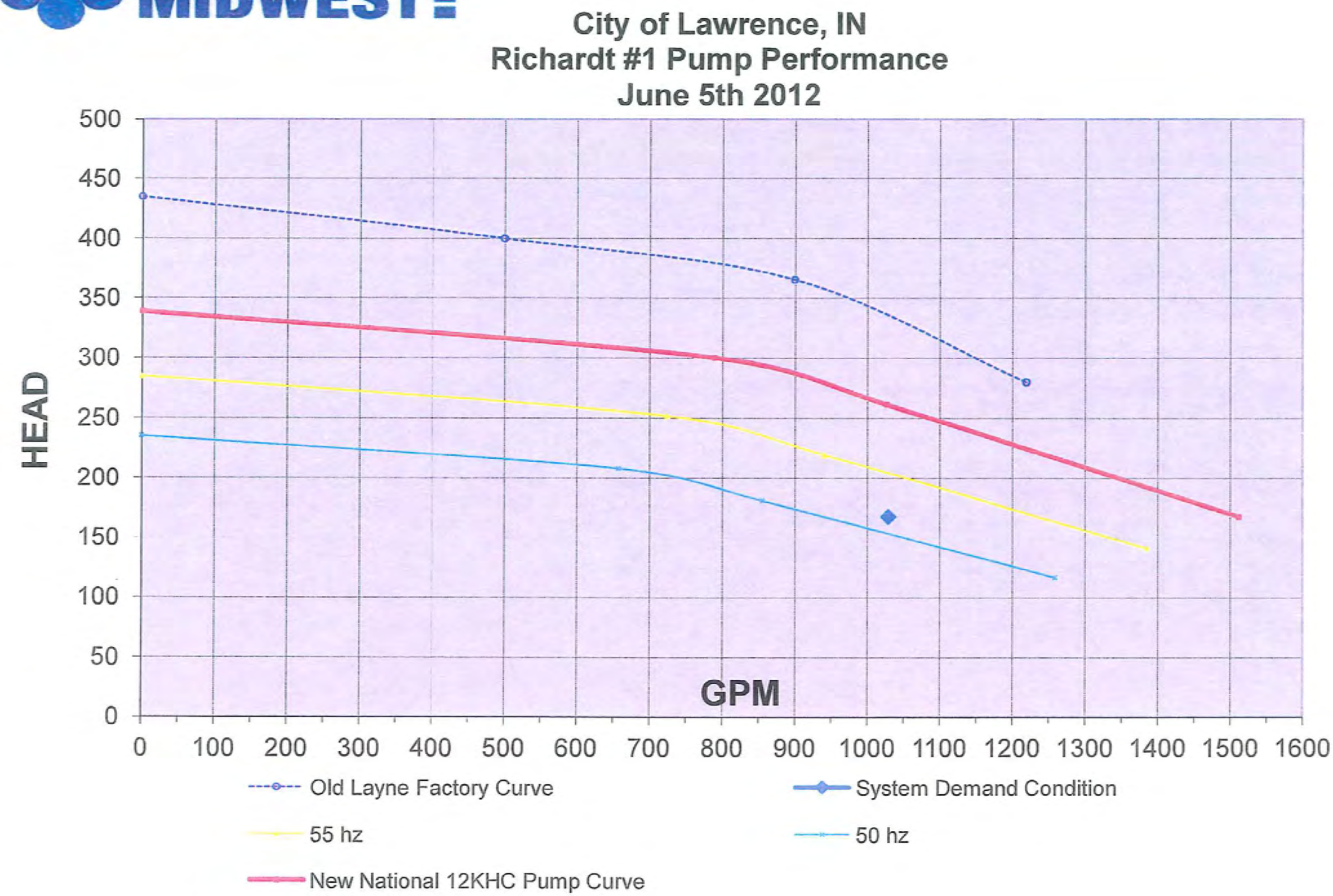
OWNER Lawrence

WELL Richardt #1 WELL DIAMETER 16" WELL DEPTH 242'

NORMAL PSI SWL 131' PROBE

Time	Pumping Level (ft.)	Drawdown (ft.)	PSI	Orifice Size (in.)	Inches	GPM	Specific Capacity	TDH (ft.)	Amps
12:57	133.42	2.42	55	10x8	12	1027	424.40	260.50	99.6
1:00	134.17	3.17					324.00	261.20	97.8
1:03	134.25	3.25					316.00	261.30	98.3
1:06	134.42	3.42					300.30	261.50	
1:09	134.42	3.42					300.30	261.50	
1:11	137.13	6.13	13			1517	246.70	167.20	104
1:14	137.75	6.75					224.00	167.80	102
1:17	138.00	7.00					216.00	168.00	105
1:20	138.17	7.17					210.90	168.20	

BY: Leonard Flora


City of Lawrence, IN
Richardt #1 Pump Performance
June 5th 2012
HEAD
500
450
400
350
300
250
200
150
100
50
0
GPM
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
Old Layne Factory Curve
System Demand Condition
55 hz
50 hz
New National 12KHC Pump Curve

Scott Copy

TANK INDUSTRY CONSULTANTS

EVALUATION OF THE

500,000 GALLON PEDESTAL SPHEROID WATER STORAGE TANK

"OAKLANDON ROAD TOWER"

LAWRENCE, INDIANA

FOR

CITY OF LAWRENCE UTILITIES LAWRENCE, INDIANA

October 22, 2008 and December 2, 2008

TM

08.110.H214.01

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610 / 696-0403

Houston, Texas
281 / 367-3511

Richmond, Virginia
804 / 897-7176

December 12, 2008

Mr. Scott Salsbery
Director of Operations
City of Lawrence Utilities
9201 Harrison Park Court
Lawrence, Indiana 46216

SUBJECT:

The subject of this report is the field evaluation of the 500,000 gallon pedestal spheroid water storage tank located in Lawrence, Indiana. The tank was owned by the City of Lawrence Utilities and was known as the "Oaklandon Road Tower." The field evaluation was performed on October 22, 2008 and December 2, 2008, by James A. Peyer, Harold H. Knight, and Noah M. Peyer of Tank Industry Consultants. The Owner's representative on the site at the time of the field evaluation was Dan Settle. The pedestal spheroid tank was of welded steel construction. According to information on the tank nameplate, the tank was built in 1983 by Universal Tank & Iron Works, Inc., under serial number 7101-500. The tank nameplate also stated the tank had a capacity of 500,000 gallons, was 144 ft to high water level, and had a head range of 37 ft 6 in.

OBJECTIVE:

The purpose of this washout and evaluation was to determine the condition of the tank interior dry, interior wet, exterior, visible foundation, and accessories. The purpose of this report is to present the findings of the evaluation and to make recommendations for recoating, repairing, corrosion protection, and maintenance. Budget estimates for the work, anticipated life of the coating and the structure, and the replacement cost of the tank are also included.

AUTHORIZATION:

This washout, evaluation, disinfection, and report were authorized in the Tank Industry Consultants Standard Form of Agreement signed by Scott Salsbery of the City of Lawrence and Steve Roetter of Tank Industry Consultants and dated April 18, 2008.

SUMMARY:

Exterior Coating: The exterior coating system was in good overall condition and providing adequate corrosion protection. Tank Industry Consultants believes that the exterior surfaces of the tank should not require repainting within the next 4 to 5 years from a corrosion standpoint although aesthetics may dictate a quicker recoating schedule. However, the exterior should be re-evaluated in 3 to 4 years to determine a more precise recoating schedule. Due to the very poor adhesion of much of the existing exterior coating, completely cleaning and recoating the tank is recommended.

Interior Dry Coating: The coating on the majority of the interior dry surfaces of the tank appeared to be in fair overall condition. However, surface rust and peeled topcoating were observed. Tank Industry Consultants believes that the interior dry surfaces should be painted within the next 2 years from a corrosion standpoint. Due to the very poor adhesion of the existing interior dry coating and the widespread areas of peeled coating, completely cleaning and recoating the interior dry surfaces is the recommended option.

Interior Wet Coating: The interior wet coating system appeared to be in fair overall condition as areas of surface rust were observed. Installing a cathodic protection system could delay the interior wet recoating for several years. If a cathodic protection system is not installed, the interior wet should be re-evaluated in 3 years to determine a recoating schedule. It is recommended that when the interior wet is completely cleaned and repainted, an epoxy coating system should be used.

ANSI/OSHA and Safety-Related Deficiencies: There were OSHA and safety-related deficiencies on this tank. These deficiencies included:

- an uncovered junction box on the lighting system conduit exposed wiring,
- the base cone, pedestal, bowl manhole, and interior wet ladder side rails were dimensionally too small,
- the base cone, pedestal, bowl manhole, and interior wet ladder head clearances were dimensionally too small,
- the base cone, pedestal, bowl manhole, access tube, and interior wet ladder rungs were not of a slip-resistant design,
- the base cone, pedestal, and bowl manhole ladder rungs were not spaced at consistent intervals,
- conduits and cables were attached to the base cone, pedestal, and access tube ladders which could interfere with the climber's use of the ladder side rails,
- the base cone and pedestal ladder safe-climbing devices did not extend the industry recommended height above the condensate and top platforms, respectively,
- the spacing between horizontal bars and vertical bars on the base cone ladder safety cage exceeded the maximum allowed spacing intervals,
- the base cone ladder safety cage width was dimensionally too small,
- the toe rooms on the access tube ladder and interior wet ladder were dimensionally too small,
- the access tube and interior wet ladders were not equipped with safe-climbing devices, and
- the top platform access opening was not equipped with a cover.

If the Owner wishes to fully comply with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA, Sanitary, and Operational Deficiencies: There were AWWA, sanitary, and operational deficiencies on this tank as well:

- the gap between the overflow pipe and flap gate could allow the ingress of insects into the tank,
- the screening on the overflow pipe flap gate was not restrictive enough to prevent the ingress of insects in the tank
- the roof vent was not of a clog-resistant design,
- the vertically-oriented roof vent screening was not shielded from wind-driven dust and debris, and
- the gaps in the roof vent protective screening could allow the ingress of insects into the tank.

These deficiencies should be corrected.

The safety-related, sanitary, and operating deficiencies listed above are not intended to be a complete list of deficiencies on this tank. The Owner should refer to the complete report text and accompanying photographs for a complete account of all observed deficiencies.

This evaluation and the reporting of the condition of this tank do not warrant the original structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications which may be required for compliance with present structural codes.

PHOTOGRAPHS:

Color photographs were taken of the visible portions of the foundations, the tank interior wet, interior dry, and exterior and are included as a part of this report.

NOMENCLATURE:

Warning: Some appurtenances on this tank may be referred to as erection or rigging attachments, lugs, or brackets. This does not mean that they are safe for rigging. Each attachment for each tank should be evaluated on an individual basis by a structural engineer or an experienced rigger before being used. These devices may have been intended for only the original erectors and painters to use with specialized equipment.

ADHESION TESTS:

All adhesion tests performed during this evaluation were done in general accordance with ASTM D3359. The results are reported herein using the ASTM scale. The ASTM scale is a relative scale to rate adhesion from 0 to 5 with 5 being the best. A table of adhesion test results classification is included with this report.

HEAVY METALS TESTS:

Samples of the exterior, interior dry, and interior wet coating systems were taken at the time of the previous field evaluation and sent to a laboratory for atomic absorption analyses. The test results were as follows:

	Cadmium		Chromium		Lead	
	mg/kg	percent	mg/kg	percent	mg/kg	percent
Exterior Red & Yellow	<25	<0.0025%	<250	<0.025%	<250	<0.025%
Exterior White	<25	<0.0025%	<250	<0.025%	<250	<0.025%
Interior Dry	<25	<0.0025%	9,030	0.903%	308	0.0308%
Interior Wet	<25	<0.0025%	<250	<0.025%	<250	<0.025%

Tank Industry Consultants performs this test only to determine if there is lead, chromium or cadmium present in the coating samples. To limit damage to the existing coating, only small areas were tested. The small number of samples taken and the difficulty of retrieving all primer from the steel profile may cause the tests performed to not accurately represent the total coating system. Variations in thickness, types of coatings applied, and the interim cleaning and painting operations will also affect the actual readings. The reliability of the results is also dependent on the amount of primer included in the sample. The Consumer Product Safety Commission specifies that an amount greater than 0.06% lead is considered potentially hazardous. Additional testing to determine the amount of leachable contaminants present in the spent cleaning debris will need to be performed following cleaning operations at the time of repainting. Results from the laboratory analysis are included following the adhesion tables.

ULTRASONIC THICKNESS MEASUREMENTS:

Roof:	(all readings were taken through coating)
Cap:	0.302 in. to 0.311 in.
Finger:	0.308 in. to 0.315 in.
Knuckle:	0.283 in. to 0.287 in.
Shell:	0.420 in. to 0.427 in.
Bowl:	
Knuckle:	0.836 in. to 0.860 in.
Upper Finger:	(inaccessible)
Lower Finger:	0.889 in. to 0.892 in.
Upper Cone:	0.537 in. to 0.541 in.
Lower Cone:	0.540 in. to 0.546 in.
Transition Flare:	1.207 in. to 1.211 in.
Dome:	1.485 in.
Access Tube:	
Top:	0.397 in. to 0.404 in.
Bottom:	0.688 in. to 0.692 in.
Top Platform:	0.302 in. to 0.305 in.
Pedestal:	

Ring #8:	0.799 in. to 0.803 in.
Ring #7:	0.801 in. to 0.804 in.
Ring #6:	0.778 in. to 0.783 in.
Ring #5:	0.788 in. to 0.791 in.
Ring #4:	0.781 in. to 0.786 in.
Ring #3:	0.792 in. to 0.797 in.
Ring #2:	0.795 in. to 0.798 in.
Ring #1:	0.812 in. to 0.818 in., bottom
Condensate Platform:	0.281 in.
Base Cone:	
Ring #6:	0.732 in. to 0.737 in.
Ring #5:	0.779 in. to 0.783 in.
Ring #4:	0.760 in. to 0.764 in.
Ring #3:	0.751 in. to 0.754 in.
Ring #2:	0.735 in. to 0.738 in.
Ring #1:	0.746 in. to 0.751 in., bottom
Base Plate:	1.549 in. to 1.553 in.

OBSERVATIONS:

A. Foundation and Site

SITE:
- Size: approx. 150 ft x 225 ft
- Fence:
  - Type: wooden picket
  - Height: 4 ft 6 in.
- Gate:
  - Location: east side of site
  - Width: 10 ft 6 in.
  - Locked: no

- Nearest Structure:
  - Type: playground
  - Direction: northeast
  - Distance: approx. 22 ft

  - Type: residence
  - Direction: east
  - Distance: approx. 75 ft

  - Type: restroom
  - Direction: southeast
  - Distance: approx. 80 ft

Nearest Overhead Power Lines:
Direction: northwest
Distance: approx. 50 ft

FOUNDATION:
Projection above Grade:
North: 5-1/2 in. to 9-1/2 in.
South: 5 in. to 5-3/4 in.
East: 5-1/4 in. to 8 in.
West: 5-1/2 in. to 6-1/4 in.
Grout: approx. 1 in. to 2-1/2 in. thick
Sealant: none visible

1. **Site Location**: The tank was located on Oaklandon Road in Lawrence, Indiana. The tank site was located in a city park, and playground equipment surrounded the tank. Railroad tracks were located to the north of the park, roads were located south and west of the park, and residences were located east of the park. Overhead power lines were located just outside the park to the north and west. (See photos 3-5)

2. **Site Conditions**: The tank site was covered with grass and gravel and appeared to be graded to provide adequate drainage away from the foundation. The entire park was equipped with a short wooden picket fence which was equipped with a gate on the east side of the site. The gate was not equipped with a lock. Electrical meters were located on the site adjacent to the east side of the base cone. (See photos 1-2, 6-10)

3. **Foundation**: The exposed concrete surfaces of the foundation appeared to be in adequate overall condition at the time of the field evaluation. A few minor hairline cracks were observed at the locations of the anchor bolts. The top surface of the foundation had been painted white, and mildew was noted on the foundation surfaces. The top of the foundation nearly had the AWWA recommended projection of 6 in. to 12 in. above grade. (See photos 13-14)

4. **Grout**: There was a pad of grout between the base plate and the top of the foundation. The grout appeared to be in good condition as no significant voids were observed. Mildew was observed on the grout, and the grout had been painted white. No sealant was visible at the grout-to-base plate interface. (See photos 13-14)

B. Exterior Surfaces

DESCRIPTION:
Construction: welded
Type: pedestal spheroid

NAMEPLATE:
Location: on base cone access door

Universal Tank
& Iron Works, Inc.
Indianapolis, IN
1983
Capacity 300,000 gallons
Height to High Level 144 ft 0 in.
Head Range 37 ft 6 in.
Type: spheroid
Serial No. 7101-500`

BASE PLATE PROJECTION:
Interior: 3-3/4 in. to 4-5/8 in.
Exterior: 4-1/2 in. to 5-1/4 in.

ANCHOR BOLTS:
Number: 20
Size: 1-3/8 in. diameter
Chairs: none
Gussets:
Side Plates: 2 in. to 9-1/2 in.
Width: 12-1/4 in. (between gusset plates adjacent to each anchor bolt)

ACCESS DOOR:
Size: approx. 29 in. x 59 in.
Locked: yes

OVERFLOW PIPE:
Size: 8 in. diameter
Air Break: 16-1/2 in.
Protective Screen: 4 mesh
Flap Gate: yes
Splash Pad: 3 ft x 6 ft

PAINTER'S RINGS:
Number: 4
Locations: 1 above painter's manhole, 1 below painter's manhole, 2 on bowl
Size: 7/8 in. diameter
Brackets:
Size: 3/4 in. diameter x 3 in. long
Spacing: approx. 3 ft

PAINTER'S MANHOLE:
Size: 22-1/2 in. diameter
Hinged: yes, exterior
Locked: no, pinned

PAINTER'S RUNGS:
- Number: 7
- Size: 1-1/2 in. x 1/4 in., flat bar
- Width: 6 in.

ROOF OPENINGS:
- Access Tube Manhole:
  - Type: hinged
  - Size: 24 in. diameter
  - Curb: 6 in.
  - Welded: exterior only
  - Overlap: 2-1/2 in.
  - Locked: no

- Container Roof Manhole:
  - Type: hinged
  - Size: 24 in. diameter
  - Curb: 4-3/4 in.
  - Welded: exterior only
  - Overlap: 2-1/2 in.
  - Locked: yes

- Roof Vent:
  - Type: dome cover
  - Neck Height: 10-3/4 in. to 12 in.
  - Neck Diameter: 24 in.
  - Screen:
    - Orientation: vertical
    - Size: 16 mesh
  - Cover: 38 in. diameter

ROOF OBSTRUCTION LIGHTS:
Type: double-globe
Location: on roof cap
Manufacturer: Crouse-Hinds
Operational: yes
Photoelectric Cell: unknown

EXTERIOR COATING AND METAL CONDITION:

	Coating Thickness		Approx. % Failure to		Adhesion	Metal Loss	
	Range	Typical	Primer	Rust		Typical	Deepest
Base Cone	11 mils to 27 mils	14 mils	Neg.	Neg.	0 T	Neg.	Neg.
Pedestal	12 mils to 16 mils	-	Neg.	Neg.	3 T	Neg.	Neg.
Bowl	10 mils to 15.5 mils	-	Neg.	Neg.	3 T	Neg.	Neg.
Shell	12.5 mils to 21 mils	15 mils	<1/2%	Neg.	0 S	Neg.	Neg.
Roof	6 mils to 20 mils	15.5 mils	<1/2%	Neg.	0 T	Neg.	Neg.

Key to Table

Adhesion	5 (very good)	T = Topcoat to Underlying Coating	Neg. = negligible
	4 (good)		
	3 (fair)	S = Primer to Steel	
	2 (poor)		
	1 (very poor)		
	0 (very poor)		

1. **Exterior Coating Condition**: The coating on the exterior of the tank appeared to be in good overall condition as no significant areas of topcoating failure or corrosion were noted. The exterior coating exhibited very poor to fair adhesion to the steel and underlying coating. The exterior of the tank was painted in a hot air balloon scheme with the container being striped red, green, and yellow, and a basket containing people was depicted on the pedestal. The hot air balloon on the container read, "OAKLANDON COMMUNITY." The red, yellow, and green colors of the graphics had faded in areas.

2. **Base Plate Projection**: The exterior and interior base plates appeared to be in adequate overall condition at the time of the field evaluation. Mildew was observed on the exterior base plate surfaces. No significant areas of corrosion were observed although the coating on the interior base plate surfaces had peeled. (See photos 13-14, 53)

3. **Anchor Bolts**: The base cone was equipped with 20 anchor bolts. The anchor bolts were not equipped with chairs but rather a gusset plate on each side of the bolt. No significant areas of coating failure or corrosion were observed on the anchor bolts and gusset plates although mildew was noted. (See photos 13-14)

4. **Overflow Pipe and Condensate Drain Pipe**: **There were sanitary deficiencies noted: (1) the gap between the overflow pipe and flap gate could allow the ingress of insects into the tank, and (2) the screening on the overflow pipe discharge was not restrictive enough to prevent the ingress of insects in the tank.** The overflow pipe and condensate drain pipe exited from the base cone and discharged above a concrete splash pad. The discharge end of the overflow pipe was equipped with a screened flap gate. The flap gate screening appeared to be in adequate condition at the time of the field evaluation but it did not appear to be restrictive enough to prevent the ingress of

insects into the tank. A gap was located between the flap gate and overflow pipe. The discharge end of the condensate drain pipe was screened, and corrosion was observed on the pipe flange surrounding the screening. (See photos 11-12)

5. **Base Cone Condition**: The base cone appeared to be in nearly its original structural condition at the time of the field evaluation. The base cone coating had cracked, and mildew was noted on the lower base cone surfaces and on the seams. Graffiti was observed on the base cone, and some of the graffiti had been touched-up previously. The base cone coating had very poor adhesion to the underlying coating. The base cone was equipped with a locked door, and the tank nameplate was mounted on the access door. Two antennas were mounted near the top of the east side of the base cone. An unused junction box and two conduits were located on the base cone. One of the conduits was broken. (See photos 14-24)

6. **Pedestal Condition**: The pedestal appeared to be in nearly its original structural condition at the time of the field evaluation. Runs and drips were observed in the pedestal coating, but no significant areas of coating failure or corrosion were observed. The pedestal coating had fair adhesion to the underlying coating. A painter's manhole and two painter's rings were located near the top of the pedestal such that one was located below the manhole and one was located above the manhole. **It is the opinion of Tank Industry Consultants that the painter's rings should not be used for rigging purposes or personnel access.** (See photos 25-30)

7. **Bowl Condition**: The coating on the bowl surfaces appeared to be in good overall condition and exhibited fair adhesion to the underlying coating. No significant areas of coating failure or corrosion were observed on the bowl, but mildew was noted on the bowl surfaces. Two painter's rings were located on the bowl. **It is the opinion of Tank Industry Consultants that the painter's rings should not be used for rigging purposes or personnel access.** (See photos 25, 31-32)

8. **Shell Condition**: The contour of the tank shell appeared adequate at the time of the field evaluation. No significant areas of coating failure or corrosion were observed on the shell at the time of the field evaluation. The shell coating exhibited very poor adhesion to the steel. (See photos 33-354)

9. **Roof Condition**: The contour of the roof appeared to be adequate at the time of the field evaluation. No significant areas of coating failure or corrosion were observed on the roof, but runs, drips, and debris were observed in the roof coating. The roof coating had very poor adhesion to the underlying coating. Three antennas, associated equipment, and an unused antenna bracket were mounted on the roof cap. (See photos 36-43, 46-47)

10. **Roof Manholes**: **There was a safety related deficiency noted: the roof was equipped with only one container manhole.** The roof was equipped with one access tube roof manhole and one container roof manhole. The manholes were equipped with hinged covers. The container roof manhole was locked prior to and after this evaluation. The manholes were welded on the exterior only. Corrosion was observed around a hole cut in the container manhole curb, and it appeared the hole would be covered by the cover overlap when the cover is closed. (See photos 46, 48)

11. **Roof Vent**: **There were AWWA, sanitary, and operational deficiencies noted: (1) the roof vent was not of a clog-resistant design, (2) the vertically-oriented screening was not shielded from wind-driven dust and debris, and (3) the gaps in the protective screening could allow the**

ingress of insects into the tank. The roof was equipped with a vent in the roof cap. Gaps were observed in the screening which could allow the ingress of insects into the tank. No significant corrosion was observed on the vent. (See photos 42-45)

12. **Obstruction Lights:** The roof was equipped with a double-globe obstruction light mounted on the roof cap. A photoelectric cell for the fixture was not found at the field evaluation. The fixture was illuminated at the time of the field evaluation. (See photo 42)

C. Interior Dry Surfaces

BASE CONE:
- Size: approx. 32 ft 9 in. diameter
- Floor: concrete
- Wooden Enclosure: approx. 4 ft x 4 ft x 6 ft tall

INTERIOR DRY LIGHTING:
- Type: single-globe incandescent
  - Number: 1 in base cone, 3 in pedestal, 1 in access tube
  - Protective Globes: yes
  - Protective Cages: yes
  - Operational: only 1 fixture in base cone and 1 in pedestal
- Type: halogen
  - Number: 3 in base cone
  - Operational: yes

INLET/OUTLET PIPE:
- Size: 12 in. diameter
- Insulation: 1-1/2 in. foam w/ jacket
- Brackets:
  - Location: pedestal
  - Number: 3
  - Size: approx. 3 in. x 3 in. x 3/8 in., angle x 8 ft 9 in. long
  - U-Bolts: approx. 1 in. diameter

OVERFLOW PIPE BRACKETS:
- Base Cone: approx. 12 in. x 3/8 in., flat bar x 12 in. long
- Pedestal:
  - Number: 6
  - Size: 8 in. x 3/8 in., flat bar x 10-1/2 in. long

BASE CONE LADDER:
- Number of Rungs: 37
- Height from Floor to Lowest Rung: 5 in.
- Width: 16 in.
- Side Rails: 2 in. x 3/8 in., flat bar
- Rung Size: 3/4 in. diameter, smooth
- Spacing: 11-3/4 in. to 12 in. on center
- Toe Room: open
- Head Clearance: 19-1/2 in.
- Brackets:
  - Size: 2 in. x 2 in. x 3/16 in., angle
  - Construction: welded
  - Spacing: 5 ft
- Safe-Climbing Device:
  - Type: notched-tubular rail
  - Extension below Platform: 25-1/2 in.
- Safety Cage:
  - Width: 25 in.
  - Depth: 29 in.
  - Vertical Bars:
    - Size: 1-1/2 in. x 1/4 in., flat bar
    - Spacing: 10-1/2 in. and 12-1/2 in.
  - Horizontal Bars:
    - Size: 2 in. x 2 in. x 3/16 in., angle
    - Spacing: approx. 5 ft

CONDENSATE PLATFORM:
- Location: near top of base cone
- Drain Pipe:
  - Size: 1-1/2 in. diameter
  - Brackets: approx. 5-3/4 in. x 3/8 in., flat bar x 8 in. long
- Support: 3 in. x 3 in. x 3/8 in., angle
- Access Opening:
  - Size: 23-1/2 in. diameter
  - Closeable Cover: yes
  - Curb: 5-1/2 in.

PEDESTAL:
- Size: approx. 12 ft diameter
- Stiffeners:
  - Size: 5-1/2 in. x 1-1/8 in.
  - Construction: seal welded

PEDESTAL LADDER:

- Number of Rungs: 61
- Width: 16 in.
- Side Rails: 2 in. x 3/8 in., flat bar
- Rung Size: 3/4 in. diameter, smooth
- Spacing: 11-3/4 in. to 12 in. and 13 in. on center
- Toe Room: 7 in.
- Head Clearance: 24 in.
- Brackets:
  - Size: 3 in. x 5/16 in., flat bar x 8 in. long
  - Construction: welded
  - Spacing: approx. 2 ft, 9 ft, and 10 ft
- Safe-Climbing Device:
  - Type: notched-tubular rail
  - Extension above Platform: 29 in.
- Safety Cage: none

PAINTER'S RAIL:

- Size: 4 in. x 1/4 in., flat bar x 2-1/2 in. projection
- Brackets: approx. 2-1/4 in. x 2 in. x 5/16 in., angle

TOP PLATFORM:

- Size: approx. 12 ft diameter
- Supports:
  - Size: 3 in. x 3 in. x 3/8 in., angle
  - Construction: intermittently welded
- Access Opening:
  - Size: 24 in. x 30 in.
  - Cover: none
  - Curb: 3-5/8 in.

BOWL MANHOLE LADDER:

- Number of Rungs: 11
- Width: 16 in.
- Side Rails: 2 in. x 3/8 in., flat bar
- Rung Size: 3/4 in. diameter, smooth
- Spacing: 11-3/4 in. to 12 in. on center
- Toe Room: 8-1/4 in. minimum
- Construction:
  - Top: welded to bowl
  - Bottom: welded to flat bar bracket
  - Bracket: 2 in. x 5/16 in., flat bar x 9-1/4 in. long
- Safe-Climbing Device: none
- Safety Cage: none

BOWL MANHOLE:
- Type: double-crab
- Size: 14 in. x 18 in.
- Neck: 6 in. projection x 1 in. thick
- Cover:
  - Size: 16-5/8 in. x 21-3/8 in. x 3/8 in., thick
  - Hinged: no
- Bolts:
  - Number: 2
  - Size: 3/4 in. diameter x 9 in. long

ACCESS TUBE: approx. 3 ft diameter

ACCESS TUBE LADDER:
- Number of Rungs: 59
- Width: 16 in.
- Side Rails: 2 in. x 3/8 in., flat bar
- Rung Size: 3/4 in. diameter, smooth
- Spacing: 12 in. on center
- Toe Room: 6 in.
- Brackets:
  - Size: 3 in. x 5/16 in., flat bar x 7-1/2 in. long
  - Construction: welded
  - Spacing: approx. 9 ft
- Safe-Climbing Device: none

INTERIOR DRY COATING AND METAL CONDITION:

	Coating Thickness		Approx. % Failure to		Adhesion	Metal Loss	
	Range	Typical	Primer	Rust		Typical	Deepest
Base Cone	11 mils to 20 mils	14.5 mils	Neg.	Neg.	0 T	Neg.	Neg.
Pedestal	8.5 mils to 12 mils	-	<1%	< 1/2%	1 S	Neg.	Neg.
Dry Bowl	10.5 mils to 17 mils	-	5%	1%	0 T	Neg.	Neg.
Access Tube	9 mils to 13 mils	-	2%	1%	0 S	Neg.	Neg.

Key to Table

Adhesion	5 (very good)	T = Topcoat to Underlying Coating	Neg. = negligible
	4 (good)		
	3 (fair)	S = Primer to Steel	
	2 (poor)		
	1 (very poor)		
	0 (very poor)		

1. **Interior Dry Coating Condition**: The coating on the interior dry surfaces appeared to be in fair to poor overall condition as areas of topcoating failure and surface rust were observed. The coating exhibited very poor adhesion to the steel and underlying coating.

2. **Inlet/Outlet Pipe**: The inlet/outlet pipe extended down from a penetration in the bowl, through the pedestal and base cone interior into the wooden enclosure in the base cone and through the

concrete floor. The pipe was covered with foam insulation which was located under a jacket which was taped to the pipe. Most of the insulation was intact, which prevented the evaluation of the pipe. However, a section of insulation was missing from the section of the inlet/outlet pipe containing an expansion joint. The coating on the visible pipe section and expansion joint had cracked and peeled, and corrosion was noted. The inlet/outlet pipe was U-bolted to angle brackets in the pedestal. (See photos 50-51, 56, 67-68, 73-74)

3. **Overflow and Condensate Drain Pipes**: The overflow pipe extended down from a penetration in the bowl, through the pedestal interior, and penetrated the base cone just above the concrete floor. The condensate drain pipe extended down from the underside of the condensate platform, along the base cone, and penetrated the base cone just above the floor. The overflow pipe was equipped with welded flat bar brackets in the pedestal and base cone, and the condensate drain pipe was also equipped with welded flat bar brackets in the base cone. The pipes and brackets appeared to be in nearly their original condition at the time of the field evaluation. (See photos 57, 62, 67, 69)

4. **Interior Dry Lighting System**: **There was a safety-related deficiency noted: an uncovered junction box on the conduit for the light system exposed wiring.** There were five incandescent light fixtures located in the interior dry part of the tank such that one was located in the base cone, three were located in the pedestal, and one was located in the access tube. Only one fixture in the base cone and one in the pedestal were operational at the time of the field evaluation. Three operational halogen light fixtures were also located in the base cone. The single-globe pedestal fixtures were equipped with globes and cages. An uncovered junction box was observed on the conduit for the lighting system which was located at the bottom of the base cone ladder safety cage. (See photos 49, 55-56, 59, 70-71)

5. **Base Cone Condition**: The coating on the interior dry base cone appeared to be in adequate condition as no significant areas of coating failure or corrosion were observed. The base cone coating exhibited very poor adhesion to the underlying coating. The base cone floor was constructed of concrete. The floor was not equipped with a drain, but no evidence of drainage problems were observed. A couple of electrical cabinets and unused piping and pumps were located in the base cone. A small wooden enclosure was located in the base cone which contained an electrical cabinet for the communications equipment, a heater, and the base of the inlet/outlet pipe. (See photos 49-58)

6. **Base Cone Ladder**: **There were safety-related and OSHA deficiencies noted: (1) the 2 in. x 3/8 in. ladder side rails did not precisely meet the required 2-1/2 in. x 3/8 in. minimum, (2) the ladder rungs were not of a slip-resistant design, (3) the ladder rungs were not spaced at consistent intervals, (4) the 19-1/2 in. head clearance did not meet the required 30 in. minimum, (5) conduits and cables were attached to the ladder which could interfere with the climber's use of the ladder side rails, (6) the safe-climbing device did not extend the industry recommended 54 in. above the platform, (7) the 10-1/2 in. and 12-1/2 in. spacing between vertical bars on the ladder safety cage exceeded the maximum allowed 9-1/2 in. spacing intervals, (8) the 5 ft spacing between horizontal bars on the ladder safety cage exceeded the maximum allowed 4 ft spacing intervals, and (9) the 25 in. width of the safety cage did not meet the required 27 in. minimum.** A ladder extended from the floor of the base cone to the condensate platform. The base cone ladder was equipped with welded angle brackets. The ladder and brackets to be in nearly their original structural condition at the time of this field evaluation. The ladder was equipped with a safety cage which was constructed of welded angle and flat bar members, and with a notched-tubular rail safe-climbing

device. Conduits and cables were attached to the ladder which could restrict the climber's use of the ladder side rails. (See photos 56, 58-60)

7. **Condensate Platform**: A platform was located near the top of the base cone and was equipped with an intermittently welded support angle. Dirt, corrosion, and rust staining were observed on the condensate platform. The access opening through the platform was equipped with a closable cover and a curb. The condensate platform was equipped with a drain pipe, but the orientation of the drain pipe prevented water from draining from the platform. A drain hole was also located in the platform, but evidence of accumulated water was observed on the platform. (See photos 56, 61-65)

8. **Pedestal Condition**: The coating on the interior dry pedestal surfaces appeared to be in good overall condition as no significant areas of corrosion or coating failure were observed. An area of corrosion and peeled topcoating was observed on the pedestal surfaces just above the condensate platform. The pedestal coating had very poor adhesion to the steel. The pedestal was equipped with seal welded stiffening angles. A painter's rail was located near the top of the pedestal just beneath the top platform. The rail was constructed of a flat bar and was equipped with welded angle brackets. **The painter's rail should not be used for rigging purposes.** (See photos 66-40)

9. **Pedestal Ladder**: **There were safety-related and OSHA deficiencies noted: (1) the 2 in. x 3/8 in. ladder side rails did not precisely meet the required 2-1/2 in. x 3/8 in. minimum, ladder rungs were not of a slip-resistant design, (3) the ladder rungs were not spaced at consistent intervals, (4) the 24 in. ladder head clearance at the top platform did not meet the required 30 in. minimum, (5) conduits and cables were attached to the ladder which could interfere with the climber's use of the ladder side rails, and (6) the safe-climbing device did not extend the industry recommended 54 in. above the platform.** A ladder extended up the pedestal from the condensate platform to the top platform. The pedestal ladder was equipped with welded flat bar brackets. The ladder and brackets to be in nearly their original structural condition at the time of this field evaluation. The ladder was equipped with a safe-climbing device which did not extend the industry recommended height above the top platform. Cables and conduits were attached to the ladder which could restrict the climber's use of the ladder side rails. (See photos 67, 70-71)

10. **Top Platform**: **There was a safety-related and OSHA deficiency noted: the top platform access opening was not equipped with a cover.** A platform was located near the top of the pedestal which provided access from the pedestal ladder to the painter's manhole, bowl manhole ladder, and access tube ladder. A significant amount of dirt was observed on the platform, and corrosion was also noted. The platform was equipped with intermittently welded support angles. Drain holes were located in the platform, and slots were located around the perimeter of the platform for drainage; however, evidence of trapped water was observed . (See photos 67, 69, 71-72)

11. **Bowl Ladder and Manhole**: **There were safety-related and OSHA deficiencies noted: (1) the 2 in. x 3/8 in. ladder side rails did not precisely meet the required 2-1/2 in. x 3/8 in. minimum, (2) the ladder rungs were not of a slip-resistant design, and (3) the ladder rungs were not spaced at consistent intervals.** A double-crab manhole was located in the bowl. The manhole cover was not hinged. A ladder extended from the top platform to the bowl manhole. The top of the bowl manhole ladder side rails were welded to the bowl, and the base of the ladder was welded to a flat bar bracket on the top platform floor. The ladder and bracket appeared to be to be in nearly their original structural condition at the time of this field evaluation. (See photos 72, 75)

12. **Interior Dry Bowl Condition**: The coating on the dry bowl surface appeared to be in poor overall condition. The bowl coating had cracked, and the dry bowl coating had peeled in large sheets. Runs and drips were observed in the dry bowl coating. The topcoating had failed to the underlying coatings in areas, and surface rust was observed. The bowl coating had very poor adhesion to the underlying coating. (See photos 75-76)

13. **Access Tube Condition**: The coating on the access tube appeared to be in poor condition as the coating had cracked and peeled. Surface rust and topcoating failures were noted. Drips and runs were observed in the coating. The access tube coating exhibited very poor adhesion to the steel. (See photos 76-77)

14. **Access Tube Ladder**: **There were safety-related and OSHA deficiencies noted: (1) the 2 in. x 3/8 in. ladder side rails did not precisely meet the required 2-1/2 in. x 3/8 in. minimum, (2) the ladder rungs were not of a slip-resistant design, (3) the cables and conduit attached to the ladder side rails could restrict the climber's access to the side rail, (4) the 6 in. toe room did not precisely meet the required 7 in. minimum., and (5) the ladder was not equipped with a safe-climbing device.** A ladder extended up from the top platform to the access tube manhole at the roof. The access tube ladder was equipped with brackets which were welded to the ladder and to the access tube. The ladder and brackets appeared to be in adequate condition at the time of the field evaluation. Cables and conduits were attached to the ladder. (See photos 76-77)

D. Interior Wet Surfaces

ROOF SUPPORT STRUCTURE:
Stiffeners:
Number: 12
Size: approx. 3 in. x 2 in. x 1/4 in., angle

INTERIOR SHELL STIFFENING ANGLE:
Size: approx. 6 in. x 6 in. x 3/8 in.
Construction: intermittently welded

CATHODIC PROTECTION: none

OVERFLOW:
Inlet Type: weir box
Location: approx. 12 in. below the roof finger-to-knuckle seam
Weir Box: 12 in. x 12 in. x 24 in.

INTERIOR WET LADDER:
Number of Rungs: 49
Width: 16 in.
Side Rails: 2 in. x 3/8 in., flat bar
Rung Size: 3/4 in. diameter, smooth
Spacing: 12 in. on center
Toe Room: 6-3/8 in.
Head Clearance: 18 in.
Brackets:
Construction: welded
Size: 2-1/2 in. x 5/16 in., flat bar x 9 in. long
Spacing: approx. 2 ft, 9 ft, 10 ft
Safe-Climbing Device: notched-tubular rail

ACCESS TUBE:
Rail:
Location: approx. 33 in. below roof
Size: 4 in. x 1/4 in., flat bar x 2 in. projection
Brackets: 2 in. x 1/4 in., flat bar x 1-3/4 in. long
Stiffeners: 7 in. x 1 in.

INLET/OUTLET PIPE:
Size: 12 in. diameter
Projection: 10 in. above bowl
Protective Cover: none

INTERIOR WET COATING AND METAL CONDITION:

	Coating Thickness		Approx. % Failure to		Adhesion	Metal Loss	
	Range	Typical	Primer	Rust		Typical	Deepest
Roof	3.5 mils to 7.5 mils	5 mils	Neg.	Neg.	5 S	1/16 in.	1/16 in.
Shell	-	-	Neg.	1%	-	Neg.	Neg.
Bowl	9.5 mils to 14 mils	13 mils	Neg.	1%	3 S	Neg.	Neg.

Key to Table

Adhesion 5 (very good) T = Topcoat to Underlying Coating Neg. = negligible
4 (good)
3 (fair) S = Primer to Steel
2 (poor)
1 (very poor)
0 (very poor)

1. **Interior Wet Coating Condition**: The coating on the interior wet was in fair overall condition as areas of surface rust were observed. The interior wet coating exhibited fair to very good adhesion to the steel.

2. **Roof Condition**: The interior wet roof coating appeared to be in fair overall condition as some corrosion was noted. The lapped roof plate seams had been intermittently welded, and sealant

had been applied at these seams. The interior roof support structure consisted of intermittently welded radial stiffeners. Corrosion was observed along the radial stiffeners and along the seams. Two lugs were located on the roof cap. **The lugs should not be used for rigging purposes.** (See photos 78-80, 82-83)

3. **Shell Condition**: The coating on the interior shell appeared to be in good overall condition as only minor surface rust was noted. The shell coating was discolored due to mineral staining from the water. An intermittently welded stiffening angle was located around the shell. **The shell stiffening angle should not be used for rigging purposes.** (See photos 83-84)

4. **Overflow Pipe**: The overflow was equipped with a weir box inlet which was located on the access tube. The overflow pipe extended down adjacent to the access tube and penetrated the bowl cone through a reinforcing pad. The weir box was located such that the high water line was located below the roof finger-to-knuckle seam. (See photos 88-89, 93-95)

5. **Bowl Condition**: The coating on the bowl appeared to be in good overall condition as only minor surface rust was noted. Debris was observed in the coating on the bowl cone. An unused eye was located on the bowl cone. **The unused eye should not be used for rigging purposes.** (See photos 85-87, 94-97)

6. **Interior Wet Ladder**: **There were safety and OSHA deficiencies noted: (1) the 2 in. x 3/8 in. side rails did not precisely meet the required 2-1/2 in. x 3/8 in. side rails minimum, (2) the ladder rungs were not of a slip-resistant design, (3) the 6-3/8 in. toe room did not meet the required 7 in. minimum, and (4) the 18 in. head clearance at the roof manhole did not meet the required 30 in. minimum.** The interior wet ladder was located on the access tube. The wet ladder was equipped with a notched-tubular rail safe-climbing device. The wet ladder was welded to brackets which were welded to the access tube. The ladder and brackets appeared to be in adequate condition at the time of the field evaluation although a few random spots of corrosion were observed. (See photos 90-92)

7. **Access Tube Condition**: The coating on the access tube appeared to be in good condition as only minor surface rust was observed. The wet ladder and overflow pipe weir box were located on the access tube. A rail was located near the top of the access tube. **The rail should not be used for rigging purposes.** (See photos 81, 89-93)

8. **Inlet/Outlet Pipe**: The inlet/outlet pipe projected above the bowl. The pipe opening was not equipped with a protective cover. (See photo 97)

RECOMMENDATIONS:

A. Foundation and Site

1. **Site Maintenance**: The site should be maintained so that the top of the foundation continues to project approximately 6 in. to 12 in. above grade and so that proper drainage away from the foundation continues. Site maintenance should be performed with the mower discharge directed away from the base of the tank to prevent rock chips in the coating.

2. **Site Access and Restoration**: Contractor and heavy equipment access to the site would be difficult due to the small size of the site and the proximity of the playground equipment. Provisions should be included in the specifications for the restoration of any paving, curbing, sidewalks, fences, sod, or other surfaces and structures disturbed by the contractor's work.

3. **Tank and Site Security**: Water tanks have been defined by some courts under certain circumstances as attractive nuisances. As such, there may be a significant potential liability to the Owner for injury to persons on the tank and tank site, even if access is not authorized. Recent events have prompted the entire water industry to consider measures that inhibit intentional acts that could threaten the water supply. A review of the security requirements for the tank and site is recommended to confirm that the existing measures are consistent with the Owner's security requirements for their water system. Primary tank and site security should be focused on eliminating, preventing, and detecting unauthorized access to the tank. Such security measures might include routinely and periodically verifying all manholes and doors are locked. Other security measures might include installing motion sensors, site lighting, surveillance cameras, alarms on tank manholes and doors, and arranging more frequent site visits by law enforcement agencies. As graffiti was observed on the base cone, it is recommended that a chain-link fence topped with barbed wire and equipped with a locked gate be installed around the area immediately surrounding the base cone.

4. **Foundation**: When the tank exterior is repainted, any unsound concrete should be chipped to sound material and the concrete should be brush-off blasted. Any deteriorated areas or voids found should have a bonding agent and a vinyl emollient modified concrete patching mortar applied to build up the surface to its original contour. (This repair did not appear to be necessary at the time of the field evaluation). The concrete should then be painted with a concrete sealer.

5. **Grout Maintenance**: All loose grout should be chipped away to solid material when the tank is empty. Any shim plates which can be easily removed should be taken out. Any voids in the grout should be filled with a nonshrinking, nonstaining, structural grout material. The grout should be placed as far back under the base plates as possible and squared off vertically with the edge of the base plates. (This repair did not appear to be necessary at the time of the field evaluation). Any gap between the steel base plates and the grout should be filled with a flexible sealant.

B. <u>Exterior Surfaces</u>

1. **Life of the Exterior Coating**: The exterior coating system was in good overall condition and providing adequate corrosion protection. Tank Industry Consultants believes that the exterior surfaces of the tank should not require repainting within the next 4 to 5 years from a corrosion standpoint although aesthetics may dictate a quicker recoating schedule. However, the exterior should be re-evaluated in 3 to 4 years to determine a more precise recoating schedule. Due to the very poor adhesion of much of the existing exterior coating, completely cleaning and recoating the tank is recommended.

2. **Coating Testing**: Prior to preparation of specifications for the cleaning and coating of the exterior of the tank, several samples of the exterior coating system should be subjected to laboratory analysis to test for ingredients which may at that time be subject to regulations concerning their handling and disposal.

3. **Cleaning**: Containment of the wind-blown debris and containment of paint droplets may be required due to the proximity of the adjacent playground equipment.

4. **Recommended Coating System**:

a. **Complete Cleaning and Repainting**: The optimum long-life coating system presently available for this site is an epoxy-polyurethane coating system. Properly formulated and applied polyurethanes have good resistance to condensation, mildew, and chipping. The polyurethanes also have excellent color and gloss retention and the longest expected service life of any of the common exterior tank coatings. The typical life of a properly applied epoxy-polyurethane coating system is approximately 15 to 20 years. These coatings are also presently manufactured to meet current VOC requirements.

b. **Coating Application**: The entire tank exterior should be cleaned to the equivalent of an SSPC-SP 6, Commercial Blast Cleaning and have an epoxy-primed, epoxy intermediate and polyurethane finish coating system applied. However, care must be taken during the application of this particular coating system because this coating does have poor dry-fall characteristics, and potential damage to the surrounding property must be taken into consideration. The polyurethane coatings also require close monitoring of temperature and humidity during application.

5. **Effective Service Life**: Tank Industry Consultants defines the life of a coating as the amount of time before repainting becomes necessary due to coating failure and corrosion. During the coating life the Owner should expect the coating to lose its gloss, start to chalk, show signs of weathering, and possibly some rust staining. Future touch-up may be required on isolated coating failures. If aesthetics are a concern, the Owner may have to topcoat the repainted tank prior to the end of the expected service life. However, future topcoating would be less expensive than complete cleaning and recoating and could delay the next complete cleaning and repainting for many years.

6. **Other Systems**: With air emission volatile organic compounds (VOC) restrictions being put in place around the nation, alternative coating systems may become available which would be viable options for this tank. The Owner should review the available systems prior to preparing specifications for the recoating project.

7. **Coating Curing**: It would be more economical to paint the tank exterior at the same time the interior wet is painted, since the tank must be drained while the exterior is painted, and the applied coatings cure. This will also reduce mobilization and observation costs.

8. **Rehabilitation Schedule**: To obtain the lowest possible prices for the work outlined in the recommendations, the Owner should have the specifications prepared and the work bid in the spring, with the work scheduled to start in early summer (if possible).

9. **Grinding and Bracket Removal**: Any unused brackets or erection lugs should be removed prior to the exterior repainting. Any weld burrs, weld spatter, or erection scars should be ground off to provide a smooth surface for the application of the coating.

10. **Electrical Apparatus**: All unused electrical conduit, antennas, meters, fixtures, electrical equipment, and cabinets should be removed from the tank and tank site. All required equipment

should be repaired and maintained in accordance with the National Electric Code (NEC). The broken conduit penetrating the base cone should be repaired.

11. **Nameplate**: The tank nameplate should be removed for the cleaning and coating of the tank and then be reattached to the base cone using the existing bracket.

12. **Anchor Bolts**: After abrasive blast cleaning, the anchor bolts, gussets, and nuts should then be examined for deterioration. If deterioration is found and the anchor bolts are mild steel, the deteriorated areas of the anchor bolts should be repair welded as necessary.

13. **Painter's Rings: The painter's rings should not be used for rigging purposes or personnel access.**

14. **Overflow Pipe**: As a gap was located between the flap gate and overflow pipe and the existing screening on the discharge end of the overflow pipe did not appear to be restrictive enough to prevent the ingress of insects into the tank, it is recommended that an elastomeric check valve be installed. The installation of an elastomeric check valve would offer protection against the ingress of insects and would also deter clogging.

15. **Clog-Resistant Vent**: The tank was not equipped with a clog-resistant vent. AWWA Standards recommend that all vents with screening against insects be designed to ensure "fail-safe" operation if the insect screens become occluded. Inadequate ventilation could cause a tank collapse if the tank is rapidly drained while the screen is occluded or frosted over. Therefore, the existing vent should be replaced with a new clog-resistant vent. The new vent should be designed so that it is removable so that it can serve as an additional means of access to the tank interior wet container. Until such time as the vent can be replaced, the existing screening should be shielded from wind-driven dust and debris, and the gaps in the screening should be eliminated.

16. **Existing Roof Manhole**: The hole cut in the existing roof manhole curb should be sealed.

17. **Additional Roof Manhole**: OSHA and safety-related standards require a second roof manhole for emergency egress during coating and repairing operations. Therefore, if a removable vent is not installed, a second roof manhole should be installed in the roof. The manhole and cover should be designed in accordance with current industry and safety standards. Both the new and the existing roof manholes should be locked at all times to prevent unauthorized access to the tank interior.

18. **Obstruction Lights**: The Owner should file a FAA Form 7460 to verify the need for obstruction lighting on the tank. If the lighting is not required, the light assembly and all associated conduits and brackets should be removed. If the lights are required, a photoelectric cell should be integrated into the system to reduce bulb maintenance costs.

C. Interior Dry Surfaces

1. **Life of the Interior Dry Coating**: The coating on the majority of the interior dry surfaces of the tank appeared to be in fair overall condition. However, surface rust and peeled topcoating were observed. Tank Industry Consultants believes that the interior dry surfaces should be painted within the next 2 years from a corrosion standpoint. Due to the very poor adhesion of the existing interior dry

coating and the widespread areas of peeled coating, completely cleaning and recoating the interior dry surfaces is the recommended option.

2. **Coating Testing**: Prior to preparation of specifications for the cleaning and coating of the interior dry portions of the tank, several samples of the coating system should be subjected to laboratory analysis to test for ingredients which may at that time be subject to regulations concerning their handling and disposal.

3. **Recommended Coating System**: Due to the very poor adhesion of the existing coating and the widespread areas of peeled coating, the entire interior dry surfaces should be cleaned to the equivalent of an SSPC-SP 6, Commercial Blast Cleaning and have a two-coat epoxy coating system applied. The typical life of a properly formulated and applied epoxy coating system is approximately 15 to 20 years or more in a dry environment. These coatings are also presently manufactured to meet current VOC requirements.

4. **Grinding and Bracket Removal**: Any unused brackets or erection lugs should be removed prior to the interior dry repainting. Any weld burrs, weld spatter, or erection scars should be ground off to provide a smooth surface for the application of the coating.

5. **Painter's Rail: The painter's rail located near the top of the interior dry pedestal should not be used for rigging purposes or personnel access.**

6. **Inlet/Outlet Pipe**: When the interior dry is repainted, sections of insulation should be removed from the inlet/outlet pipe to evaluate its condition. Specifications should be written to include an alternate bid for pipe replacement and insulation replacement. Until such time as the interior dry is repainted, the expansion joint should be insulated.

7. **Bowl Manhole**: The cover on the bowl manhole should be equipped with a hinged support arm located in the interior dry part of the tank. The crabs should be equipped with retaining chains in order to hold them to the bowl when the cover is removed.

8. **Interior Dry Ladders**: If compliance with current OSHA and safety-related standards is desired, the interior dry ladders should be replaced with ladders which meet current dimensional requirements and have rungs which are spaced at consistent intervals. In addition, the safety cage is not required on ladders with safe-climbing devices. In order to reduce cleaning and painting costs and future maintenance costs and because the existing safety cage does not meet current dimensional requirements, Tank Industry Consultants recommends that the base cone ladder safety cage be removed. At the time of the interior dry repainting, the interior dry ladder safe-climbing devices should be cleaned and protected from the application of coating, and the safe-climbing devices on the base cone and pedestal ladder should be modified to extend the industry recommended 54 in. minimum above the condensate and top platforms, respectively. A safe-climbing device should be installed on the access tube ladder. The cables and conduits should be relocated away from the interior dry ladders. The ladders and platforms should be modified to allow adequate head clearance through the platforms.

9. **Interior Dry Lighting**: The lighting fixtures in the interior dry portions of the tank should be regularly maintained. Any burned out bulbs, damaged globes, or missing cages or fixtures should be replaced. The exposed wiring on the uncovered junction box for the dry lightning system should be enclosed.

10. **Condensate and Top Platforms**: At the time of interior dry recoating, the platforms should be flooded with water and additional drain holes should be installed. The orientation of the drain pipe on the condensate platform should be modified so that it adequately drains water from the platform. The top platform access opening should be equipped with a closable cover.

D. Interior Wet Surfaces

1. **Life of the Interior Wet Coating**: The interior wet coating system appeared to be in fair overall condition as areas of surface rust were observed. Installing a cathodic protection system could delay the interior wet recoating for several years. If a cathodic protection system is not installed, the interior wet should be re-evaluated in 3 years to determine a recoating schedule. It is recommended that when the interior wet is completely cleaned and repainted, an epoxy coating system should be used.

2. **Coating Testing**: Prior to preparation of specifications for the cleaning and coating of the interior of the tank, several samples of the interior coating system should be subjected to laboratory analysis to test for ingredients which may at that time be subject to regulations concerning their handling and disposal.

3. **Cathodic Protection**: To prevent further corrosion and metal loss at the areas of coating failure below the top capacity level, a cathodic protection system should be installed.

   a. **Type**: When the cathodic protection system is installed, an ice-resistant cathodic protection system which features long-life anodes, automatic potential and current control, with an independently controlled circuit should be specified.

   b. **Scheduling**: If the cathodic protection system is installed prior to complete cleaning and repainting the tank interior, the system should be removed and protected prior to cleaning and painting. After the interior is completely cleaned and recoated, the cathodic protection system should not be energized until after the First Anniversary Inspection. The Owner should conduct washouts and evaluations approximately every 3 years to monitor the need for cathodic protection. As the interior coating begins to show signs of failure, the cathodic protection system should be energized to aid in minimizing corrosion below the top capacity level.

   c. **Maintenance**: Cathodic protection, if operated and maintained properly, will control active corrosion below the water level and extend the useful life of a coating system. It should be noted that maintenance as recommended by the cathodic protection manufacturer is required for the cathodic protection system to work properly. Without proper monitoring, the cathodic protection system may operate too high and cause the coating to blister, or the system may operate too low and not adequately protect the exposed steel surfaces.

4. **Recommended Interior Wet Coating System:**

   a. **Epoxy Coating System**: The optimum long-life coating system presently available for the interior wet surfaces of water tanks is a two-component epoxy coating system. A two-coat epoxy system is recommended for the interior wet of this tank. This coating system should meet the certification criteria of ANSI/NSF 61 and state department of health regulations.

b. **Coating Application**: When the interior wet is to be repainted, the entire tank interior wet should be cleaned to the equivalent of an SSPC-SP 10, Near-White Blast Cleaning and an epoxy coating system applied.

c. **Service Life**: The typical life of a properly formulated and applied epoxy coating system is approximately 12 to 15 years in immersion service. Tank Industry Consultants defines the life of a coating as the expected service life before repainting becomes necessary due to coating failure and corrosion. The Owner could extend the service life of the coating by installing, properly maintaining and operating a cathodic protection system to help protect the steel surfaces in areas which have experienced coating failure.

5. **Pit Welding and Pit Filling**: After initial cleaning, all significant pitting which is found should be welded, and all pitting with rough edges that would make the pitting difficult to coat properly should be filled with a solventless epoxy seam sealer. It is recommended that the pitting in the bowl be repaired within the next year by application of an epoxy seam sealer.

6. **Rough Edges**: All unused brackets should be removed from the interior and exterior surfaces at the time of the next recoating. Any weld burrs, spatter, scars or rough edges in the steel should be ground smooth to provide a better surface for coating. (It was estimated that approximately 20 man-hours of grinding will be required on the interior of the tank.)

7. **Access Tube Rail, Bowl Eye, and Roof Lugs**: **The access tube rail, bowl eye, and roof lugs should not be used for rigging purposes.**

8. **Interior Wet Ladder**: Interior wet ladders are susceptible to ice damage and accelerated rates of corrosion. If the Owner decides to keep the interior wet ladder, it should be replaced by a ladder which complies with current industry standards.

9. **Overflow Pipe**: The part of the overflow pipe located in the wet container should be relocated to the access tube.

ECONOMIC FACTORS:

Item	Cost	Life in Years
Replacement of tank with a new one	$ 875,000[1]	75+

The following is a complete list of repairs and estimated costs for their respective recommendations found in the RECOMMENDATION section of this report.

Item	Sanitary & Safety	Scheduled Maintenance Repairs
Clean and Paint Exterior:		
Spot Repair and Topcoat		$ 70,000
Localized Containment		40,000
SP 6, Complete Clean, Epoxy/Polyurethane System		100,000
Containment		80,000
Clean and Paint Interior Dry:		
Completely Clean and Repaint		20,000
Clean and Paint Interior Wet:		
SP 10, 2-Coat Epoxy System		65,000
Cathodic Protection System		10,000
Miscellaneous Chipping and Grinding		2,000
Pit Repair		2,000
Overflow Pipe Elastomeric Check Valve	$ 3,500	
Relocate Overflow Pipe to Interior Dry Access Tube	8,000	
Install Top Platform Access Opening Cover	1,000	
Install Curbs around Top Platform Access Opening	1,500	
Replace Interior Dry Ladders	8,000	
Remove Base Cone Ladder Safety Cage	1,000	
Install Access Tube Ladder Safe-Climbing Device	2,000	
Remove Interior Wet Ladder	1,000	
Replace Interior Wet Ladder	3,000	
Install Interior Wet Ladder Safe-Climbing Device	2,000	
Clog-Resistant Vent	7,500	
Existing Vent Modifications	2,000	
Additional Roof Manhole	5,000	
Contingency Items	3,000	5,000

Estimates are believed to be a high average of bids that would be received in 2009.

[1] The replacement estimate includes costs associated with new tank fabrication and erection, foundation, painting, and engineering. The budget estimate given does not include costs associated with tank demolition, site acquisition, and distribution interruptions.

The following economic factors include only those work items which the Engineer believes to be the minimum to properly maintain this tank from an operational standpoint. Other items related to safety and risk management should be evaluated by the Owner.

Item	Cost
Clean and Paint Interior Dry:	
Completely Clean and Repaint	$ 20,000
Cathodic Protection System	10,000
Overflow Pipe Elastomeric Check Valve	3,500
Install Top Platform Access Opening Cover	1,000
Install Curbs around Top Platform Access Opening	1,500
Replace Interior Dry Ladders	8,000
Remove Base Cone Ladder Safety Cage	1,000
Install Access Tube Ladder Safe-Climbing Device	2,000
Remove Interior Wet Ladder	1,000
Clog-Resistant Vent	7,500
Contingency Items & Touch-Up Coating Damaged by These Repairs	20,000
Total of Engineer's Recommendations	**$ 75,500**

Tank Industry Consultants has no control over the cost of labor, materials, or equipment, or over the contractors' methods of determining prices, or over competitive bidding, or the market conditions. Opinions of probable cost, as provided for herein, are to be made on the basis of our experience and qualifications and represent our best judgment as design professionals familiar with the design, maintenance, and construction of concrete and steel plate structures. However, Tank Industry Consultants cannot and does not guarantee that proposals, bids, or the construction cost will not vary from opinions of probable cost prepared for the Owner.

Due to the numerous potential scopes of work which exist, the Owner should obtain an updated budget estimate once the final scope of work has been determined. This would enable the Owner to accurately budget monies for additional mobilization costs and damaged coating rehabilitation costs.

Engineering and resident observation costs are not included in the Total of the Engineer's Recommendations because these fees are dependent upon the scope of work to be performed. Tank Industry Consultants performs all facets of the engineering services which would be required for this project. Estimated fees for engineering and resident observation will be furnished upon request.

CLOSURE:

Brief Summation: The City of Lawrence Utilities has a 500,000 gallon pedestal spheroid tank which was in fair overall condition. Proper maintenance after completing the recommendations herein would include periodic washouts and evaluations approximately every 3 years, and the installation and proper operation and maintenance of a new cathodic protection system.

Contractor Selection: The work should be performed by a competent bonded contractor, chosen from competitive bids taken on complete and concise specifications. The coatings used should be furnished by an experienced water tank coating manufacturer, supplying the field service required for application of technical coatings.

Standards for Repairs and Coatings: All work done and coatings applied should be applied in accordance with ANSI/NSF Standard 61, the manufacturer's recommendation, AWWA D100 and AWWA D102 (latest revisions), and the SSPC: The Society for Protective Coatings.

Observation of Work: Observation of the work in progress by experienced personnel will offer additional assurance of quality protective coating application. Observations can be performed on a continuous basis or spot (critical phase) basis. The actual cost of observation may be less using spot as opposed to full-time resident observation; however, with spot observation it is often necessary for work to be redone to comply with the specifications. This somewhat lowers the quality of the finished product, lengthens the job, and is frequently a cause of conflict between the contractor, Owner, and field technician. Resident full-time observation minimizes the amount of "rework" required.

Anniversary and Maintenance Evaluations: An anniversary evaluation should be conducted prior to the end of the one year bonded guarantee. Washouts and coating, structural, sanitary, safety, and corrosion evaluations should be conducted not less than every three years.

Time Frame: If the work is not performed within the next 2 years, the structure should be reevaluated prior to the preparation of specifications and solicitation of bids.

Specifications and Bidding Documents: The recommendations in this report are not intended to be specifications on which a contractor can bid. Complete bidding documents must include general and special conditions, detailed technical specifications, and other information necessary for the competitive bidding process. To properly protect the interests of the Owner, Contractor, and Engineer; the initial evaluation, the technical specifications, legal portions of the contract documents, and the observation should be performed by the same firm or with close coordination of all parties involved.

Limitations of Evaluation: It is believed that the conditions reported herein reflect the condition of the tank as observed on the date of the evaluation, using reasonable care in making the observations, and safety in gaining access to the tank. Should latent defects be discovered during the cleaning of the structure, they should be brought to the attention of the Owner and the Engineer.

Seismic and Wind Loadings: This tank is located in a region of low seismic activity. This evaluation and the reporting of the condition of this tank do not warrant the structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications which may be required for compliance with present structural codes. It is possible the tank was erected in compliance with pre-existing industry standards which have since been replaced by more restrictive standards.

Hazardous Materials in Coatings: It should be taken into consideration that Federal, State, and local environmental agencies have placed stricter controls on the removal of heavy-metal based coatings from steel structures by the use of conventional abrasive blasting techniques. The paint and blast residue may be considered to be hazardous waste depending on the concentration of heavy-metal particles in residue.

Please contact Tank Industry Consultants if you have any questions or comments.

Respectfully submitted,

Tank Industry Consultants

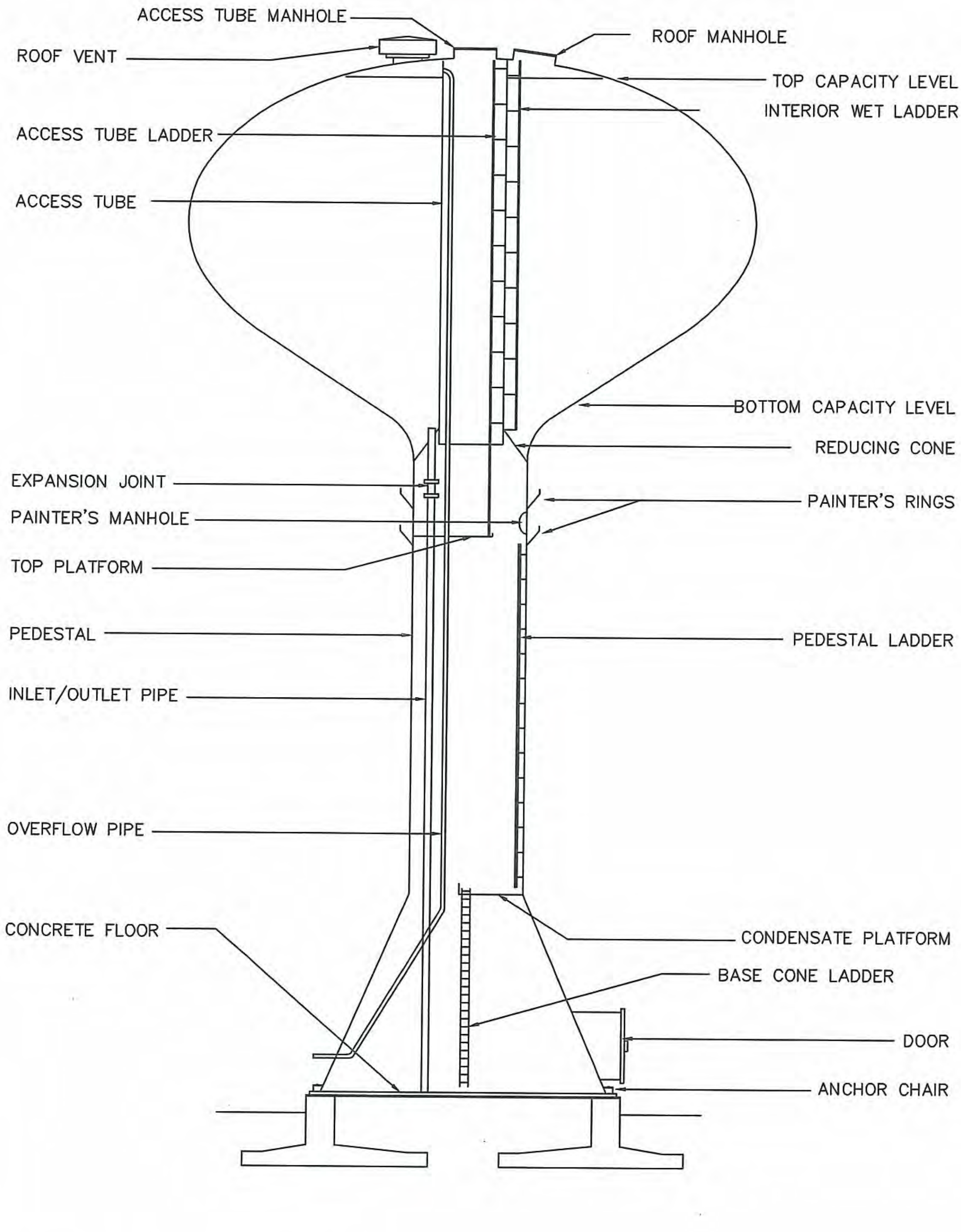
Jennifer Coon, CHMM, CET

12.12.08

Gregory R. "Chip" Stein, P.E.
Managing Principal

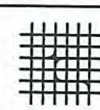
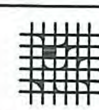
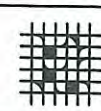
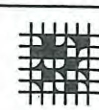
SINGLE PEDESTAL SPHEROID TANK

NOMENCLATURE



Classification of Adhesion Test Results

Method A – X Cut Tape Test Approx. 1.5 in. long cuts at 30 deg. to 45 deg. apart.	Surface	Classification
No peeling or removal.		5
Trace peeling or removal along incisions.		4
Jagged removal along incisions up to 1/16 in. (1.6mm) on either side.		3
Jagged removal along most of incisions up to 1/8 in. (3.2mm) on either side.		2
Removal from most of the area of the X under the tape.		1
Removal beyond the area of the X.		0

Method B – Lattice Cut Tape Test Six parallel cuts at 2mm apart.	Surface	Classification
The edges of the cuts are completely smooth; none of the squares of the lattice are detached.	No Failure	5
Small flakes of the coating are detached at intersections; less than 5% of the lattice is affected.		4
Small flakes of the coating are detached along edges and at intersections of cuts. The area affected is 5% to 15% of the lattice.		3
The coating has flaked along the edges and on parts of the squares. The area affected is 15% to 35% of the lattice.		2
The coating has flaked along the edges of cuts in large ribbons and whole squares have detached. The area affected is 35% to 65% of the lattice.		1
Flaking and detachment worse than grade 1.		0

Tank Industry Consultants

7740 West New York Street
Indianapolis, Indiana 46214

Telephone – 317/271-3100
FAX – 317/271-3300

- CERTIFICATE OF ANALYSIS -

Report Date: *10-Dec-08*

Client ID: TANK_INDUST

Tank Industry Consultants
7740 West New York Street
Indianapolis, Indiana 46214

Attn: Julie Perkins

Phone: (317) 271-3100
FAX: (317) 271-3300

Our Lab # 08014555-001 **Your Sample ID:** Int. Dry B. Conc

Your Project # 08.110.H214.01 **Collection Date:** 10/22/08
Your Project Name: Paint Samples **Collected By:** Client
Sample Type: Paint Chips **Receipt Date:** 12/03/08 14:20

Total Metals, ICP-AES

Analytical Method	Prep Method	Prep Date	By
SW846 6010B	SW846 3050B	12/9/2008	iholmes

Parameter	Result	Units	Qual	Quant. Limit	CAS #	Analysis Date	By
Cadmium, Cd	< 25.0	mg/kg		25.0	7440-43-9	12/10/2008	kfoltz
Chromium, Cr	9030	mg/kg		250	7440-47-3	12/10/2008	kfoltz
Lead, Pb	308	mg/kg		250	7439-92-1	12/10/2008	kfoltz

Our Lab # 08014555-002 **Your Sample ID:** Int. Wet

Your Project # 08.110.H214.01 **Collection Date:** 10/22/08
Your Project Name: Paint Samples **Collected By:** Client
Sample Type: Paint Chips **Receipt Date:** 12/03/08 14:20

Total Metals, ICP-AES

Analytical Method	Prep Method	Prep Date	By
SW846 6010B	SW846 3050B	12/9/2008	iholmes

Parameter	Result	Units	Qual	Quant. Limit	CAS #	Analysis Date	By
Cadmium, Cd	< 25.0	mg/kg		25.0	7440-43-9	12/10/2008	kfoltz
Chromium, Cr	< 250	mg/kg		250	7440-47-3	12/10/2008	kfoltz
Lead, Pb	< 250	mg/kg		250	7439-92-1	12/10/2008	kfoltz

ESG Laboratories
5927 WEST 71ST STREET
INDIANAPOLIS INDIANA 46278

PHONE (317) 290-1471
FAX (317) 290-1670

Our Lab # 08014555-003

Your Sample ID: Ext. Roof Yellow, Red

Your Project # 08.110.H214.01

Your Project Name: Paint Samples

Sample Type: Paint Chips

Collection Date: 10/22/08

Collected By: Client

Receipt Date: 12/03/08 14:20

Total Metals, ICP-AES

Analytical Method	Prep Method	Prep Date	By
SW846 6010B	SW846 3050B	12/9/2008	iholmes

Parameter	Result	Units	Qual	Quant. Limit	CAS #	Analysis Date	By
Cadmium, Cd	< 25.0	mg/kg		25.0	7440-43-9	12/10/2008	kfoltz
Chromium, Cr	< 250	mg/kg		250	7440-47-3	12/10/2008	kfoltz
Lead, Pb	< 250	mg/kg		250	7439-92-1	12/10/2008	kfoltz

Our Lab # 08014555-004

Your Sample ID: Ext. B. Cone White

Your Project # 08.110.H214.01

Your Project Name: Paint Samples

Sample Type: Paint Chips

Collection Date: 10/22/08

Collected By: Client

Receipt Date: 12/03/08 14:20

Total Metals, ICP-AES

Analytical Method	Prep Method	Prep Date	By
SW846 6010B	SW846 3050B	12/9/2008	iholmes

Parameter	Result	Units	Qual	Quant. Limit	CAS #	Analysis Date	By
Cadmium, Cd	< 25.0	mg/kg		25.0	7440-43-9	12/10/2008	kfoltz
Chromium, Cr	< 250	mg/kg		250	7440-47-3	12/10/2008	kfoltz
Lead, Pb	< 250	mg/kg		250	7439-92-1	12/10/2008	kfoltz

12/10/2008

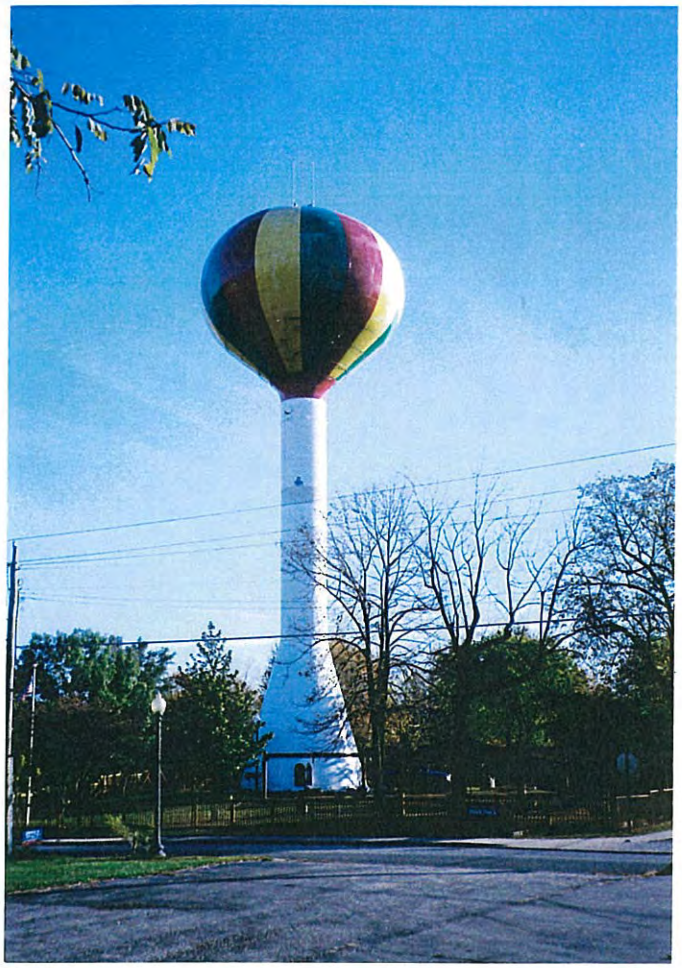
Lab Manager

Date

ESG Laboratories

5927 WEST 71ST STREET
INDIANAPOLIS, INDIANA 46278

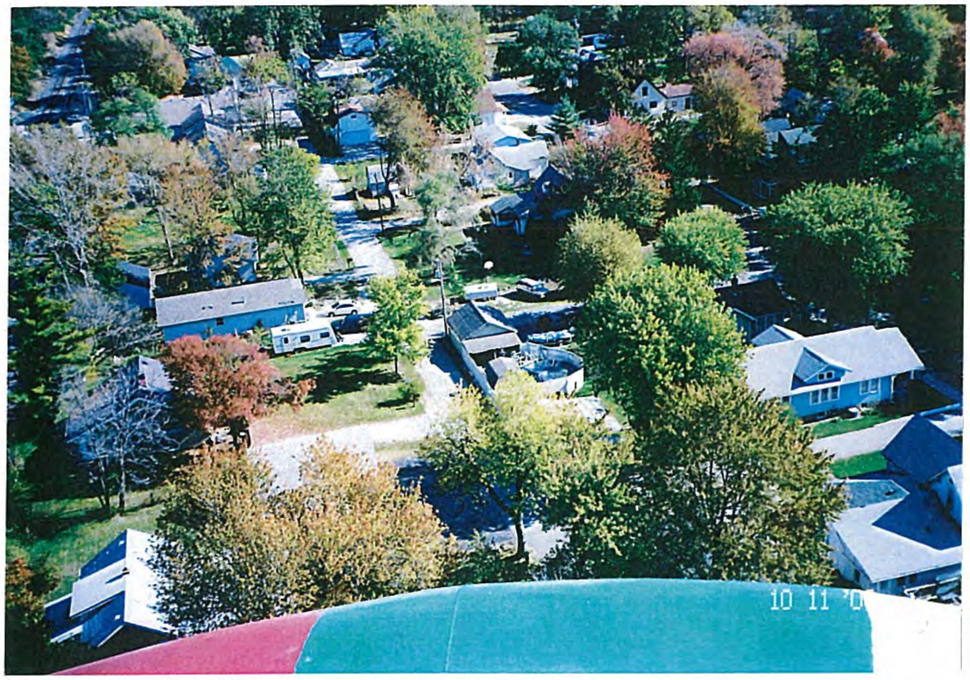
PHONE (317) 290-1471
FAX (317) 290-1670



500,000 Gallon Elevated
Pedestal Spheroid
"Oaklandon Road Tower"
City of Lawrence Utilities
Lawrence, Indiana

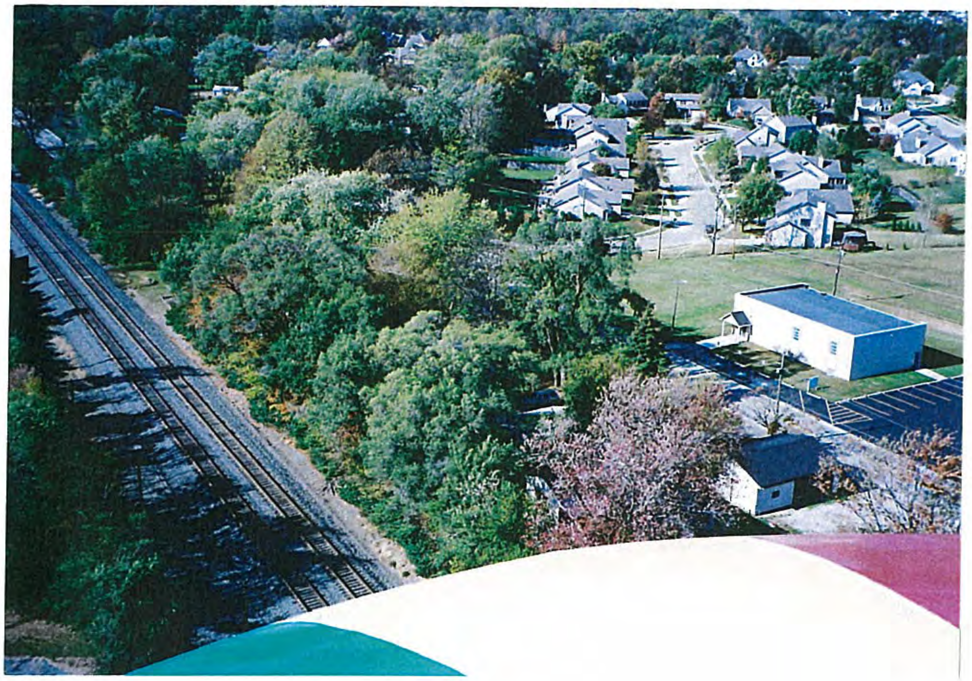
1. Tank and site.

2. Tank.



3. Surrounding area.

4. Surrounding area.



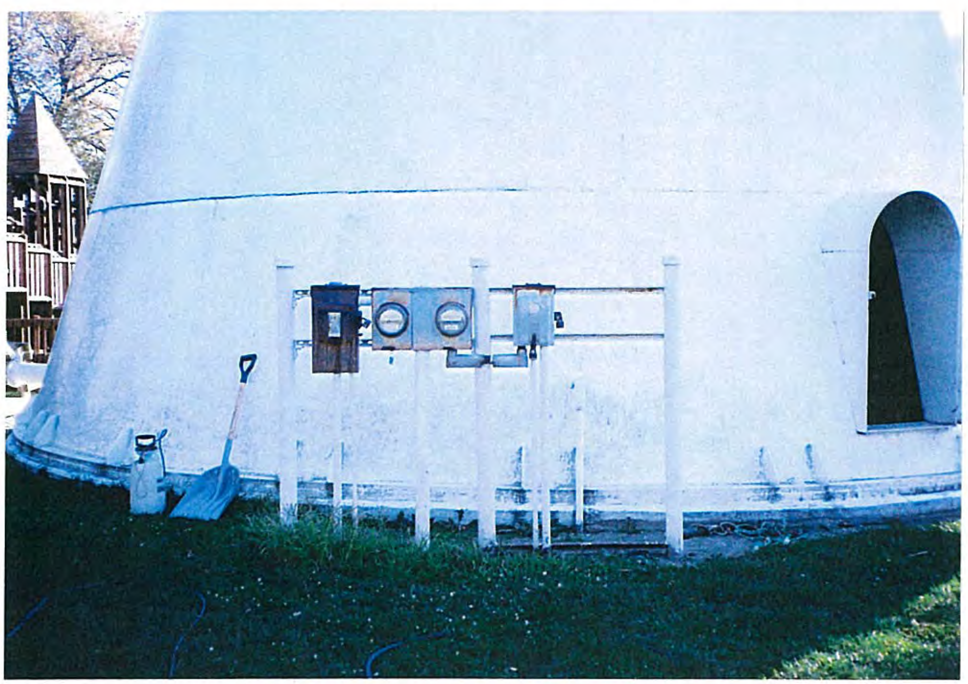
5. Surrounding area.

6. Site.

7. Site.

8. Playground adjacent to tank.

9. Playground adjacent to tank.



10. Electrical meters adjacent to tank.

11. Overflow pipe and condensate pipe discharges above splash pad.

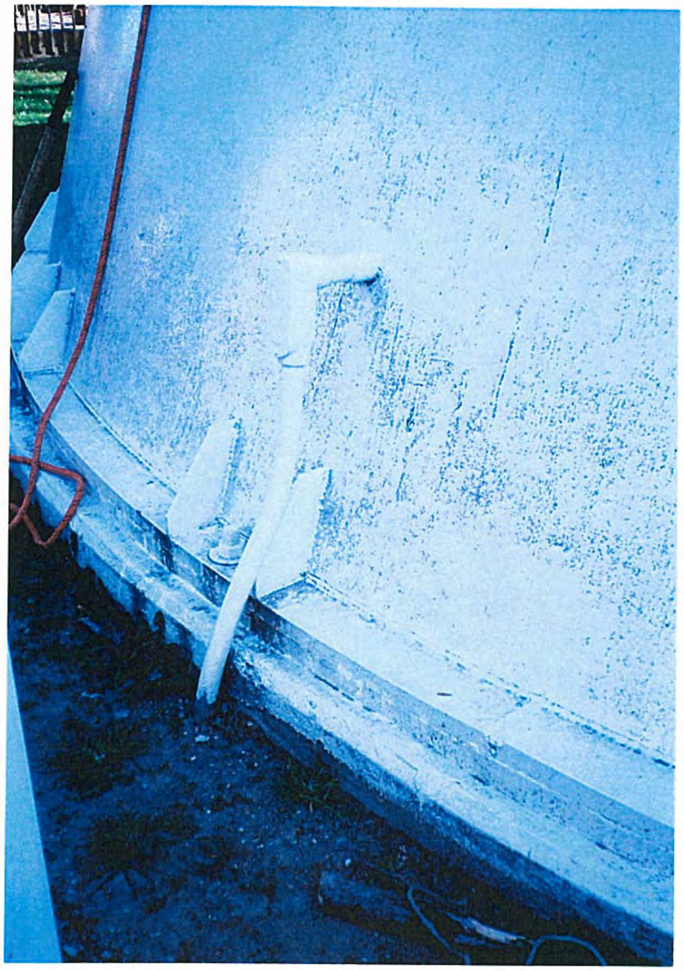
12. Overflow pipe and condensate pipe discharges.

13. Tank foundation, grout, base plate, anchor bolt, and gussets. Note mildew.

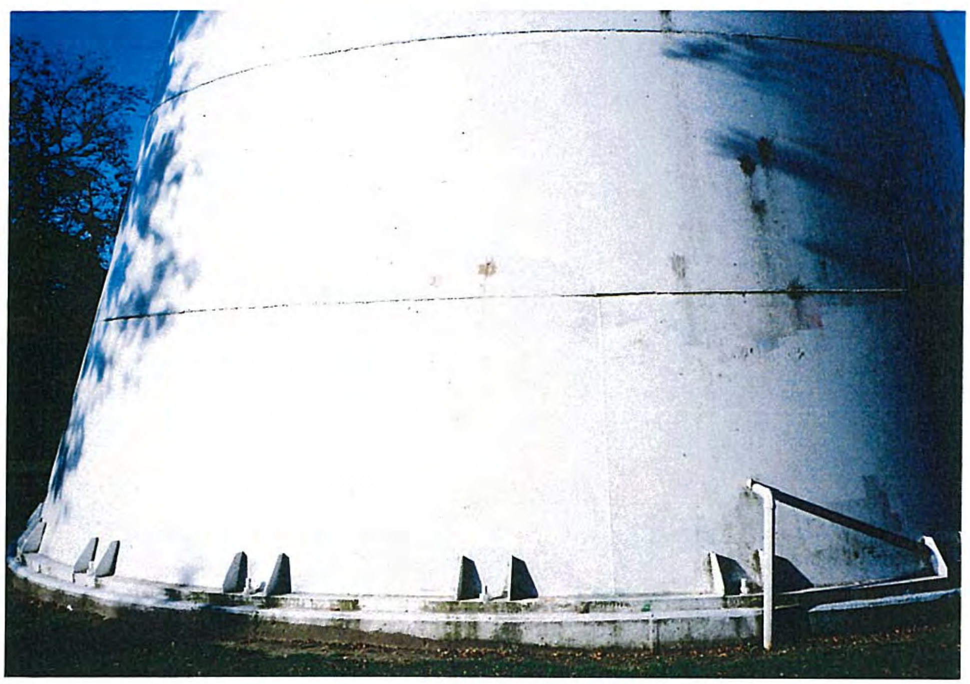
14. Junction box on base cone.

15. Conduit on base cone.

16. Broken conduit on base cone.



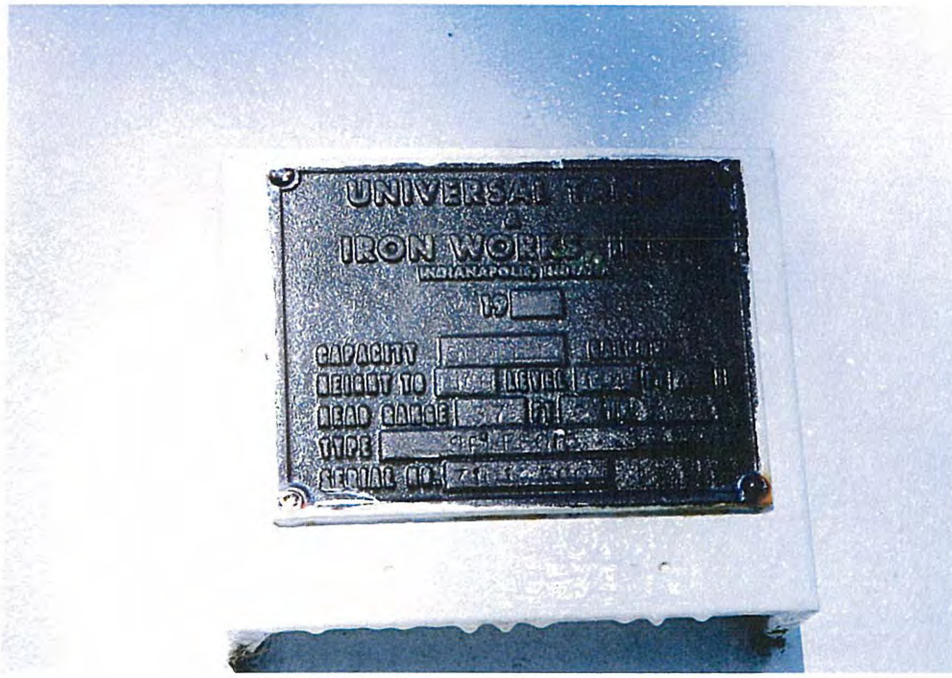
17. Conduit on base cone.



18. Base cone.

19. Coating adhesion tests and coating thickness measurements on base cone.

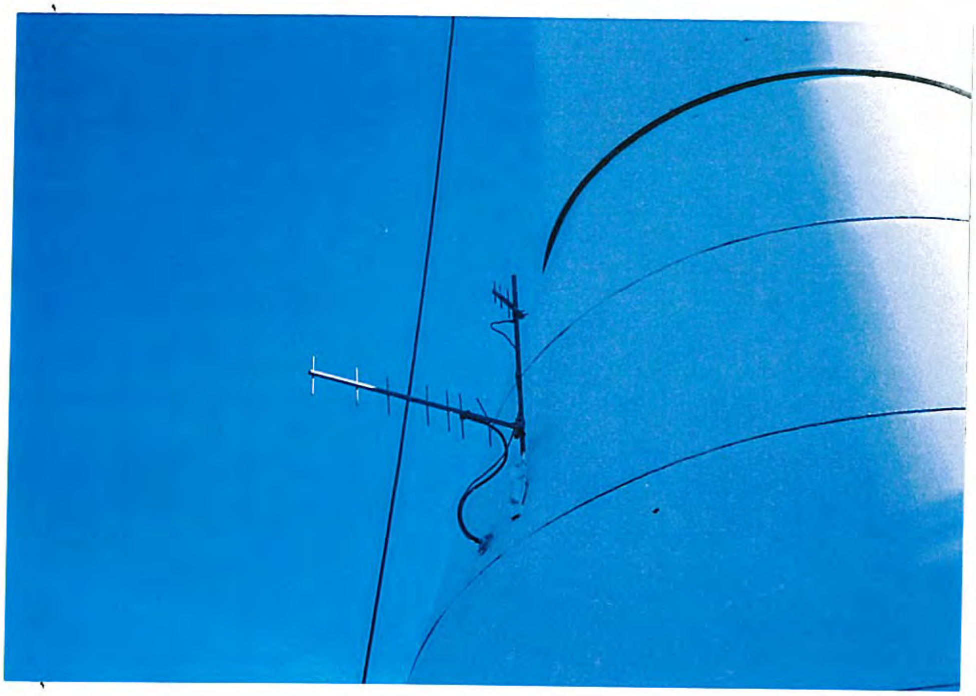
20. Access door.



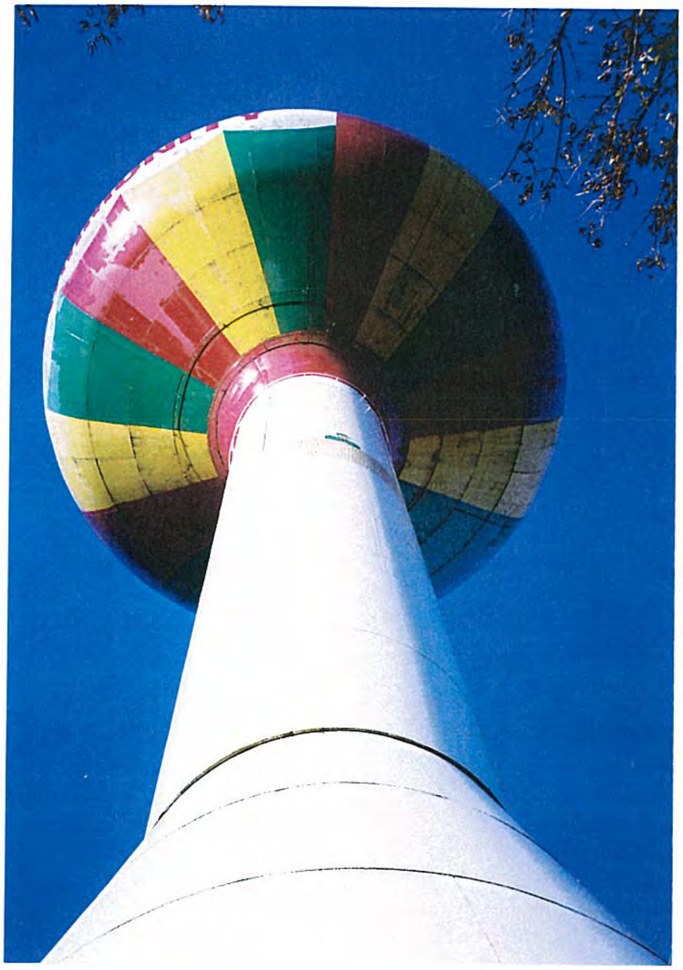
21. Tank nameplate.

22. Cracked base cone coating.

23. Graffiti on base cone.



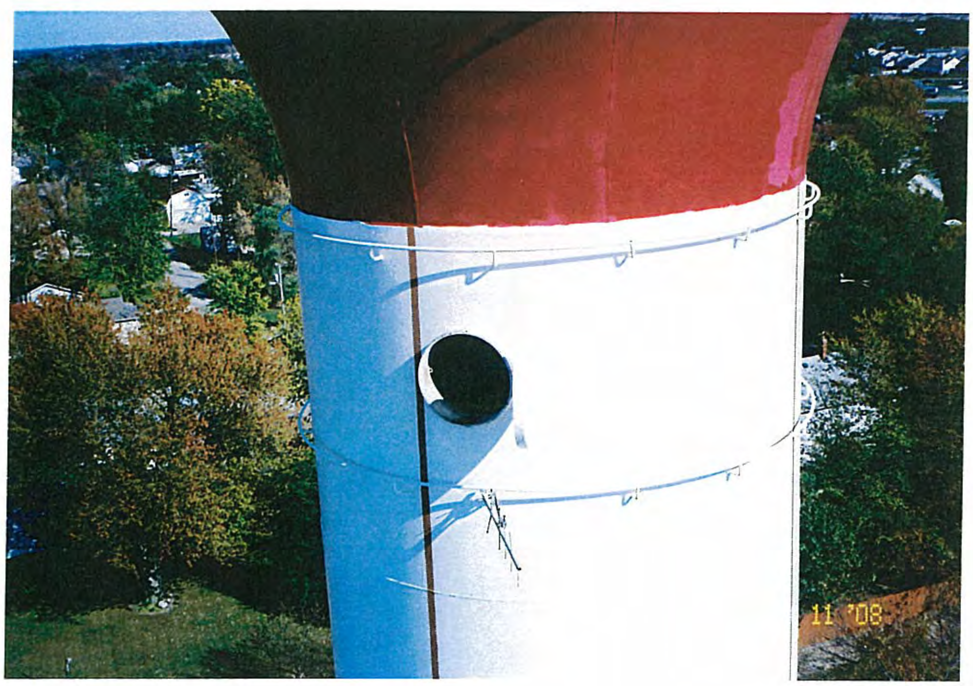
24. Antennas on base cone.



25. Pedestal and bowl.

26. Graphics on pedestal.

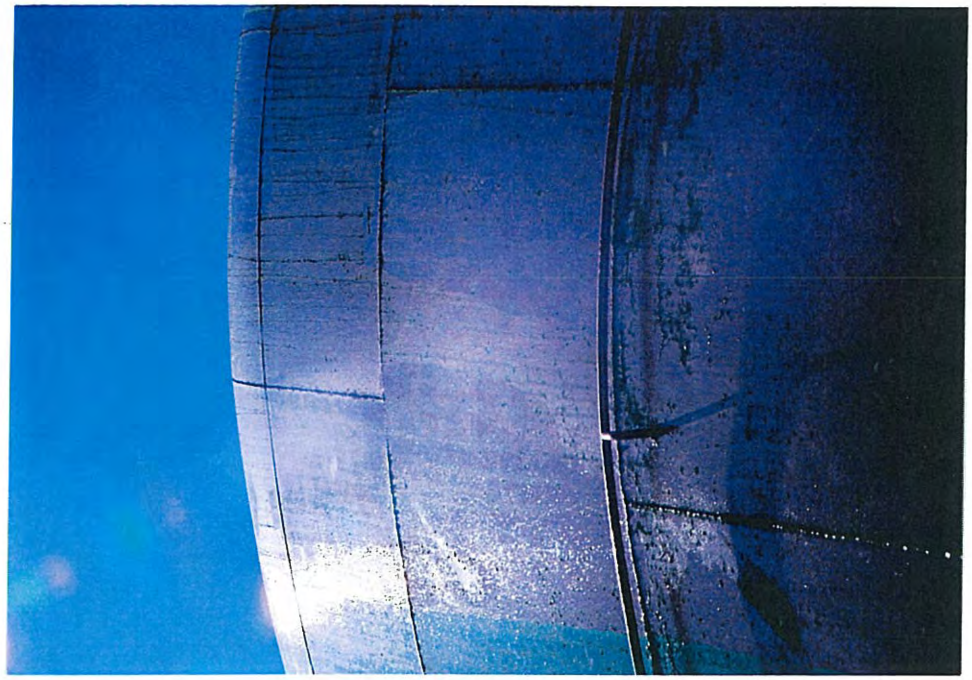
27. Painter's rings and painter's manhole.



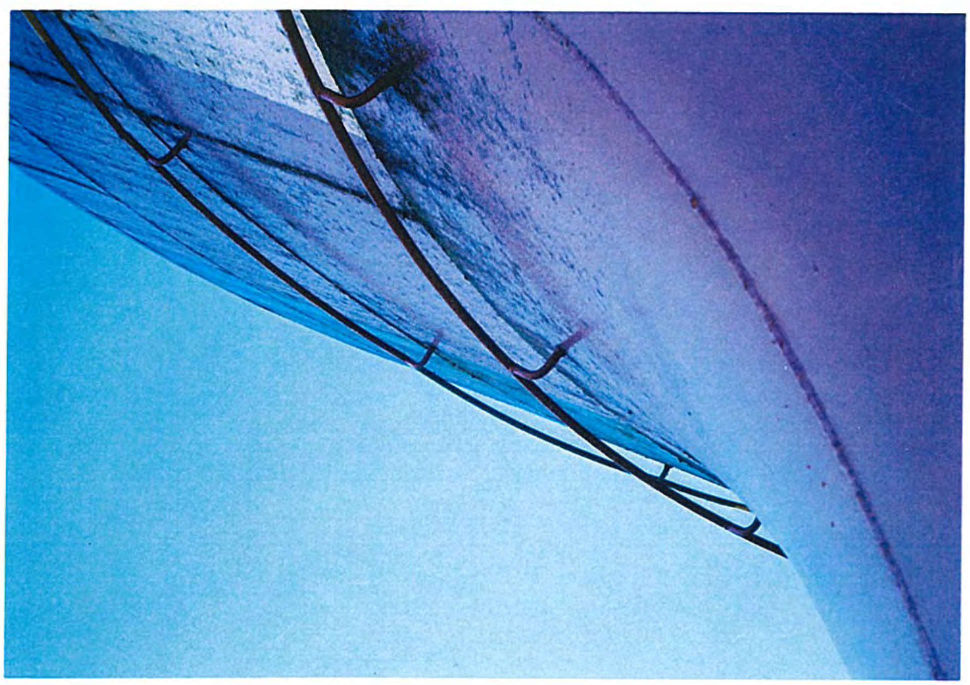
28. Painter's rings and painter's manhole.

29. Painter's ring and mildew on pedestal seam.

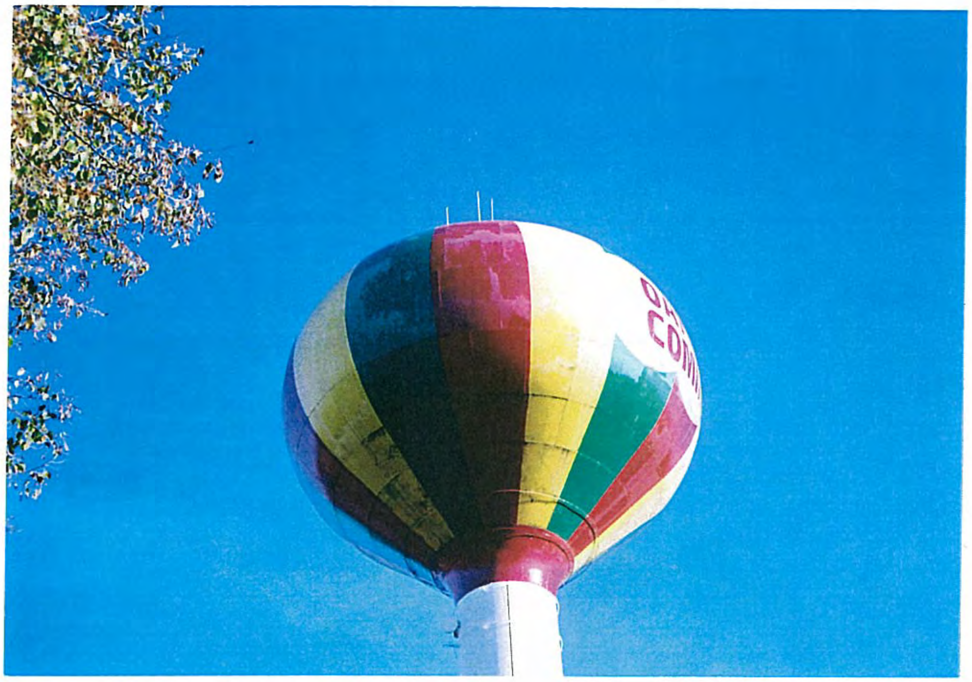
30. Faded coating on pedestal.



31. Bowl and painter's ring.

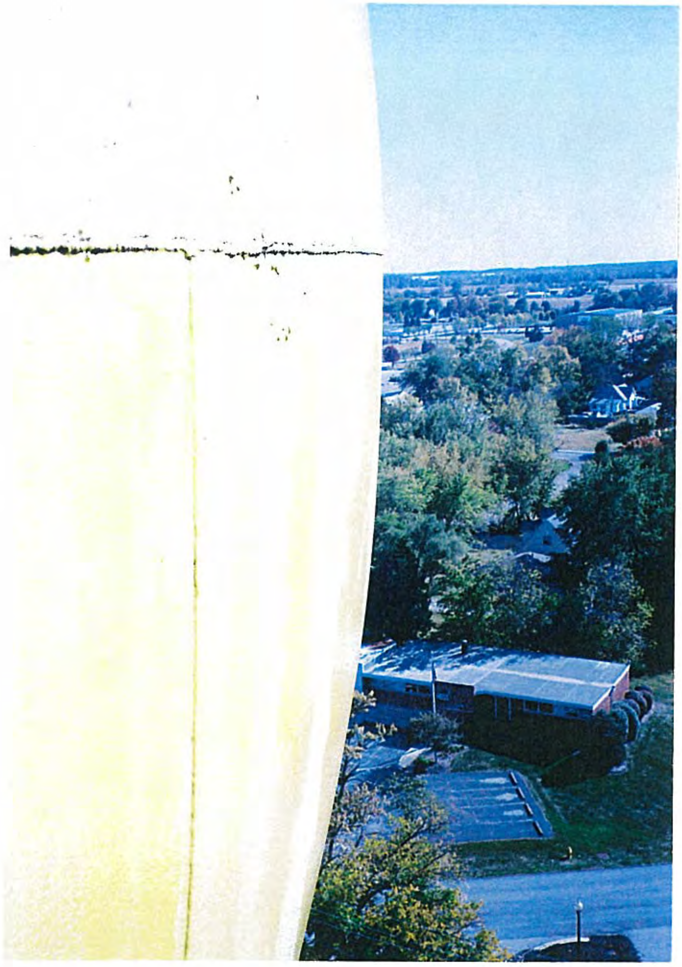


32. Bowl and painter's rings.

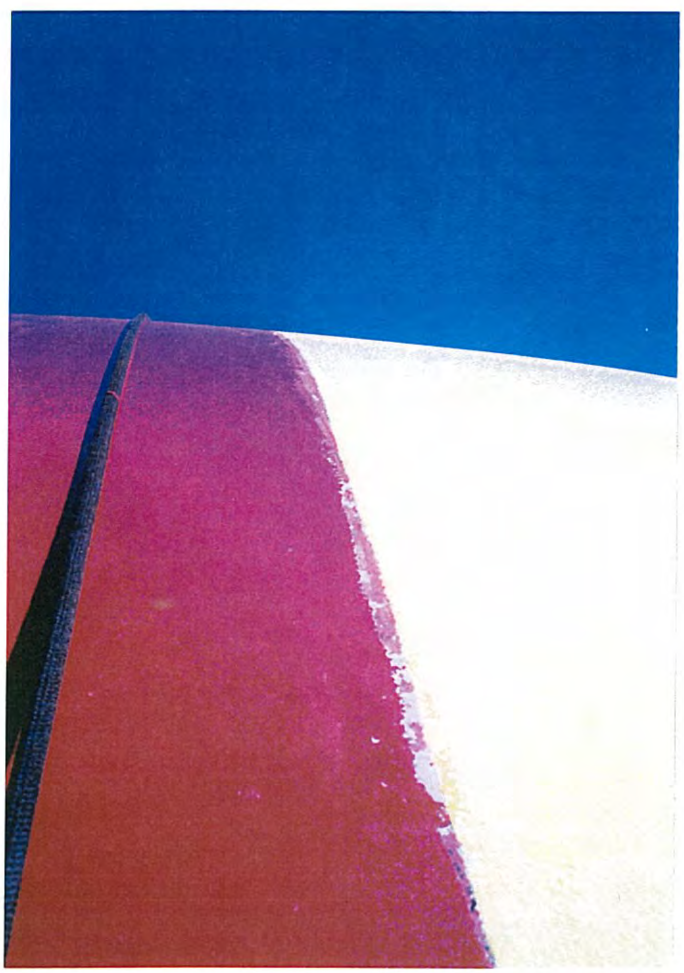


33. Container.

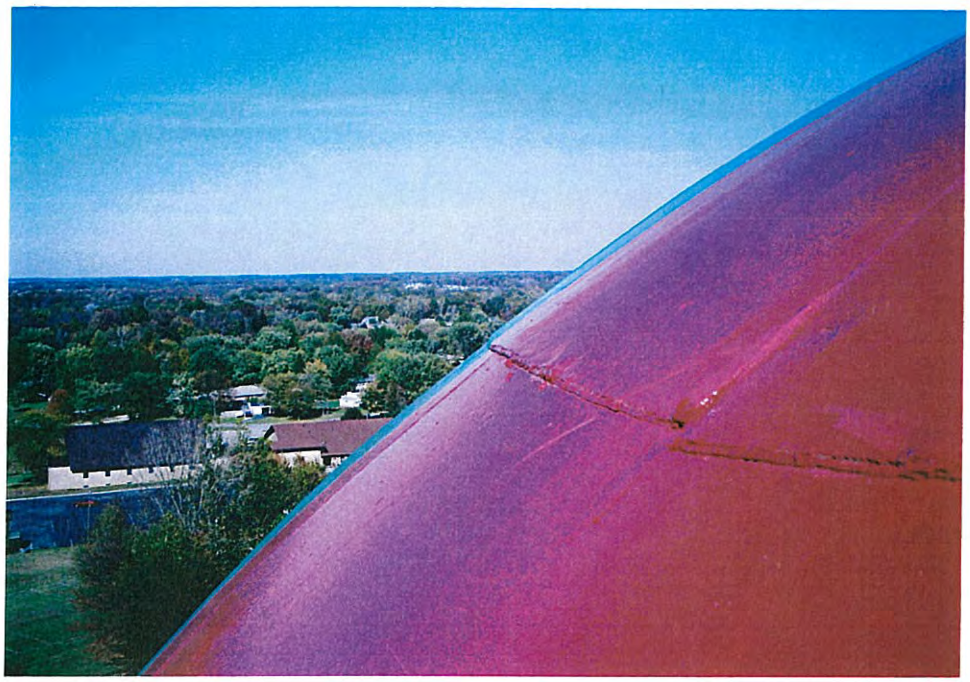
34. Container.



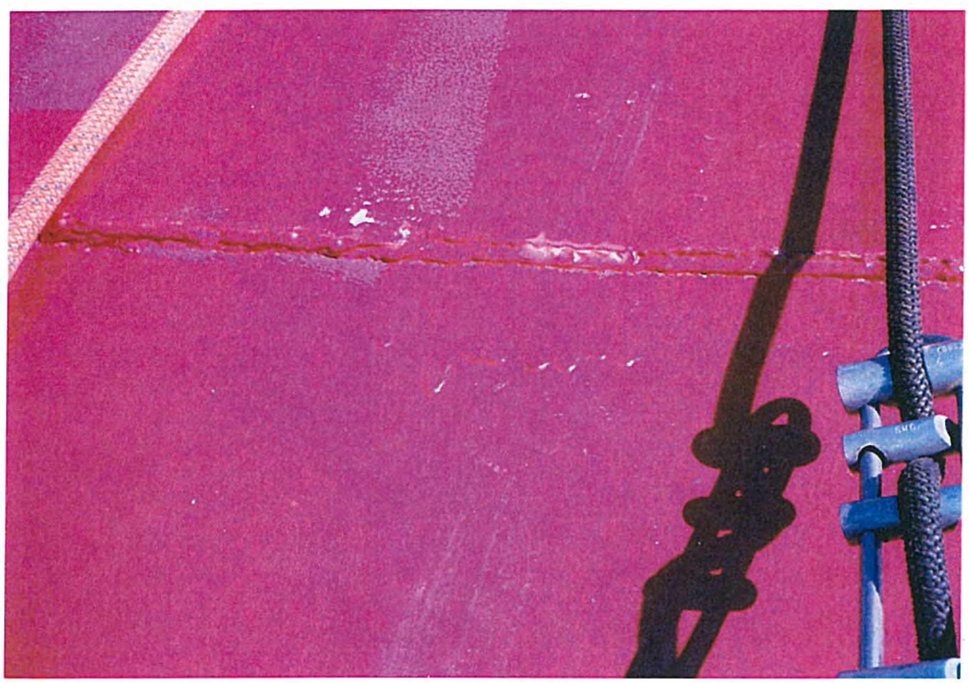
35. Faded graphic coating on shell.



36. Faded graphic coating on roof knuckle.

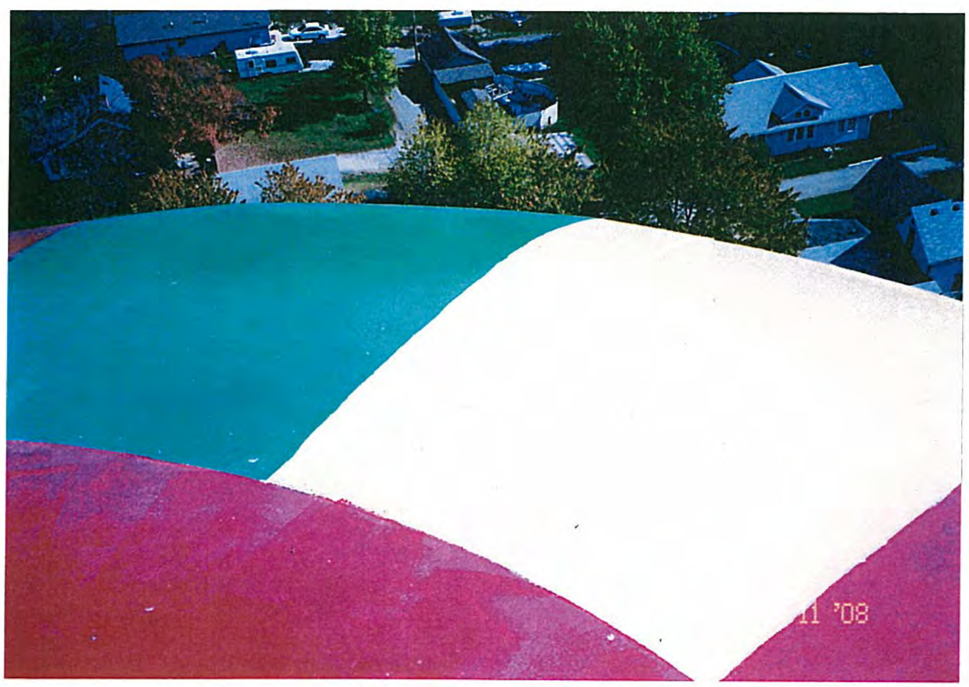


37. Roof knuckle.



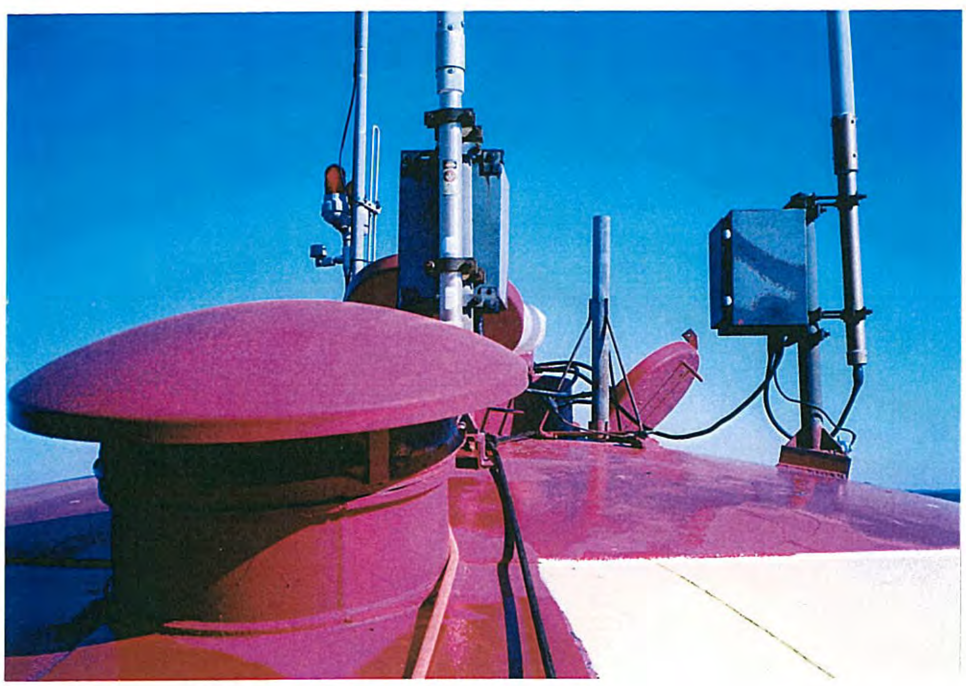
38. Faded graphic coating on roof.

39. Roof exterior.



40. Roof exterior.

41. Coating adhesion test on roof.

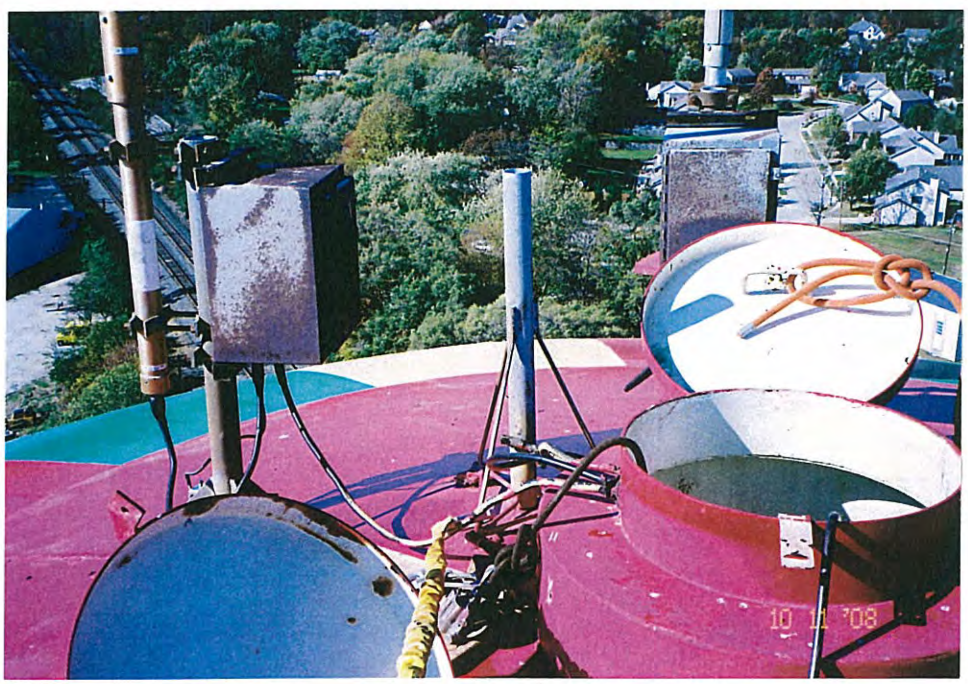


42. Roof vent, obstruction lights, antennas, electrical cabinets, and antenna equipment.

43. Roof vent, antennas, electrical cabinets, and antenna equipment.

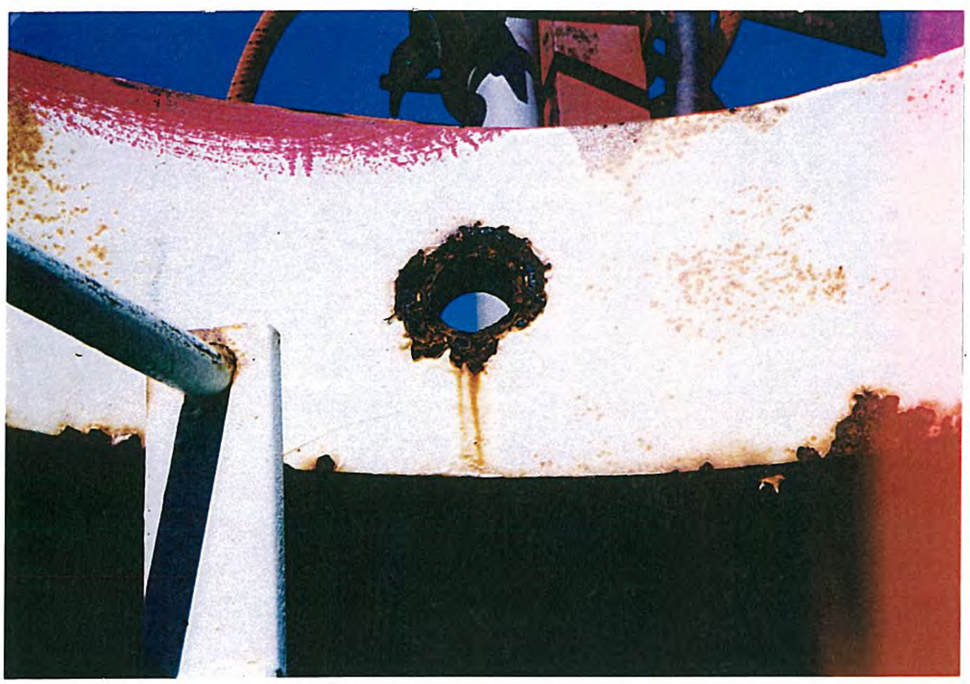
44. Roof vent.

45. Roof vent screening.

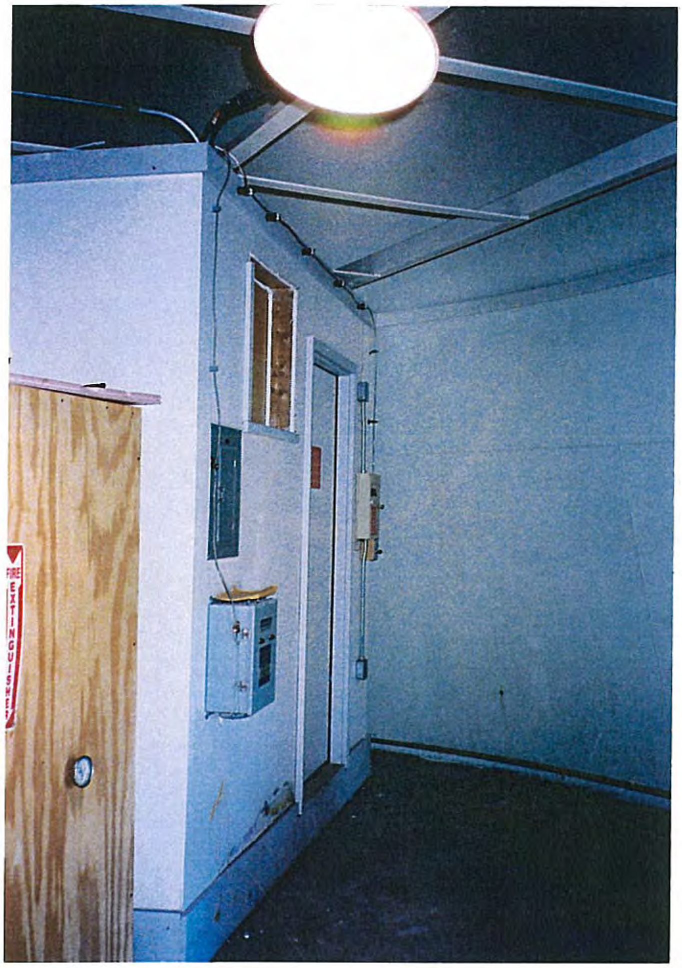


46. Antenna equipment and access tube manhole.

47. Antenna bracket on roof.



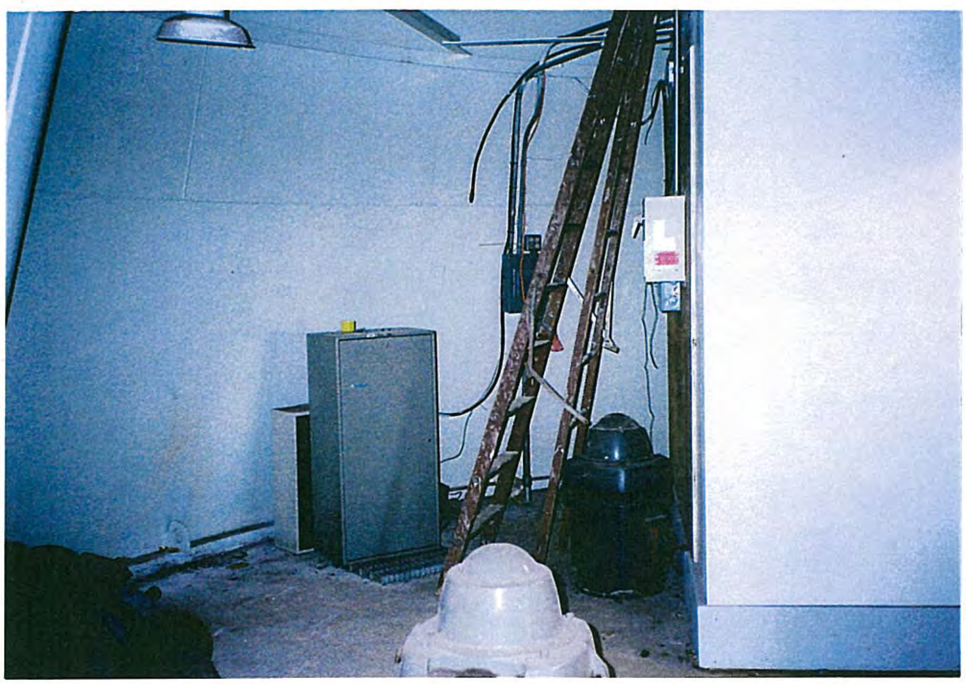
48. Corrosion around hole in container roof manhole curb.



49. Enclosure in base cone interior.

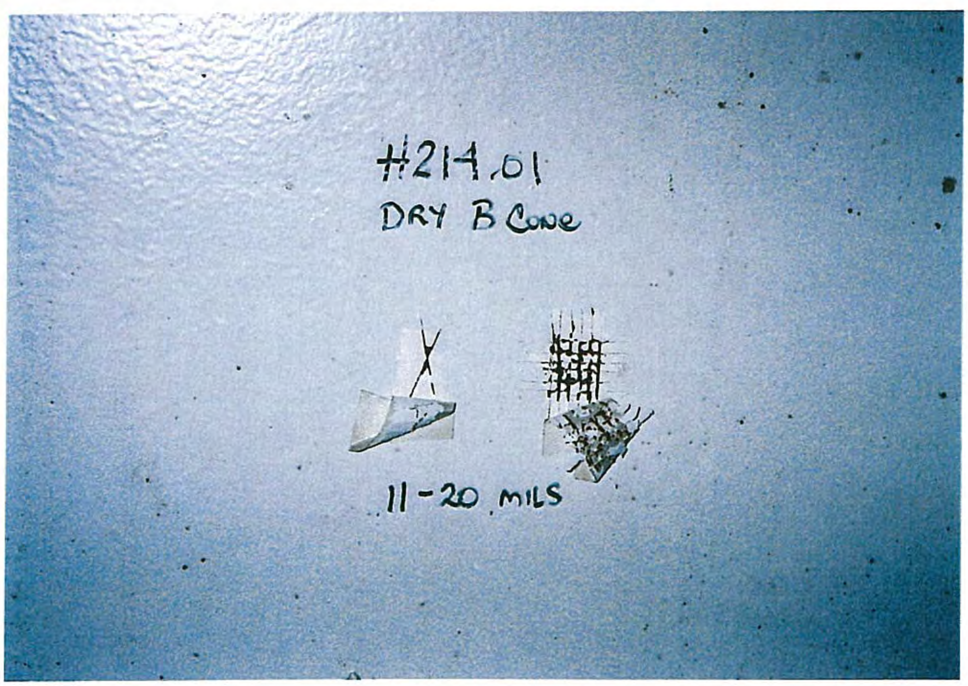
50. Enclosure in base cone interior.

51. Dirt on base cone enclosure floor around inlet/outlet pipe penetration through concrete floor/

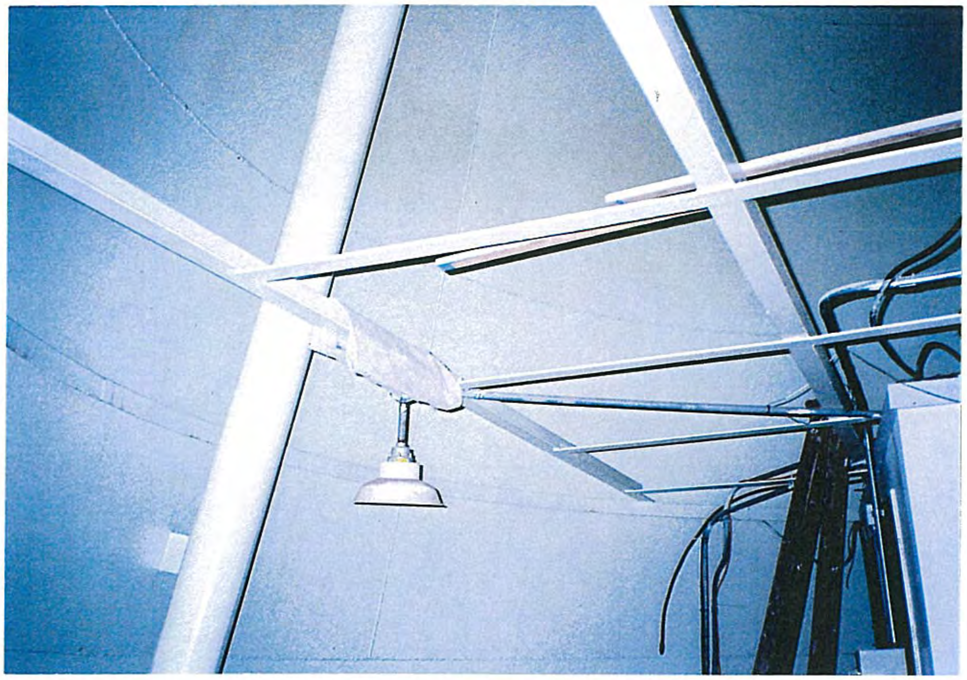


52. Electrical cabinets and unused pumps in base cone.

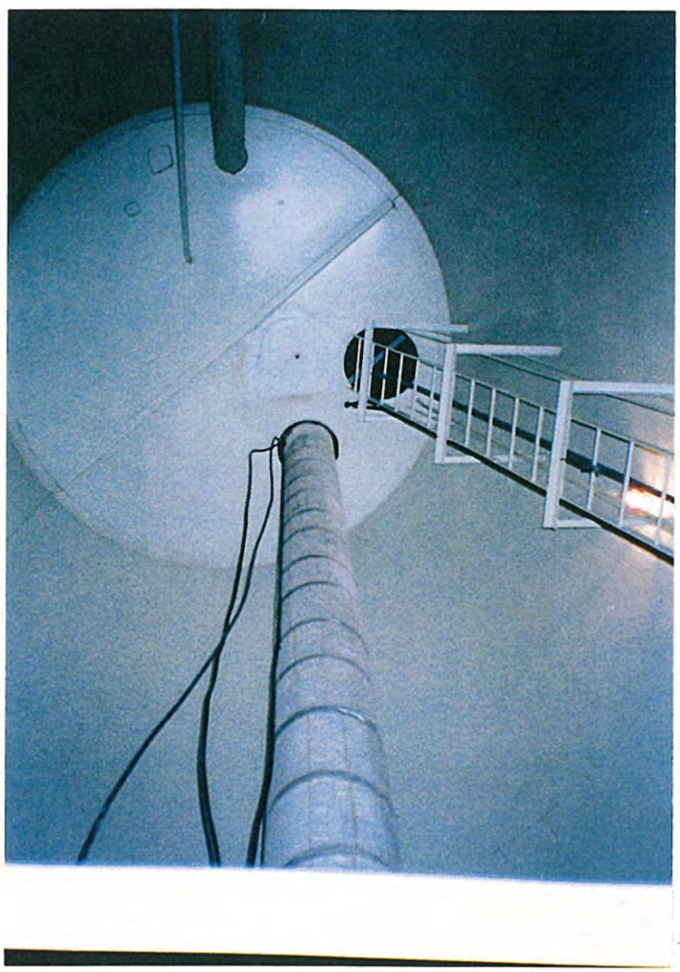
53. Peeled coating on interior dry base plate projection.



54. Coating thickness measurements and coating adhesion tests on in dry base cone.



55. Base cone interior.

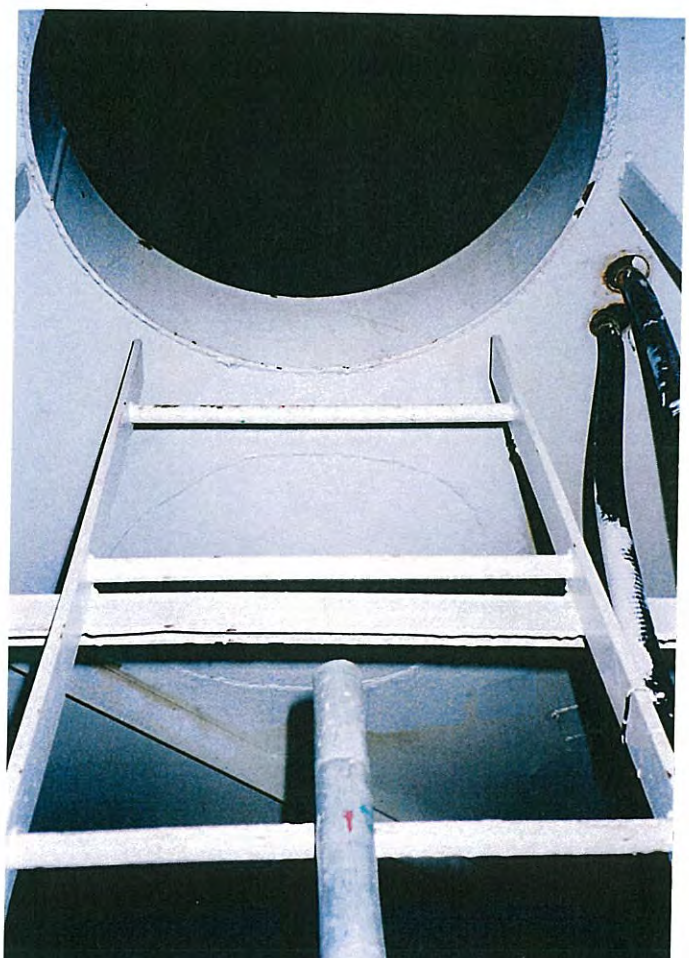


56. Cables, inlet/outlet pipe, base cone ladder, safety cage, safe-climbing device, light fixture, and underside of condensate platform.

57. Overflow pipe, condensate drain pipe, and brackets.

58. Base cone ladder, safe-climbing device, wooden pallet, and unused pump.

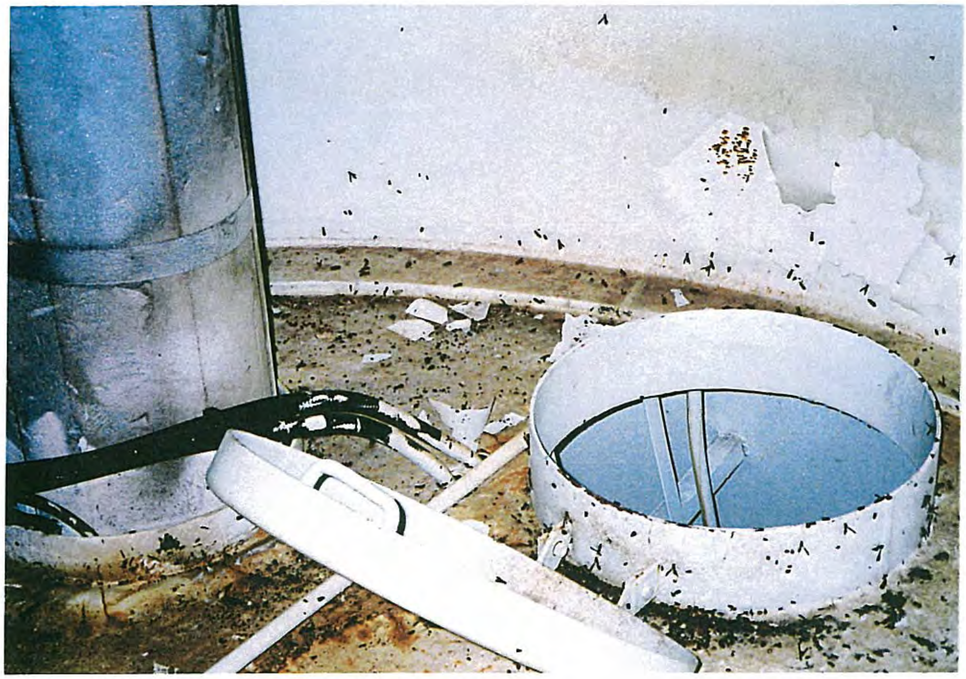
59. Base cone ladder, safe-climbing device, safety cage, and light fixture. Note uncovered junction box.



60. Base cone ladder, safe-climbing device, condensate platform access, and cables.

61. Hole in condensate platform.

62. Condensate platform drain pipe.



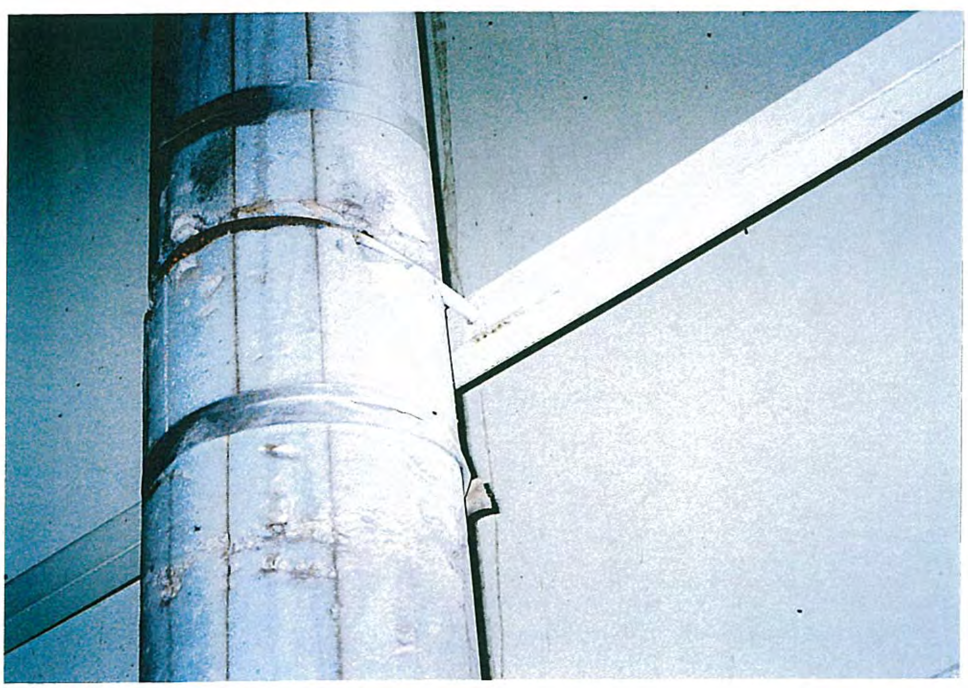
63. Condensate platform.

64. Evidence of accumulated water on condensate platform. Note failed coating.

65. Dirt and corrosion around drain hole in condensate platform.

66. Peeled topcoating and corrosion on pedestal just above condensate platform.

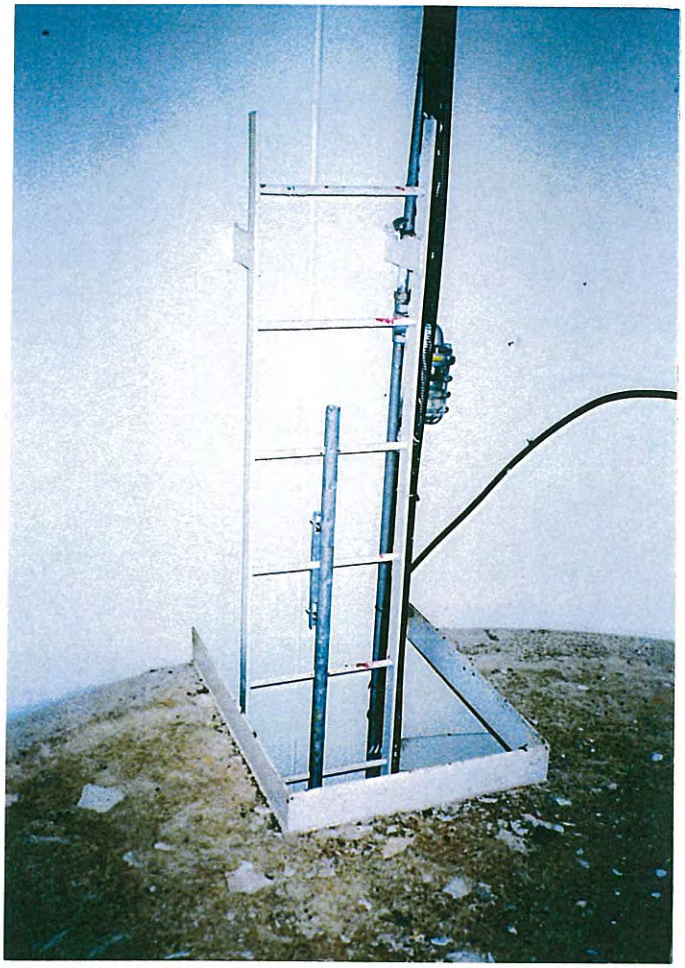
67. Pedestal, overflow pipe, inlet/outlet pipe, pedestal ladder, safe-climbing device, and underside of top platform.



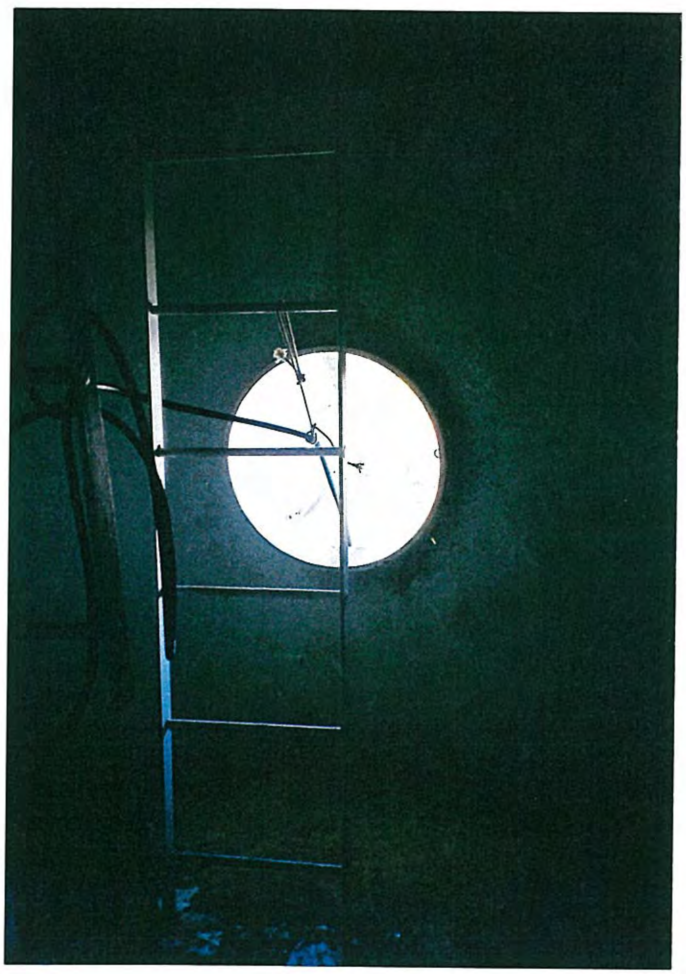
68. Inlet/outlet pipe and bracket.

69. Overflow pipe and brackets in pedestal.

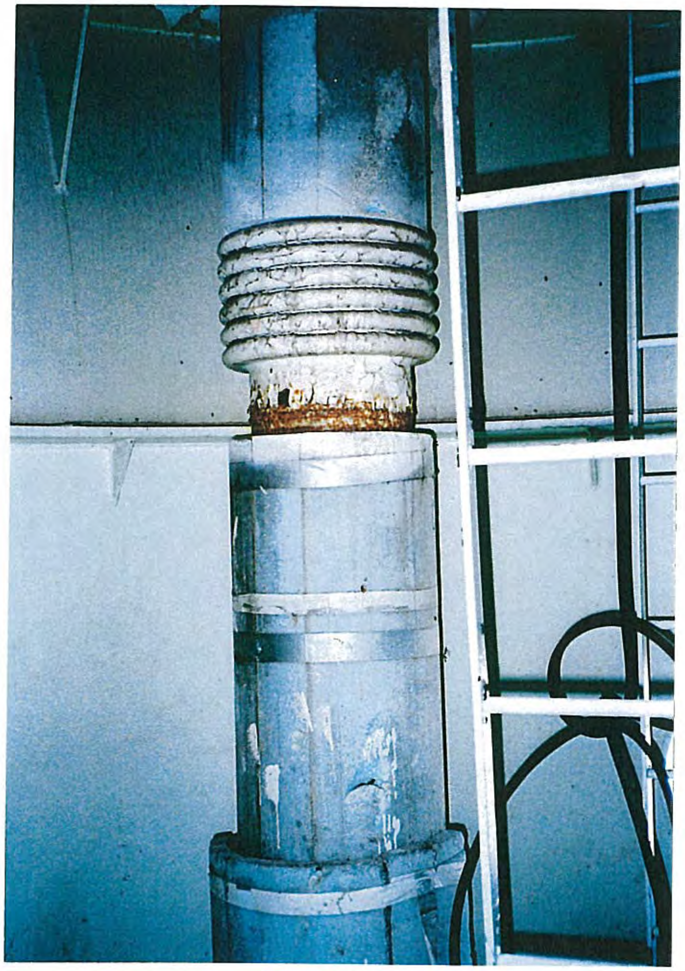
70. Pedestal ladder, safe-climbing device, cables, and inoperable light fixture.



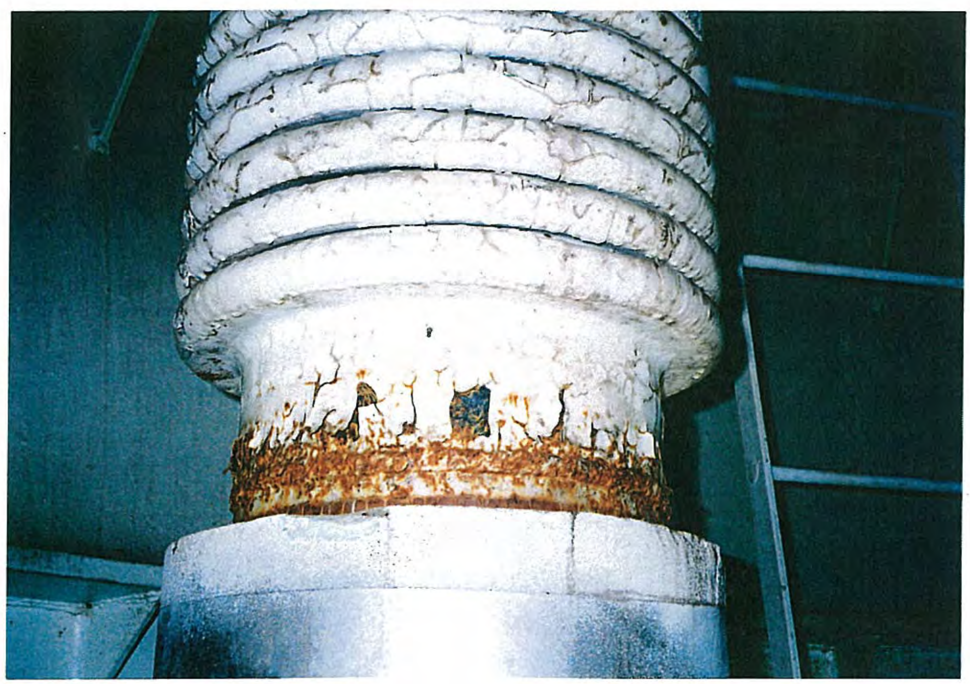
71. Pedestal ladder, safe-climbing device, conduit, cables, inoperable light fixture, and top platform.



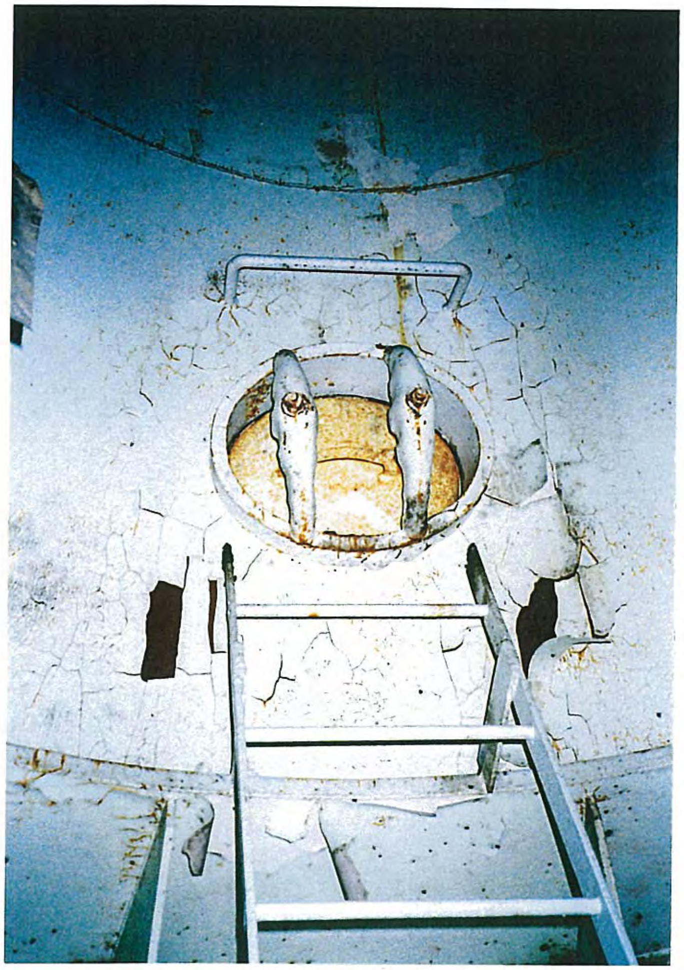
72. Top platform, painter's manhole, and access tube ladder.



73. Corrosion on exposed expansion joint in inlet/outlet pipe.



74. Corrosion on expansion joint in inlet/outlet pipe.

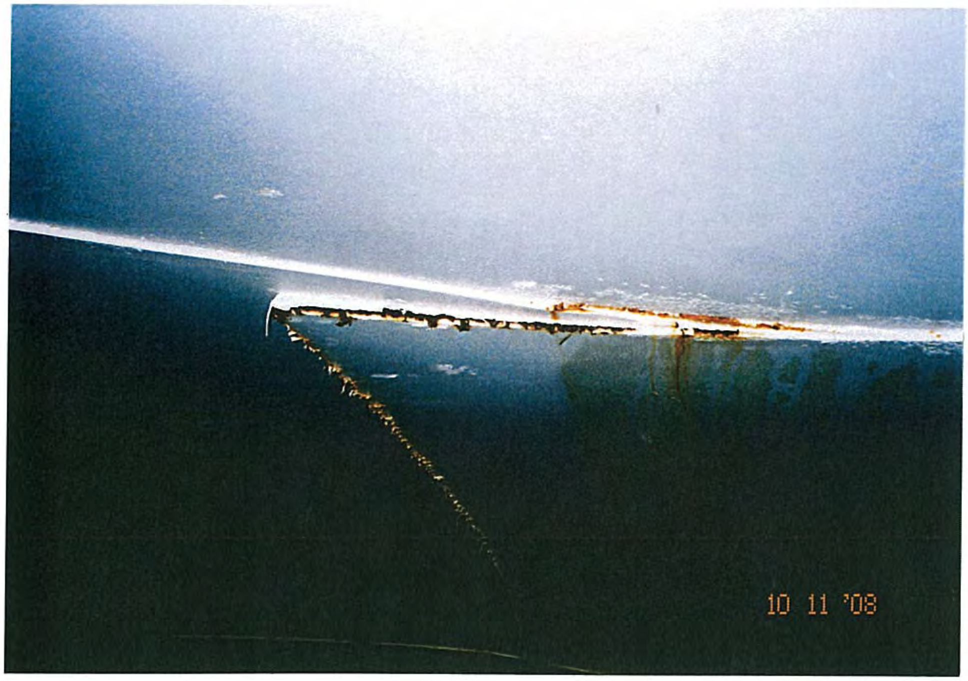


75. Bowl manhole and ladder. Note corrosion and peeled coating on bowl.

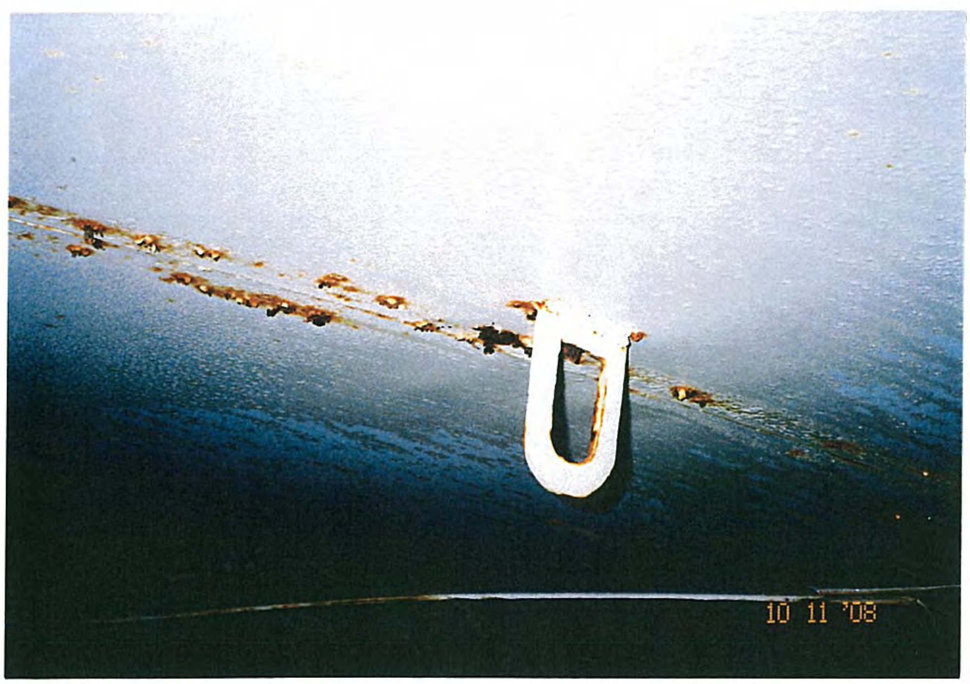
76. Dry bowl, access tube, and ladder.

77. Access tube, ladder, and cables. Note corrosion.

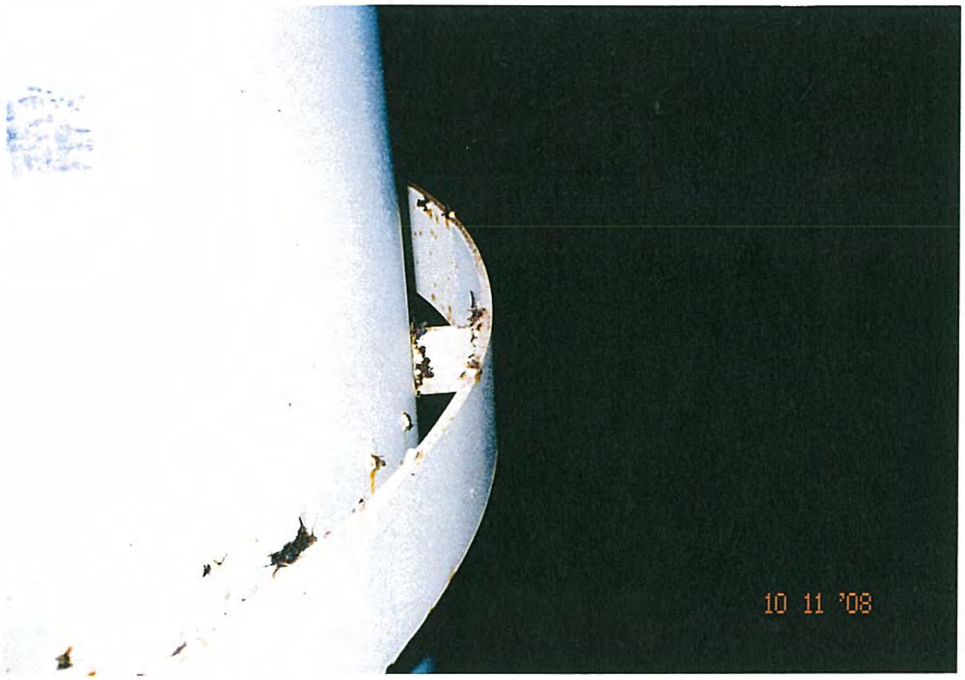
78. Corrosion around access tube penetration through wet roof.



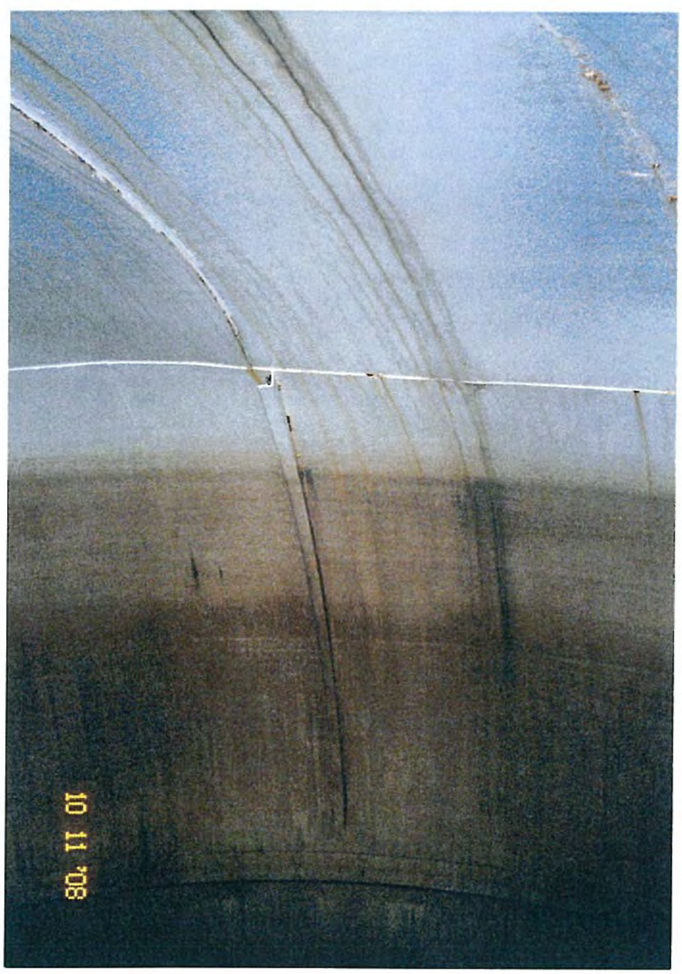
79. Corrosion along roof seams.



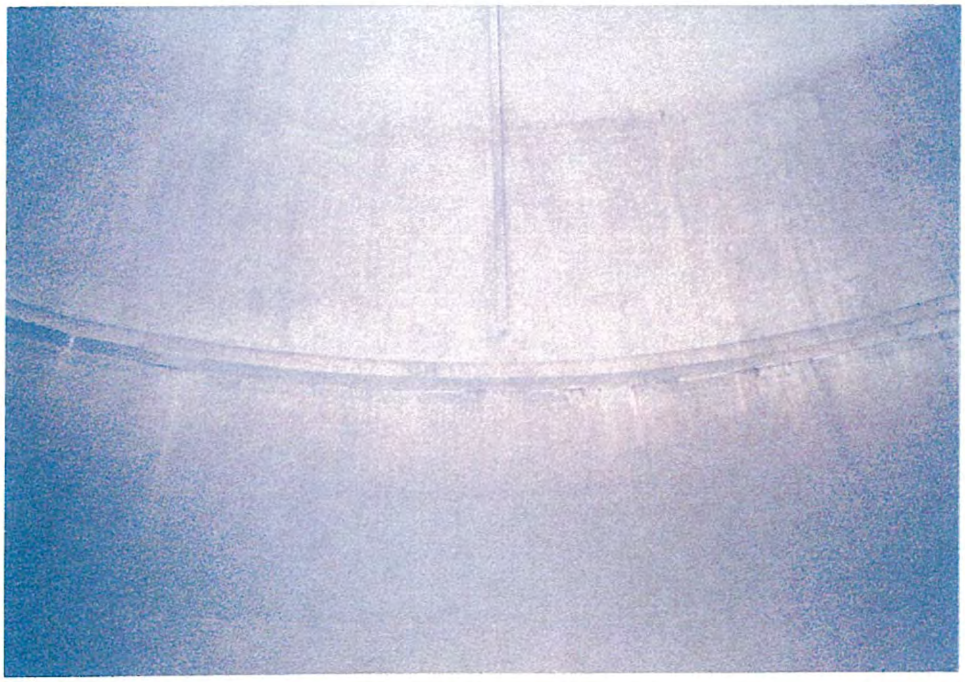
80. Corrosion on roof and lug.



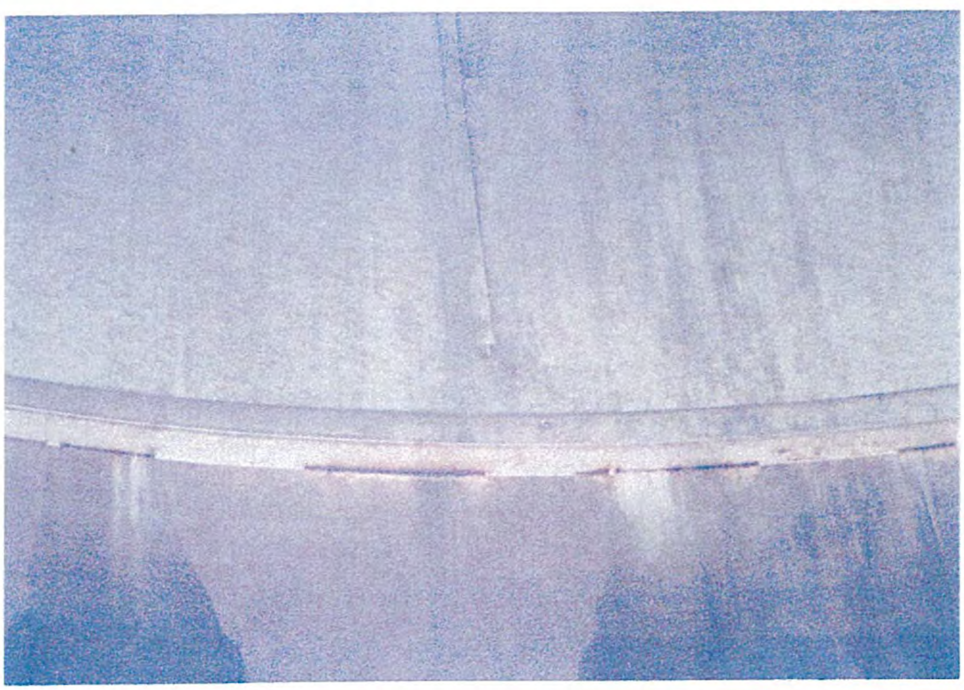
81. Painter's ring around access tube.



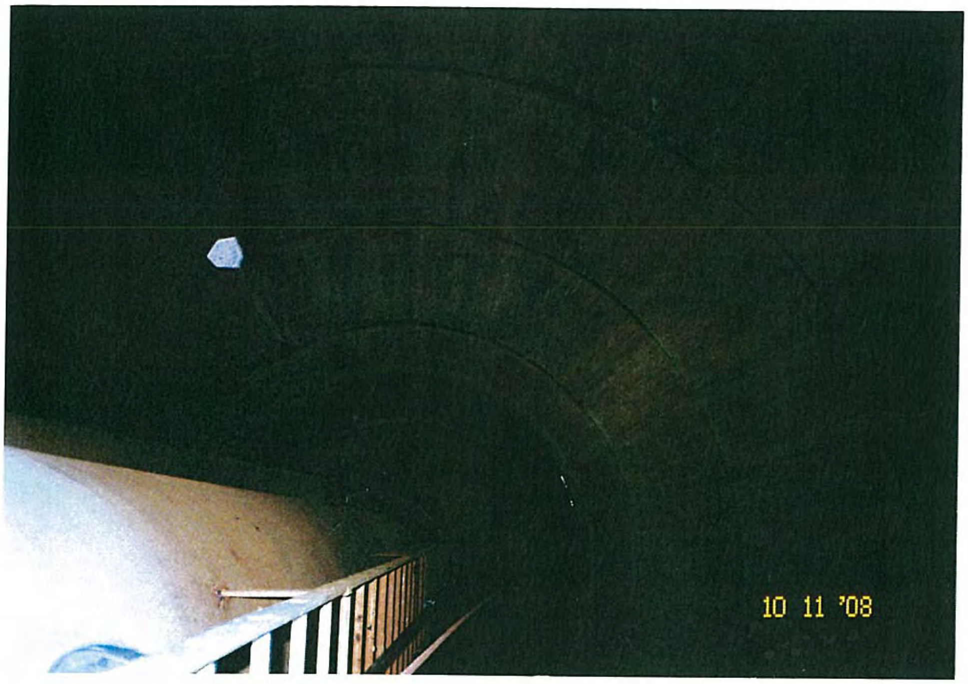
82. Roof knuckle interior.



83. Roof knuckle and shell.



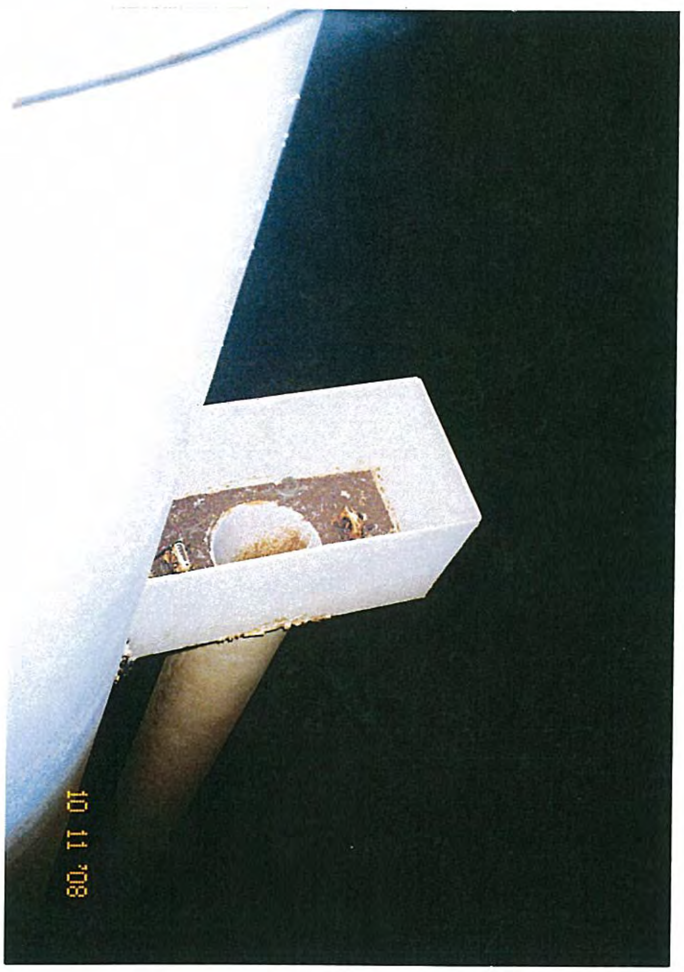
84. Interior shell angle.



85. Bowl interior.

86. Corrosion on bowl.

87. Corrosion on bowl.



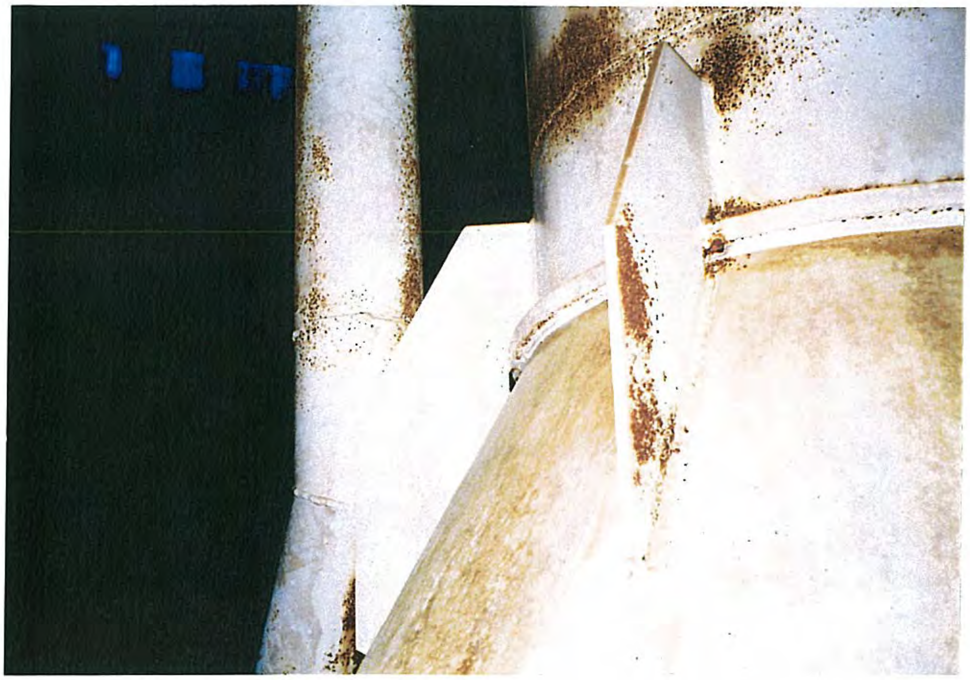
88. Overflow inlet weir box.

89. Overflow pipe and access tube.

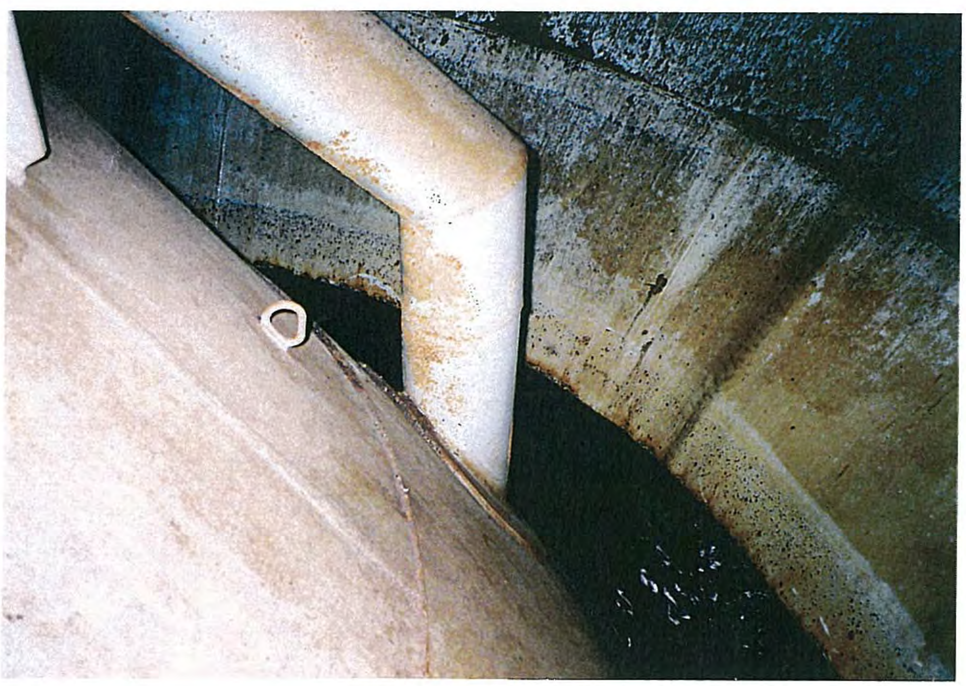
90. Interior wet ladder and access tube.

91. Wet ladder and access tube stiffeners.

92. Corrosion on wet ladder bracket.

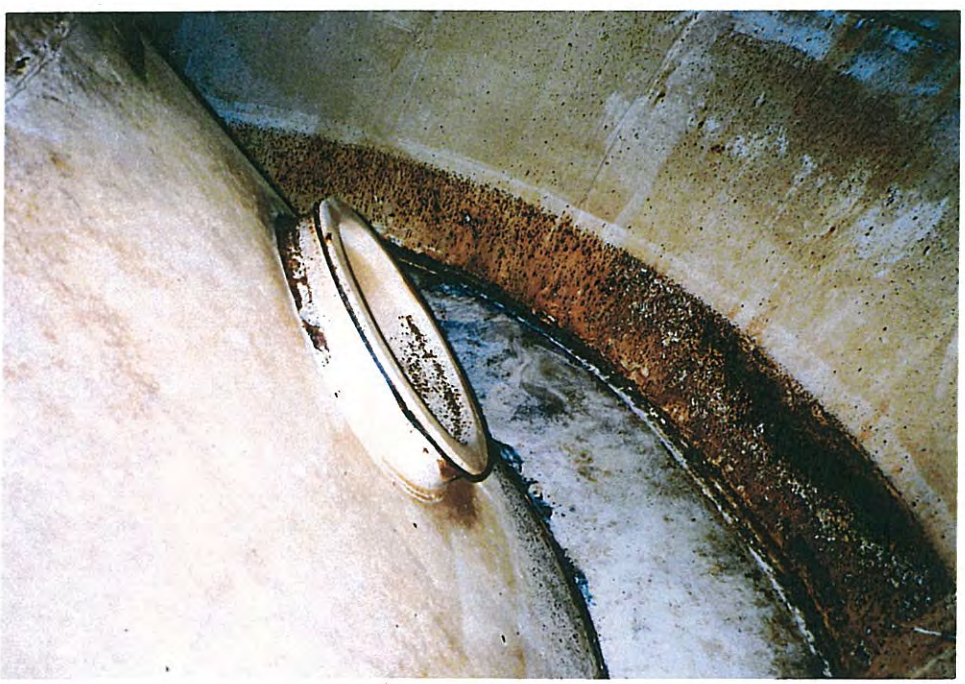


93. Corrosion on base of access tube and overflow pipe.



94. Overflow pipe, bowl cone, and unused eye on bowl.

95. Overflow pipe penetration through bowl cone.

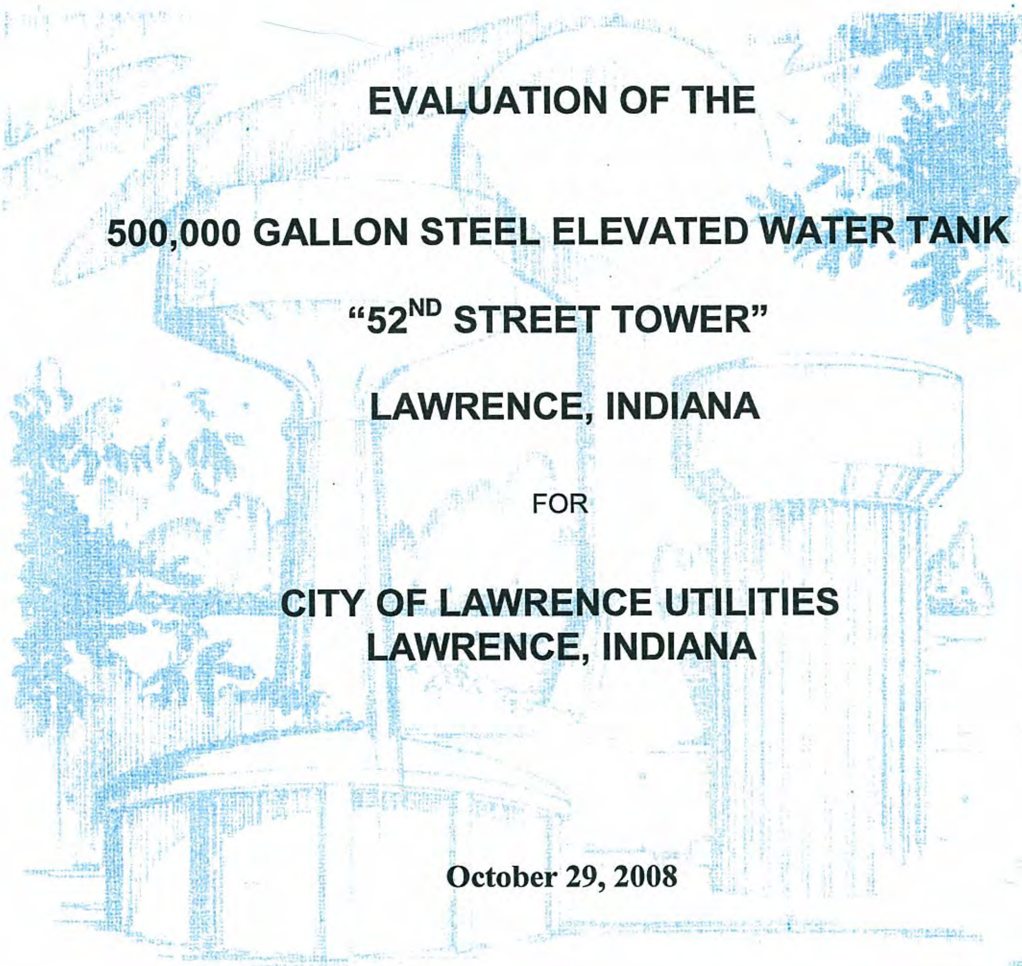


96. Bowl manhole.

97. Inlet/outlet pipe.

Scott copy

TANK INDUSTRY CONSULTANTS



EVALUATION OF THE

500,000 GALLON STEEL ELEVATED WATER TANK

"52ND STREET TOWER"

LAWRENCE, INDIANA

FOR

CITY OF LAWRENCE UTILITIES
LAWRENCE, INDIANA

October 29, 2008

TM

08.110.H214.02

Table of Contents

TIC
TANK
INDUSTRY
CONSULTANTS
INC.

7740 West New York Street
Indianapolis, Indiana 46214
317 / 271-3100 - Phone
317 / 271-3300 - FAX

Bolingbrook, Illinois
630 / 226-0745

Philadelphia, Pennsylvania
610 / 696-0403

Houston, Texas
281 / 367-3511

Richmond, Virginia
804 / 897-7176

November 13, 2008

Mr. Scott Salsbery
Director of Operations
City of Lawrence Utilities
9201 Harrison Park Court
Lawrence, Indiana 46216

SUBJECT:

The subject of this report is the field evaluation of the 500,000 gallon steel elevated water tank in Lawrence, Indiana. The tank was owned by the City of Lawrence Utilities and was known as the "52nd Street Tower." The field evaluation was performed on October 29, 2008, by Michael L. Doolittle and Noah M. Peyer of Tank Industry Consultants. The Owner's representative on the site at the time of the field evaluation was Greg Gee. The toro-ellipsoidal tank was of welded steel construction. According to information on the tank nameplate, the tank was built in 1973 by Universal Tank & Iron Works under serial number 5962.500, and had a capacity of 500,000 gallons. The tank nameplate also stated that the 6-column tank was 134 ft 6 in. to top capacity level and had a 30 ft head range.

OBJECTIVE:

The purpose of this washout and evaluation was to determine the condition of the tank interior, exterior, exposed foundations, and accessories. The purpose of this report is to present the findings of the evaluation and to make recommendations for recoating, repairing, corrosion protection, and maintenance. Budget estimates for the work, anticipated life of the coating and the structure, and the replacement cost of the tank are also included.

AUTHORIZATION:

This washout, evaluation, disinfection, and report were authorized in the a letter of authorization, dated April 18, 2008, and signed by Mr. Scott Salsbery, Director of Operations, Lawrence Utilities, Lawrence, Indiana.

SUMMARY:

Exterior Coating: The exterior coating system appeared to be providing adequate protection to the majority of the steel surfaces. Tank Industry Consultants believes that the exterior of the container and tower surfaces should not need to be painted within the next 4 to 5 years from a corrosion standpoint. Due to the good to fair adhesion of the existing exterior primer, topcoating appears to be an option. However, since the existing exterior topcoat exhibited very poor adhesion to the underlying coating, it is expected a large amount of the existing exterior topcoat would be removed during the surface preparation. The exterior coating system should be evaluated immediately prior to preparing specifications to determine if the coating adhesion is still adequate to accept a topcoat.

Interior Coating: The interior coating system appeared to be in generally good condition and providing adequate corrosion protection. To prevent metal loss at areas of spot coating failure on the interior surfaces below the water level, a cathodic protection system should be installed within the next 12 to 18 months. If cathodic protection is not installed within the next 18 months, the interior should be completely cleaned and painted within 3 to 4 years. It is recommended that when the interior is completely cleaned and repainted, an epoxy coating system should be used.

ANSI/OSHA and Safety-Related Deficiencies: There were OSHA and safety-related deficiencies on this tank. These deficiencies included:

- the rust on the exterior ladder safe-climbing devices may not allow the devices to function properly,
- the head clearance on the tower ladder at the balcony access was not dimensionally compliant,
- the exterior ladder side rails were not dimensionally compliant,
- the rungs were not of a slip-resistant design,
- the tower ladder was not equipped with a vandal deterrent,
- the balcony access opening was not equipped with closure chains or a cover to deter personnel from accidentally falling from the balcony,
- the balcony railing was not dimensionally compliant,
- pipes and other debris on the balcony floor created a trip hazard, and
- the transition cone opening in the bowl was not equipped with a safety grate or railing.

If the Owner wishes to fully comply with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA and Operational Deficiency: There was a sanitary and operating deficiency on this tank as well:

- a gap was noted at the perimeter of the roof vent pallet.

These deficiencies should be corrected.

The safety-related, sanitary, and operating deficiencies listed above are not intended to be a complete list of deficiencies on this tank. The Owner should refer to the complete report text and accompanying photographs for a complete account of all observed deficiencies.

This evaluation and the reporting of the condition of this tank do not warrant the original structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications which may be required for compliance with present structural codes.

PHOTOGRAPHS:

Color photographs were taken of the visible portions of the foundations, the tank interior and exterior and are included as a part of this report. The significant photographs are keyed to the observations.

NOMENCLATURE:

The terms used in describing the various components of steel water tanks are unique to the industry. In fact, the terms vary from firm to firm and from person to person. In an attempt to define the terms used in this report, a sketch of the general type of tank covered is included at the end of the narrative portion of this report. Also, to aid in reference to the columns, the ladder column is referred to as column 1 and the remaining 5 columns are numbered clockwise. **Warning: Some appurtenances on this tank may be referred to as erection or rigging attachments, lugs, or brackets. This does not mean that they are safe for rigging. Each attachment for each tank should be evaluated on an individual basis by a structural engineer or an experienced rigger before being used. These devices may have been intended for only the original erectors and painters to use with specialized equipment.**

ADHESION TESTS:

All adhesion tests performed during this evaluation were done in general accordance with ASTM D3359. The results are reported herein using the ASTM scale. The ASTM scale is a relative scale to rate adhesion from 0 to 5 with 5 being the best. A table of adhesion test results classification is included with this report following the sketch of the tank.

HEAVY METALS TESTS:

A sample of the exterior coating system was sent to a laboratory for atomic absorption analyses. Due to the generally good condition of the interior coating the destructive sampling of the interior coating was not performed. The test results from the sample of the exterior coating system were as follows:

	Cadmium		Chromium		Lead	
	mg/kg	percent	mg/kg	percent	mg/kg	percent
Exterior Column #1	<25	<0.0025%	<250	<0.025%	<250	<0.025%

Tank Industry Consultants performs this test only to determine if there is lead, cadmium, or chromium present in the coating samples. To limit damage to the existing coating, only small areas were tested. The small number of samples taken and the difficulty of retrieving all primer from the steel profile may cause the tests performed to not accurately represent the total coating system. Variations in thickness, types of coatings applied, and the interim cleaning and painting operations will also affect the actual readings. The reliability of the results is also dependent on the amount of primer included in the sample. The Consumer Product Safety Commission specifies that an amount greater than 0.06% lead is considered potentially hazardous. Additional testing to determine the amount of leachable contaminants present in the spent cleaning debris will need to be performed following cleaning operations at the time of repainting. Results from the laboratory analysis are included following the adhesion tables.

ULTRASONIC THICKNESS MEASUREMENTS:

Roof:	(all readings were taken through coating)
Cap:	0.290 in.
Finger:	0.290 in.
Shell:	0.420 in.
Bowl:	
Knuckle:	0.359 in.
Torus:	0.371 in.
Riser:	
Bottom Ring:	0.618 in.
Column:	
Other Cans:	0.406 in.
Bottom Can:	0.429 in.

OBSERVATIONS:

A. Foundations and Site

SITE:

- Size: approx. 110 ft x 63 ft
- Fence:
  - Type: metal bar fence on south side and rest of fence chain link; 3 strands of barbed wire located on north and west fence
  - Height: 6 ft
- Gate:
  - Location: south side of site
  - Width: 13 ft 6 in.
  - Locked: yes

Nearest Structures:
Type: mobile home sales office
Direction: east
Distance: approx. 40 ft

Type: mobile home park
Direction: south
Distance: approx. 300 ft

Type: motel and parking
Direction: west
Distance: approx. 300 ft

Nearest Overhead Power Lines:
Direction: southeast
Distance: approx. 24 ft

FOUNDATIONS:
Number: 6 columns, 1 riser
Size:
Column: 48 in. square
Riser: 7 ft square
Sealant: none

Column Number:	Projection Above Grade:	Grout Thickness:
1	12 in.	1-1/8 in.
2	12 in.	1-1/8 in.
3	12 in.	1-1/8 in.
4	11 in.	1-1/8 in.
5	12 in.	1-1/8 in.
6	13 in.	1-1/8 in.
Riser	5 in. to 8 in.	1-1/8 in.

1. **Site Location**: The tank was located near the intersection of East 52nd Street and East Pendleton Pike in Lawrence, Indiana. Mobile home parks were located south and east of the tank site. An empty lot and a motel were located west of the tank site. Overhead power lines were located southeast of the site. (See photos 1-4)

2. **Site Conditions**: The tank site was covered with grass and was graded to provide adequate drainage away from the foundations. The tank site was equipped with a white metal bar fence on the south side by the site access and with a chain link fence on the three remaining sides. The chain link fence was topped with barbed wire on the north and west sides of the site. The white metal bar fence on the south side was equipped with a locked gate. A building was located adjacent to the tank on the south side of the site. A water spigot and a hydrant were located outside the fence on the south side of

the site. An electrical box, meter, and security camera were mounted on the pole on the southeast side of the site. (See photos 1, 5-6)

3. **Foundations**: Spalling of the concrete surface was observed on the column #4 foundation. Except for minor cracking, the exposed surfaces of the other foundations appeared to be in nearly their original structural condition at the time of this field evaluation. The tops of the foundations generally had the AWWA recommended projection of 6 in. to 12 in. above grade. A white coating was present on the foundations. (See photos 8-13, 16)

4. **Grout**: The column and riser base plates were equipped with a pad of grout between the base plates and the tops of the foundations. The grout appeared to be in adequate condition as there were no significant deficiencies observed. There was no sealant located at the grout-to-base plate interface. (See photos 8-10)

B. Exterior Tower and Container

DESCRIPTION:
- Construction: welded steel
- Columns: 6
- Tower: 3 bays
- Bowl: torus
- Shell:
  - Diameter: approx. 55 ft
  - Shell Height: 7 ft 8 in.
- Roof: ellipsoidal

NAMEPLATE:
- Location: above riser manhole

UNIVERSAL TANK
&
IRON WORKS
INDIANAPOLIS, IN
1973
CAPACITY 500,000 GALLONS
HEIGHT TO HIGH LEVEL 134 FT 6 IN.
HEAD RANGE 30 FT 0 IN.
TYPE TORO ELLIPSOIDAL
SERIAL # 5962.500

COLUMNS:
- Type: tubular
- Size: approx. 30 in. diameter
- Base Plate: approx. 40 in. diameter x 1-1/2 in. thick
- Anchor Bolts:
  - Number Per Column: 2
  - Size: 1-1/2 in. diameter

RISER:
- Diameter: approx. 5 ft
- Base Plate: approx. 5 ft 9 in. diameter x 1-1/2 in. thick
- Anchor Bolts:
  - Number: 4
  - Size: 1-1/2 in. diameter

RISER MANHOLE:
- Type: double-crab
- Size: 24 in. x 18 in.
- Cover:
  - Size: 27 in. x 21 in.
  - Hinged: no
- Bolts:
  - Number: 2
  - Size: 1 in. diameter x 10 in. long

DIAGONAL BRACING:
- Bottom Bay:
  - Rod Diameter: 1-3/4 in. (upset to 2 in.)
  - Wing Plate: 9-1/2 in. x 8 in. x 3/4 in. thick
- Middle Bay:
  - Rod Diameter: 1-3/4 in. (upset to 2 in.)
  - Wing Plate: 25-1/2 in. x 8 in. x 3/4 in. thick
- Top Bay:
  - Rod Diameter: 1-3/8 in. (upset to 1-5/8 in.)
  - Wing Plate: 25-1/2 in. x 8 in. x 3/4 in. thick
- Rod Pin Size: approx. 1-1/2 in. to 2 in. diameter x 2 in. long

RISER RODS:
- Number of Levels: 3
- Size: 1 in. (upset to 1-1/4 in.)
- Wing Plate: 5-1/2 in. x 5-1/2 in. x 1/4 in. thick
- Rod Pin Size: approx. 1 in. diameter x 3-1/2 in. long

STRUTS:
- Type: 2 channels intermittently welded together to form a "T" shape
- Bottom Level Size: 8 in. x 2-1/4 in., channel (horizontal) over 7 in. x 2 in., channel (vertical)
- Top Level Size: 8 in. x 2-1/4 in., channel (horizontal) over 7 in. x 2 in., channel (vertical)

OVERFLOW PIPE:
- Size: 10 in. diameter
- Visible Air Break: yes, 24 in.
- Flap Gate: yes, screened and counterweighted
- Brackets:
  - Size: 11 in. x 6 in., flat bar (horizontal) and 4 in. x 2 in., flat bar (vertical)
  - Spacing: approx. 15 ft

TOWER LADDER:
- Distance From Ground to Lowest Rung: 14 ft
- Width: 16 in.
- Side Rails: 2 in. x 1/4 in., flat bar
- Rung Size: 3/4 in. diameter
- Spacing: 12 in. on center
- Toe Room: 7 in.
- Head Clearance: 19 in. at balcony
- Brackets:
  - Construction: welded
  - Size: 3 in. x 1/4 in., flat bar x 8 in. long
  - Spacing: 2 ft and 7 ft
- Safe-Climbing Device: notched-tubular rail
- Vandal Deterrent: none

BALCONY:
- Floor Thickness: 1/4 in.
- Width: 30 in.
- Handrail:
  - Height: 42 in.
  - Size: 2 in. x 2 in. x 3/16 in., angle
- Uprights: 1-3/4 in. x 1-3/4 in. x 3/16 in., angle
- Mid-Rail: 1-1/2 in. x 3/16 in., flat bar
- Toe Bar:
  - Height Above Floor: 4 in.
  - Size: 1/2 in. thick flat bar
- Access Opening:
  - Size: 23-3/8 in. diameter
  - Neck: 6 in. x 1/4 in.
  - Closure Chains: no

SHELL AND ROOF LADDER:
- Number of Rungs: 40
- Type: fixed
- Side Rails: 2 in. x 1/4 in., flat bar
- Width: 16 in.
- Rung Size: 3/4 in. diameter
- Spacing: 12 in. on center
- Toe Room: 9 in.
- Brackets:
  - Construction: welded
  - Size: 4 in. x 5/16 in., flat bar
  - Spacing: 8 ft
- Safe-Climbing Device: notched-tubular rail

SIGNS: "LAWRENCE"
- Color: black
- Location: north side of shell
- Height: 68 in. tall
- Letter Width: 34 in.
- Brush Stroke: 12 in.
- Sign Length: approx. 36 ft

ROOF OPENINGS:
- Manhole:
  - Size: 23-3/8 in. diameter
  - Type: hinged
  - Curb: 6 in.
  - Welded: exterior only
  - Overlap: 2-1/2 in.
  - Locked: yes

- Roof Vent:
  - Type: clog-resistant
  - Screen:
    - Orientation: horizontal pallet
    - Size: 16 x 16 mesh

ROOF OBSTRUCTION LIGHTS:
- Type: double-globe
- Location: adjacent to roof vent
- Photoelectric Cell: adjacent to bottom of tower ladder

EXTERIOR COATING AND METAL CONDITION:

	Coating Thickness Range	% Failure to Underlying Coating	% Failure to Rust	Adhesion	Metal Loss Typical	Metal Loss Deepest
Columns	7 mils to 16 mils	< 2%	< 1/2%	0 T 4 S	Neg.	Neg.
Riser	4.5 mils to 7 mils	Neg.	< 1/2%	0 T 4 S	Neg.	Neg.
Diagonal Bracing	13 mils to 16 mils	Neg.	Neg.	0 T 4 S	Neg.	Neg.
Riser Rods	-	approx. 5%	Neg.	-	Neg.	Neg.
Struts	6 mils to 13 mils	< 10%	Neg.	-	Neg.	Neg.
Bowl	7 mils to 10 mils	Neg.	< 1/2%	0 T 3 S	Neg.	Neg.
Balcony	6 mils to 8 mils	approx. 5%	< 1/2%	-	Neg.	Neg.
Shell	6 mils to 8 mils	approx. 20%	Neg.	0 T 4 S	Neg.	Neg.
Roof	7 mils to 10 mils	approx. 30%	Neg.	0 T 4 S	Neg.	Neg.

Key to Table

Adhesion 5 (very good) T = Topcoat to Underlying Coating Neg. = negligible
4 (good)
3 (fair) S = Primer to Steel
2 (poor)
1 (very poor)
0 (very poor)

1. **Exterior Coating Condition**: From a corrosion standpoint the coating on the exterior of the tower and container appeared to be in generally good condition and providing adequate protection from corrosion to most of the underlying steel. The exterior topcoat exhibited very poor adhesion to the underlying coating and was peeling. The exterior primer exhibited good to fair adhesion to the steel. The coating appeared to be an epoxy-polyurethane coating system.

2. **Base Plates**: The column and riser base plates appeared to be in good overall condition at the time of the field evaluation. Isolated corrosion was observed along the edge of the base plates. Light debris and isolated coating failures were observed on the base plate projection. (See photos 8-11)

3. **Anchor Bolts**: Each of the columns was equipped with two anchor bolts, and the riser was equipped with four anchor bolts. Minor rust was observed on the anchor bolts and nuts. One of the bolt holes in the riser base plate was not entirely covered by the anchor bolt nut. (See photos 8-11)

4. **Column Condition**: The columns were of welded steel construction and appeared to be in nearly their original structural condition at the time of the field evaluation. Weathered topcoat exposing the underlying coating and peeled topcoat were observed on the columns. There were hand holds located on the columns above the struts and directly beneath the bowl. **It is the opinion of Tank Industry Consultants that the hand holds should not be used for rigging purposes or personnel access.** (See photos 18-25)

5. **Riser Condition**: The riser was of welded construction. The riser appeared to be in nearly its original structural condition at the time of the field evaluation. Isolated areas of missing topcoat exposing the underlying coating were noted on the riser. The riser was equipped with a double-crab manhole. The riser manhole cover was not equipped with a hinged support. (See photos 12-15 and 26-29)

6. **Diagonal Bracing**: The coating system on the diagonal bracing appeared to be in good overall condition at the time of the field evaluation. Coating failure and corrosion were observed at the clevis connections to the wing plates. The diagonal bracing rods were upset on the ends. The diagonal bracing was equipped with turnbuckles, clevises, and wing plates. (See photos 21-25)

7. **Riser Rods**: The tower was equipped with three sets of riser rods which were located at the strut levels and just below the bowl. Peeled topcoat was observed on the riser rods. The riser rods were equipped with turnbuckles and wing plates. **It is the opinion of Tank Industry Consultants that the riser rods should not be used for rigging purposes or personnel access.** (See photos 23-25 and 27-33)

8. **Struts**: The tower was equipped with two sets of struts. The struts were bolted and welded to the wing plates. The struts appeared to be in nearly their original condition at the time of this field evaluation. Peeled topcoat was observed on the struts, more so on the top set of struts. The struts were equipped with drain holes. (See photos 23-25)

9. **Overflow Pipe**: The overflow pipe exited through the roof knuckle and extended down the shell, through the balcony, and down the column to near grade. The discharge end of the overflow pipe was equipped with an above-ground air break and a screened, counter-weighted flap gate. The pipe was equipped with welded steel brackets which appeared to be in their original structural condition at the time of this field evaluation. Cracked coating was observed on the welds of the lower overflow pipe bracket. (See photos 16-18, 43, and 45)

10. **Tower Ladder**: **There were safety and OSHA deficiencies noted: (1) the rust on the safe-climbing device may not allow the device to function properly, (2) the 19 in. head clearance on the tower ladder at the balcony access did not meet the required 30 in. minimum, (3) the 2 in. x 1/4 in. side rails did not meet the required minimum of 2-1/2 in. x 3/8 in. side rails, (4) the rungs were not of a slip-resistant design, and (5) the ladder was not equipped with a vandal deterrent.** The tower was equipped with a ladder which provided access from near grade to the balcony. The ladder was equipped with a notched-tubular safe-climbing device which appeared rust covered. The tower ladder was welded to brackets which were welded to the column. The tower ladder and brackets appeared to be in nearly their original structural condition at the time of this field evaluation. A conduit was attached to the ladder brackets. (See photos 34-37)

11. **Bowl Condition**: The coating on the bowl surfaces appeared to be providing good overall corrosion protection to the majority of the steel. A few isolated rust spots were noted on the bowl. Mildew was observed on the bowl. (See photos 29-33)

12. **Balcony Condition**: **There were safety and OSHA deficiencies noted: (1) the balcony access opening was not equipped with closure chains or a cover to deter personnel from accidentally falling from the balcony, (2) the 2 in. x 2 in. x 3/16 in. handrail did not comply with the required 2 in. x 2 in. x 3/8 in., (3) the 1-1/2 in. x 3/16 in. mid-rail did not comply with the**

required 2 in. x 2 in. x 3/8 in., (4) the 1-3/4 in. x 1-3/4 in. x 3/16 in. uprights did not comply with the required 2 in. x 2 in. x 3/8 in., and (5) pipes and other debris on the balcony floor created a trip hazard. Access to the balcony from the tower ladder was through an opening in the balcony floor. The balcony floor was equipped with drain holes. The underside of the balcony floor was intermittently welded to the shell and toe bar. The safety railing was of welded construction. Broken top welds were noted on the splice plates for the balcony toe bar. Peeled coating was observed on the balcony railing and floor. (See photos 36-41)

13. **Shell Condition**: The contour of the tank shell appeared good as no significant discontinuities were observed at the time of this field evaluation. Large areas of peeled topcoat were observed on the shell. A sign was located on the north side of the shell. The sign coating was faded and had peeled in areas. A cracked conduit was observed on the shell. (See photos 41-45)

14. **Exterior Shell and Roof Ladders**: **There were safety and OSHA deficiencies noted: (1) the rust on the safe-climbing device may not allow the device to function properly, (2) the 2 in. x 1/4 in. side rails did not meet the required minimum of 2-1/2 in. x 3/8 in. side rails, and (3) the rungs were not of a slip-resistant design.** The container was equipped with a ladder which provided access from the balcony to the roof. The ladder was equipped with a notched-tubular safe-climbing device. The ladder was welded to brackets which were welded to the container. The ladder and brackets appeared to be in nearly their original structural condition at the time of this field evaluation. (See photos 40, 49, and 51)

15. **Roof Condition**: The contour of the roof appeared to be adequate at the time of this evaluation. Significant weathering and peeling of the topcoat were observed on the roof. (See photos 46-48)

16. **Obstruction Lights**: The roof was equipped with a double-globe obstruction light mounted near the roof vent. The obstruction light was equipped with a photoelectric cell that was mounted near the bottom of column #1. The obstruction light was not illuminated at the time of this field evaluation, and appeared to need repair. One bulb and globe were missing from the fixture. (See photos 50-51)

17. **Roof Manhole**: The roof was equipped with one manhole. The manhole was equipped with a hinged and locked cover. The roof manhole was welded on the exterior only. (See photo 49)

18. **Roof Vent**: **There was a sanitary and operational deficiency noted: an approximately 1 in. gap was noted at the perimeter of the vent pallet.** The roof was equipped with a clog-resistant vent in the approximate center of the roof. The vent appeared to be equipped with pallets which would facilitate ventilation during filling or draining of the tank. The high density polyethylene pallet in the vent appeared warped and cracking. (See photos 51-53)

C. Interior Surfaces

CATHODIC PROTECTION: none

OVERFLOW:
Inlet Type: weir box
Location: 8 in. below the roof knuckle-to-finger connection

INTERIOR PIPING:
Siphon Pipe Size: 5 in. diameter

Inlet/Outlet Pipe:
Size: 11-1/2 in. I.D.
Projection: 19-1/2 in. above riser floor
Protective Cover: yes

Drain Pipe:
Size: 5-3/4 in. I.D.
Projection: 4-1/2 in. above riser floor

INTERIOR COATING AND METAL CONDITION:

	Coating Thickness Range	% Failure to		Metal Loss	
		Primer	Rust	Typical	Deepest
Roof	10 mils to 13 mils	Neg.	approx. 5%	Neg.	Neg.
Shell	10 mils to 13 mils	Neg.	< 1/2%	Neg.	Neg.
Bowl	10 mils to 13 mils	Neg.	Neg.	Neg.	Neg.
Riser	13 mils to 16 mils	Neg.	< 1%	Neg.	Neg.

Key to Table
Neg. = negligible

1. **General Interior Coating Condition:** The coating on the interior surfaces of the tank appeared to be in generally good condition and appeared to be providing adequate protection from corrosion to most of the underlying steel. The coating appeared to be an epoxy coating system.

2. **Roof Condition:** Surface rust was observed on the interior roof cap, and rust staining was observed along the roof seams. Sealant was located along the lapped roof seams. (See photos 54-60)

3. **Shell Condition:** The shell coating was discolored due to mineral staining from the water. Isolated spot corrosion was observed on the interior shell. Rust was observed on the column post head stiffeners on the interior shell. (See photos 61-63)

4. **Overflow Pipe:** The overflow pipe inlet was equipped with a weir box. The location of the overflow inlet was such that the top capacity level was below the roof finger-to-roof knuckle connection. (See photos 57-58)

5. **Bowl Condition**: **There was a safety-related and OSHA deficiency noted: the transition cone opening in the bowl was not equipped with a safety grate or railing. Personnel should not be allowed in the container unless attached to safety lines until a grate or railing can be installed**. The coating on the bowl appeared to be in good overall condition. A siphon pipe was located in the torus. The air check valve for the siphon pipe was missing; however, the siphon pipe did operate to lower the water level in the torus prior to the time of this evaluation. (See photos 64-68)

6. **Riser Condition**: A grate was located over the riser opening in the transition cone. The grate appeared to be welded shut. The coating on the interior riser appeared to be in good overall condition. A plugged coupling and eyelet for the future installation of a cathodic protection system were located at the bottom of the riser. (See photos 69-72)

7. **Riser Piping**: The inlet/outlet pipe was located in the base of the riser. The inlet/outlet pipe projected 19-1/2 in. above the riser base plate. The inlet/outlet pipe was equipped with a protective cover. The tank was equipped with a drain pipe in the bottom of the riser. The drain pipe projected 4-1/2 in. above the riser base plate. (See photos 71-72)

RECOMMENDATIONS:

A. Foundations and Site

1. **Site Maintenance**: The site should be maintained so that the top of all foundations continues to project a minimum of 6 in. to a maximum of 12 in. above grade and so that proper drainage away from the foundations continues. Site maintenance should be performed with the mower discharge directed away from the base of the tank to prevent rock chips in the coating and the accumulation of grass on the base plates. The gate should be locked at all times to deter unauthorized entry and limit liability for the Owner.

2. **Tank and Site Security**: Water tanks have been defined by some courts under certain circumstances as attractive nuisances. As such, there may be a significant potential liability to the Owner for injury to persons on the tank and tank site, even if access is not authorized. Recent events have prompted the entire water industry to consider measures that inhibit intentional acts that could threaten the water supply. A review of the security requirements for the tank and site is recommended to confirm that the existing measures are consistent with the Owner's security requirements for their water system. Primary tank and site security should be focused on eliminating, preventing, and detecting unauthorized access to the tank. Such security measures might include routinely and periodically verifying all doors, manholes, and gates are locked, and all exterior ladders have suitable deterrents. Other security measures might include installing no-trespass signs, improving the fence, installing more barbed wire, upgrading the site lighting, installing alarms on gates, doors, and tank manholes, and arranging more frequent site visits by law enforcement agencies.

3. **Foundations**: When the tank exterior is repainted, any unsound concrete should be chipped to sound material and the concrete should be brush-off blasted. Any deteriorated areas or voids found should have a bonding agent and a vinyl emollient modified concrete patching mortar applied to build up the surface to its original contour. The concrete should then be painted with a concrete sealer.

4. **Grout Maintenance**: All loose grout should be chipped away to solid material when the tank is empty. Any shim plates which can be easily removed should be taken out. Any voids in the grout should be filled with a nonshrinking, nonstaining, structural grout material. The grout should be placed as far back under the base plates as possible and squared off vertically with the edge of the base plates. Any gap between the steel base plates and the grout should be filled with a flexible sealant.

5. **Overhead Power Lines**: **All overhead power lines within 40 ft of the tank should be relocated underground in order to prevent potential electrical shock to personnel working on the tank.** The relocation of the power lines should be performed in accordance with the National Electric Code (NEC) guidelines.

B. Exterior Tower and Container

1. **Life of the Exterior Coating**: The exterior coating system appeared to be providing adequate protection to the majority of the steel surfaces. Tank Industry Consultants believes that the exterior of the container and tower surfaces should not need to be painted within the next 4 to 5 years from a corrosion standpoint. Due to the good to fair adhesion of the existing exterior primer, topcoating appears to be an option. However, since the existing exterior topcoat exhibited very poor adhesion to the underlying coating, it is expected a large amount of the existing exterior topcoat would be removed during the surface preparation. The exterior coating system should be evaluated immediately prior to preparing specifications to determine if the coating adhesion is still adequate to accept a topcoat.

2. **Coating Testing**: Prior to preparation of specifications for the cleaning and coating of the exterior of the tank, several samples of the exterior coating system should be subjected to laboratory analysis to test for ingredients which may at that time be subject to regulations concerning their handling and disposal.

3. **Cleaning**: When the exterior is to be cleaned, all varieties of containment should be investigated. Containment of the wind-blown debris and paint droplets will be required due to the proximity of the adjacent residences.

4. **Recommended Coating System**:

   a. **Spot Clean and Topcoat**: If the exterior is to be repainted within the next few years, then spot cleaning and topcoating the tank appears to be the recommended option. The typical life of a spot cleaned and topcoated system is approximately 5 to 8 years, but is highly dependent on previous surface preparation and the condition of the underlying coating system.

   b. **Coating Application**: The entire exterior surfaces of the tank should be high-pressure washed to remove chalked coating, mildew, and contaminants. After washing, the damaged and rusted areas should be spot cleaned to the equivalent of an SSPC-SP 6, Commercial Blast Cleaning, or SSPC-SP 11, Power Tool Cleaning to Bare Metal. All areas of excessive coating thickness and runs in the coating should be cleaned to the equivalent of an SSPC-SP 7, Brush-Off Blast Cleaning, to remove the excessive mils. The spot cleaned areas should receive a spot prime coat compatible with the present coating system. The entire exterior surfaces should then be intermediate coated and topcoated with a compatible coating system.

5. **Alternative Coating System:**

a. **Complete Cleaning and Repainting:** The optimum long-life coating system presently available for this site is an epoxy-polyurethane coating system. Properly formulated and applied polyurethanes have good resistance to condensation, mildew, and chipping. The polyurethanes also have excellent color and gloss retention and the longest expected service life of any of the common exterior tank coatings. The typical life of a properly applied epoxy-polyurethane coating system is approximately 12 to 15 years. These coatings are also presently manufactured to meet current VOC requirements.

b. **Coating Application:** When the tank is to be repainted, the tank should be completely cleaned and repainted. The entire tank exterior should be cleaned to the equivalent of an SSPC-SP 6, Commercial Blast Cleaning and have an epoxy-primed, epoxy intermediate and polyurethane finish coating system applied. However, care must be taken during the application of this particular coating system because this coating does have poor dry-fall characteristics, and potential damage to the surrounding property must be taken into consideration. The polyurethane coatings also require close monitoring of temperature and humidity during application.

6. **Effective Service Life:** Tank Industry Consultants defines the life of a coating as the amount of time before repainting becomes necessary due to coating failure and corrosion. During the coating life the Owner should expect the coating to lose its gloss, start to chalk, show signs of weathering, and possibly some rust staining. Future touch-up may be required on isolated coating failures. If aesthetics are a concern, the Owner may have to topcoat the repainted tank prior to the end of the expected service life. However, future topcoating would be less expensive than complete cleaning and recoating and could delay the next complete cleaning and repainting for many years.

7. **Other Systems:** With air emission volatile organic compounds (VOC) restrictions being put in place around the nation, alternative coating systems may become available which would be viable options for this tank. The Owner should review the available systems prior to preparing specifications for the recoating project.

8. **Coating Curing:** It would be more economical to paint the tank exterior at the same time the interior is painted, since the tank must be drained while the exterior is painted, and the applied coatings cure. This will also reduce mobilization and observation costs.

9. **Rehabilitation Schedule:** To obtain the lowest possible prices for the work outlined in the recommendations, the Owner should have the specifications prepared and the work bid in the spring, with the work scheduled to start in early summer (if possible).

10. **Grinding and Bracket Removal:** Any unused brackets or erection lugs should be removed prior to the exterior repainting. Any weld burrs, weld spatter, or erection scars should be ground off to provide a smooth surface for the application of the coating.

11. **Nameplates:** The tank nameplates should be removed for the cleaning and coating of the tank. The nameplates should be cleaned and reattached to the tank using new brackets.

12. **Anchor Bolts:** The anchor bolt on the riser with the bolt hole not fully covered should be equipped with a heavy washer under the anchor bolt nut to cover the bolt hole in the base plate.

13. **Riser Manhole**: At the time of recoating and repairs, the gasket for the manhole should be replaced. At the time of exterior rehabilitation, the riser manhole should either be enlarged or augmented with a 30 in. diameter manhole.

14. **Riser Rods and Hand Holds: The riser rods and the hand holds on the columns should not be used for rigging or personnel access.**

15. **Exterior Ladders**: If compliance with OSHA dimensional and safety standards is desired, the exterior ladders should be replaced with ladders which meet current requirements. The rusted ladder safe-climbing devices should be replaced. At the time of the exterior repainting, the safe-climbing devices should be cleaned and protected from the application of the exterior coating.

16. **Vandal Deterrent**: The addition of a vandal deterrent would offer the Owner further protection from unauthorized access to the ladder and tank.

17. **Balcony**: The broken welds at the toe bar splices should be repair welded. If strict compliance with OSHA and safety-related standards is desired, the balcony safety railing should be replaced with dimensionally compliant members. The balcony access from the tower ladder should be modified to provide adequate head clearance. Closure chains or a cover should be installed at the balcony access. The pipes and other debris on the balcony floor should be removed to eliminate the trip hazard.

18. **Overflow Pipe**: The cracked coating on the overflow pipe bracket welds might indicate cracked welds. The cracked coating should be cleaned off the bracket welds and the welds closely evaluated.

19. **Clog-Resistant Vent**: The warped high density polyethylene pallet for the vent should be replaced, and the proper operation of the pallets verified.

20. **Roof Manhole**: The roof manhole and cover should continue to be locked to improve water system security.

21. **Obstruction Lights**: The Owner should file a FAA Form 7460 to verify the need for obstruction lighting on the tank. If the lighting is required the cracked conduit and light should be repaired and new bulbs and globes should be installed. If the lighting is not required, the light assembly and all associated conduits and brackets should be removed.

C. Interior Surfaces

1. **Life of the Interior Coating**: The interior coating system appeared to be in generally good condition and providing adequate corrosion protection. To prevent metal loss at areas of spot coating failure on the interior surfaces below the water level, a cathodic protection system should be installed within the next 12 to 18 months. If cathodic protection is not installed within the next 18 months, the interior should be completely cleaned and painted within 3 to 4 years. It is recommended that when the interior is completely cleaned and repainted, an epoxy coating system should be used.

2. **Coating Testing**: Prior to preparation of specifications for the cleaning and coating of the interior of the tank, several samples of the interior coating system should be subjected to laboratory

analysis to test for ingredients which may at that time be subject to regulations concerning their handling and disposal.

3. **Cathodic Protection**: To prevent further corrosion and metal loss at areas of spot coating failure below the top capacity level, a cathodic protection system should be installed.

a. **Type**: When the cathodic protection system is installed, an ice-resistant cathodic protection system which features long-life anodes, automatic potential and current control, with an independently controlled circuit and anode for the riser should be specified.

b. **Scheduling**: If the cathodic protection system is installed prior to complete cleaning and repainting the tank interior, the system should be removed and protected prior to cleaning and painting. After the interior is completely cleaned and recoated, the cathodic protection system should not be energized until after the First Anniversary Inspection. The Owner should conduct washouts and evaluations approximately every 3 years to monitor the need for cathodic protection. As the interior coating begins to show signs of failure, the cathodic protection system should be energized to aid in minimizing corrosion below the top capacity level.

c. **Maintenance**: Cathodic protection, if operated and maintained properly, will control active corrosion below the water level and extend the useful life of a coating system. It should be noted that maintenance as recommended by the cathodic protection manufacturer is required for the cathodic protection system to work properly. Without proper monitoring, the cathodic protection system may operate too high and cause the coating to blister, or the system may operate too low and not adequately protect the exposed steel surfaces.

4. **Recommended Interior Coating System**:

a. **Epoxy Coating System**: The optimum long-life coating system presently available for the interior of water tanks is a two-component epoxy coating system. A two-coat epoxy system is recommended for the interior of this tank. This coating system should meet the certification criteria of ANSI/NSF 61 and state department of health regulations.

b. **Coating Application**: When the interior is to be repainted, the entire tank interior should be cleaned to the equivalent of an SSPC-SP 10, Near-White Blast Cleaning and an epoxy coating system applied.

c. **Service Life**: The typical life of a properly formulated and applied epoxy coating system is approximately 12 to 15 years in immersion service. Tank Industry Consultants defines the life of a coating as the expected service life before repainting becomes necessary due to coating failure and corrosion. The Owner could extend the service life of the coating by installing, properly maintaining and operating a cathodic protection system to help protect the steel surfaces in areas which have experienced coating failure.

5. **Pit Welding and Pit Filling**: After initial cleaning, all significant pitting which is found should be welded, and all pitting with rough edges that would make the pitting difficult to coat properly should be filled with a solventless epoxy seam sealer.

6. **Seam Sealing**: The existing roof manhole and existing roof vent intersections should be sealed with an epoxy seam sealer at the time of the interior recoating.

7. **Flexible Sealant**: The unwelded lapped roof seams should be sealed with a flexible sealant at the time of the interior recoating.

8. **Rough Edges**: All unused brackets should be removed from the interior and exterior surfaces at the time of the next recoating. Any weld burrs, spatter, scars or rough edges in the steel should be ground smooth to provide a better surface for coating.

9. **Transition Cone Railing and Riser Safety Grate**: Tank Industry Consultants recommends that a safety railing be installed around the transition cone opening in the bowl. The apparently welded shut safety grate over the riser opening should be modified or replaced so that the safety grate has a hinged opening to allow access to the wet riser. The safety grate should be bolted to brackets to allow for removal of the grate during cleaning and painting. **Until such time as a safety railing is installed personnel should not access the interior wet area of the tank unless they are attached to independently secured safety lines.**

10. **Siphon Pipe**: The missing air check valve for the siphon pipe should be replaced.

ECONOMIC FACTORS:

Item	Cost	Life in Years
Replacement of tank with a new one	$1,000,000[1]	75+

The following is a complete list of repairs and estimated costs for their respective recommendations found in the RECOMMENDATION section of this report.

Item	Sanitary & Safety	Scheduled Maintenance Repairs
Clean and Paint Exterior:		
Spot Repair and Topcoat		$ 140,000
Containment		100,000
SP 6, Complete Clean, Epoxy/Polyurethane System		200,000
Containment		100,000
Clean and Paint Interior:		
SP 10, 2-Coat Epoxy System		80,000
Cathodic Protection System		16,000
Miscellaneous Chipping and Grinding		2,000
Seam Sealing		3,000
Pit Repair		1,500
Grout Repair		1,500
Foundation Repair		2,000
Transition Cone Railing	$ 6,000	
New Riser Safety Grate Installation	4,000	
Exterior Ladders Replacement	12,000	
Exterior Ladder Safe-Climbing Device	6,000	
Vandal Deterrent	2,000	
Balcony Safety Railing	18,000	
Balcony Access Opening Modifications	4,000	
New 30 in. Diameter Riser Manhole	6,000	
Clog-Resistant Vent Pallet	2,000	
Contingency Items	5,000	5,000

Estimates are believed to be a high average of bids that would be received in 2008.

[1] The replacement estimate includes costs associated with new tank fabrication and erection, foundation, painting, and engineering. The budget estimate given does not include costs associated with tank demolition, site acquisition, and distribution interruptions.

The following economic factors include only those work items which the Engineer believes to be the minimum to properly maintain this tank from an operational standpoint. Other items related to safety and risk management should be evaluated by the Owner.

Item	Cost
Clean and Paint Exterior:	
Spot Repair and Topcoat	$ 140,000
Containment	100,000
Cathodic Protection System	16,000
Miscellaneous Chipping and Grinding	2,000
Seam Sealing	3,000
Pit Repair	1,500
Grout Repair	1,500
Foundation Repair	2,000
Transition Cone Railing	6,000
New Riser Safety Grate Installation	4,000
Exterior Ladders Replacement	12,000
Exterior Ladder Safe-Climbing Device	6,000
Vandal Deterrent	2,000
Balcony Safety Railing	18,000
Balcony Access Opening Modifications	4,000
New 30 in. Diameter Riser Manhole	6,000
Clog-Resistant Vent Pallet	2,000
Contingency Items	10,000
Total of Engineer's Recommendations	**$336,000**

Tank Industry Consultants has no control over the cost of labor, materials, or equipment, or over the contractors' methods of determining prices, or over competitive bidding, or the market conditions. Opinions of probable cost, as provided for herein, are to be made on the basis of our experience and qualifications and represent our best judgment as design professionals familiar with the design, maintenance, and construction of concrete and steel plate structures. However, Tank Industry Consultants cannot and does not guarantee that proposals, bids, or the construction cost will not vary from opinions of probable cost prepared for the Owner.

Due to the numerous potential scopes of work which exist, the Owner should obtain an updated budget estimate once the final scope of work has been determined. This would enable the Owner to accurately budget monies for additional mobilization costs and damaged coating rehabilitation costs.

Engineering and resident observation costs are not included in the Total of the Engineer's Recommendations because these fees are dependent upon the scope of work to be performed. Tank Industry Consultants performs all facets of the engineering services which would be required for this project. Estimated fees for engineering and resident observation will be furnished upon request.

CLOSURE:

Brief Summation: The City of Lawrence Utilities has a 500,000 gallon elevated water storage tank in Lawrence, Indiana which appeared to be in good overall condition. Proper maintenance after completing the recommendations herein would include periodic washouts and evaluations approximately every 3 years, evaluations, and the installation and proper maintenance of a new ice-resistant cathodic protection system with long-life anodes.

Contractor Selection: The work should be performed by a competent bonded contractor, chosen from competitive bids taken on complete and concise specifications. The coatings used should be furnished by an experienced water tank coating manufacturer, supplying the field service required for application of technical coatings.

Standards for Repairs and Coatings: All work done and coatings applied should be applied in accordance with ANSI/NSF Standard 61, the manufacturer's recommendation, AWWA D100 and AWWA D102 (latest revisions), and the SSPC: The Society for Protective Coatings.

Observation of Work: Observation of the work in progress by experienced personnel will offer additional assurance of quality protective coating application. Observations can be performed on a continuous basis or spot (critical phase) basis. The actual cost of observation may be less using spot as opposed to full-time resident observation; however, with spot observation it is often necessary for work to be redone to comply with the specifications. This somewhat lowers the quality of the finished product, lengthens the job, and is frequently a cause of conflict between the contractor, Owner, and field technician. Resident full-time observation minimizes the amount of "rework" required.

Anniversary and Maintenance Evaluations: An anniversary evaluation should be conducted prior to the end of the one year bonded guarantee. Washouts and coating, structural, sanitary, safety, and corrosion evaluations should be conducted not less than every three years.

Time Frame: If the work is not performed within the next 18 months, the structure should be reevaluated prior to the preparation of specifications and solicitation of bids.

Specifications and Bidding Documents: The recommendations in this report are not intended to be specifications on which a contractor can bid. Complete bidding documents must include general and special conditions, detailed technical specifications, and other information necessary for the competitive bidding process. To properly protect the interests of the Owner, Contractor, and Engineer; the initial evaluation, the technical specifications, legal portions of the contract documents, and the observation should be performed by the same firm or with close coordination of all parties involved.

Limitations of Evaluation: It is believed that the conditions reported herein reflect the condition of the tank as observed on the date of the evaluation, using reasonable care in making the observations, and safety in gaining access to the tank. Should latent defects be discovered during the cleaning of the structure, they should be brought to the attention of the Owner and the Engineer.

Seismic and Wind Loadings: This tank is located in or near a region of low seismic activity. This evaluation and the reporting of the condition of this tank do not warrant the structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications that may be required for compliance with present structural codes. It is possible the tank was erected in compliance with pre-existing industry standards which have since been replaced by more restrictive standards.

Hazardous Materials in Coatings: It should be taken into consideration that Federal, State, and local environmental agencies have placed stricter controls on the removal of lead-based and other heavy-metal based coatings from steel structures by the use of conventional abrasive blasting techniques. The paint and blast residue may be considered to be hazardous waste depending on the concentration of lead or other particles in residue.

Please contact Tank Industry Consultants if you have any questions or comments.

Respectfully submitted,

Tank Industry Consultants

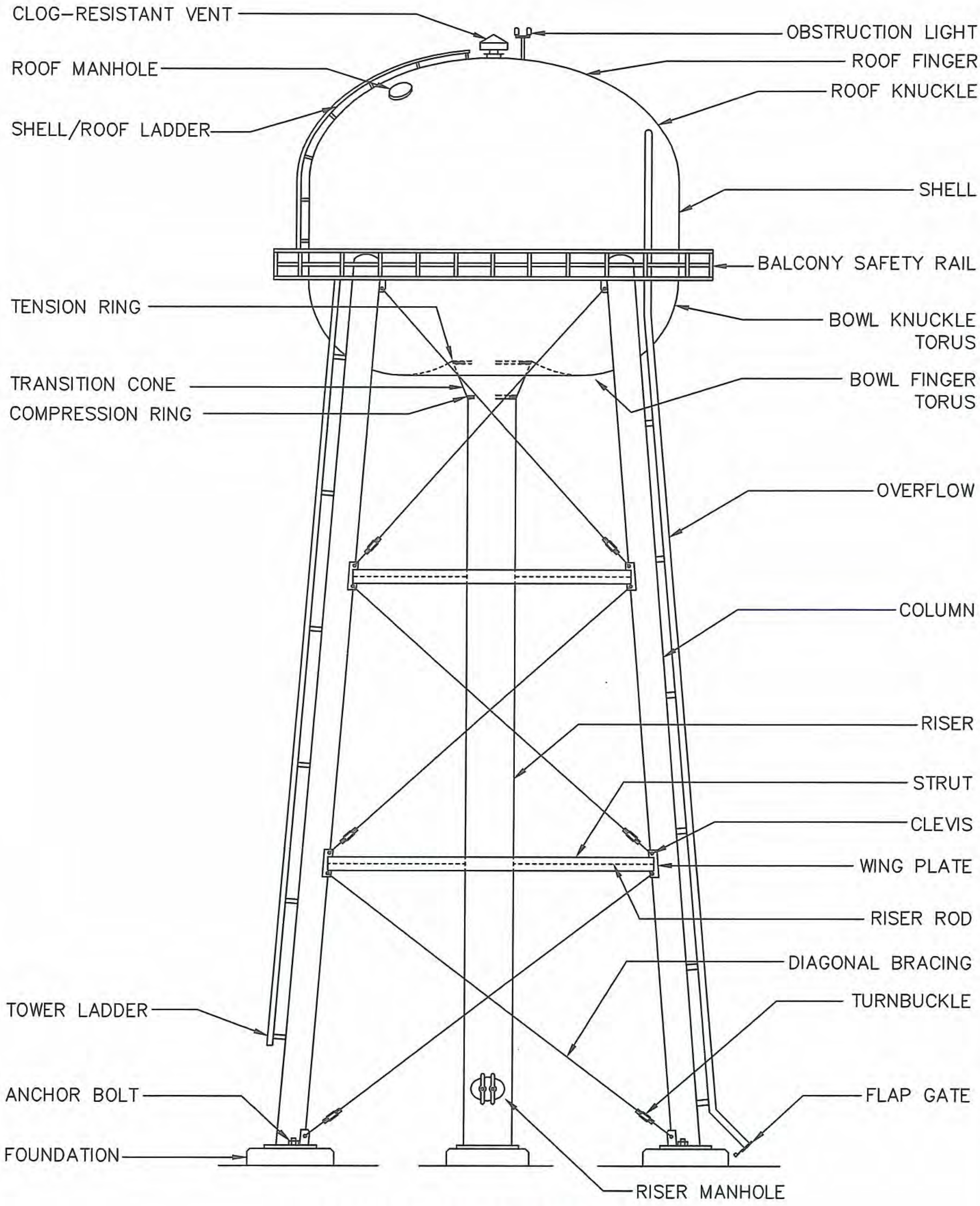
Patrick J. Brown, P.E.
Project Engineer

11.13.08

Gregory R. "Chip" Stein, P.E.
Managing Principal

GREGORY R. STEIN
REGISTERED
No. 920018
STATE OF
INDIANA
PROFESSIONAL ENGINEER

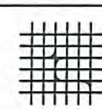
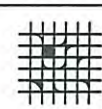
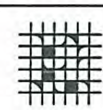
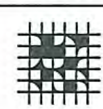
TORO-ELLIPSOIDAL TANK



NOMENCLATURE

Classification of Adhesion Test Results

Method A – X Cut Tape Test Approx. 1.5 in. long cuts at 30 deg. to 45 deg. apart.	Surface	Classification
No peeling or removal.		5
Trace peeling or removal along incisions.		4
Jagged removal along incisions up to 1/16 in. (1.6mm) on either side.		3
Jagged removal along most of incisions up to 1/8 in. (3.2mm) on either side.		2
Removal from most of the area of the X under the tape.		1
Removal beyond the area of the X.		0

Method B – Lattice Cut Tape Test Six parallel cuts at 2mm apart.	Surface	Classification
The edges of the cuts are completely smooth; none of the squares of the lattice are detached.	No Failure	5
Small flakes of the coating are detached at intersections; less than 5% of the lattice is affected.		4
Small flakes of the coating are detached along edges and at intersections of cuts. The area affected is 5% to 15% of the lattice.		3
The coating has flaked along the edges and on parts of the squares. The area affected is 15% to 35% of the lattice.		2
The coating has flaked along the edges of cuts in large ribbons and whole squares have detached. The area affected is 35% to 65% of the lattice.		1
Flaking and detachment worse than grade 1.		0

Tank Industry Consultants

7740 West New York Street
Indianapolis, Indiana 46214

Telephone – 317/271-3100
FAX – 317/271-3300

- CERTIFICATE OF ANALYSIS -

Report Date: *05-Nov-08*

Client ID: TANK_INDUST

Tank Industry Consultants
7740 West New York Street
Indianapolis, Indiana 46214

Attn: Julie Perkins

Phone: (317) 271-3100
FAX: (317) 271-3300

Our Lab # 08013237-001
Your Sample ID: Ext. Col. 1

Your Project # 08.110.H214.02
Collection Date: 10/29/08

Your Project Name: **Paint Sample**
Collected By: Client

Sample Type: Paint Chips
Receipt Date: 10/31/08 13:30

Total Metals, ICP-AES

Analytical Method	Prep Method	Prep Date	By
SW846 6010B	SW846 3050B	11/4/2008	iholmes

Parameter	Result	Units	Qual	Quant. Limit	CAS #	Analysis Date	By
Cadmium, Cd	< 25.0	mg/kg		25.0	7440-43-9	11/5/2008	kfoltz
Chromium, Cr	< 250	mg/kg		250	7440-47-3	11/5/2008	kfoltz
Lead, Pb	< 250	mg/kg		250	7439-92-1	11/5/2008	kfoltz

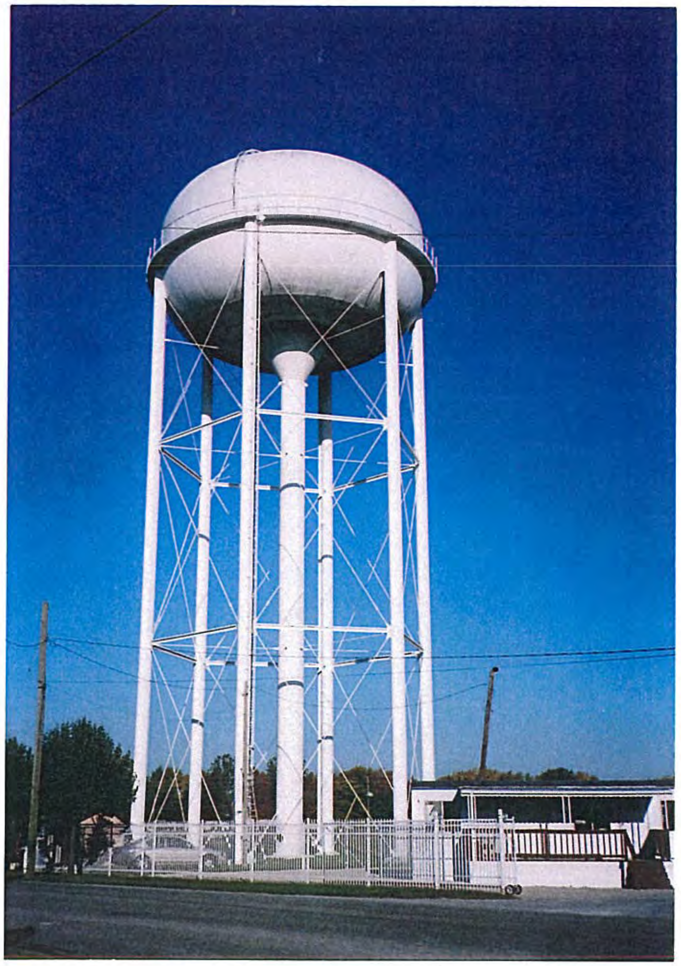
11/5/2008

Lab Manager **Date**

ESG Laboratories

5927 WEST 71ST STREET
INDIANAPOLIS, INDIANA 46278

PHONE (317) 290-1471
FAX (317) 290-1670



500,000 Gallon
Steel Elevated Tank
"52nd Street Tower"
City of Lawrence Utilities
Lawrence, Indiana

1. Tank and site.

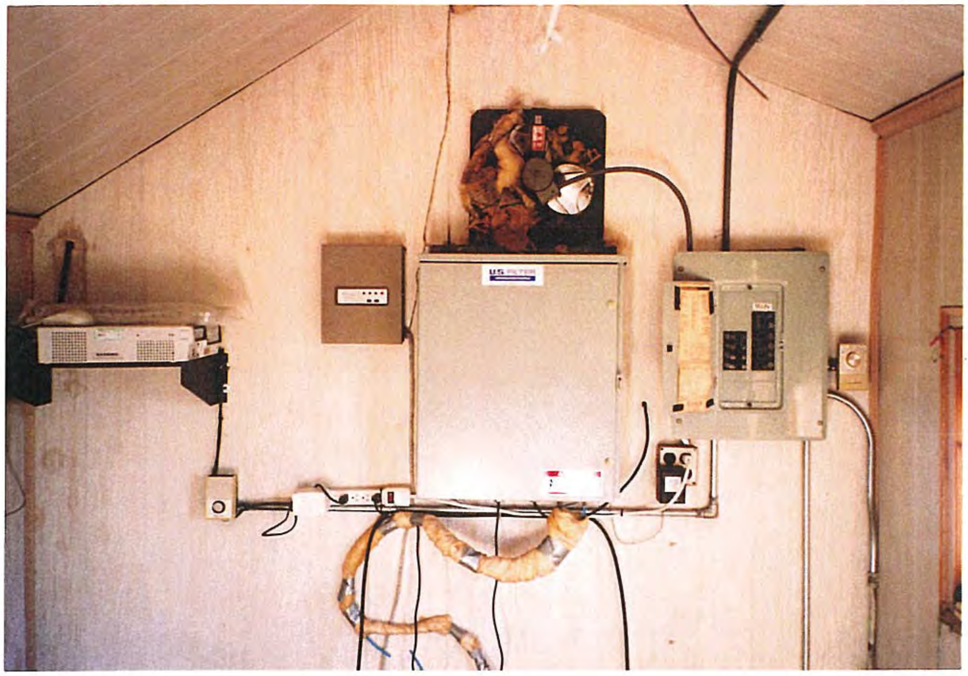
2. Surrounding area.

3. Surrounding area.

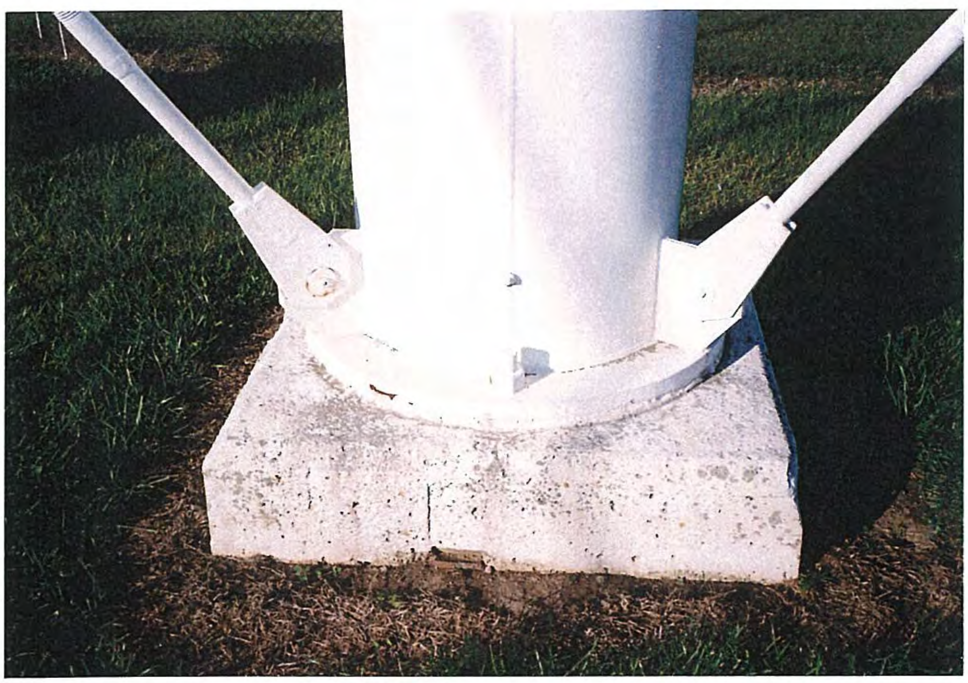
4. Surrounding area.

5. Tank and site.

6. Site access.



7. Equipment in building on site.



8. Column foundation, base plate, and anchor bolt.

9. Column foundation, base plate, and anchor bolt. Note rust near wing plate.

10. Column foundation, base plate, and anchor bolt. Note rust near wing plate.

11. Riser base plate and anchor bolt. Note corrosion and gap at bolt hole.

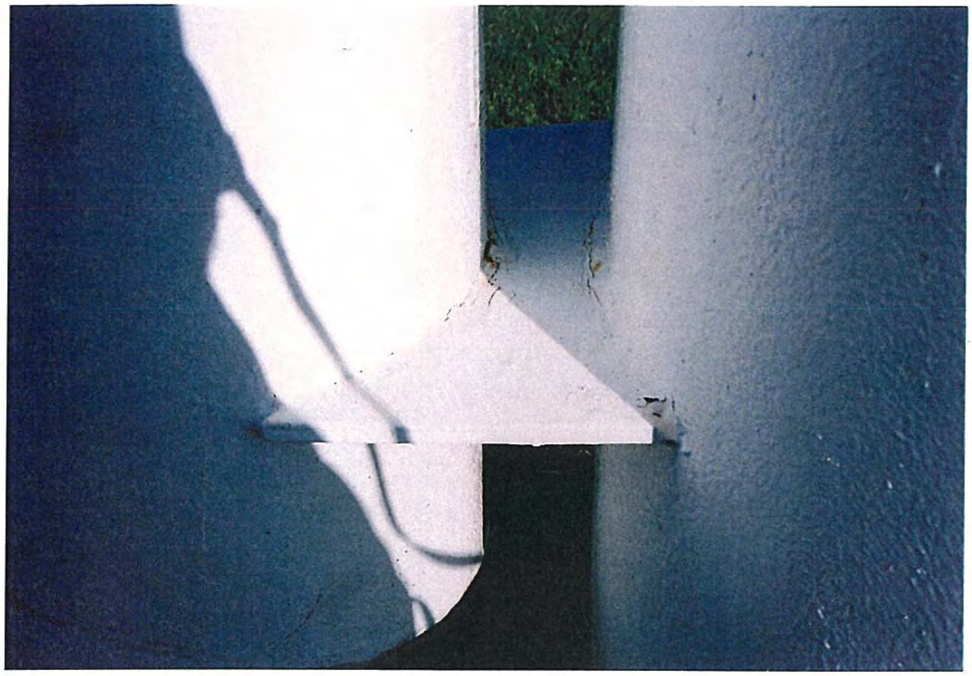
12. Columns and riser.

13. Riser, manhole, and tank nameplates.

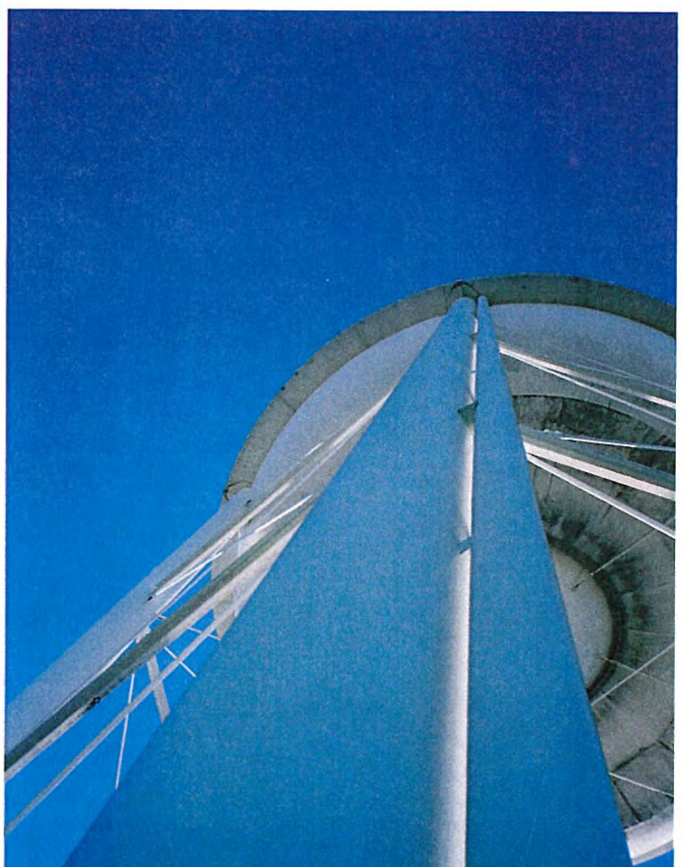
14. Cover and crabs for riser manhole.

15. Tank nameplates on riser.

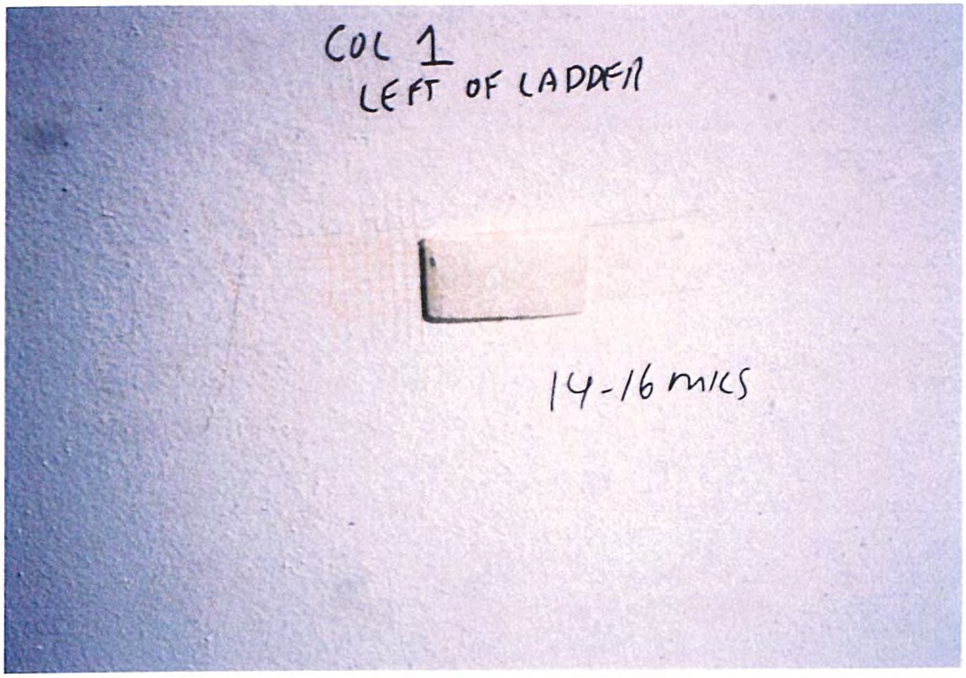
16. Discharge end of the overflow pipe.



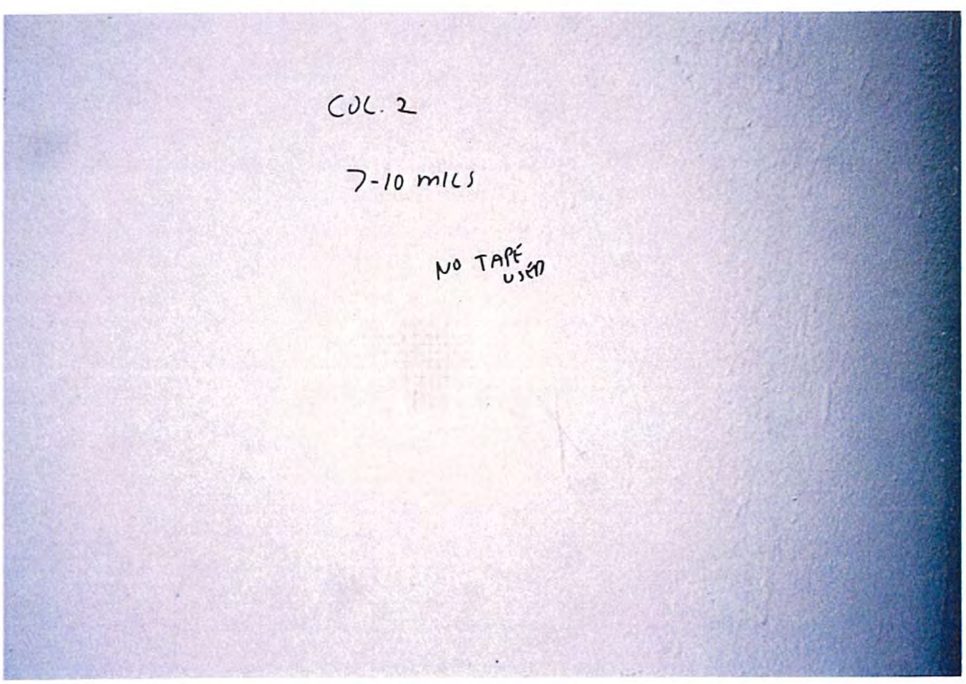
17. Cracked coating on lower overflow pipe bracket.



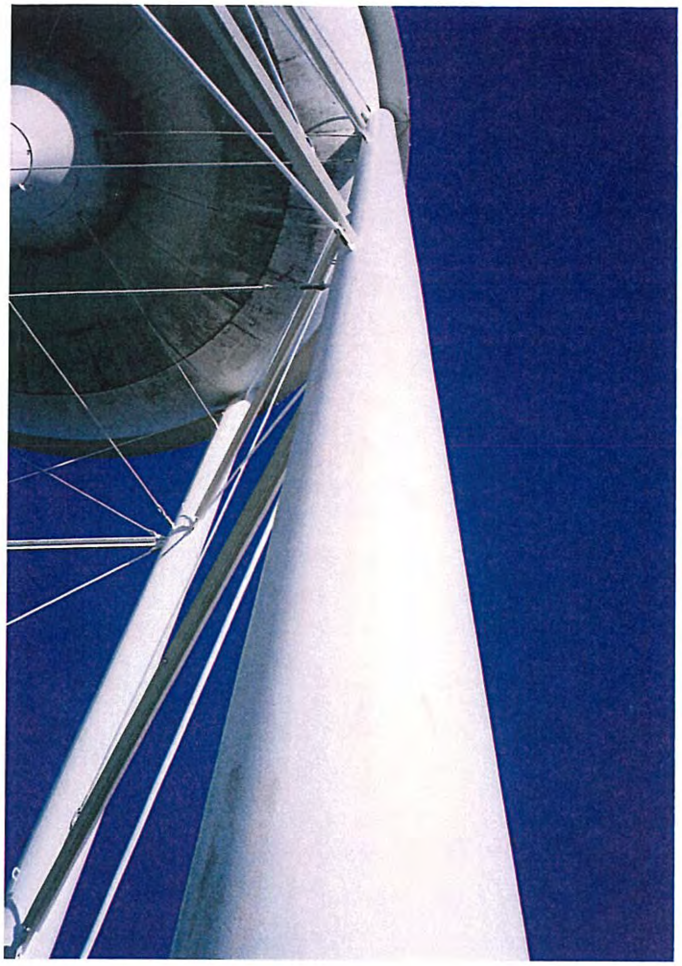
18. Overflow pipe on column.



19. Coating thickness measurements and coating adhesion tests on column #1.



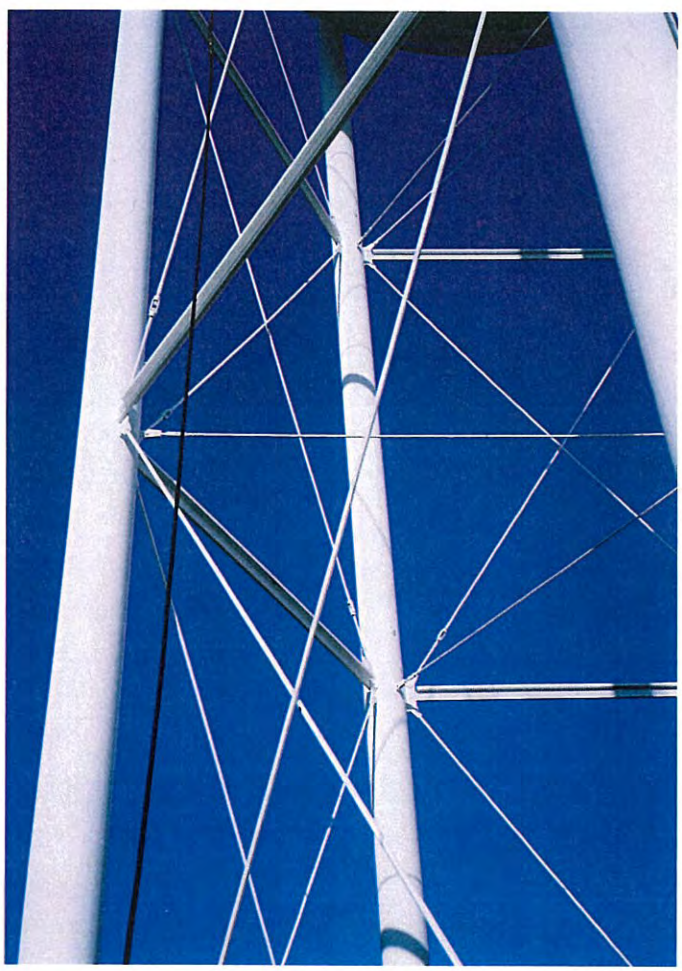
20. Coating thickness measurements and coating adhesion tests on column #2.



21. Column. Note areas of exposed underlying coating.

22. Corrosion at diagonal bracing clevis and wing plate at bottom of column.

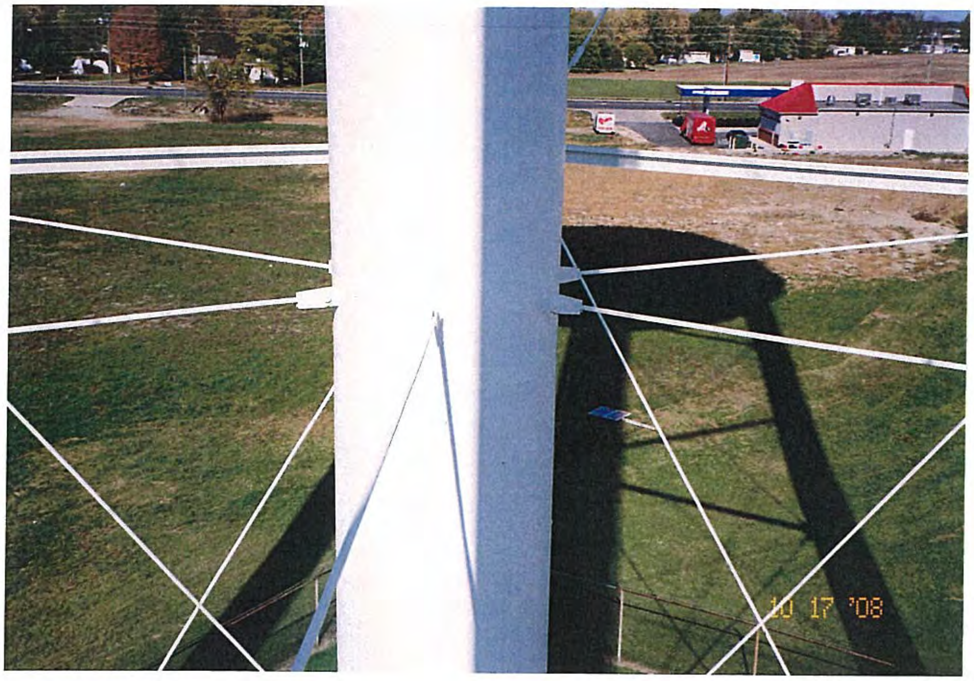
23. Columns, struts, diagonal bracing, and riser rods.



24. Columns, struts, diagonal bracing, and riser rods.

25. Column, struts, diagonal bracing, and riser rod.

26. Coating thickness measurements and coating adhesion test on exterior riser.



27. Riser and riser rods.

28. Riser and riser rods.

29. Bowl, riser, and riser rods. Note mildew on bowl.

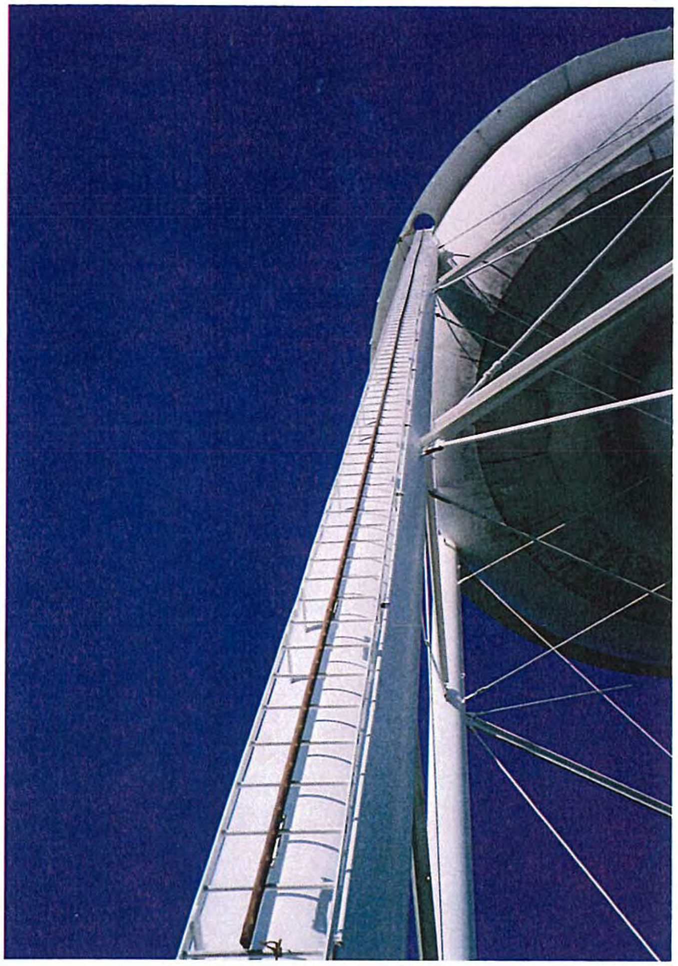
30. Riser rods and transition cone below bowl.

31. Mildew on exterior bowl.

32. Mildew on exterior bowl.

33. Mildew on exterior bowl.

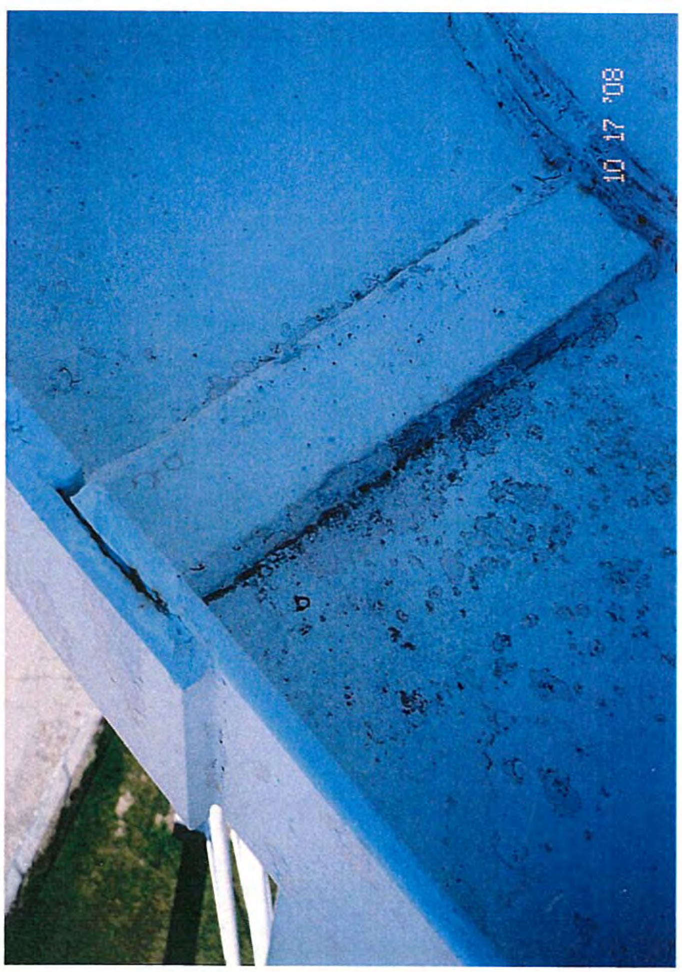
34. Bottom of tower ladder. Note photoelectric cell on column.



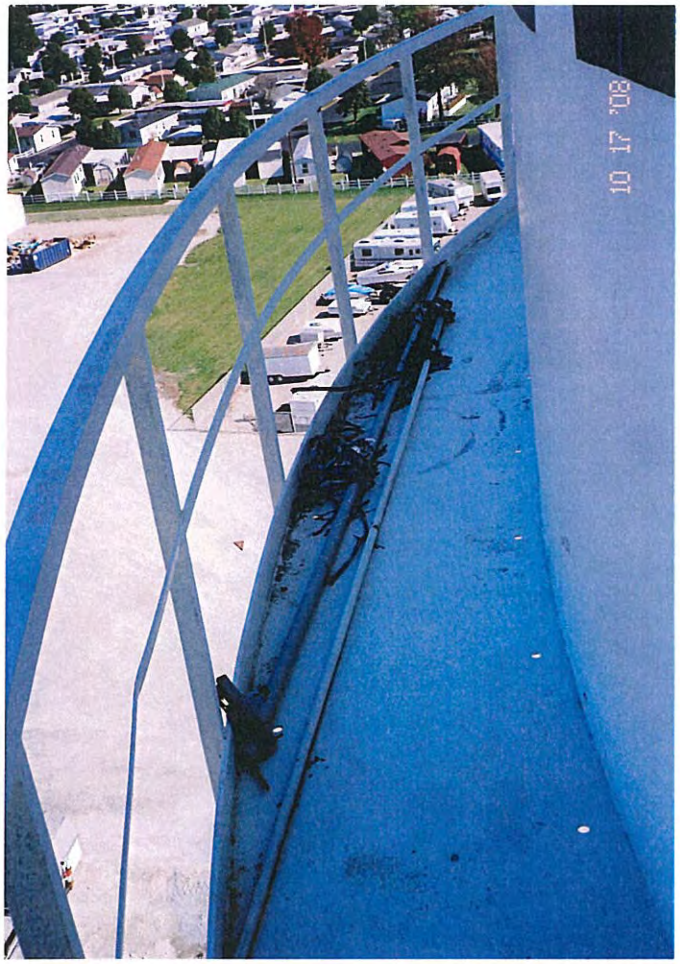
35. Tower ladder.

36. Tower ladder and conduit at balcony.

37. Balcony access.



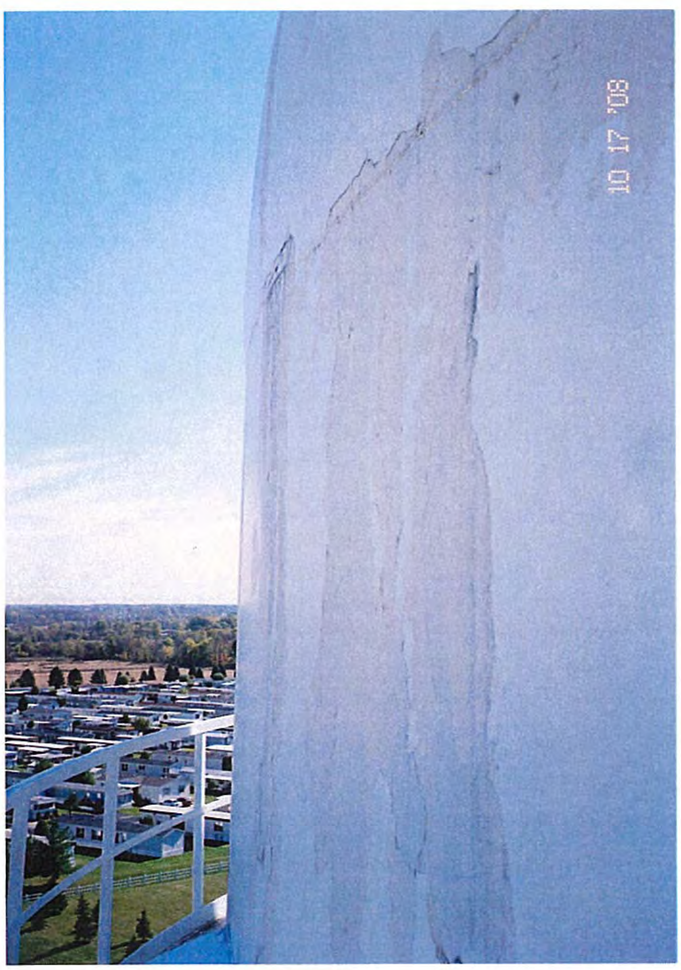
38. Cracked weld at top of toe bar splice.



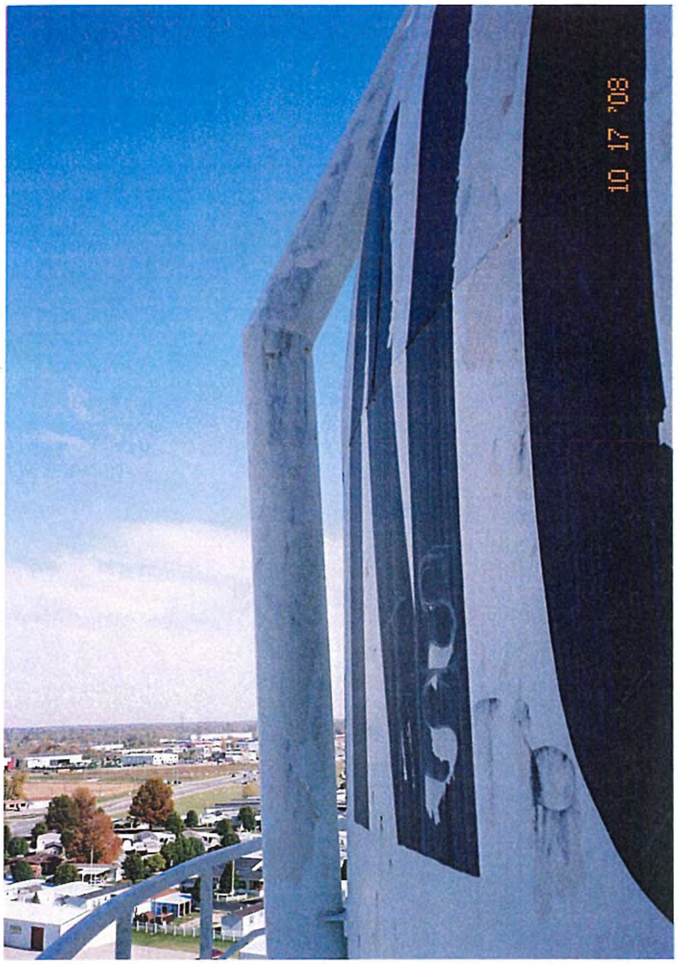
39. Pipes and debris lying on balcony.

40. Balcony, shell, conduit, and shell and roof ladder.

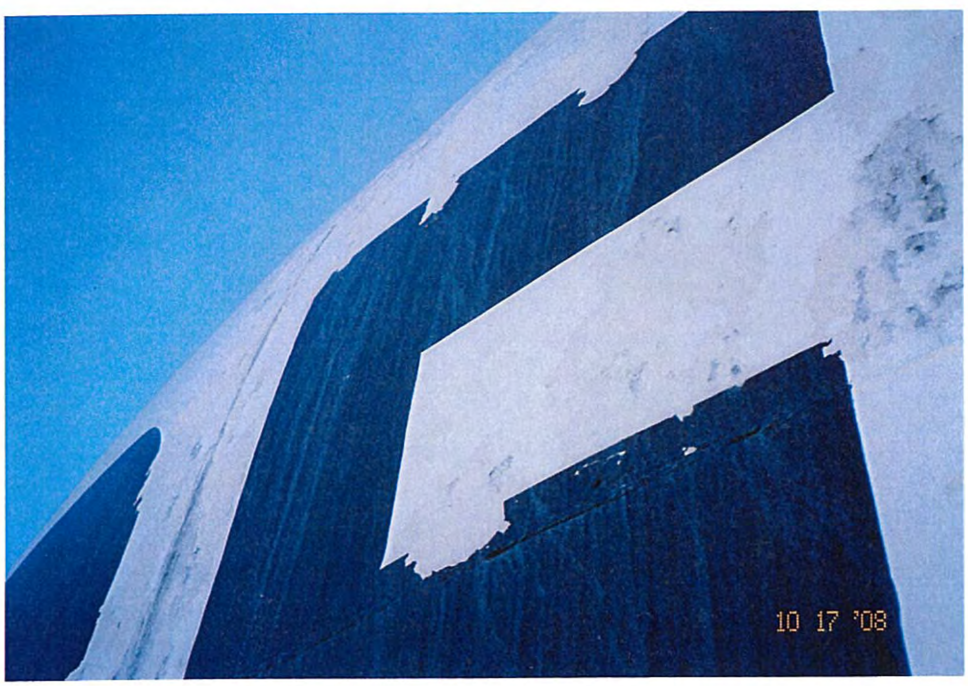
41. Cracked conduit on shell.



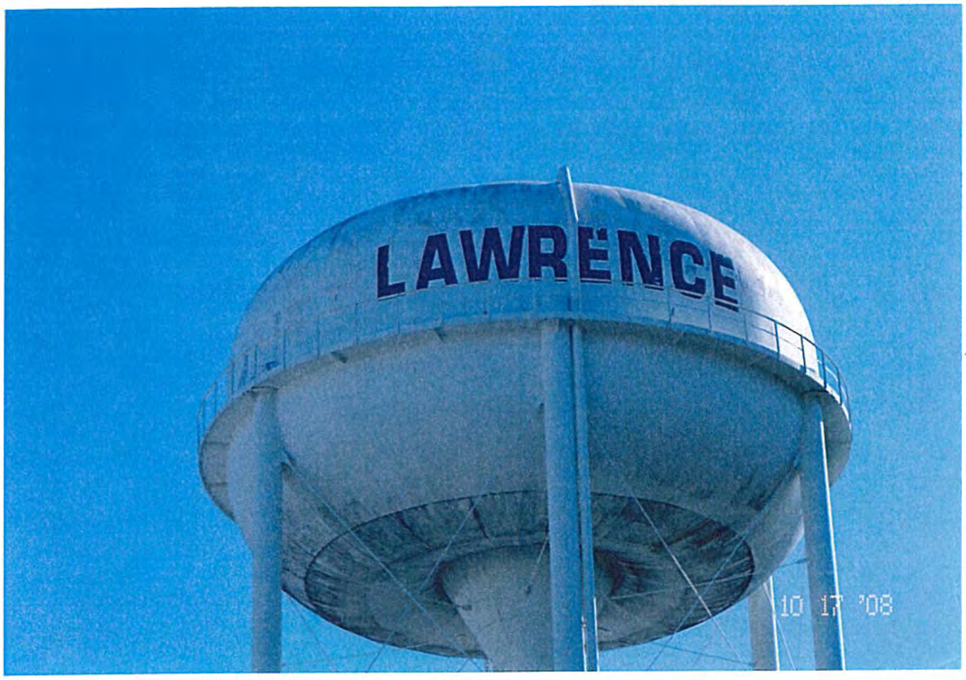
42. Peeled topcoat on exterior shell.



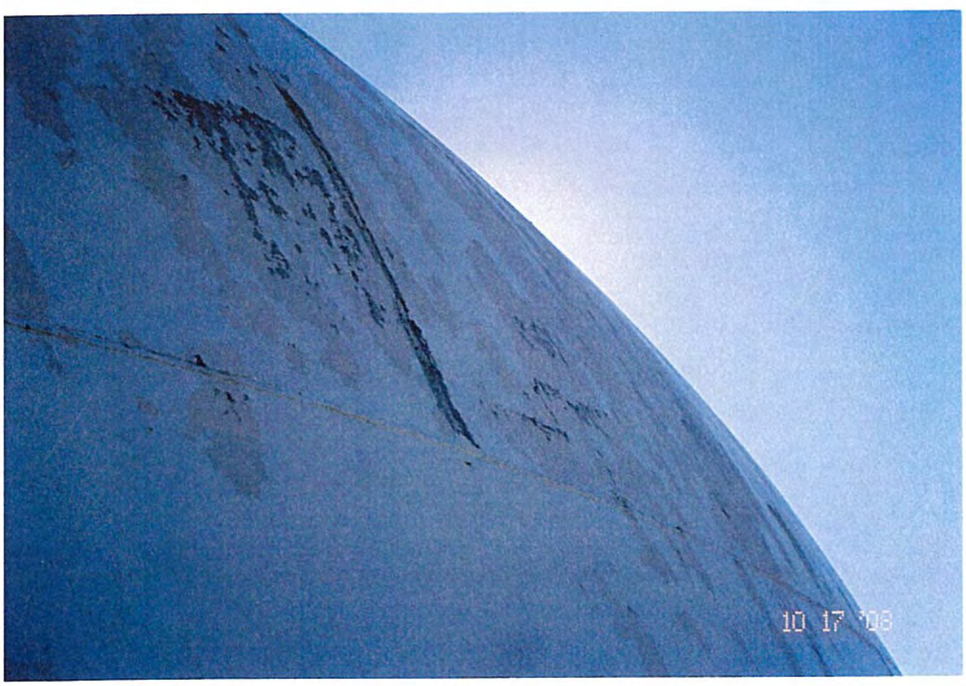
43. Peeled and faded coating on overflow pipe, shell, and sign.



44. Peeled and faded coating on shell and sign.



45. Container and sign.



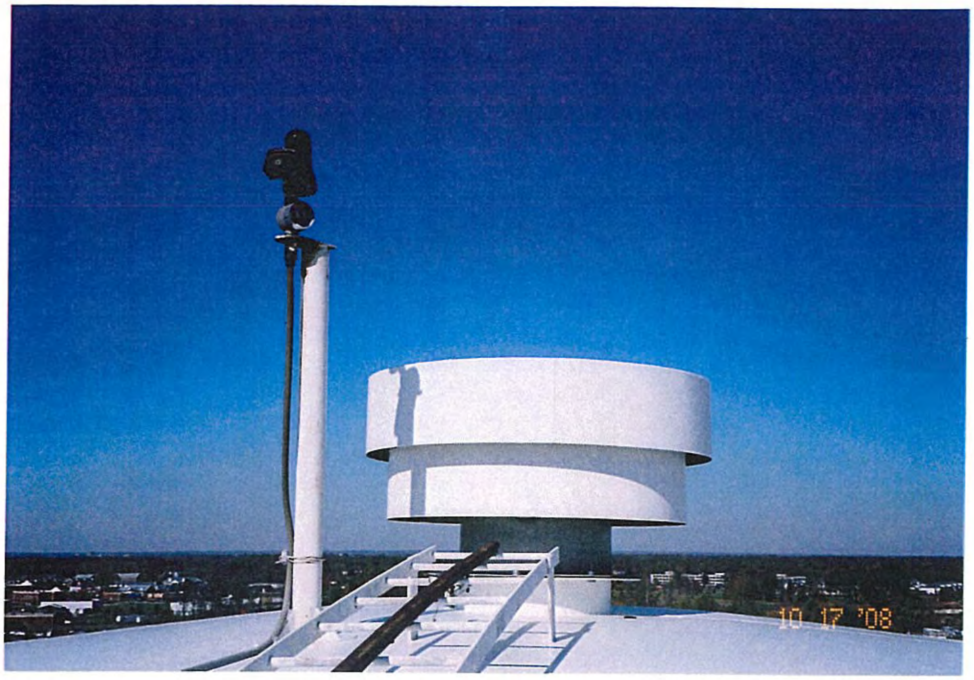
46. Peeled topcoat on roof knuckle.

47. Weathered topcoat on roof knuckle.

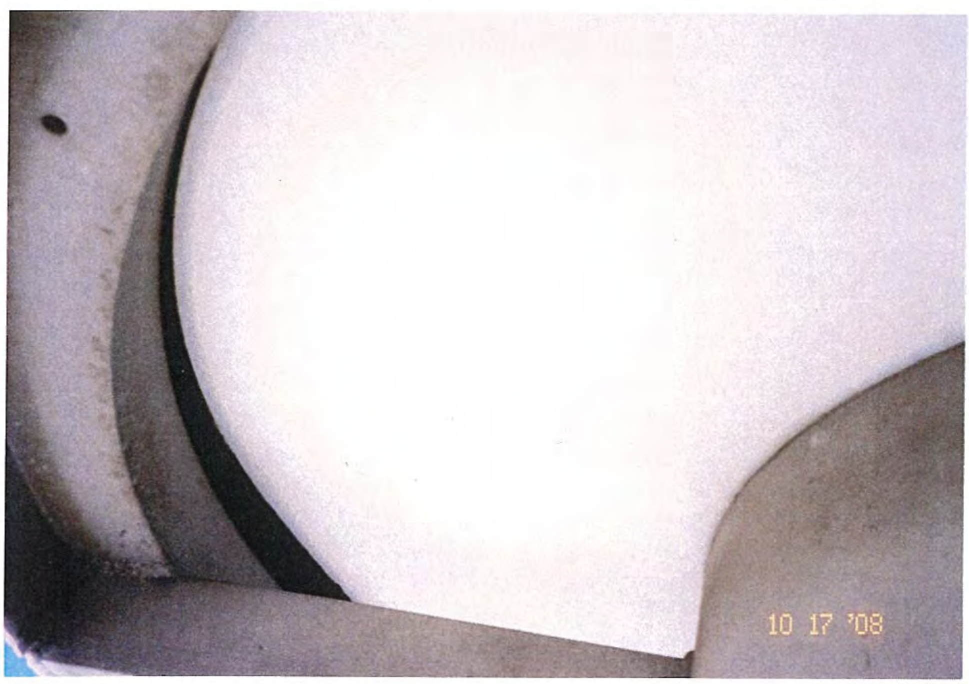
48. Weathered topcoat on roof.

49. Roof manhole and ladder.

50. Obstruction light on roof. Note bulb and globe missing.

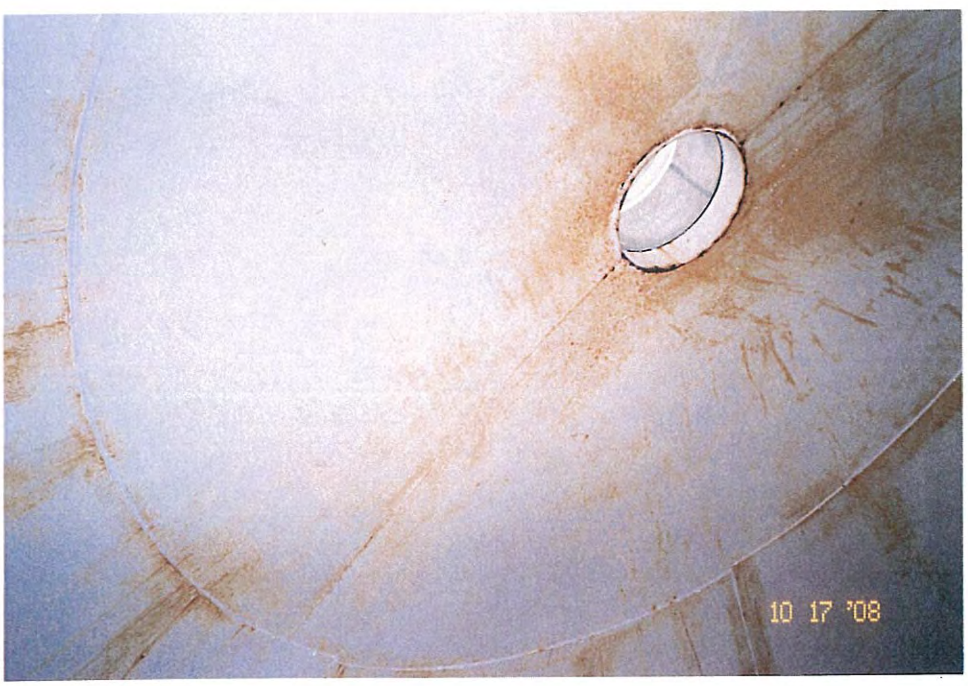


51. Obstruction light and roof vent.



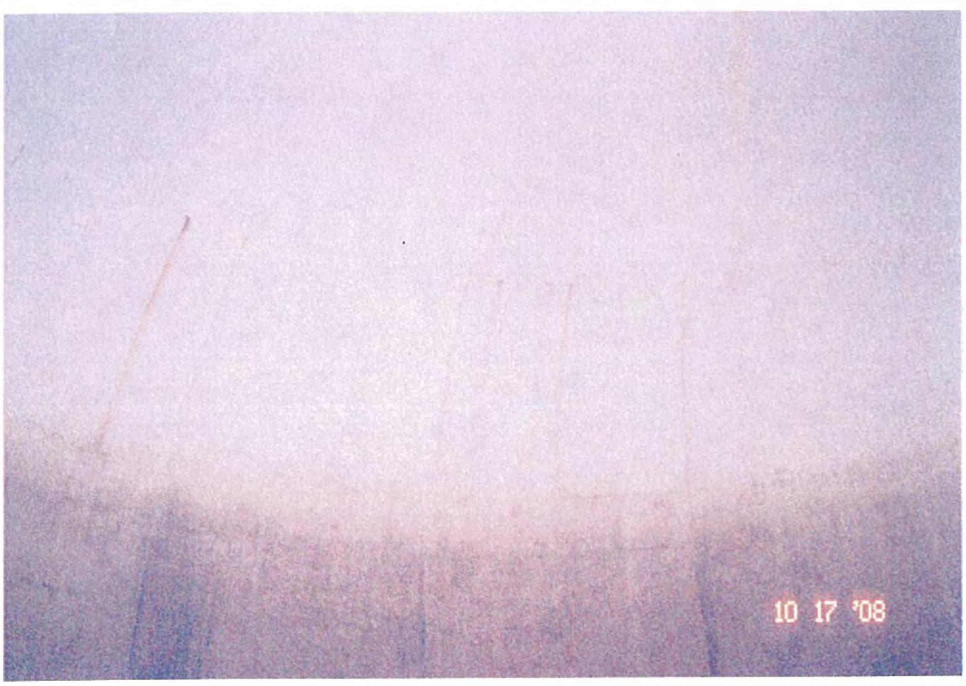
52. Gap at roof vent pallet.

53. Gap at roof vent pallet.



54. Surface rust on interior roof.

55. Interior roof.

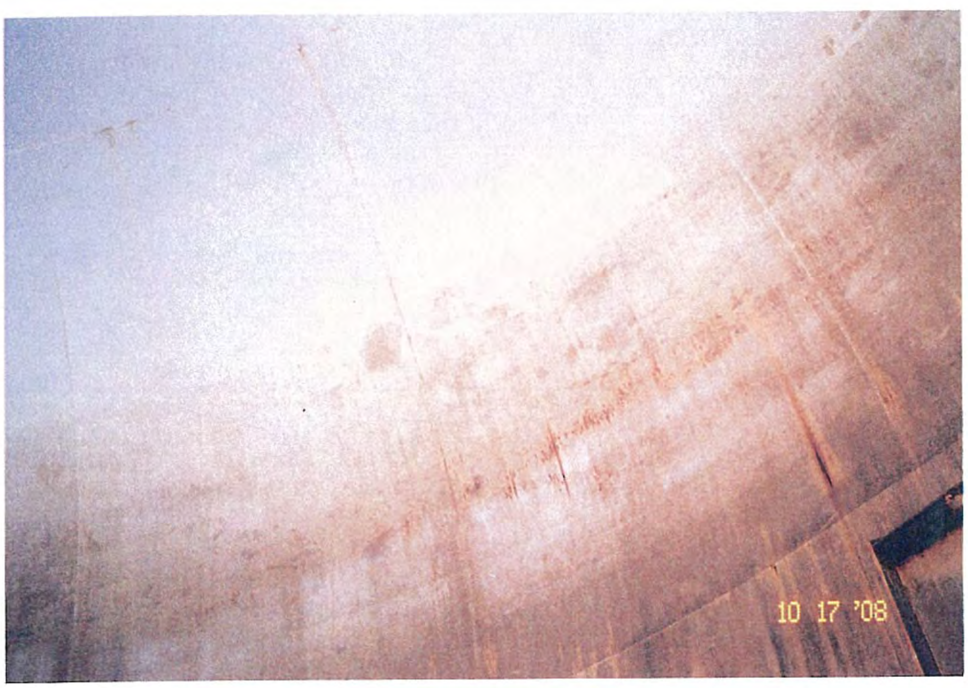


56. Interior roof.

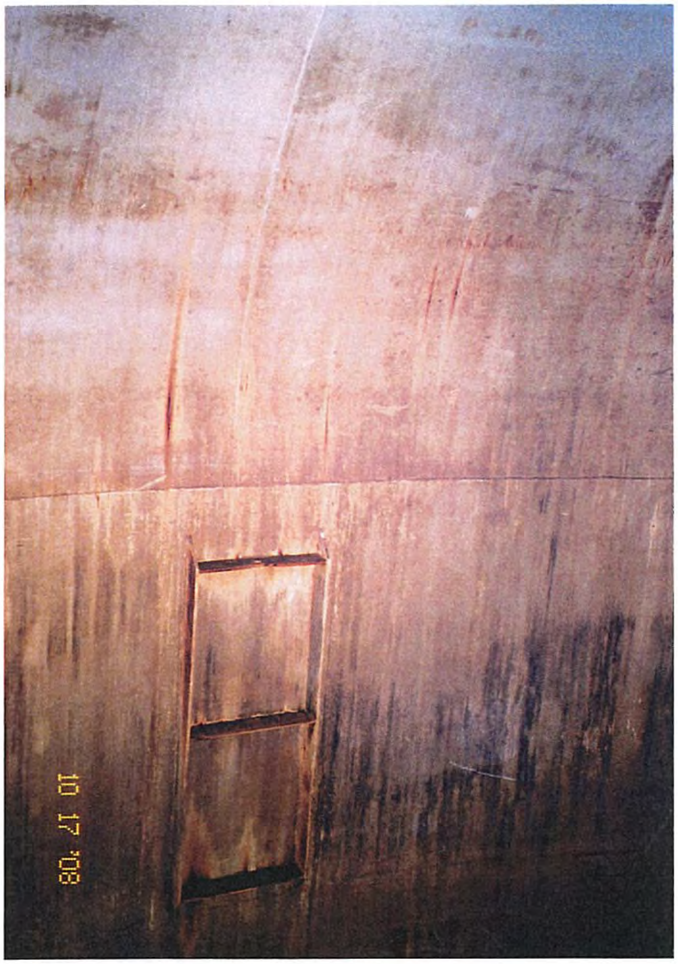
57. Interior roof and overflow weir box.

58. Overflow weir box.

59. Interior roof knuckle.



60. Interior roof knuckle.
Note spot rust.



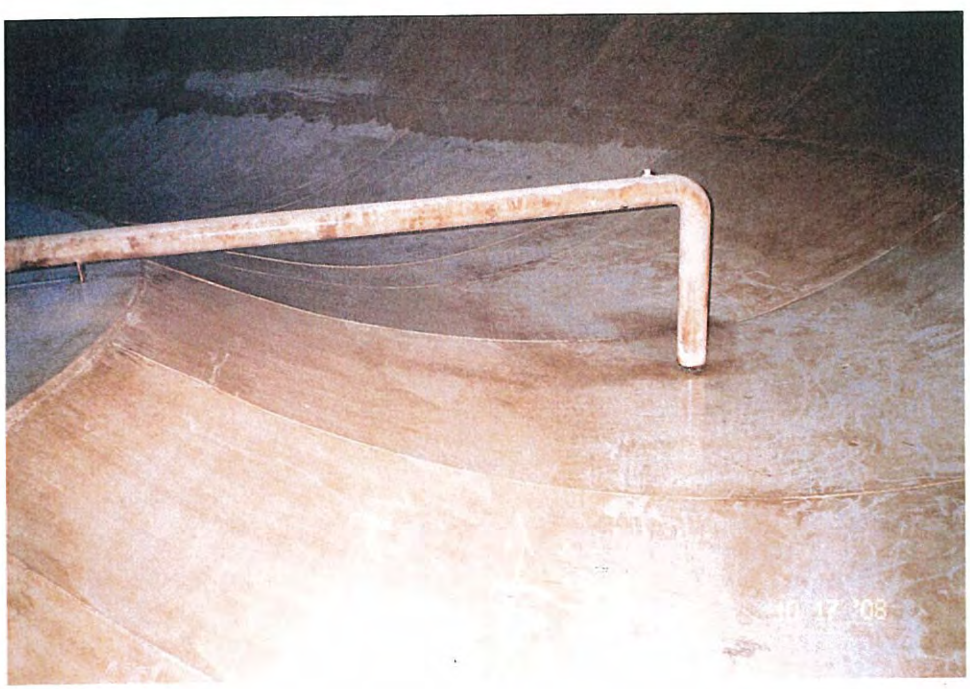
61. Spot rust on interior roof knuckle, shell, and column post head stiffeners.

62. Corrosion on column post head stiffeners on interior shell.

63. Interior shell.

64. Interior bowl.

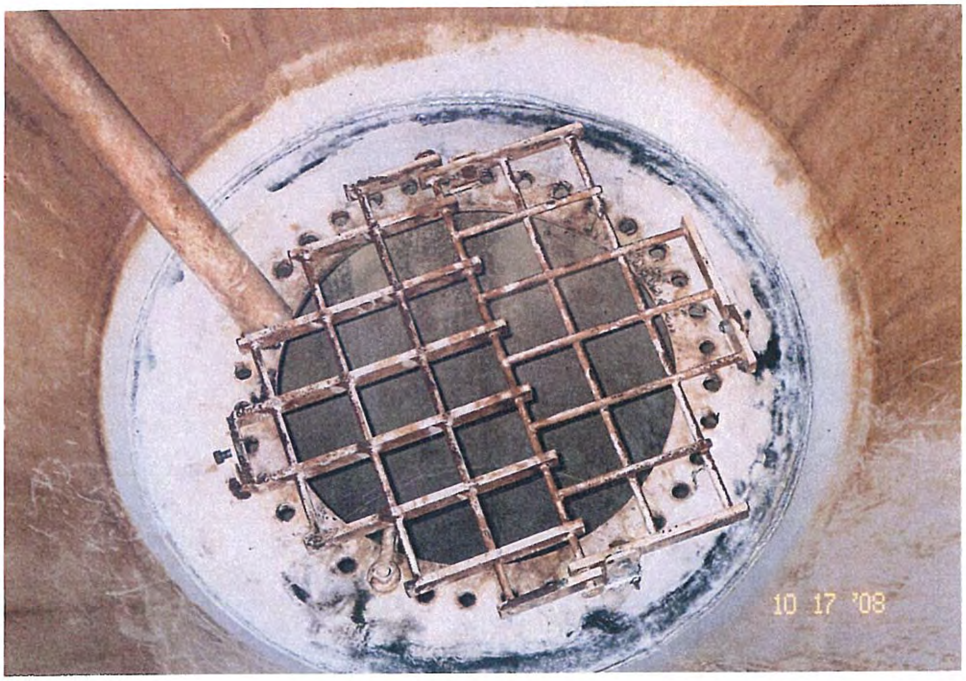
65. Interior bowl.



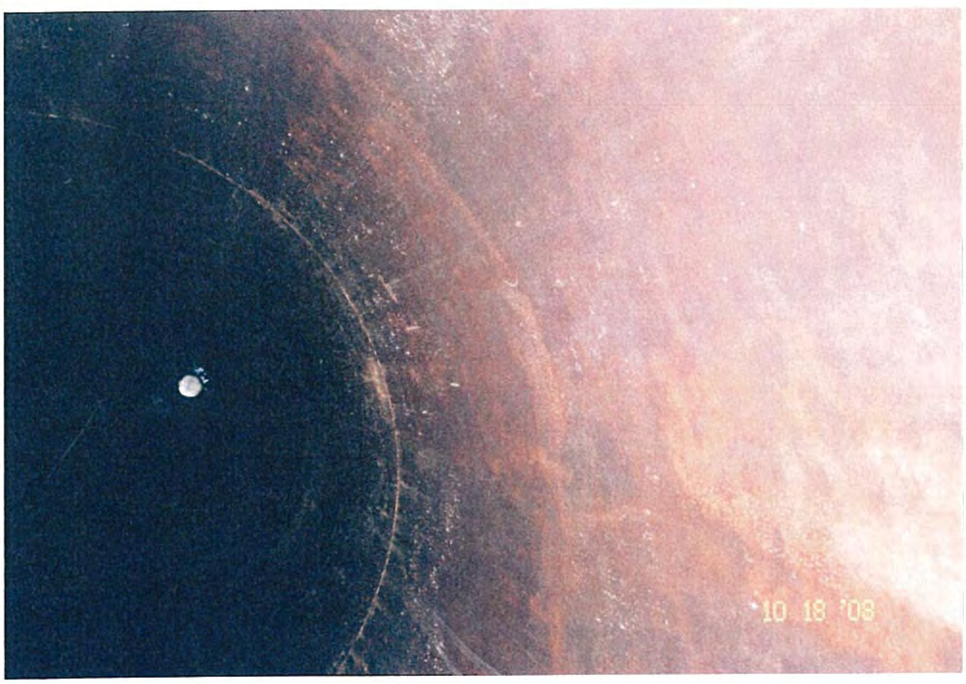
66. Siphon pipe in bowl.

67. Siphon pipe in bowl.

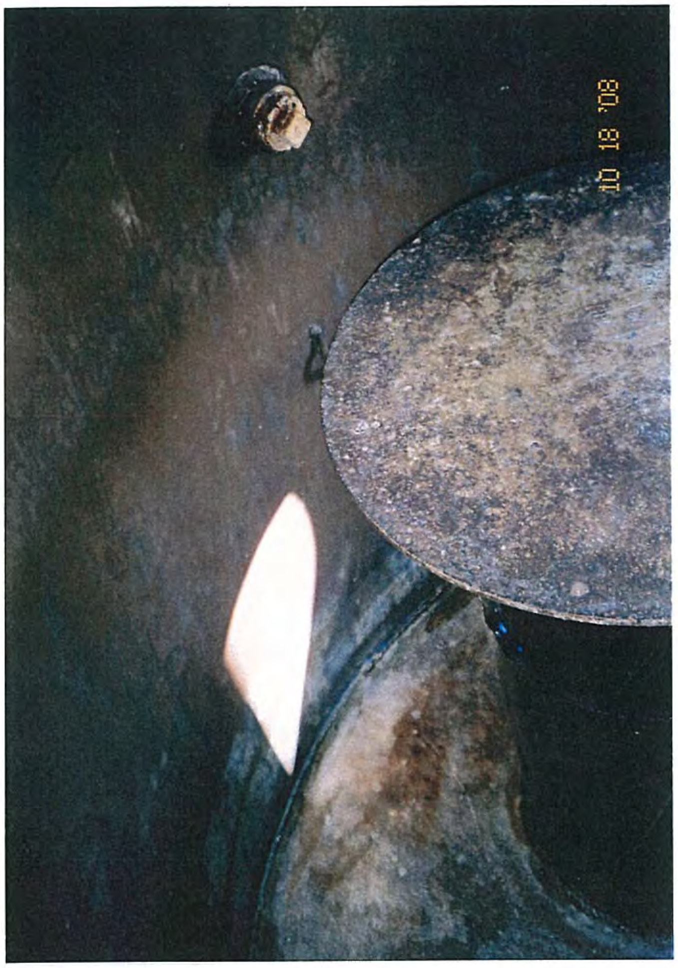
68. Siphon pipe in transition cone.



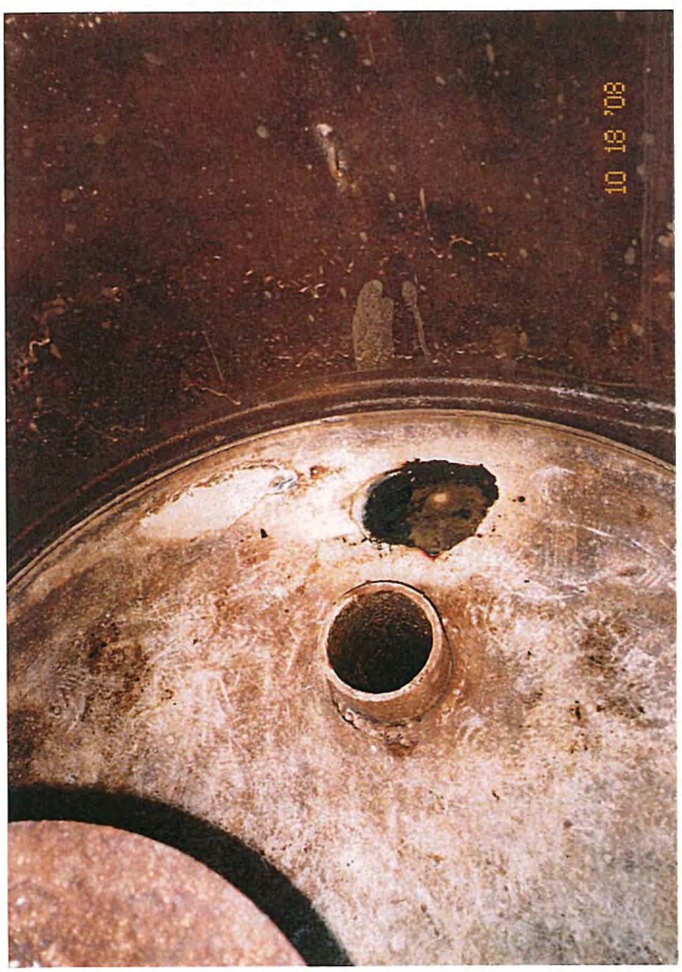
69. Grate at riser opening.



70. Interior riser.



71. Plugged coupling in riser and inlet/outlet pipe with protective cover in bottom of riser.



72. Drain pipe in bottom of riser.

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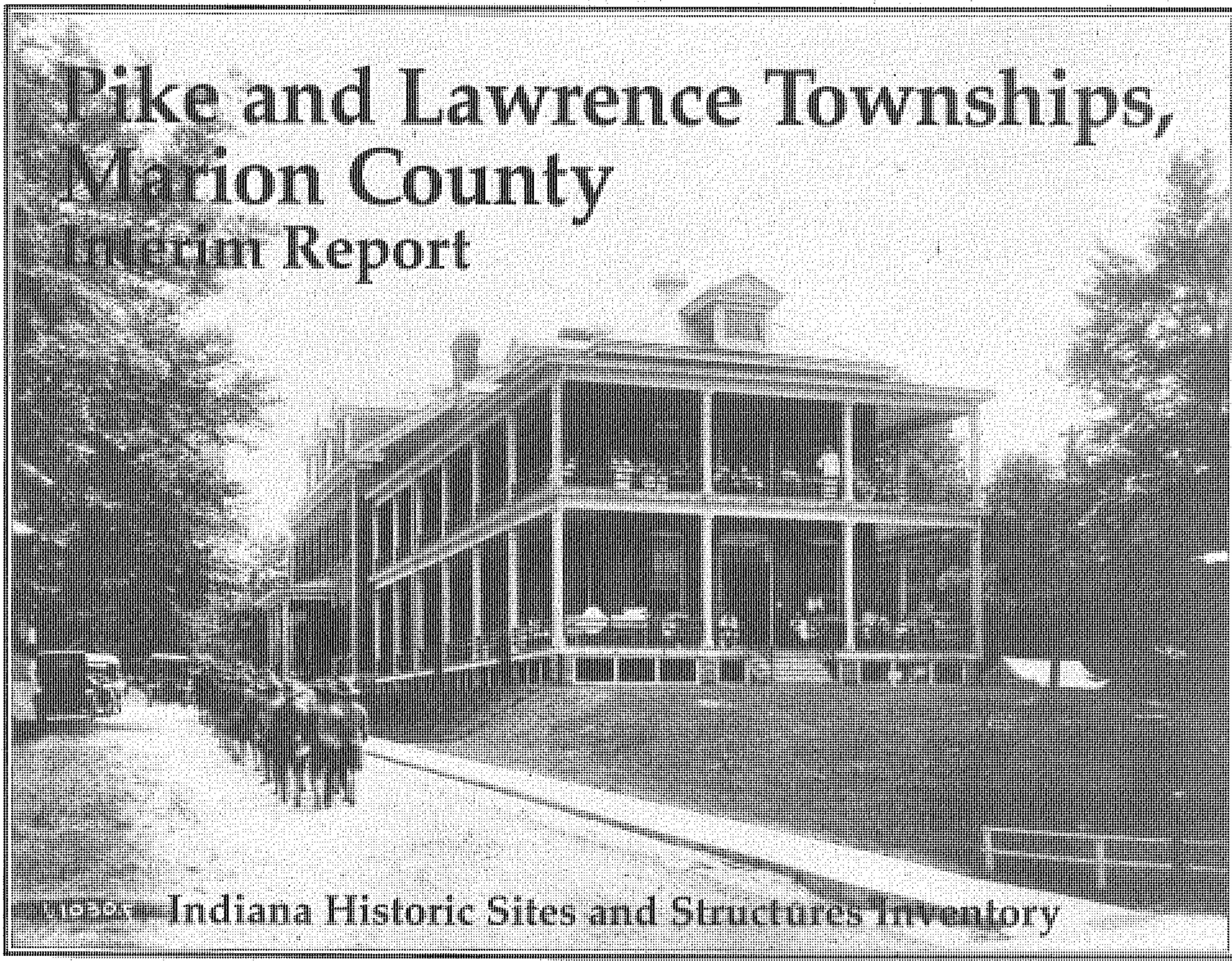
APPENDIX D

Pike and Lawrence Townships,

Marion County Interim Report

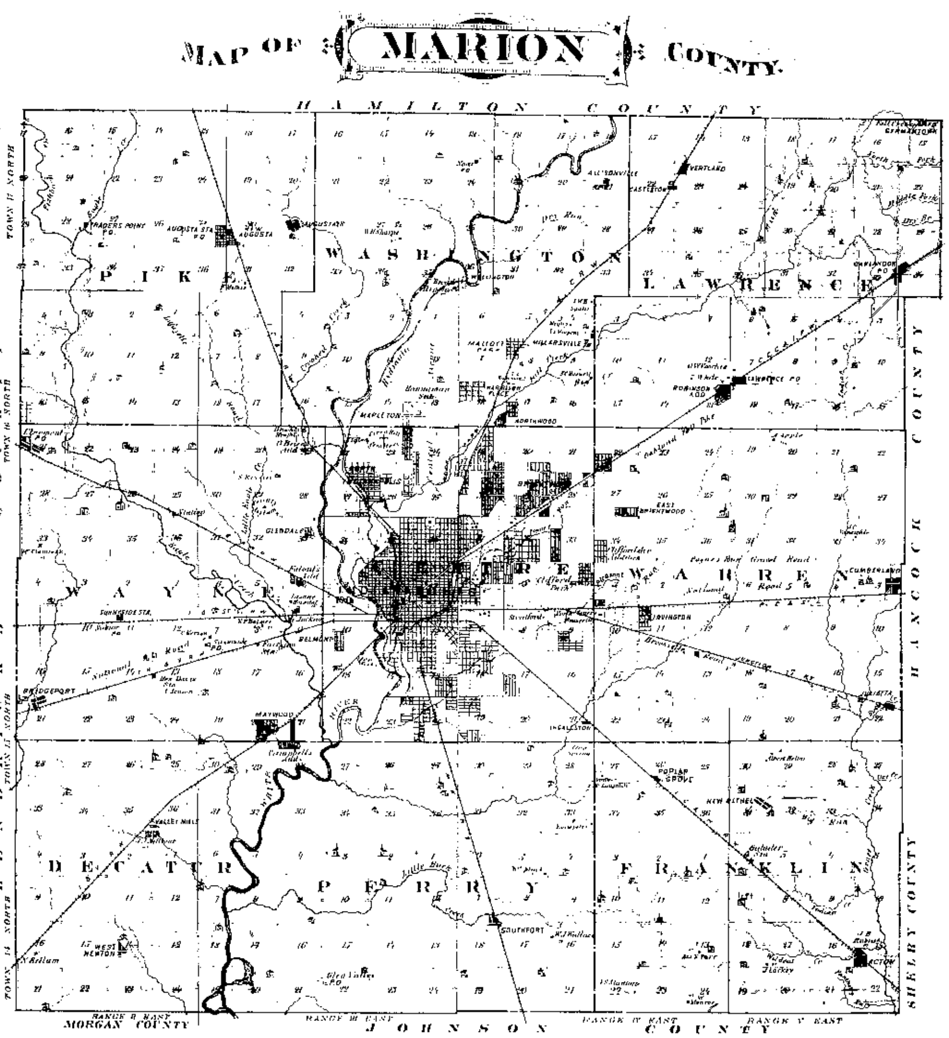
Pike and Lawrence Townships, Marion County

Interim Report

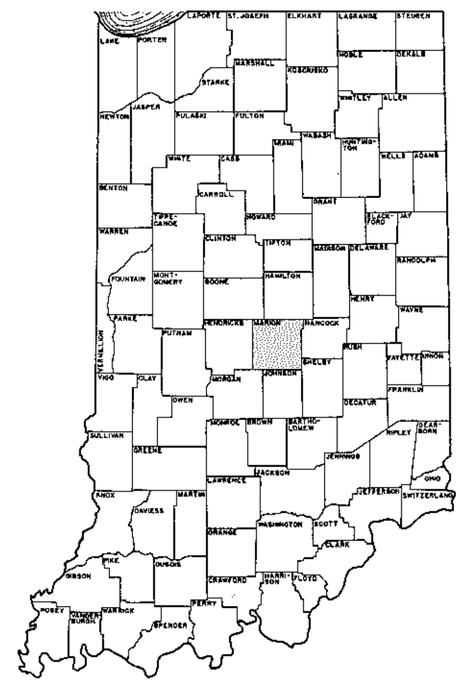


Indiana Historic Sites and Structures Inventory

Pike and Lawrence Townships
Marion County
Interim Report



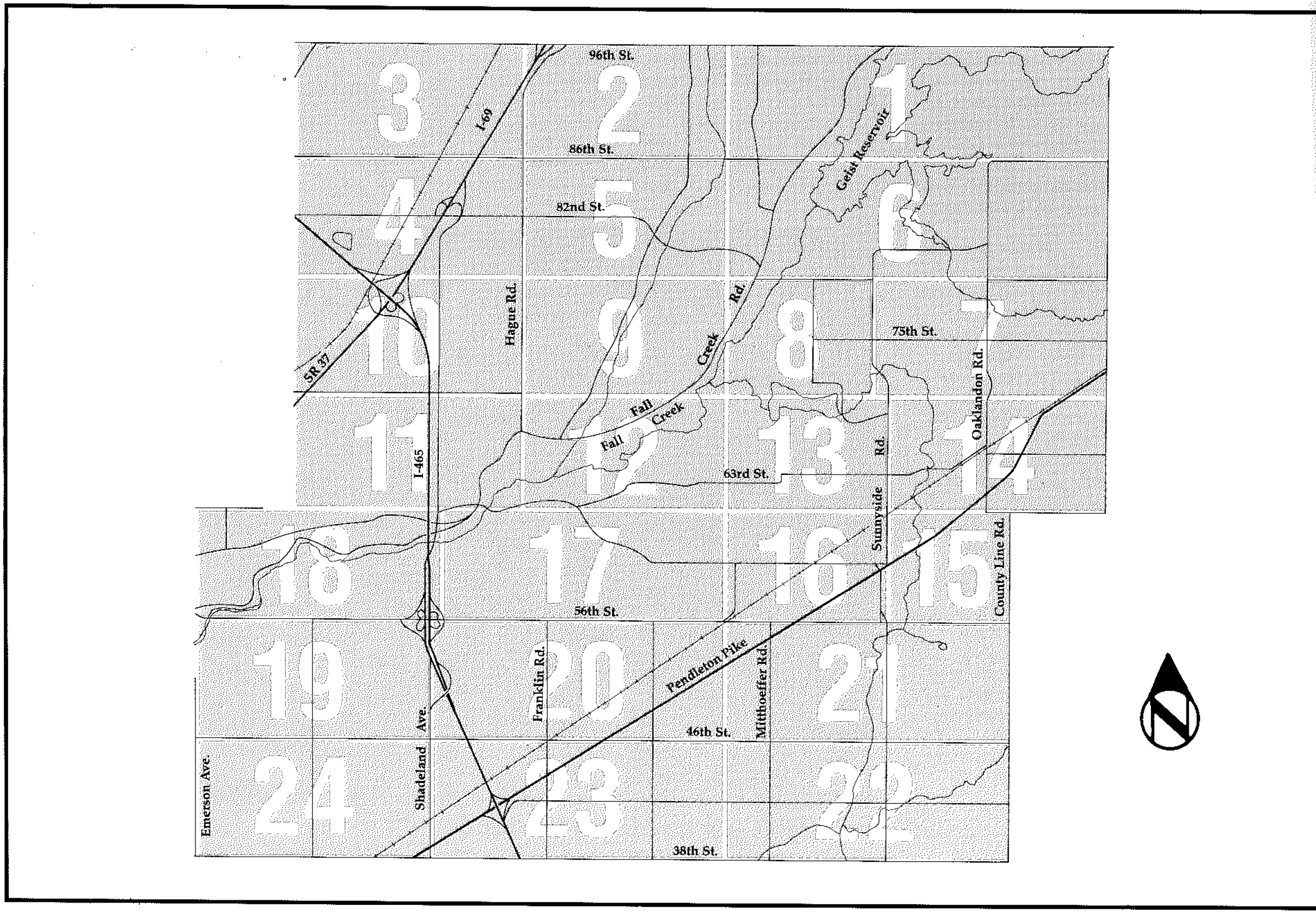
c.1876



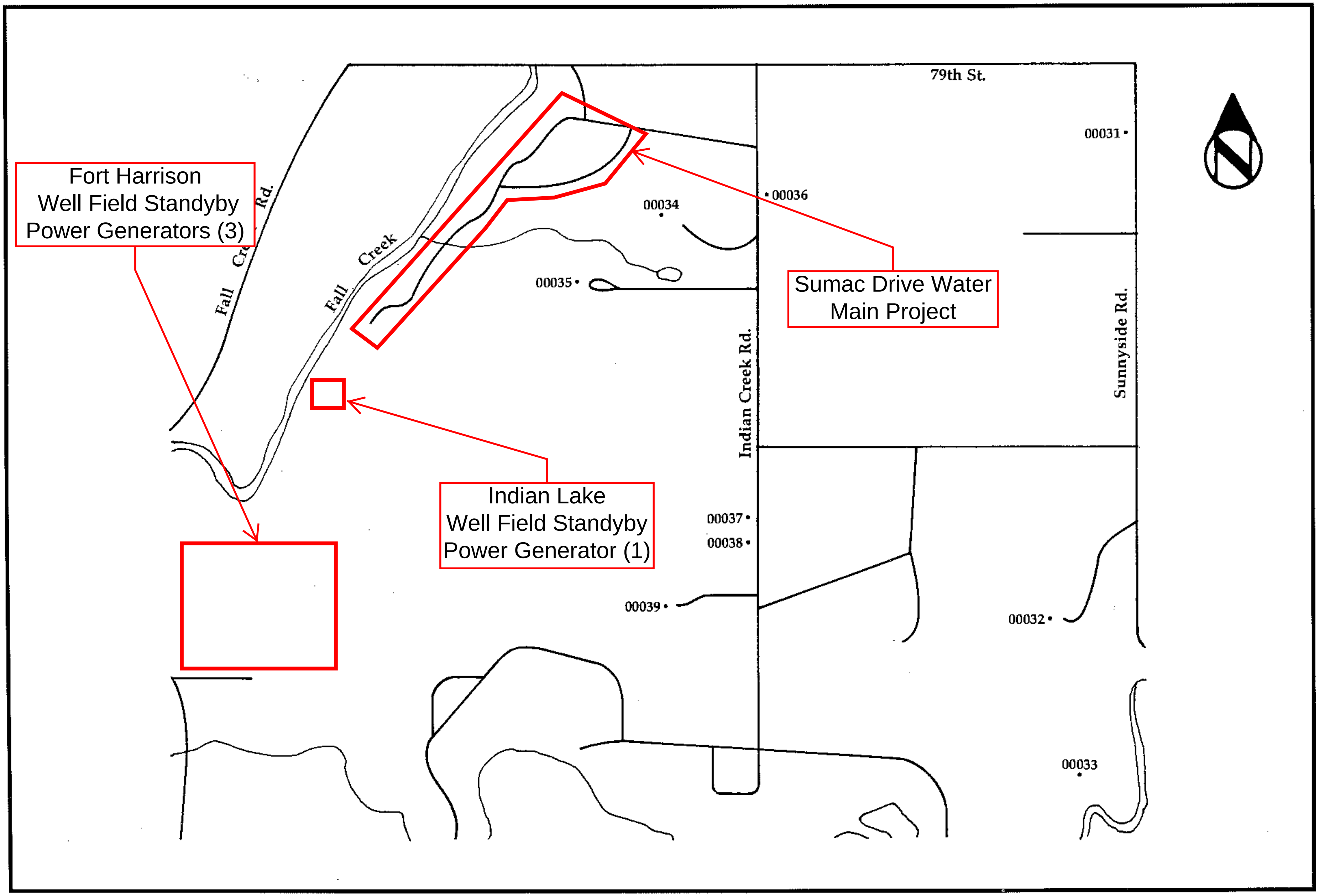
This interim report is designed to be utilized as a working document by government agencies, local organizations, and private citizens as the basis for a wide variety of projects.

Published March 1994.

Key Map of Lawrence Township, Marion County
Sites 00001-00223



Lawrence Township — Map #8
Sites #00031-00039



No.	Rtg.	Description
031	N	**Todd Cemetery,** 7850 Sunnyside Road; c.1860-1890; Exploration/Settlement (393)
032	N	**House,** River Birch Lane; I-house/ Greek Revival/Colonial Revival; c.1850-1925; Architecture (393)

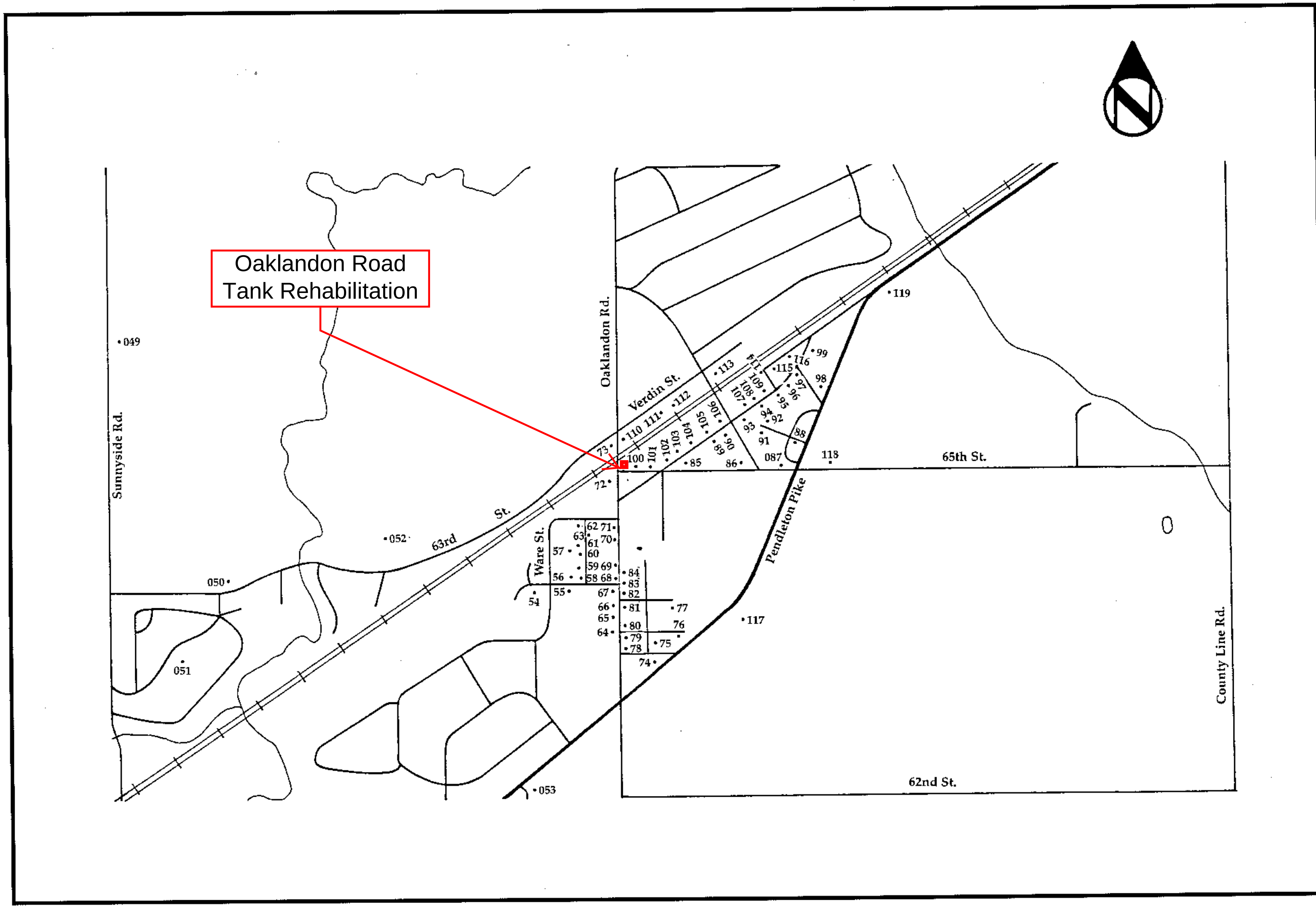
032

No.	Rtg.	Description
033	C	**Camp Elm,** 7290 Sunnyside Road; Bungalow; c.1925; Outbuildings: shelters, sheds; Architecture, Education, Social/Ethnicity, Recreation (393)
034	C	**Day Cemetery,** 7800 Indian Lake Road; c.1850-1910; Exploration/Settlement (393)
035	N	**Emery House,** 7700 Indian Lake Road; French Eclectic; c.1910-1927; Outbuildings: barn, caretaker's house; Architecture (393)
036	C	**House,** 7715 Indian Lake Road; Bungalow; c.1925; Architecture (393)
037	C	**House,** 7456 Indian Lake Road; Bungalow; c.1930; Architecture (393)
038	C	**House,** 7442 Indian Lake Road; Bungalow; c.1930; Architecture (393)

035

No.	Rtg.	Description
039	O	**Beverland Farm,** 7340 Indian Lake Road; Greek Revival; c.1845/1933-1937 (Frank Welcher, builder); Outbuildings: barn, shed, garage, servant's house, log cabin; Agriculture, Architecture (393)

Lawrence Township — Map #14
Site #00049-00119



No.	Rtg.	Description
049	C	**Farm,** 6817 Sunnyside Road; End-gable; c. 1900; Agriculture, Architecture (393)
050	N	**Mollenkopf Farm,** 11244 E. 63rd Street; T-plan; c.1885; Outbuildings: barn, shed; Agriculture, Architecture (144)
051	O	**Sunnyside Sanitarium,** 6201 Sunnyside Road; Neoclassical; 1916 (W.E. Russ, architect); Outbuildings: cottages; Architecture, Health/Medicine (144)

051

No.	Rtg.	Description
052	C	**House,** 11402 East 62nd Street; Bungalow; c.1930; Architecture (393)
053	O	**Christopher Apple House,** 11663 Pendleton Pike; Federal; 1859; Outbuildings: barn; Architecture, Exploration/Settlement (144) NR
054	C	**Emmet Robinson House,** 11633 Oshawa Street; Bungalow; c.1935; Architecture (144)
055	C	**House,** 11715 Oshawa Street; Bungalow; c.1927; Architecture (144)
056	C	**House,** 11716 Oshawa Street; Bungalow; c.1927; Architecture (144)

055

No.	Rtg.	Description
057	C	**Cecil Mollenkopf House,** 6415 Ware Street; Vernacular; c.1939; Architecture (393)
058	C	**House,** 6404 Mosby Street; Bungalow; c.1935; Architecture (144)
059	C	**John Howard Apple House,** 6420 Mosby Street; Bungalow; c.1929; Architecture; (144)
060	C	**Howard Hamilton House,** 6428 Mosby Street; Gable-front; c.1939; Architecture; (393)
061	C	**Hutcheson House,** 6436 Mosby Street; Bungalow; c.1930; Architecture (393)
062	C	**Hutcheson House,** 6440 Mosby Street; Bungalow; c.1930; Architecture (393)
063	C	**Robert Bogart House,** 6439 Mosby Street; Bungalow; c.1929; Architecture (393)
064	C	**House,** 6340 Oaklandon Road; T-plan; c.1880; Architecture (144)
065	N	**Hanna House,** 6360 Oaklandon Road; Gabled-ell; c.1873; Architecture (144)
066	C	**House,** 6370 Oaklandon Road; Bungalow; c.1930; Architecture (144)
067	C	**House,** 6386 Oaklandon Road; Vernacular; c.1875; Architecture (144)

0

No.	Rtg.	Description
068	N	**House,** 6402 Oaklandon Road; Bungalow; c.1915; Architecture (144)
069	O	**Dr. Charles J. Kneer House,** 6408 Oaklandon Road; Colonial Reviva 1923; Architecture (144)

0

No.	Rtg.	Description
070	O	**Oaklandon Christian Church,** 6432 Oaklandon Road; Gothic Revival; c.1909/1948; Architecture, Religion (39

071 N **Oaklandon Universalist Church,** 6450 Oaklandon Road; Vernacular; 1921-25; Architecture, Religion (393)

072 N **Oaklandon State Bank,** 6546 Oaklandon Road; Commercial Vernacular; 1917; Architecture, Commerce (393)


072

073 N **Dr. J. K. Heltman House,** 6564 Oaklandon Road; Gable-front; c.1865; Architecture (393)

074 C **House,** 11819 Simcoe Street; Bungalow; c.1925; Architecture (144)

075 C **House,** 11832 Simcoe Street; Bungalow; c.1925; Architecture (144)


075

076 N **House,** 11917 Center Street; Bungalow; c.1925; Architecture (144)

077 N **Schmidt House,** 11917 E. Nogales Street; Vernacular; c.1925; Architecture (144)

078 N **McCord Funeral Home,** 6359 Oaklandon Road; Bungalow; c.1910; Architecture (144)

079 C **House,** 6371 Oaklandon Road; Bungalow; c.1905; Architecture (144)

080 N **McConnell House,** 6381 Oaklandon Road; Bungalow; c.1905; Architecture (144)

081 C **House,** 6415 Oaklandon Road; Bungalow; c.1915; Architecture (144)

082 C **House,** 6421 Oaklandon Road; Bungalow; c.1925; Architecture (144)

083 C **House,** 6427 Oaklandon Road; Bungalow; c.1925; Architecture (144)

084 C **John McGinnis Barbershop & Residence,** 6449 Oaklandon Road; Vernacular; 1927; Architecture, Commerce (144)

085 C **Arthur V. Apple House,** 11915 Broadway; Gabled-ell; c.1910; Architecture (393)

086 N **Apple/McCord House,** 12024 E. 65th Street; T-plan; c.1880; Outbuildings: barn; Agriculture, Architecture (393)

087 C **House,** 12050 E. 65th Street; Bungalow; c.1927; Architecture (393)

088 C **Paradise Tourist Cabins,** 6540-6618 Paradise Lane, 6544-6608 Paradise Court, 12126 Paradise Drive; c.1929-1938; Architecture, Social history, Transportation (393)


086

089 C **House,** 12045 Broadway; Bungalow; c.1925; Architecture (393)

090 C **House,** 11957 Broadway; Vernacular; c.1880; Architecture (393)


090

091 C **House,** 12037 Paradise Drive; Vernacular; c.1900; Architecture (393)

092 C **House,** 6546 Paradise Lane; Lustron; c.1945 (U.S. Steel, architect/builder); Architecture (393)

093 C **House,** 12103 Broadway; Bungalow; c.1930; Architecture (393)

094 C **House,** 12109 Broadway; Bungalow; c.1930; Architecture (393)

095 C **House,** 12119 Broadway; Bungalow; c.1925; Architecture (393)

096 C **House,** 12125 Broadway; Bungalow; c.1925; Architecture (393)

097 C **House,** 12139 Broadway; Bungalow; c.1925; Architecture (393)

098 N **Ernest Newhouse House,** 6621 Olvey Street; Bungalow; c.1932; Architecture (393)

099 C **House,** 12071 Broadway; Bungalow; c.1925; Architecture (393)

100 N **Morse/Lingle House,** 11904 Broadway; Gabled-ell; c.1875; Architecture (393)

100

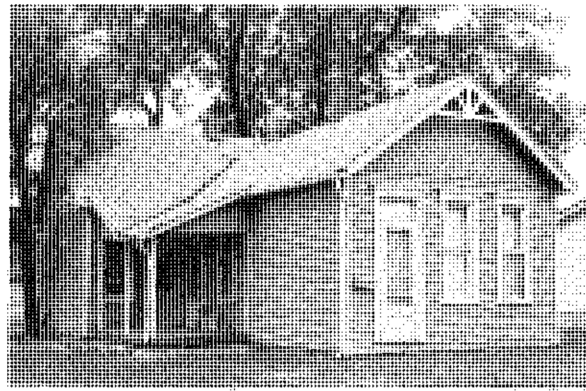
101 C **Fire House,** 11904 Broadway; Art Deco; 1925; Architecture, Politics/Government (393)

102 C **House,** 11910 Broadway; Bungalow; c.1920; Architecture (393)

103 C **House,** 11922 Broadway; Bungalow; c.1930; Architecture (393)

104 C **Dr. C. J. Kneer House,** 11936 Broadway; c.1902; T-plan, Architecture (393)

105 N **House,** 11946 Broadway; Gabled-ell; c.1875; Architecture (393)



105

106 C **Charles Klepfer House,** 11958 Broadway; Gable-front; c.1900; Architecture (393)

107 C **House,** 12040 Broadway; T-plan; c.1890; Architecture (393)

108 C **House,** 12104 Broadway; Bungalow; c.1930; Architecture (393)

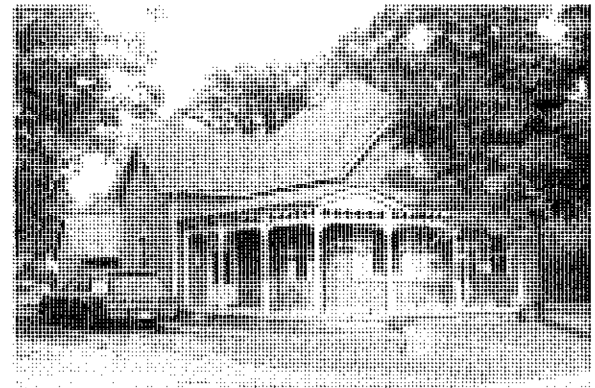
109 C **House,** 12112 Broadway; Bungalow; c.1925; Architecture (393)

110 O **House,** 6555 Oaklandon Road; T-plan; c.1870; Architecture (393)

111 C **House,** 11735 Verdin Street; T-plan; c.1880; Architecture (393)

112 C **House,** 11807 Verdin Street; T-plan; c.1875; Architecture (393)

113 N **Anton Klepfer House,** 6617 Brandon Street; Vernacular; c.1885; Architecture (393)



113

114 C **McCord House,** 6656 North Wayne Street; Gable-front; c.1870; Architecture (393)

115 C **House,** 11845 Railroad Street; Bungalow; c.1915; Architecture (393)

116 C **House,** 11919 Railroad Street; End-gable; c.1865; Architecture (393)

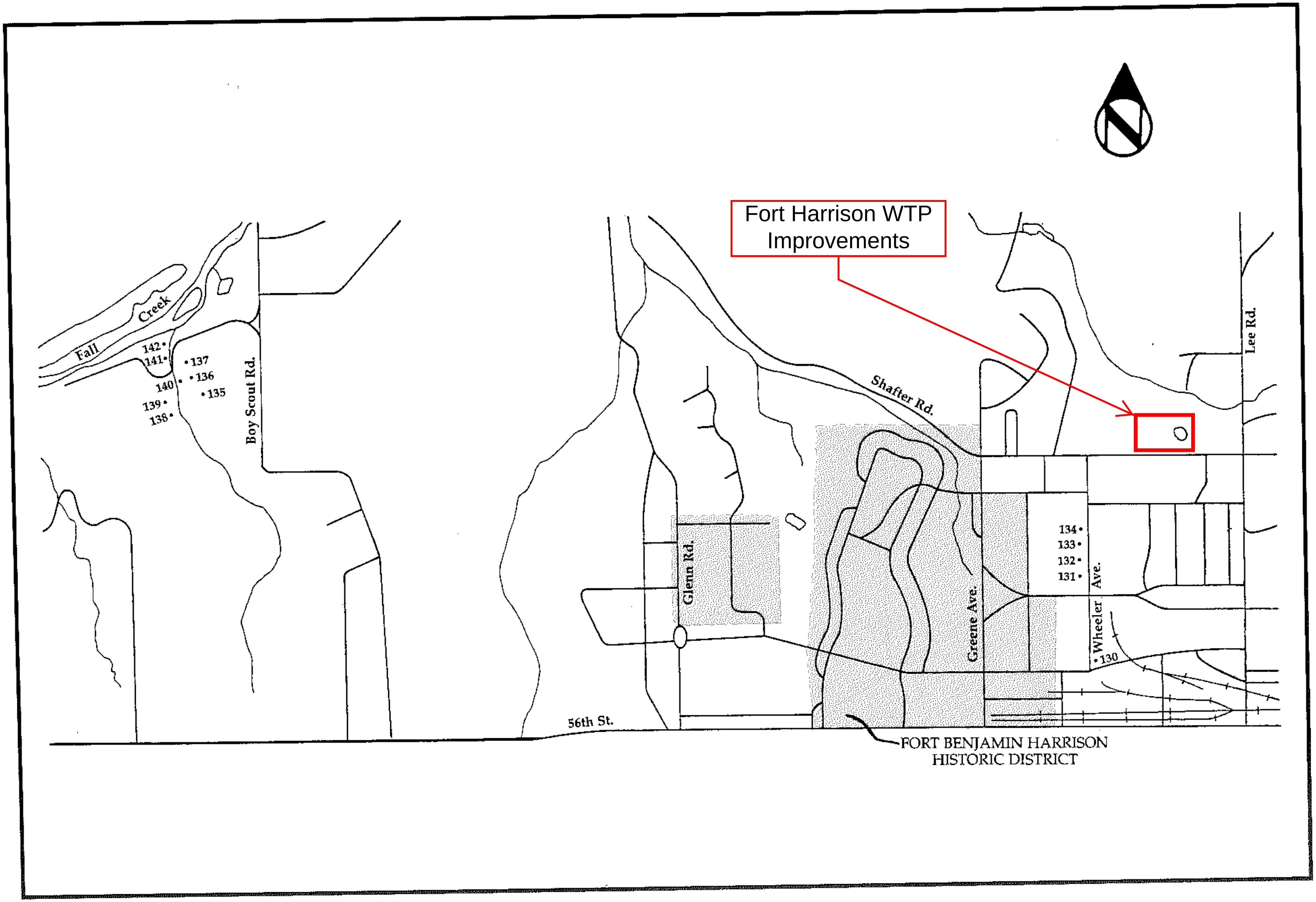
118

117 C **Farm,** 12025 Pendleton Pike; Bungalow; c.1925; Agriculture, Architecture (144)

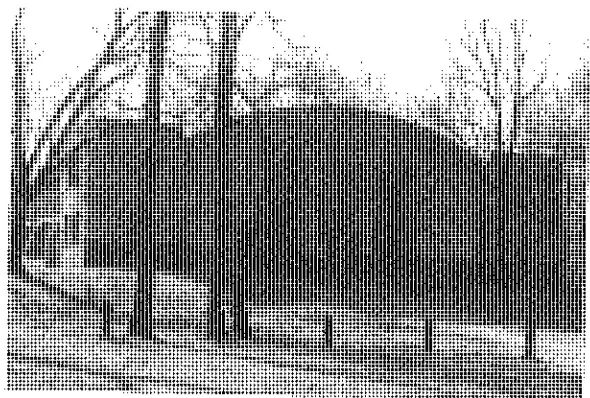
118 C **House,** 12140 65th Street; American four-square; c.1915; Architecture (393)

119 N **Combs Farm** 12233 Pendleton Pike; Bungalow; c.1855; Outbuildings: barn (Demolished); Agriculture, Architecture (393)

Lawrence Township — Map #17
Sites #00130-00142

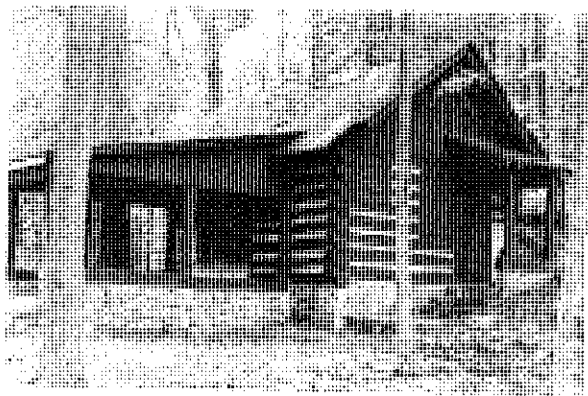


No.	Rtg.	Description
130	C	**Commercial Building,** Wheeler Avenue; Colonial Revival; c.1910; Architecture, Military (295)
131	C	**Warehouse,** Wheeler Avenue; Colonial Revival; c.1910; Architecture, Military (295)
132	C	**Warehouse,** Wheeler Avenue; Colonial Revival; c.1910; Architecture, Military (295)
133	C	**Warehouse,** Wheeler Avenue; Colonial Revival; c.1910; Architecture, Military (295)
134	C	**Warehouse,** Wheeler Avenue; Colonial Revival; c.1910; Architecture, Military (295)
135	O	**Belzer Field House,** Camp Belzer, 6102 Boy Scout Road; Fieldhouse/Quonset Hut; 1918; Architecture, Engineering, Social/Ethnicity (295)



135

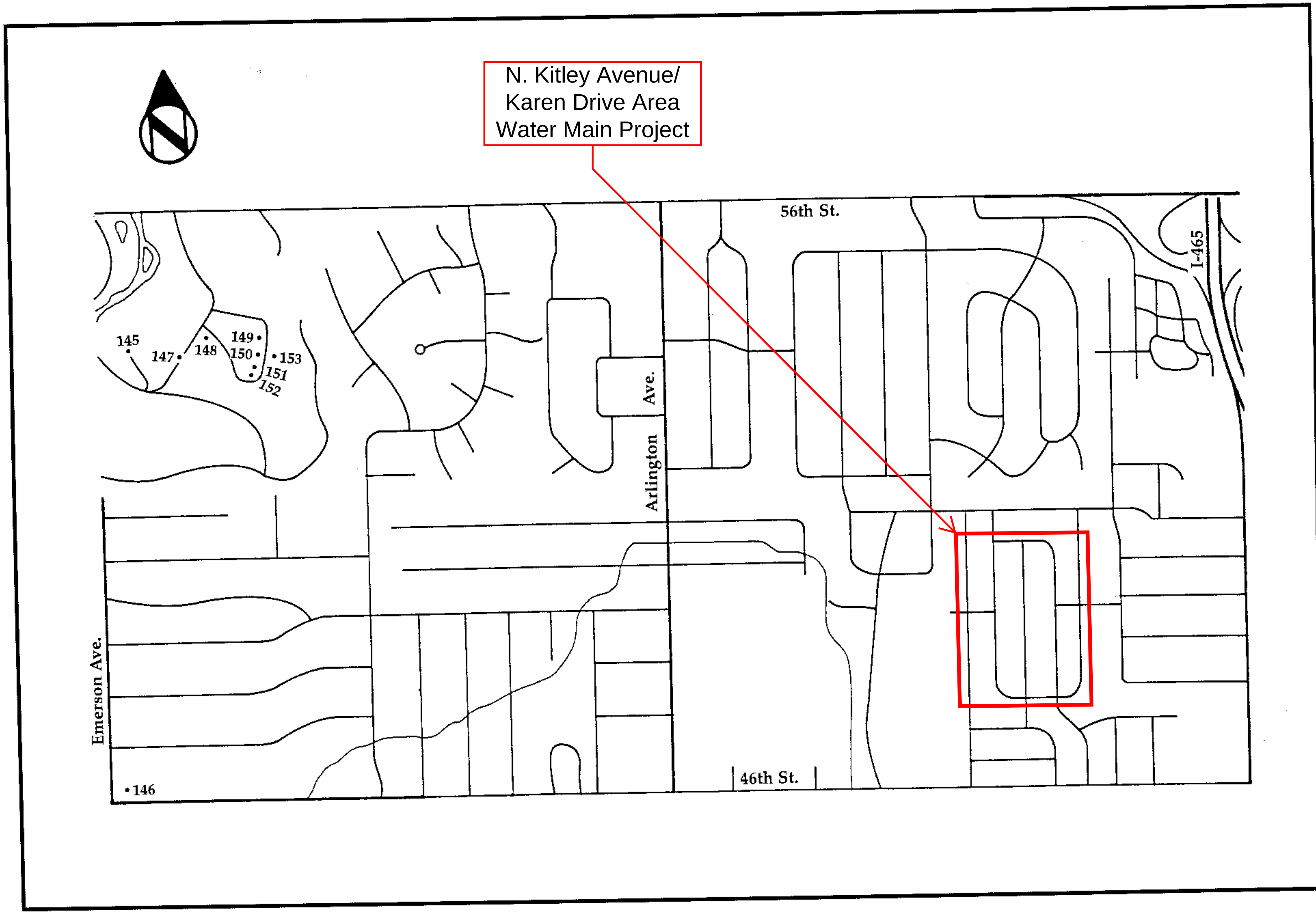
136	N	**Belzer Mess Hall,** Camp Belzer, 6102 Boy Scout Road; Vernacular; c.1915; Architecture, Social/Ethnicity (295)
137	C	**Well House,** Camp Belzer, 6102 Boy Scout Road; c.1915; Architecture (295)
138	C	**"K" Hut,** Camp Belzer, 6102 Boy Scout Road; Bungalow; c.1915; Architecture, Social/Ethnicity (295)
139	C	**Chief Belzer Cabin,** Camp Belzer, 6102 Boy Scout Road; Log Cabin; c.1910; Architecture, Social/Ethnicity (295)



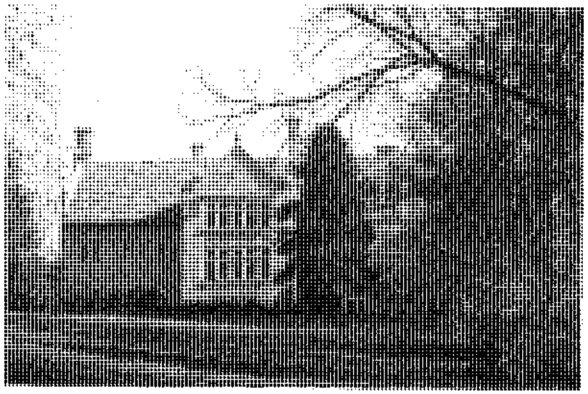
139

140	C	**Trading Post,** Camp Belzer, 6102 Boy Scout Road; Prairie; c.1915; Architecture, Social/Ethnicity (295)
141	C	**Infirmary,** Camp Belzer, 6102 Boy Scout Road; Bungalow; c.1915; Architecture, Social/Ethnicity (295)
142	C	**Sycamore Lodge,** Camp Belzer, 6102 Boy Scout Road, Bungalow; c.1915; Architecture, Social/Ethnicity (295)

Lawrence Township — Map #19
Sites #00145-00153



No.	Rtg.	Description
145	O	**Stoughton A. Fletcher House/ Laurel Hall,** 5395 Emerson Way; Jacobethan Revival; c.1911 (Herbert L Bass & Co., architect; Latham & Walters, builder); Outbuildings: bridge, retaining wall, pumphouse; Architecture, Landscape Architecture (295)



145

146	N	**Pogue/Highland Cemetery,** 4601 N. Emerson Avenue; c.1850-1890; Exploration/Settlement (295)
147	N	**Fletcher Bridge,** Cathedral High School campus; c.1915; Architecture, Engineering (295)
148	O	**Loretto Hall,** 5225 E. 56th Street; Tudor Revival; c.1927; Architecture, Education, Religion (295)
149	N	**Carriage House,** Cathedral High School campus; Tudor Revival; c.1915; Architecture (295)
150	N	**Chaplain's House,** Cathedral High School campus; Vernacular; c.1914; Architecture (295) (Demolished)
151	N	**House,** Cathedral High School campus; Vernacular; c.1914; Architecture (295) (Demolished)

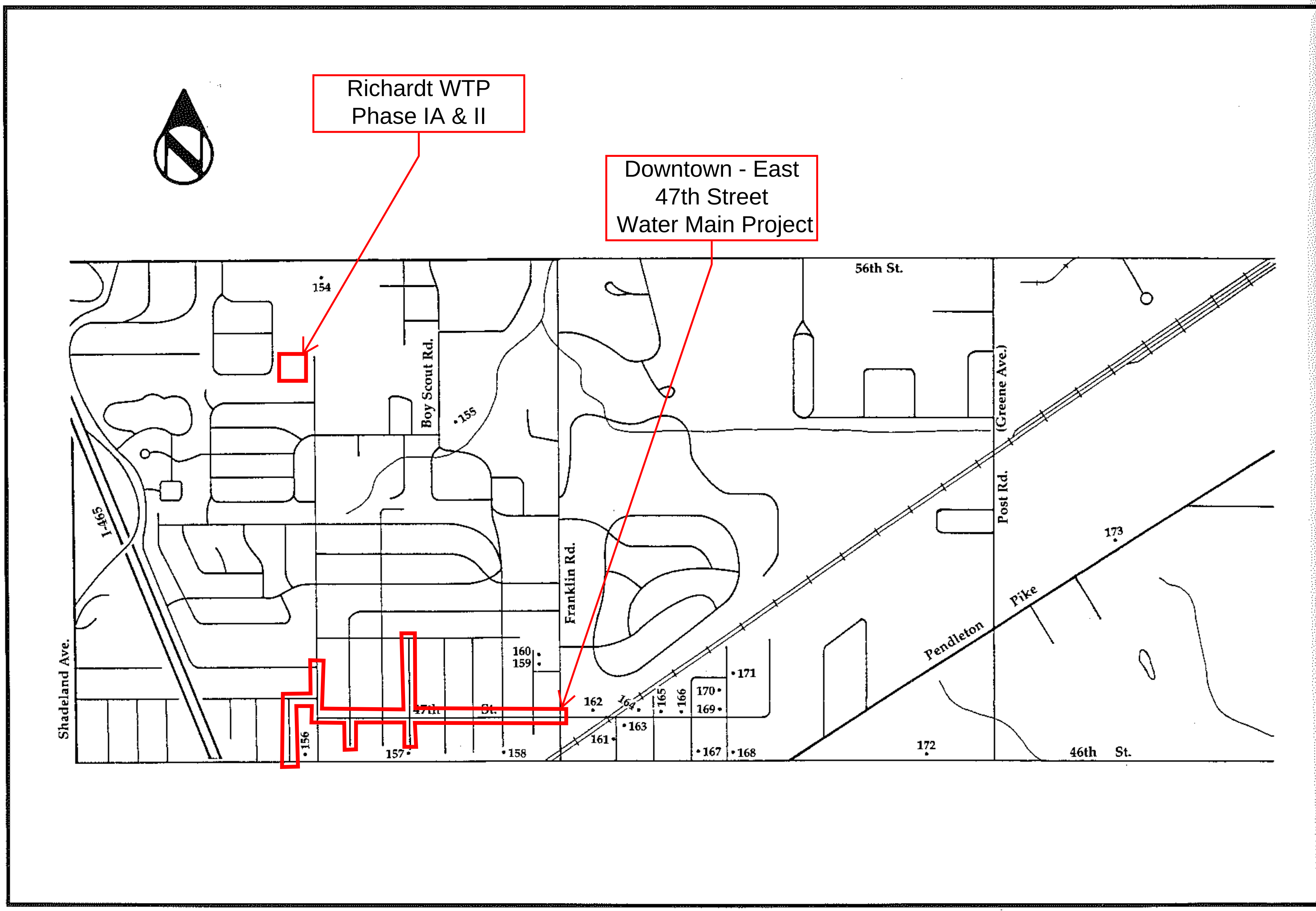
148

152	N	**Caretaker's House,** Cathedral High School campus; Vernacular; c.1914; Architecture (295) (Demolished)

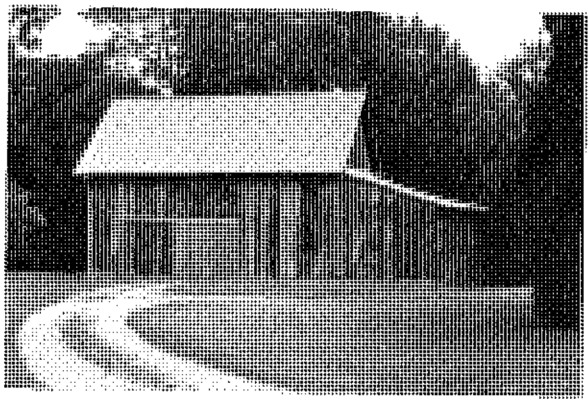
152

153	C	**Chapel,** Cathedral High School campus; Vernacular; c.1914; Architecture, Religion (295)

Lawrence Township — Map #20
Sites #00154-00173

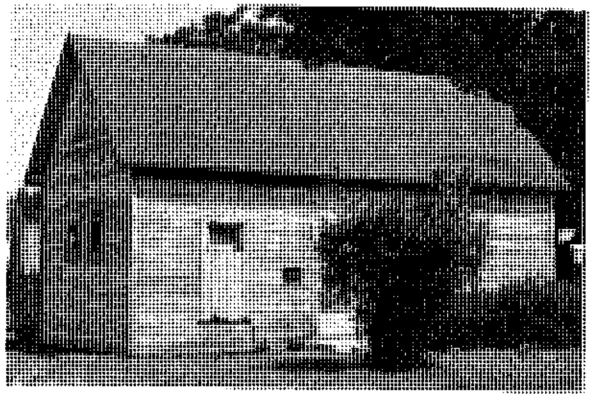


No.	Rtg.	Description
154	C	**Lawrence High School,** 7500 E. 56th Street; Art Moderne; c.1940; Architecture, Education (295)
155	C	**House,** 5415 Boy Scout Road; Tudor Revival; c.1930; Outbuildings: transverse-frame barn; Architecture (295)



155

No.	Rtg.	Description
156	C	**House,** 7480 E. 46th Street; Tudor Revival; c.1935; Architecture (295)
157	C	**House,** 7602 E. 46th Street; T-plan; c.1885; Architecture (295)
158	N	**House,** 7710 E. 46th Street; Hall-and-parlor; c.1840; Architecture (295) (Significantly Altered)
159	C	**House,** 4747 N. Van Cleave; End-gable; c.1900; Architecture (295)
160	C	**House,** 4801 N. Van Cleave; Bungalow; c.1925; Architecture (295)
161	N	**House,** 4630 McCoy; Central-passage; c.1860; Architecture (295)
162	C	**House,** 8028 E. 47th Street; Bungalow; c.1925; Architecture (295)

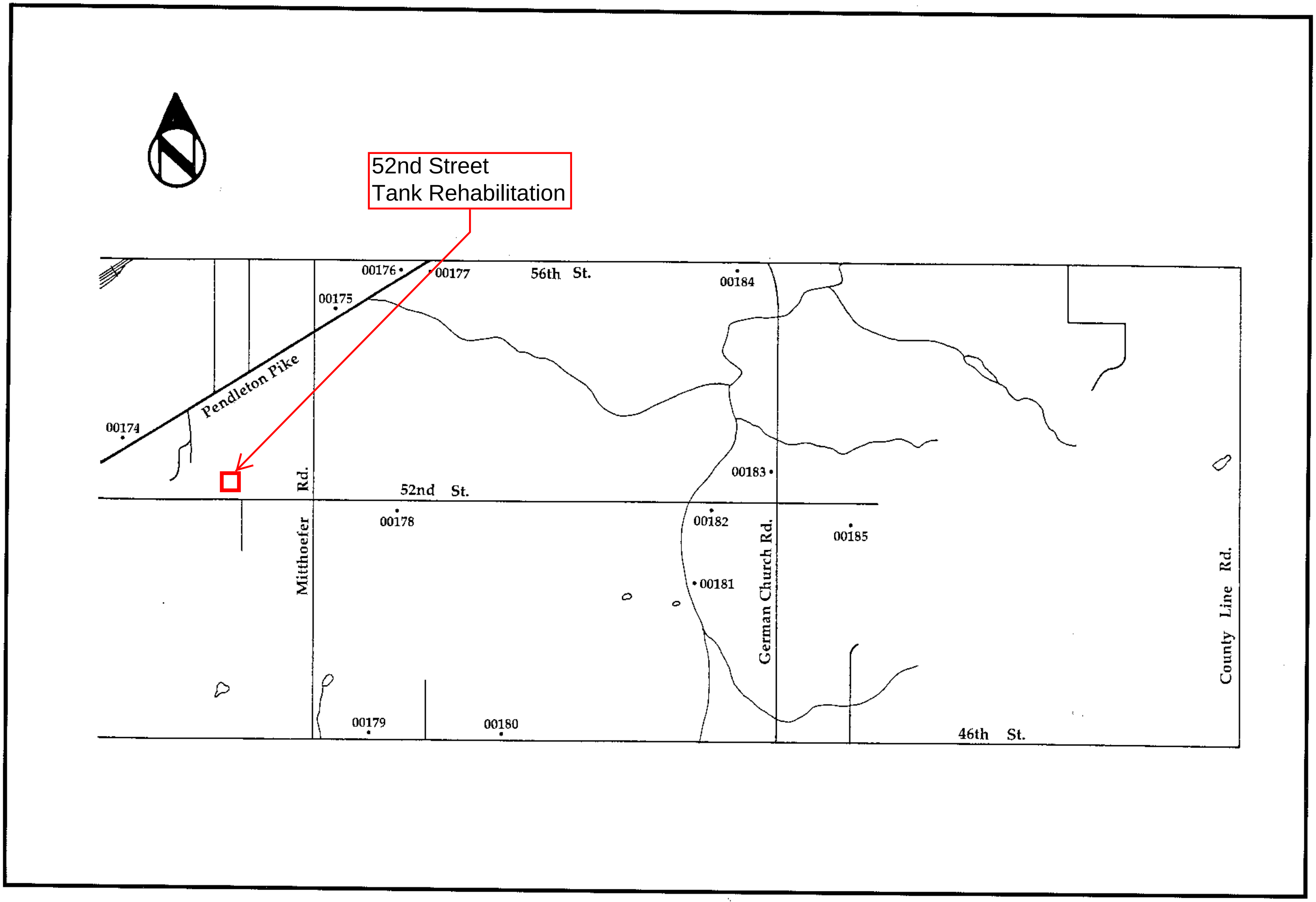


158

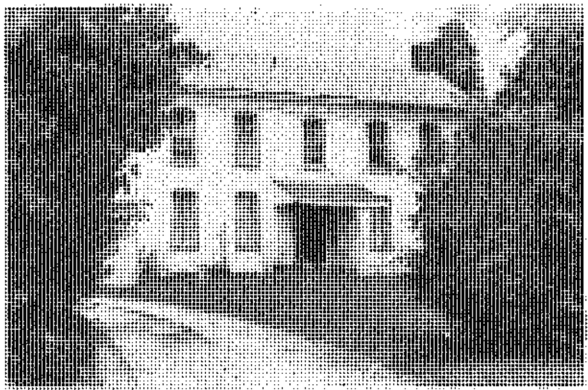
161

No.	Rtg.	Description
163	C	**House,** 8105 E. 47th Street; Bungalow; c.1925; Architecture (295)
164	C	**House,** 8150 E. 47th Street; Gable-front; c.1885, Architecture (295)
165	C	**House,** 8202 E. 47th Street; Bungalow; c.1920; Architecture (295)
166	C	**House,** 8220 E. 47th Street; Bungalow; c.1925; Architecture (295)
167	N	**House,** 8304 E. 46th Street; Bungalow; c.1920; Architecture (295)
168	N	**House,** 8408 E. 46th Street; Bungalow; c.1915; Architecture (295)
169	C	**House,** 8340 E. 47th Street; Bungalow; c.1925; Architecture (295)
170	C	**House,** 8345 E. 48th Street; Bungalow; c.1925; Architecture (295)
171	C	**House,** 4737 N. Mehaffey; Bungalow; c.1925; Architecture (295)
172	C	**Dwight Mowrey House,** 8928 E. 46th Street; Bungalow; c.1925; Architecture (295)
173	C	**House,** 9214 Pendleton Pike; Bungalow; c.1920; Outbuildings: barn; Architecture (295)

Lawrence Township — Map #21
Sites #00174-00185



No.	Rtg.	Description
174	C	**House,** 9610 Pendleton Pike; Bungalow; c.1920; Architecture (144)
175	O	**Levi Bolander House,** 10030 Pendleton Pike; I-house; 1863; Architecture (144) (Demolished)



175

No.	Rtg.	Description
176	C	**House,** 10130 Pendleton Pike; Bungalow; c.1920; Architecture (144)
177	C	**House,** 10143 Pendleton Pike; Bungalow; c.1920; Architecture (144)
178	C	**House,** 10120 E. 52nd Street; Bungalow; c.1915; Architecture (144)
179	C	**House,** 10042 E. 46th Street; Bungalow; c.1925; Architecture (144)
180	C	**House,** 10404 E. 46th Street; English Cottage; c.1925; Architecture (144)
181	C	**Indian Creek Cemetery,** W. 52nd Street; c.1830-1860; Exploration/Settlement (144)
182	N	**Whiteside/Hamilton Farm,** 10853 E. 52nd Street; Vernacular; c.1890; Outbuildings: English barn; Agriculture, Architecture (144)
183	C	**House,** 5252 German Church Road; Bungalow; c.1920; Outbuildings; school/barn c.1880; Architecture, Education (144)
184	N	**Bolander Farm,** 10919 E. 56th Street; Bungalow; c.1930; Outbuildings: barns; Agriculture, Architecture (144)
185	C	**Stoner Farm,** 5199 German Church Road; T-plan; c.1898; Agriculture, Architecture (144)

APPENDIX E

Natural Resources Conservation Service

Farmland Conversion Impact Rating

and Correspondence

Amy Harvell

From: Michael Ellis
Sent: Friday, September 30, 2016 12:57 PM
To: 'Bolton, Lisa - NRCS, Indianapolis, IN'
Cc: Amy Harvell
Subject: Water System Improvements - Lawrence Municipal Utilities (Lawrence, IN)
Attachments: AD-1006 combined.pdf; Site Figure.pdf; Soil Survey Map.pdf

Lisa,

Please review the attached Farmland Conversion Form for the Water System Improvements Projects in Lawrence, Indiana. You should have received the following attachments:

1) Farmland Conversion Impact Rating Form;
2) Site Figures; and
3) Soils Map.

Here is a general description of the projects:

- The Fort Harrison Well Field Standyby Power Generators (3) Project (Site A) consists of installing emergency diesel powered generators on elevated platforms adjacent to existing well houses and running electrical conduit below grade from each generator to their respective well house.
- The Indian Lake Well Field Standyby Power Generator Project (Site B) consists of installing an emergency generator on an elevated platform adjacent to an existing well house and running electrical conduit below grade from the generator to the well house.
- All other projects (Sites C through I) are either interior improvements only or occurring on previously disturbed land/non-farmland, causing no direct or indirect conversion.

Please let me know if you have any questions or require any additional information. You may reach me with email or at the phone number listed below of 788-4800. Please provide comments at your earliest convenience. Thank you for your assistance.

Michael Ellis, C.F.M. | Environmental Scientist
Wessler Engineering, Inc.
6219 South East Street, Indianapolis, Indiana 46227
P: 317-788-4551

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 9/30/2016
Name of Project Water System Improvements	Federal Agency Involved EPA through IN SRF
Proposed Land Use Water Treatment&Distribution System	County and State Marion, Indiana

PART II *(To be completed by NRCS)*	Date Request Received By NRCS	Person Completing Form:

Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☐	NO ☐	Acres Irrigated	Average Farm Size

Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %	Amount of Farmland As Defined in FPPA Acres: %
Name of Land Evaluation System Used	Name of State or Local Site Assessment System	Date Land Evaluation Returned by NRCS

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	0.027	0.009	0	0
B. Total Acres To Be Converted Indirectly	0	0	0	0
C. Total Acres In Site	0.027	0.009	12	3
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide Important or Local Important Farmland				
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value				
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)				

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)				
2. Perimeter In Non-urban Use	(10)				
3. Percent Of Site Being Farmed	(20)				
4. Protection Provided By State and Local Government	(20)				
5. Distance From Urban Built-up Area	(15)				
6. Distance To Urban Support Services	(15)				
7. Size Of Present Farm Unit Compared To Average	(10)				
8. Creation Of Non-farmable Farmland	(10)				
9. Availability Of Farm Support Services	(5)				
10. On-Farm Investments	(20)				
11. Effects Of Conversion On Farm Support Services	(10)				
12. Compatibility With Existing Agricultural Use	(10)				
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	0	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	0	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

(See Instructions on reverse side)

Form AD-1006 (03-02)

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 9/30/2016
Name of Project Water System Improvements	Federal Agency Involved EPA through IN SRF
Proposed Land Use Water Treatment&Distribution System	County and State Marion, Indiana

PART II *(To be completed by NRCS)*	Date Request Received By NRCS	Person Completing Form:	
Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☐ NO ☐	Acres Irrigated	Average Farm Size
Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %	Amount of Farmland As Defined in FPPA Acres: %	
Name of Land Evaluation System Used	Name of State or Local Site Assessment System	Date Land Evaluation Returned by NRCS	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating Site E	Site F	Site G	Site H
A. Total Acres To Be Converted Directly	0	0	0	0
B. Total Acres To Be Converted Indirectly	0	0	0	0
C. Total Acres In Site	40	30	0.1	1.5
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide Important or Local Important Farmland				
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value				
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)				

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	Maximum Points	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)				
2. Perimeter In Non-urban Use	(10)				
3. Percent Of Site Being Farmed	(20)				
4. Protection Provided By State and Local Government	(20)				
5. Distance From Urban Built-up Area	(15)				
6. Distance To Urban Support Services	(15)				
7. Size Of Present Farm Unit Compared To Average	(10)				
8. Creation Of Non-farmable Farmland	(10)				
9. Availability Of Farm Support Services	(5)				
10. On-Farm Investments	(20)				
11. Effects Of Conversion On Farm Support Services	(10)				
12. Compatibility With Existing Agricultural Use	(10)				
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	0	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

(See Instructions on reverse side) **Form AD-1006 (03-02)**

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 9/30/2016
Name of Project Water System Improvements	Federal Agency Involved EPA through IN SRF
Proposed Land Use Water Treatment&Distribution System	County and State Marion, Indiana

PART II *(To be completed by NRCS)*	Date Request Received By NRCS	Person Completing Form:

Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☐ NO ☐	Acres Irrigated	Average Farm Size

Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %	Amount of Farmland As Defined in FPPA Acres: %
Name of Land Evaluation System Used	Name of State or Local Site Assessment System	Date Land Evaluation Returned by NRCS

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site I	N/A	N/A	N/A
A. Total Acres To Be Converted Directly	0			
B. Total Acres To Be Converted Indirectly	0			
C. Total Acres In Site	0.1			
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide Important or Local Important Farmland				
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value				
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)				

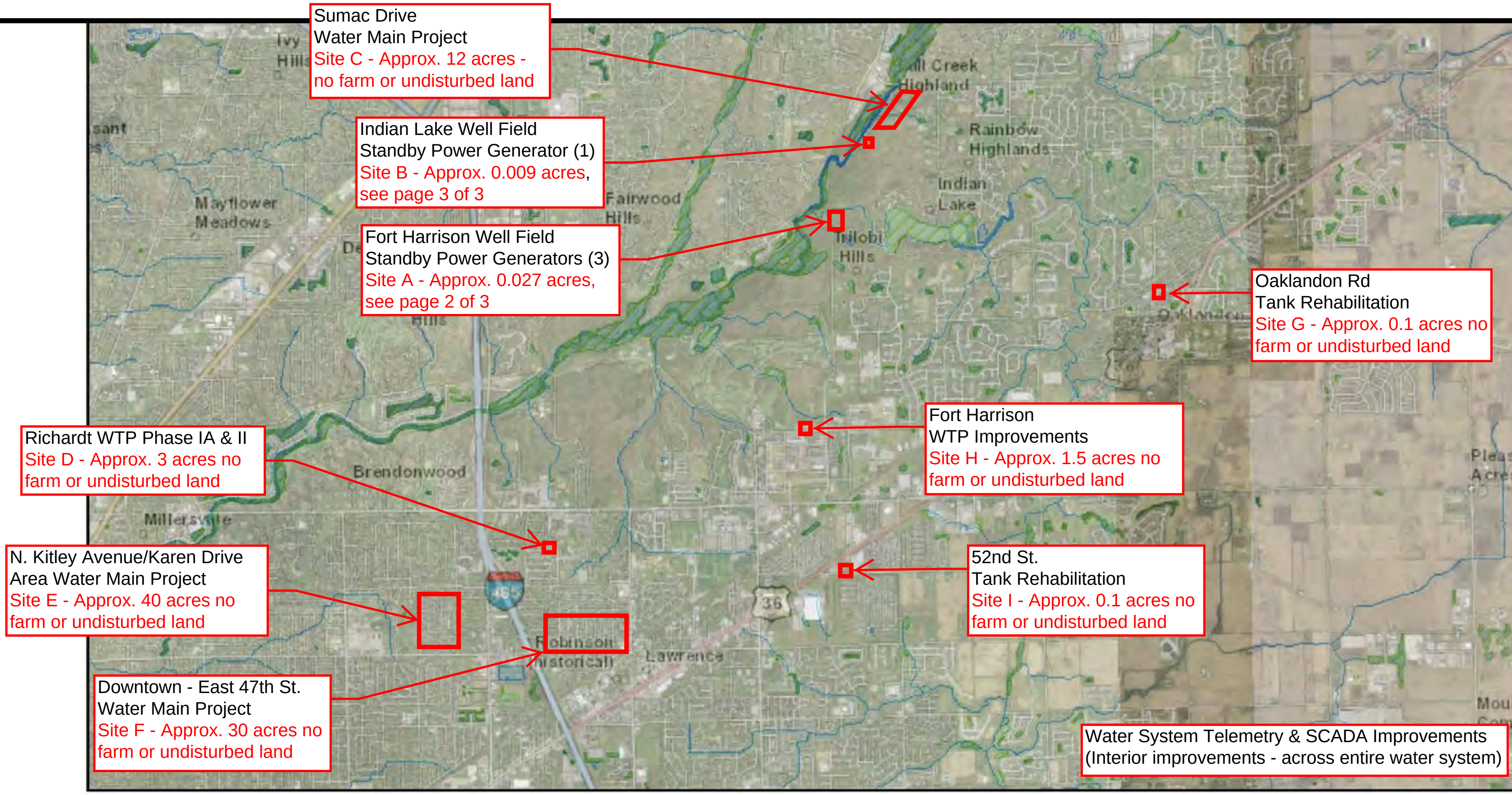
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)				
2. Perimeter In Non-urban Use	(10)				
3. Percent Of Site Being Farmed	(20)				
4. Protection Provided By State and Local Government	(20)				
5. Distance From Urban Built-up Area	(15)				
6. Distance To Urban Support Services	(15)				
7. Size Of Present Farm Unit Compared To Average	(10)				
8. Creation Of Non-farmable Farmland	(10)				
9. Availability Of Farm Support Services	(5)				
10. On-Farm Investments	(20)				
11. Effects Of Conversion On Farm Support Services	(10)				
12. Compatibility With Existing Agricultural Use	(10)				
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	0	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	0	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

(See Instructions on reverse side) **Form AD-1006 (03-02)**



Legend

2012 Orthophotos (State boundary)
2011 Orthophotos (State boundary)
Wetlands NWI (USFWS)
Wetlands Project Metadata NWI (USFS)
Lakes (NHD)
Rivers (NHD)

1:64,000

0 0.5 1 2 mi

0 0.75 1.5 3 km

U.S. Geological Survey
U.S. Fish and Wildlife Service (USFWS) National Standards and Support

N

EXHIBIT A-11: Wetlands Map

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

October 2016
184616.03.004

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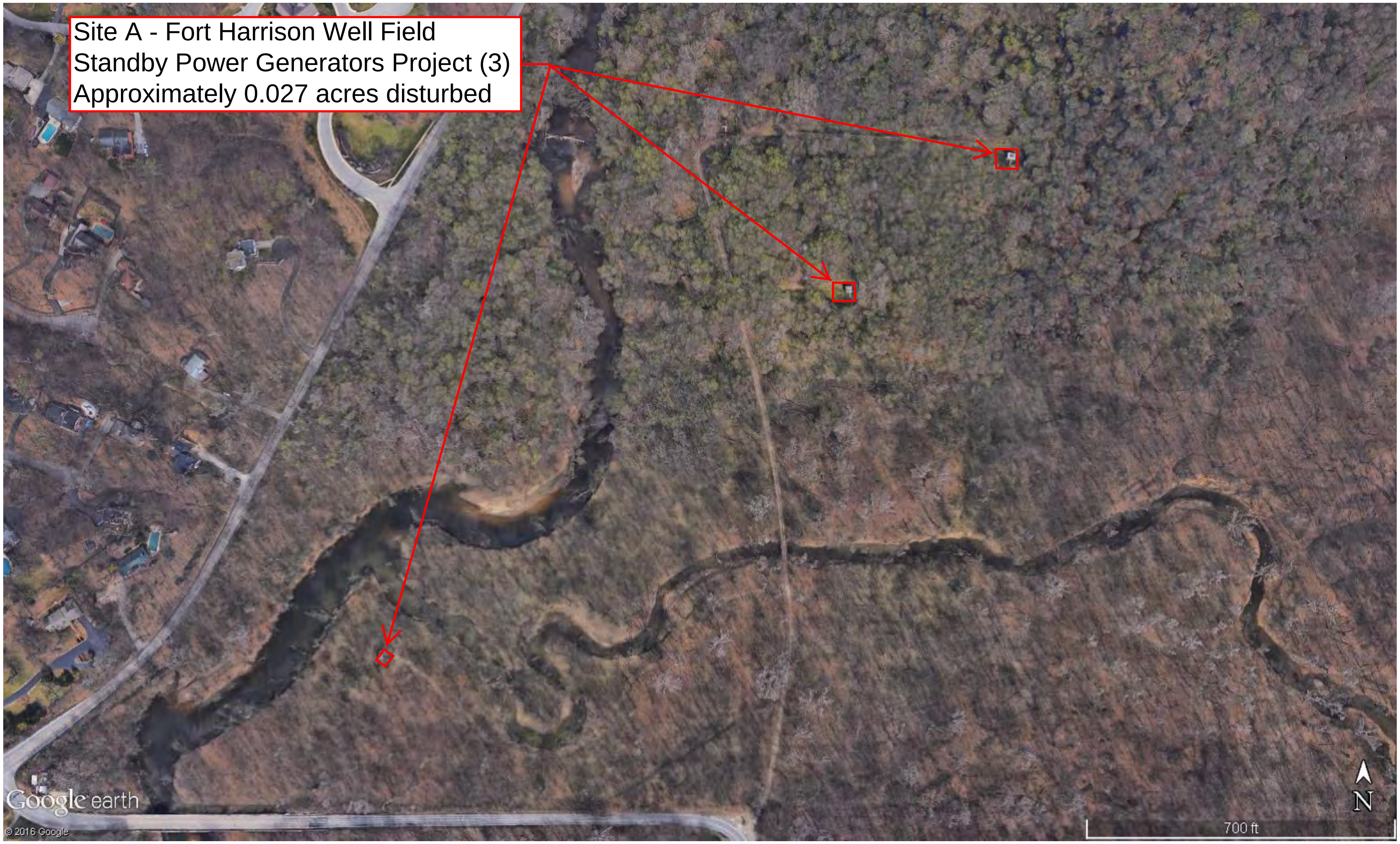
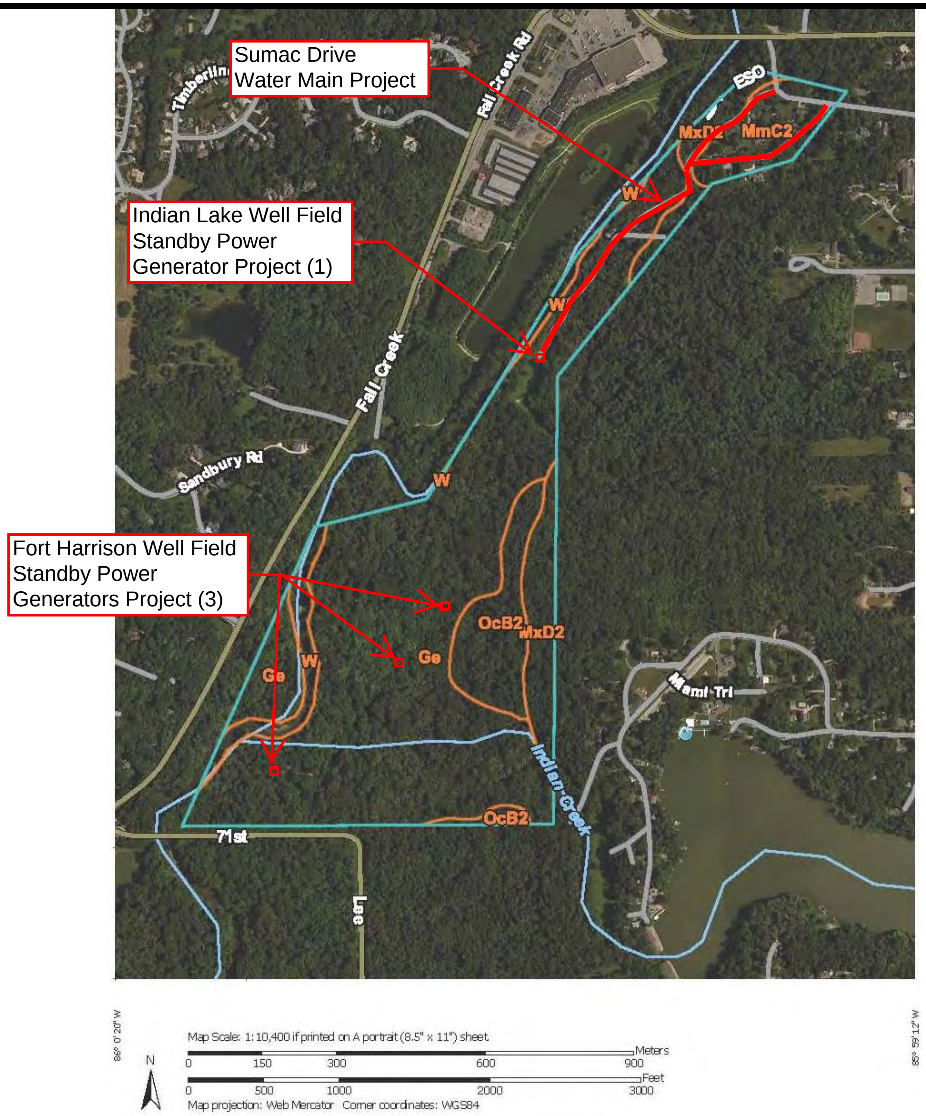

Site A - Fort Harrison Well Field
Standby Power Generators Project (3)
Approximately 0.027 acres disturbed
Google earth
© 2016 Google
N
700 ft


Site B - Indian Lake Well Field
Standby Power Generator Project (1)
Approximately 0.009 acres disturbed
Google earth
Image Landsat
N
100 ft



Map Unit Legend

Marion County, Indiana (IN097)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Ge	Gessie silt loam, 0 to 2 percent slopes, frequently flooded	96.3	71.7%
MmC2	Miami silt loam, 6 to 12 percent slopes, eroded	8.5	6.3%
MxD2	Miami complex, 12 to 18 percent slopes, eroded	12.1	9.0%
OcB2	Ockley silt loam, 2 to 6 percent slopes, eroded	11.5	8.6%
W	Water	5.9	4.4%
Totals for Area of Interest		**134.3**	**100.0%**

EXHIBIT A-14: Soil Survey Map

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

October 2016
184616.03.004

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Map Unit Legend

Marion County, Indiana (IN097)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Br	Brookston silty clay loam, 0 to 2 percent slopes	2.0	3.2%
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	59.0	96.8%
Totals for Area of Interest		**61.0**	**100.0%**

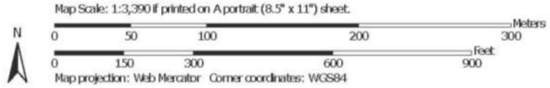

EXHIBIT A-14: Soil Survey Map

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

October 2016
184616.03.004

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Map Unit Legend

Marion County, Indiana (IN097)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Br	Brookston silty clay loam, 0 to 2 percent slopes	0.1	18.8%
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	0.5	81.2%
Totals for Area of Interest		**0.6**	**100.0%**

EXHIBIT A-14: Soil Survey Map

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

October 2016
184616.03.004

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Map Unit Legend

Marion County, Indiana (IN097)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Br	Brookston silty clay loam, 0 to 2 percent slopes	2.6	73.9%
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	0.9	26.1%
Totals for Area of Interest		**3.5**	**100.0%**

Richardt WTP Phase IA & Phase II Projects

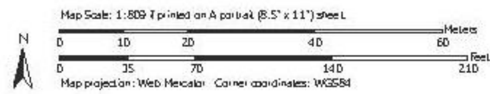

EXHIBIT A-14: Soil Survey Map

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

October 2016
184616.03.004

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Map Unit Legend

Map Scale: 1:5,360 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 250, 500, 1000, 1500

Map projection: Web Mercator Corner coordinates: WGS84

Marion County, Indiana (IN097)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Br	Brookston silty clay loam, 0 to 2 percent slopes	2.9	6.5%
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	41.3	93.5%
Totals for Area of Interest		**44.2**	**100.0%**

EXHIBIT A-14: Soil Survey Map

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

October 2016
184616.03.004

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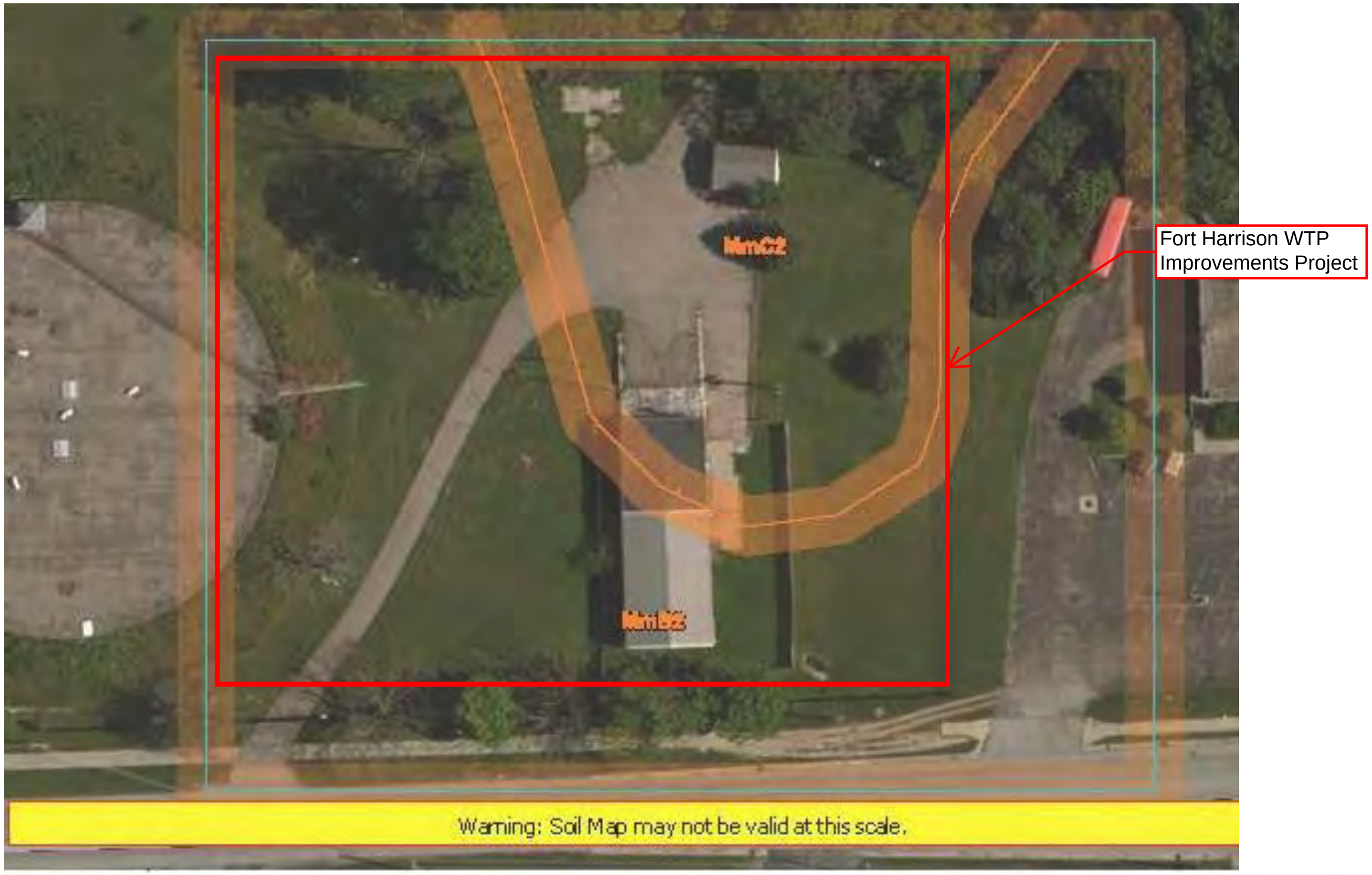

Map Scale: 1:728 if printed on A landscape (11" x 8.5") sheet.

N

0 10 20 40 60 Meters

0 35 70 140 210 Feet

Map projection: Web Mercator Corner coordinates: WGS84

Marion County, Indiana (IN097)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
MmB2	Miami silt loam, 2 to 6 percent slopes, eroded	1.7	73.6%
MmC2	Miami silt loam, 6 to 12 percent slopes, eroded	0.6	26.4%
Totals for Area of Interest		**2.3**	**100.0%**

EXHIBIT A-14: Soil Survey Map

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

October 2016
184616.03.004

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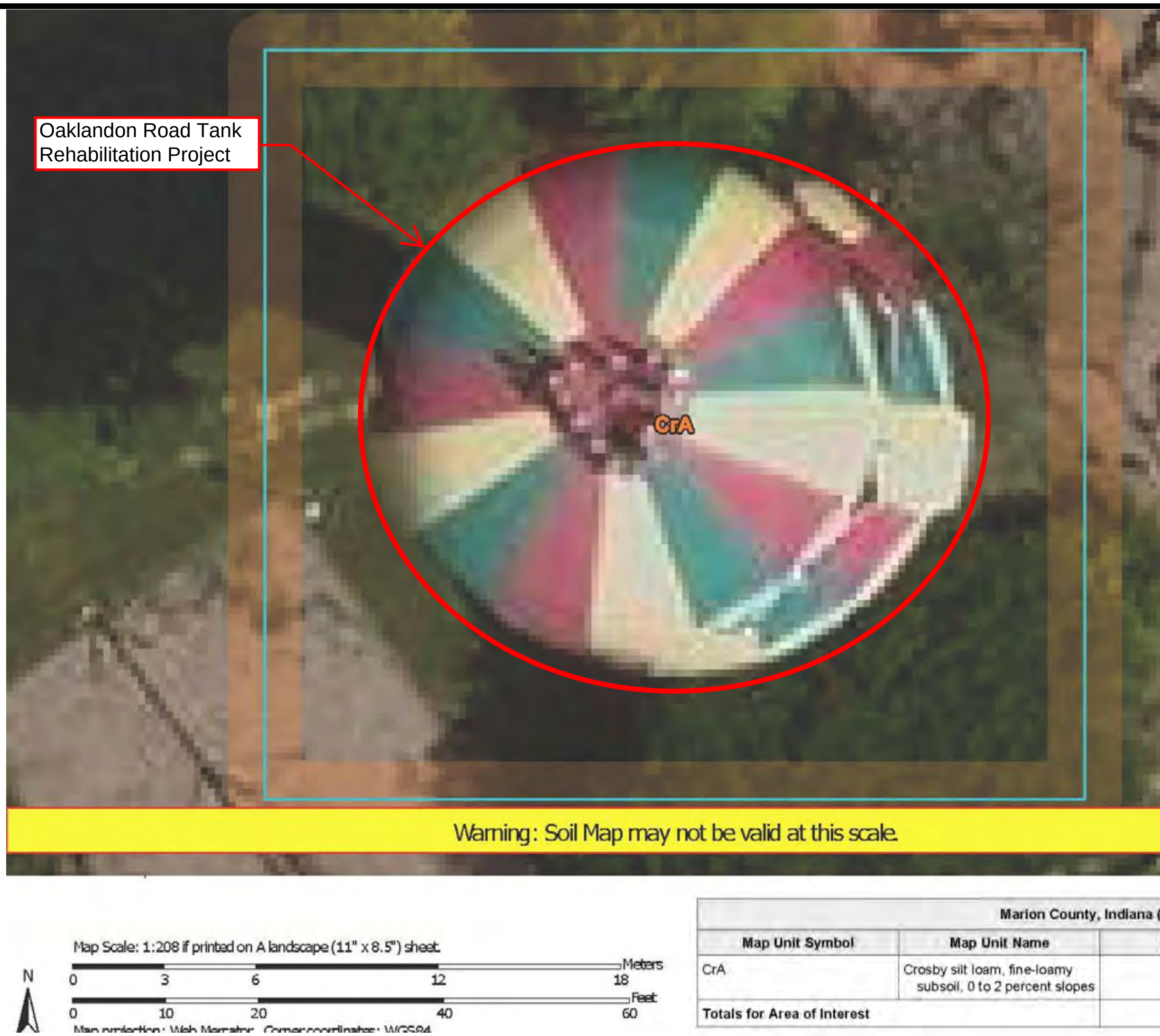

Marion County, Indiana (IN097)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	0.2	100.0%
Totals for Area of Interest		0.2	100.0%

EXHIBIT A-14: Soil Survey Map

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

October 2016
184616.03.004

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MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Marion County, Indiana
Survey Area Data: Version 20, Sep 10, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 27, 2014—Aug 28, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

EXHIBIT A-14: Soil Survey Map

Water System Improvements
Lawrence Municipal Utilities
Lawrence, Indiana

October 2016
184616.03.004

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More than a Project™

USDA
United States Department of Agriculture

Natural Resources Conservation Service
Indiana State Office
6013 Lakeside Boulevard
Indianapolis, IN 46278
317-290-3200

October 12, 2016

Michael Ellis
Wessler Engineering
6219 South East Street
Indianapolis, Indiana 46227

Dear Mr. Ellis:

The proposed project to make water system improvements in Lawrence Municipal Utilities in Marion County, Indiana, as referred to in your letter received September 30, 2016, will not cause a conversion of prime farmland.

If you need additional information, please contact Rick Neilson at 317-295-5875.

Sincerely,

Roger Kult ACTING FOR

JANE E. HARDISTY
State Conservationist

Enclosure

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*		Date Of Land Evaluation Request 9/30/2016			
Name of Project Water System Improvements		Federal Agency Involved EPA through IN SRF			
Proposed Land Use Water Treatment&Distribution System		County and State Marion, Indiana			
PART II *(To be completed by NRCS)*		Date Request Received By NRCS 9-30-16		Person Completing Form: LB	
Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*		YES ☐ NO ☒	Acres Irrigated		Average Farm Size
Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %		Amount of Farmland As Defined in FPPA Acres: %		
Name of Land Evaluation System Used	Name of State or Local Site Assessment System		Date Land Evaluation Returned by NRCS 10-12-16		

PART III *(To be completed by Federal Agency)*		Alternative Site Rating			
		Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly		0.027	0.009	0	0
B. Total Acres To Be Converted Indirectly		0	0	0	0
C. Total Acres In Site		0.027	0.009	12	3
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland					
B. Total Acres Statewide Important or Local Important Farmland					
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted					
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value					
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)					
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)				
2. Perimeter In Non-urban Use	(10)				
3. Percent Of Site Being Farmed	(20)				
4. Protection Provided By State and Local Government	(20)				
5. Distance From Urban Built-up Area	(15)				
6. Distance To Urban Support Services	(15)				
7. Size Of Present Farm Unit Compared To Average	(10)				
8. Creation Of Non-farmable Farmland	(10)				
9. Availability Of Farm Support Services	(5)				
10. On-Farm Investments	(20)				
11. Effects Of Conversion On Farm Support Services	(10)				
12. Compatibility With Existing Agricultural Use	(10)				
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	0	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	0	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

(See instructions on reverse side)

Form AD-1006 (03-02)

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*			Date Of Land Evaluation Request 9/30/2016				
Name of Project Water System Improvements			Federal Agency Involved EPA through IN SRF				
Proposed Land Use Water Treatment&Distribution System			County and State Marion, Indiana				
PART II *(To be completed by NRCS)*			Date Request Received By NRCS 9-30-16		Person Completing Form: LB		
Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*		YES ☐ NO ☒		Acres Irrigated		Average Farm Size	
Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %			Amount of Farmland As Defined in FPPA Acres: %			
Name of Land Evaluation System Used	Name of State or Local Site Assessment System			Date Land Evaluation Returned by NRCS 10-12-16			
PART III *(To be completed by Federal Agency)*				Alternative Site Rating			
				Site E	Site F	Site G	Site H
A. Total Acres To Be Converted Directly				0	0	0	0
B. Total Acres To Be Converted Indirectly				0	0	0	0
C. Total Acres In Site				40	30	0.1	1.5
PART IV *(To be completed by NRCS)* Land Evaluation Information							
A. Total Acres Prime And Unique Farmland							
B. Total Acres Statewide Important or Local Important Farmland							
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted							
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value							
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)							
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*			**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use			(15)				
2. Perimeter In Non-urban Use			(10)				
3. Percent Of Site Being Farmed			(20)				
4. Protection Provided By State and Local Government			(20)				
5. Distance From Urban Built-up Area			(15)				
6. Distance To Urban Support Services			(15)				
7. Size Of Present Farm Unit Compared To Average			(10)				
8. Creation Of Non-farmable Farmland			(10)				
9. Availability Of Farm Support Services			(5)				
10. On-Farm Investments			(20)				
11. Effects Of Conversion On Farm Support Services			(10)				
12. Compatibility With Existing Agricultural Use			(10)				
TOTAL SITE ASSESSMENT POINTS			160	0	0	0	0
PART VII *(To be completed by Federal Agency)*							
Relative Value Of Farmland *(From Part V)*			100	0	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*			160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*			260	0	0	0	0
Site Selected:	Date Of Selection			Was A Local Site Assessment Used? YES ☐ NO ☐			
Reason For Selection:							
Name of Federal agency representative completing this form:						Date:	

(See Instructions on reverse side)

Form AD-1006 (03-02)

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 9/30/2016	
Name of Project Water System Improvements	Federal Agency Involved EPA through IN SRF	
Proposed Land Use Water Treatment&Distribution System	County and State Marion, Indiana	
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 9-30-16	Person Completing Form: LB

Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☐	NO ☒	Acres Irrigated	Average Farm Size
Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %		Amount of Farmland As Defined in FPPA Acres: %	
Name of Land Evaluation System Used	Name of State or Local Site Assessment System		Date Land Evaluation Returned by NRCS 10-12-16	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating: Site I	N/A	N/A	N/A
A. Total Acres To Be Converted Directly	0			
B. Total Acres To Be Converted Indirectly	0			
C. Total Acres In Site	0.1			
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide Important or Local Important Farmland				
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value				
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)				

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	Maximum Points	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)				
2. Perimeter In Non-urban Use	(10)				
3. Percent Of Site Being Farmed	(20)				
4. Protection Provided By State and Local Government	(20)				
5. Distance From Urban Built-up Area	(15)				
6. Distance To Urban Support Services	(15)				
7. Size Of Present Farm Unit Compared To Average	(10)				
8. Creation Of Non-farmable Farmland	(10)				
9. Availability Of Farm Support Services	(5)				
10. On-Farm Investments	(20)				
11. Effects Of Conversion On Farm Support Services	(10)				
12. Compatibility With Existing Agricultural Use	(10)				
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	0	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	0	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form: Date:

(See Instructions on reverse side)

Form AD-1006 (03-02)

APPENDIX F

Legal and Financial Forms

Resolution No. 8, 2016

SRF Loan Program
PER Acceptance Resolution

Whereas, the Lawrence Municipal Utilities of Lawrence, Indiana, has caused a Preliminary Engineering Report ("PER"), dated November 2016, to be prepared by the consulting firm of Wessler Engineering; and

Whereas, said PER has been presented to the public at a public hearing held on December 13, 2016, at the City of Lawrence Government Center, for public comment; and

Whereas, the Lawrence Municipal Utilities Utility Service Board finds that there was not sufficient evidence presented in objection to the recommended project in the PER.

Now, therefore be it resolved that:

1. The PER dated November 2016 be approved and adopted by the Lawrence Municipal Utilities Utility Service Board; and

2. Said PER be submitted to the State Revolving Fund Loan Program for review and approval.

Adopted and Passed by the Utility Service Board of the Lawrence Municipal Utilities of Lawrence, Indiana, this 13th day of December, of 2016.

Utility Service Board

Steven Hall, President

Dale Tekippe, Vice President

Dave Parnell, Secretary

Terry Gingles, Member

Regina Marsh, Member

Approved and signed by the Mayor of Lawrence, Indiana this 14th day of December, 2016.

Steven K. Collier, Mayor

Attest:

Julie Kukolla, Recording Secretary

Resolution No. 9, 2016

SRF Loan Program
Signatory Authorization Resolution

Whereas, the Lawrence Municipal Utilities of Lawrence, Indiana, (the "Participant") has plans for a drinking water infrastructure improvement project to meet State and Federal regulations and the Participant intends to proceed with the construction of such project:

Now, therefore, be it resolved by the Utility Service Board, the governing body of the Participant, that:

1. Steven Hall be authorized to make application for a State Revolving Fund Loan ("SRF Loan") and provide the SRF Loan Program such information, data and documents pertaining to the loan process as may be required, and otherwise act as the authorized representative of the Participant: and

2. The Participant agrees to comply with State and Federal requirements as they pertain to the SRF Loan Program; and

3. Two certified copies of this Resolution be prepared and submitted as part of the Participant's Preliminary Engineering Report.

Adopted and Passed by the Utility Service Board of the Lawrence Municipal Utilities of Lawrence, Indiana, this 13th day of December, of 2016.

Utility Service Board

Steven Hall, President

Dale Tekippe, Vice President

Dave Parnell, Secretary

Terry Ginglos, Member

Regina Marsh, Member

Approved and signed by the Mayor of Lawrence, Indiana this 14th day of December, 2016.

Steven K. Collier, Mayor

Attest:

Julie Kukolla, Recording Secretary

DWSRF Loan Program
Financial Information Form

Proposed Project Costs:

Supply / wells cost	$995,000
Transmission / distribution System cost	$2,883,000
Treatment cost	$9,318,000
Storage cost	$770,000
Subtotal construction cost	$13,966,000
Contingencies (should not exceed 10% of construction cost)	$1,396,000
Non-construction costs	$3,387,000

e.g., engineering, legal and financial services related to the project, land costs, start-up costs, and construction inspection

Total Proposed Project Cost	$18,749,000

The following are not SRF Loan Program eligible:

Previously funded SRF components that have not met useful life	$ 0
Materials and work done on private property	$ 0
Grant applications and income surveys done for other agencies	$ 0
Expenses incurred as a part of forming a utility, Regional Sewer / Water District, or Conservancy District	$ 0
Total Ineligible Costs	$ 0

List other grant / loan funding sources and amounts

Other grants	$ 0
Other loans	$ 0
Hook-on fees	$ 0
Cash on hand	$ 0
Total Other Funding Sources	$ 0

Requested SRF Loan	$18,749,000
Estimated post-project user rate for 4,000 gallons	$ TBD
Anticipated SRF interest rate	TBD

Financial Advisor:

Firm Contact:_____TBD________

Name:_____TBD______

Bond Counsel:

Firm Contact_ __TBD_____

Name____TBD____

APPENDIX G

Public Hearing Information

CONFIRMATION

Star Media
130 S. Meridian Street
Indianapolis, In 46225

CITY OF LAWRENCE CLERK
9001 E 59TH ST STE 205
INDIANAPOLIS IN 46216-

Account	AD#	Net Amount	Tax Amount	Total Amount	Payment Method	Payment Amount	Amount Due
INI-1939	0001761465	$48.67	$0.00	$48.67	Invoice	$0.00	$48.67

Sales Rep: adolph **Order Taker:** adolph **Order Created** 11/28/2016

Product	Placement	Classification	# Ins	Start Date	End Date
INI-Indianapolis Star	INI-Public Notices	Legal Notices	**1**	**12/01/2016**	**12/01/2016**
INI-indystar.com	INIW-Public Notices	Legal Notices	**1**	**12/01/2016**	**12/01/2016**

*** ALL TRANSACTIONS CONSIDERED PAID IN FULL UPON CLEARANCE OF FINANCIAL INSTITUTION**

Text of Ad: 11/28/2016

DWSRF Loan Program

Public Notice

Notice of Public Hearing
Lawrence Municipal Utilities
Preliminary Engineering Report (PER) to obtain assistance from the Drinking Water State Resolving Fund (DWSRF) Loan Program
The Lawrence Municipal Utilities will hold a public hearing at 5:30 PM on December 13, 2016 at the City of Lawrence Government Center located at 9001 East 59th Street Lawrence, IN 46216. The Lawrence Municipal Utilities' engineering consultant will present the recommended upgrades to Lawrence Municipal Utilities' drinking water infrastructure, which will include improvements at the Fort Harrison and Indian Lake well fields, Richardt water treatment plant, Fort Harrison water treatment plant, Indian Lake water treatment plant, Oaklandon Rd. Elevated Tank, 52nd St. Elevated Tank, and three water main replacement projects, as described in the PER. The project will be funded through a DWSRF loan.
At this hearing, there will be the opportunity for questions and comments from the public. Participation is welcomed and encouraged. If special assistance is required at the meeting, please contact Scott Salsbery, Utilities Superintendent. Copies of the PER are available for public viewing starting on December 2, 2016 through December 18, 2016 at the City of Lawrence Mayor's Office located at 9001 East 59th Street Lawrence, IN 46216 and the City of Lawrence Utility Operations Center located at 9201 Harrison Park Court Lawrence, IN 46216. Written comments regarding this project should be sent to Scott Salsbery, Utilities Superintendent located at 9201 Harrison Park Court Lawrence, IN 46216 prior to December 18, 2016.

(S - 12/1/16 - 0001761465)

SIGN-IN SHEET
Public Hearing

Water System Improvements
Lawrence Municipal Utilities
December 13, 2016

Utility Services Board:
Steven Hall, Pres. – 7129 Ember Court, Lawrence, IN 46236
Dale Tekippe, Vice Pres. – 7126 Nile Ridge Court, Lawrence, IN 46236
Dave Parnell, Sec'y – 12702 East 65th Street, Lawrence, IN 46236
Terry Gingles, Member – 6501 Breckenridge Drive, Lawrence, IN 46236
Regina Marsh, Member – 5837 Long Lake Lane, Lawrence, IN 46236
City Admin:
Steven Collier, Mayor – 10105 Hermosa Lane, Lawrence, IN 46236
Jason Fenwick, Controller– 9001 East 59th Street, Lawrence, IN 46216
Julie Kukolla, Exec. Admin Asst to Mayor– 9001 East 59th Street, Lawrence, IN 46216
Jim Gutting, Corporate Counsel for City– 9001 East 59th Street, Lawrence, IN 46216
Utility Staff:
Scott Salsbery, Utility Supt. – 5653 Wallingwood Drive, Lawrence, IN 46226
Paul Wanner, Dir. of Operations, LU – 9201 Harrison Park Court, Lawrence, IN 46216
Cathy Retmier, Business Office Manager– 9201 Harrison Park Court, Lawrence, IN 46216
Tina Whitcomb, Purchasing Manager– 9201 Harrison Park Court, Lawrence, IN 46216
Public:
Carlton E. Curry – 11230 Windingwood Court, Lawrence, IN 46236; (317) 855-7202; cecurry@comcast.net
Randy Warman – 12567 Geist Cove Drive, Lawrence, IN, 46236; (317) 823-7506

WESSLER
ENGINEERING

CITY OF LAWRENCE
Utility Service Board
December 13, 2016/5:30 p.m.
Regular Meeting
Public Assembly Room

Members Present: Steve Hall**,** Dale Tekippe, Dave Parnell, Terry Gingles and Regina Marsh
Staff Present: Mayor Steve Collier, Controller Jason Fenwick, Utility Superintendent Scott Salsbery, Deputy Controller Jason Streeter, Assistant Utility Superintendent Paul Wanner, Business Manager Cathy Retmier, Purchasing Manager Tina Whitcomb, DPW Director Bill Anthony
Also Present: Corporation Counsel Jim Gutting and three members of the community

Mr. Hall called the meeting to order at 5:30 p.m. and announced a quorum.

Mr. Hall asked for approval of the November 22, 2016 minutes. Mr. Parnell moved to accept the minutes; Mr. Gingles seconded the motion. The motion passed unanimously.

Mr. Hall presented the Payment of Claims in the amount of $585,726.84. The presented vouchers were $110,446.94. Mr. Tekippe moved to approve the payment of claims; Mr. Gingles provided the second. The motion passed unanimously.

Utility Superintendent Report: Mr. Hall asked Mr. Salsbery to give his report. He said the utility is seeking approval of the Hach contract so they may host and support WIMS since Proxsurve will no longer support it. The ditch project at Lawrence Park is moving forward. Scott thanked his staff for their involvement and participation in the Christmas Tree Lighting, parade, and Christmas Card Lane. He said they represented the great spirit for the City and thanked them for working hard to make it a great event.

At 5:37 Mr. Hall opened the Public Hearing. Dylan Lambermont, from Wessler Engineering, made a 26 slide presentation regarding the Preliminary Engineering Report for 2016 Drinking Water State Revolving Fund loan process. Mr. Lambermont used photos and data to present the findings and made recommendations for the Utility. He anticipates Phase I would begin in March 2018 and would be completed within a year, by March 2019. Phase II, he said, would begin in July 2019 and its conclusion would be mid-summer 2020. The estimated cost for Phase I is $8,262,500 and Phase II's cost is $10,486,500. Mr. Salsbery explained Wessler Engineering would answer any yes/no questions from the public at the hearing and said questions requiring a more detailed response should be put in writing and a written response would be prepared by the engineer and utility. After the presentation, Mr. Lambermont answered questions from the Board. The Board thanked Mr. Lambermont for his thorough presentation. **At 6:03, Mr. Hall closed the Public Hearing.**

Old Business: Mr. Hall said the USB would meet as scheduled December 27 at 5:30, per Mr. Salsbery's request. He said claims would need to be paid, but expects a short agenda.

New Business:

1. Mr. Hall asked for a motion to approve the Hach contract. Mr. Tekippe provided the motion and Mr. Parnell gave the second. After discussion, it was agreed the contract is approved, pending the three suggested changes by Mr. Gutting. The contract was approved 5-0.
2. Mr. Hall asked for a motion to accept Resolution 8, the PER Acceptance. Mr. Tekippe provided the motion to accept and Ms. Marsh gave the second. It passed 5-0.
3. Mr. Hall asked for a motion to accept Resolution 9, the signatory authorization. Mr. Parnell made the motion and Mr. Gingles gave the second; it passed unanimously.
4. Mr. Hall asked for a motion to accept Resolution 10, the 2017 salary schedule. Mr. Parnell made the motion and Mr. Tekippe gave the second; it passed unanimously.
5. Mr. Hall asked for a motion to accept Resolution 11, the 2017 budget. After discussion and questions answered by Mr. Fenwick, the board agreed to defer Resolution to the December 27 meeting's agenda. Mr. Fenwick said he believes the presented budget to be realistic and minimal for the Utilities.

Mr. Hall asked for Account Adjustments: Mrs. Retmier said there was one adjustment for the sewer portion of a bill for 6550 Royal Oakland Drive for $333.78. Mr. Parnell made the motion to approve the adjustment; Mr. Tekippe gave the second and it passed unanimously.

Remonstration of Ratepayer Dispute Regarding Disconnect Notice: There were none.
Citizen Comments: Carlton Curry requested copies of proposed resolutions be placed at the back of the room with the agenda. He also requested they be posted on the website.

There being no further business to come before the Board, Mr. Parnell motioned for **adjournment** at 6:40 p.m.; Mr. Tekippe seconded the motion and it passed 5-0.

__________________________________ __________________________________

Steven Hall, President Julie Kukolla, Recording Secretary

These minutes are not intended to be verbatim. They are a summary of discussions held, with the exception of the motions.

December 13, 2016 – PUBLIC HEARING

RESPONDENT SIGN-IN SHEET

COL/USB - Preliminary Engineering Report for 2016 Drinking Water State Revolving Fund loan application process

Questions for Utility or Engineer (please print legibly)

Note: The Utility or Engineer, at their discretion, may elect to respond to complex or detailed questions in writing.

Carlton E Curry 11230 Winding Wood Ct 46235

See Attached

WRF APPLICATION COMMENTS

Presented to the Utility Service Board Public Hearing 13 December 2016

GENERAL

The application by the Utility service Board (USB) of the City of Lawrence (COL) seems to be quite comprehensive with a 20 year outlook for capital investment for use versus expected demand. The requested Loan amount for $18+ million also appears to be reasonable given the time that inadequate maintenance practices and associated investment that, over time, has been allowed to cause critical potable water capital investment items to deteriorate. Among these items, the water treatment plants and water storage facilities stand out as critical needs.

If one were to critically challenge any of the proposed investments making up the overall content, the likely focus would be upon the Richardt Water Treatment Plant (WTP), it amount of cost and time to complete. The USB and its consultant should be prepared to respond to questions concerning this portion of the proposal likely to be raised by members of the Common Council. Specifically, given that the USB authorized an upgrade and expansion of this WTP within the past two years. Ground breaking and work actually commenced. Moreover, a design for completion was acquire and delivered to the USB for bid. The bid was taken after members of the USB were assured that innovative financing would allow the construction and bring on line the improved WTP <u>without</u> an increase in rates. The bid resulted in a lowest and best recommended base cost of just under $4 million. This bid was then assigned to the operating staff and its engineering consultant to evaluate and prepare award. However, there was an abrupt announcement made to the USB that the innovative financing was no longer an option and the design was 'shelved'. One could expect that members of Council could question why it will, according to a reading of this proposal to the WRF, two years to commence actual work on a WTP where it could be represented that a detail design is already in hand at a remaining cost less than that proposed to the WRF.

WATER STORAGE

There appears to be some concern about the amount of water storage actually required to meet historical demands within the potable water service area. The COL has a policy of allowing summer residential sprinkling rates to offer finished water at an effective lower cost for lawn maintenance. This practice enhances the quality of life within the COL especially in residential areas. Therefore, demand on a hot day does not follow the norms used by municipalities not offering such rates. Actual usage is higher on a MGPD basis. While there would probably be little or no quarrel with the reference and assumption used to calculate whether or not the existing water storage capacity is adequate, a re-evaluation of the assumptions and data presented on pages 55 and 56 appears to be in order.

For convenience, data in Table 2.2.1.1 is repeated and reordered below. First, as background, some 'unique' operating considerations will be describe to set the stage for a viewpoint different from the more traditional assumptions used to recommend that **no added finished water storage facilities are needed** with the 20 year outlook of this study. (Emphasis added.)

As a practical matter, one major recommendation is NOT to use a one day maximum average for calculating the volume of finished water storage in the COL distribution system. A better recommendation is to use AT LEAST a TWO consecutive day value set for the calculation. Even with a 5.32 MG finished water storage capacity now on line, when a two (or three) consecutive hot day period, which in the July – August time frame often occurs, the current storage capacity and introduction of replacement volume from the combined output of the three WTPs is challenged by the end of the second day. One can always 'push' the filter capacity for a short time, say one day. But, when doing so, filters tend to overload, thereby require more time to backwash, which leads to less time to finish water to the PROPER QUALITY LEVEL required by regulation, which further reduces the volume rate of finished water produced in the system and so on. Taken to 'the limit', a then potential need for an added 450,000 gallons of water to be used for standard fire suppression may become a public safety factor for consideration as well as for the potential for reduced water pressure.

Restated Table 2.2.1.1 MRO Pumping Data Summary (Page 9) **Volume Need vs Capacity**

Year	Richardt	Ft Harrison	Indian Lake	Max Day	Storage Cap	Deficit
2012	2.34	3.02	2.69	8.05		
2013	1.54	2.03	1.78	5.35		
2014	2.39	2.31	1.85	6.55		
2015	2.01	2.81	2.04	6.86		
2016	2.06	2.06	1.94	5.94		
5 Year Ave	2.07	2.45	2.06			
Combined				6.58	5.32	1.26

The restated table suggests that a hot summer day duet actually results in a 1.26 MG storage deficit. Using this logic, one might better plan to add at least a **one million gallon storage facility**, probably elevated, to the finished water distribution system early in the twenty year outlook for work under this loan application.

SUMMARY

The people and business entities that make up both the living and working population of the COL should support this application to the SRF AND support whatever water utility rate structure may be needed to accomplish this long overdue and clearly needed system improvement and its ongoing maintenance.

Carlton E. Curry

Carlton E. Curry

11230 Winding Wood Court

Lawrence, IN 46235-9747

317 855 7202

More than a Project™

January 5, 2017

Mr. Scott Salsbery, Superintendent
City of Lawrence Utilities
9201 Harrison Park County
Lawrence, Indiana 46216

Dear Mr Salsbery:

At the December 13, 2016 Public Hearing for the presentation of the Water Systems Improvements Preliminary Engineering Report (PER), written comments/questions were received from Mr. Carlton E. Curry. Those written comments/questions are attached, and a written response to those comments is as follows:

Response to Item No 1: General

The Richardt Water Treatment Plant was design and permitted, and bids were received in February 2014. The construction contract was not awarded at that time. The need for upgrades and replacement of this facility remains, and has been included in the PER Selected Project accordingly. Construction costs have increased over the past 2 years, and these increases have been factored into the Engineer's Estimate for this portion of the Project. The total plant capacity will be increased from the 2014 design to maximize the groundwater resource present at the Richard wellfield. Permit from 2014 have expired and will need to be re-submitted, and the bid process will be repeated. Non-construction costs to perform this work, in addition to other related items, have been included in the PER.

Response to Item No. 2: Water Storage

Statutory guidance on water storage capacity is somewhat limited. 327 IAC incorporates the *Recommended Standards for Water Work* by reference, and those Standards state: "Storage facilities should have sufficient capacity, as determined from engineering studies, to meet domestic demands, and where fire protection is provided, fire flow demands… The minimum storage capacity (or equivalent capacity) for systems not providing fire protection shall be equal to the average daily consumption. This requirement may be reduced when the source and treatment facilities have sufficient capacity with standby power to supplement peak demands of the system"

The capacity evaluation method provided in Sections 2.2.4 and 3.4.3 of the PER compares the average day demand to the system storage capacity to determine that no additional storage capacity is needed in the system. As discussed in PER Section 2.2.5, Lawrence has four physical connections to the City of Indianapolis (CEG) water system, which can be used in the event of an emergency and partially mitigating the need for emergency storage volume. Further, the system is currently able to meet domestic and fire flow demands, confirming that the existing storage volume is adequate. Should, in the future, these conditions no longer be met, Lawrence should re-evaluate the need for additional storage in the water system.

This written response will be incorporated into the Public Hearing documentation in the PER. Please let us know if you have any comments or questions.

Sincerely,

WESSLER ENGINEERING

Dylan L. Lambermont, P.E.

Project Manager

DLL:dll:2017-01-05

Attachments: Public Hearing Written Comments dated 2016-12-13

cc: PER

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6219 South East Street
Indianapolis, IN 46227

www.wesslerengineering.com

CARLTON E. CURRY
11230 WINDINGWOOD COURT
LAWRENCE, IN 46236

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Indianapolis, IN 46227

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RANDY WARMAN
12567 GEIST COVE DRIVE
LAWRENCE, IN, 46236

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Indianapolis, IN 46227

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APPENDIX H

SRF Design Summary

Attachment E:
DWSRF Loan Program
Preliminary Design Summary – Existing Facilities

PART 1 - GENERAL INFORMATION

1.01 **Project name**: Water System Improvements

PART 2 - DESIGN INFORMATION

2.01 **Current population**: 2010 – 46,001

2.02 **Design year and population**: 2036 – 52,375

2.03 **Average Design Flow**: 4.54 MGD

1. **Domestic**:
2. **Commercial**:
3. **Industrial**:

2.04 **Peak design flow**: 6.41 MGD

PART 3 - WATER SUPPLY

3.01 Surface water

1. **Location**: N/A
2. **Type**: N/A
3. **Volume**: N/A

3.02 Ground water:

1. **Number of wells**: 10
2. **Location**:
   a. Richardt Well Field – Located at the Richardt water treatment plant located between 54th St. and 56th St. on Richardt Ave.
   b. Fort Harrison Well Field – Located north of 71st St. near the intersection of 71st St. and Lee Road.
   c. Indian Lake Well Field – Located along Fall Creek Dr. west of Indian Lake Road and north of 75th St.
3. **Type and diameter**:
   a. Well 1 – 16-inch bedrock
   b. Well 2 – 16-inch bedrock
   c. Well 3 – 12-inch bedrock
   d. Well 4 – 8-inch bedrock
   e. Well 8 – 12-inch sand and gravel
   f. Well 9 – 12-inch sand and gravel
   g. Well 10 – 12-inch sand and gravel

h. Well 14 – 16-inches sand and gravel
i. Well 15R – 16-inch sand and gravel
j. Well 16 – 20-inch sand and gravel

4. **Well Operating Capacity**:
   a. Well 1 – 1,250 gpm
   b. Well 2 – 1,000 gpm
   c. Well 3 – 750 gpm
   d. Well 4 – Offline
   e. Well 8 – 1,250 gpm
   f. Well 9 – 1,000 gpm
   g. Well 10 – 750 gpm
   h. Well 14 – 700 gpm
   i. Well 15R – 900 gpm
   j. Well 16 – 750 gpm
5. **Well house**:
   a. Well 1 – Yes
   b. Well 2 – Yes
   c. Well 3 – Yes
   d. Well 4 – Yes
   e. Well 8 – No
   f. Well 9 – Yes
   g. Well 10 – Yes
   h. Well 14 – Yes
   i. Well 15R – No
   j. Well 16 – No
6. **Aquifer type**:
   a. Richardt – Bedrock Aquifer
   b. Fort Harrison – Fall Creek Outwash Aquifer (sand and gravel)
   c. Indian Lake – Fall Creek Outwash Aquifer (sand and gravel)

3.03 **Emergency power**:

1. Richardt well field – None
2. Indian Lake well field – None
3. Fort Harrison well field - None

PART 4 - FLOW METERS

4.01 **Type and Location**: Totalizers at all wells at Richardt well field, Mag meter prior to aerators, currently installing Doppler meter for Richardt WTP discharge, mag meter for total flow from Fort Harrison well field, mag meter for Fort Harrison WTP discharge, mag meter for total flow from Indian Lake well field, and mag meter for Indian Lake WTP discharge.

PART 5 - TREATMENT

5.01 **Provide raw water analysis –** See attached.

5.02 Pumps

1. **Number**: 10
2. **Operating Capacity**:
   a. Richardt:
      1) HSP 1 – Offline
      2) HSP 2 – Offline
      3) HSP 3 – 850 gpm
      4) HSP 4 – 1,000 gpm
   b. Fort Harrison:
      1) HSP 1 – 800 gpm
      2) HSP 2 – 1,200 gpm
      3) HSP 3 – 1,000 gpm
   c. Indian Lake:
      1) HSP 1 – 1,000 gpm
      2) HSP 2 – 1,000 gpm
      3) HSP 3 – 1,000 gpm

5.03 Clarification

1. Rapid mixing
   1) **Number**: N/A
   2) **Size**: N/A
   3) **Detention time**: N/A

2. Flocculation
   1) **Number**: N/A
   2) **Size**: N/A
   3) **Detention time**: N/A
   4) **Flocculation speed**: N/A
   5) **Velocity**: N/A

3. Sedimentation
   1) **Number**: N/A
   2) **Size**: N/A
   3) **Detention**: N/A
   4) **Baffle location**: N/A
   5) **Overflow rate**: N/A
   6) **Velocity**: N/A
   7) **Sludge removal**: N/A

5.04 Filtration

1. **Type**:
   a. Richardt: Horizontal Pressure
   b. Fort Harrison: Vertical Pressure
   c. Indian Lake: Horizontal Pressure
2. **Number and size of units**:
   a. Richardt: 4 – 500 gpm
   b. Fort Harrison: 9 – 174 gpm
   c. Indian Lake: 4 – 486 gpm
3. **Peak flow rate**:
   a. Richardt: 2.07 MGD
   b. Fort Harrison: 2.44 MGD
   c. Indian Lake: 2.06 MGD
4. **Average flow rate**:
   a. Richardt: 1.22 MGD
   b. Fort Harrison: 1.42 MGD
   c. Indian Lake: 1.34 MGD
5. **Backwash rate**:
   a. Richardt: 1,200 gpm
   b. Fort Harrison: 800 gpm
   c. Indian Lake: 1,200 gpm
6. **Backwash pumps** (**number and capacity**): N/A
7. **Backwash tank capacity**:
   a. Richardt: N/A
   b. Fort Harrison: N/A
   c. Indian Lake: N/A
8. **Wastewater tank capacity**: N/A
9. **Method of cleaning**: Water wash
10. **Disposal of backwash solids**: Sanitary sewer

5.05 Aeration

1. **Type**:
   a. Richardt: Induced draft
   b. Fort Harrison: N/A
   c. Indian Lake: Induced draft
2. **Loading rate**:
   a. Richardt: Per manufacturer
   b. Fort Harrison: N/A
   c. Indian Lake: Per manufacturer

5.06 Iron and Manganese Control

1. **Type**:
   a. Richardt: Aeration, detention, filtration
   b. Fort Harrison: Filtration
   c. Indian Lake: Aeration, detention, filtration

5.07 Softening

1. **Type**: N/A
2. **Chemical feed location**: N/A
3. **Sludge removal and disposal method**: N/A
4. **Number and size of brine tank**: N/A
5. **Brine waste disposal**: N/A

PART 6 - DISINFECTION

6.01 **Type of disinfectant used**: 12.5% Bulk Sodium Hypochlorite

6.02 **Type of chemical feed system**:

1. Richardt: metering pump
2. Fort Harrison: metering pump
3. Indian Lake: metering pump

6.03 **Capacity**:

1. Richardt: 120 gpd
2. Fort Harrison: 120 gpd
3. Indian Lake: 120 gpd

6.04 **Disinfectant dosage**:

1. Richardt: 20-30 gpd
2. Fort Harrison: pre-filtration – 20-30 gpd & post-reservoir – 5-10 gpd
3. Indian Lake: pre-filtration - 20-30 gpd & post-filtration – 10-15 gpd

6.05 **Contact time**:

1. Richardt: 5 minutes
2. Fort Harrison: 72 hours
3. Indian Lake: 30 minutes

6.06 **Point of application**: Chlorine is added at each of the treatment plants.

1. Richardt: Post-filtration
2. Fort Harrison: pre-filtration and post-reservoir
3. Indian Lake: Pre-filtration and post-filtration

6.07 **Automatic switchover**: N/A

6.08 **Ventilation provided**: None

6.09 **Safety equipment**: PPE

6.10 **Testing equipment**: Hach DR3900

6.11 **Housing**: Bulk tanks and days tanks.

PART 7 - CONTROLS

7.01 **Type**: Mission system – internet based control system.

1. Richardt and Fort Harrison WTPs are controlled based on the level of the 52nd St. elevated tank.
2. Indian Lake WTP is controlled based on the level of the Oaklandon Road elevated tank.

PART 8 - WATER STORAGE

8.01 **Type**: Elevated and ground

8.02 **Number**: 2 elevated and 2 ground

8.03 **Capacity**:

1. 52nd St. elevated tank – 0.50 MG
2. Oaklandon Rd. elevated tank – 0.50 MG
3. Fort Harrison ground storage reservoir – 3 MG
4. Winding Ridge ground storage tank – 1.10 MG

8.04 **High and low water level**:

1. 52nd St. elevated tank: High – 996.50 Low – 966.50’
2. Oaklandon Rd. elevated tank: High – 996.50’ Low – 959.00’
3. Fort Harrison ground storage reservoir: High – 869.00’ Low – 849.00’
4. Winding Ridge ground storage tank: High – 854.00’ Low – 824.00’

8.05 **Elevation at bottom of tank**:

1. 52nd St. elevated tank: 860.00’
2. Oaklandon Rd. elevated tank: 850.00’
3. Fort Harrison ground storage reservoir: 849.00’
4. Winding Ridge ground storage tank: 824.00’

8.06 **Available pressure**: 50-75 psi

8.07 **Booster pump**:

1. Winding Ridge Booster Station: 2 booster pumps rated at 1,000 gpm

PART 9 - DISTRIBUTION SYSTEM

9.01 **Type of pipe material**: Ductile iron, PVC, Cast Iron

9.02 **Diameter and lengths**: 217 miles including 3”, 4”, 6”, 8”, 10”, 12”, 14”, 16”, 20”

9.03 **Number of hydrants**: 2,160

9.04 **Number and size of valves**: 4,540 including 3”, 4”, 6”, 8”, 10”, 12”, 16”, 20”

9.05 **Separation distance from sanitary sewers**: varies

9.06 **Separation distance from other water mains**: varies

9.07 **Fire protection**: Fire department via fire hydrants

PART 10 - MISCELLANEOUS

10.01 **Laboratory equipment**: Hach DR3900, Hach SC200 analyzers

10.02 **Safety equipment**: Air monitors, Chemical PPE

Attachment E:
DWSRF Loan Program
Preliminary Design Summary – Proposed Facilities
Proposed items are listed in red.

PART 1 - GENERAL INFORMATION

1.01 **Project name**: Water System Improvements

PART 2 - DESIGN INFORMATION

2.01 **Current population**: 2010 – 46,001

2.02 **Design year and population**: 2036 – 52,375

2.03 **Average Design Flow**: 4.54 MGD

1. **Domestic**:
2. **Commercial**:
3. **Industrial**:

2.04 **Peak design flow**: 6.41 MGD

PART 3 - WATER SUPPLY

3.01 Surface water

1. **Location**: N/A
2. **Type**: N/A
3. **Volume**: N/A

3.02 Ground water:

1. **Number of wells**: 10
2. **Location**:
   a. Richardt Well Field – Located at the Richardt water treatment plant located between 54th St. and 56th St. on Richardt Ave.
   b. Fort Harrison Well Field – Located north of 71st St. near the intersection of 71st St. and Lee Road.
   c. Indian Lake Well Field – Located along Fall Creek Dr. west of Indian Lake Road and north of 75th St.
3. **Type and diameter**:
   a. Well 1 – 16-inch bedrock
   b. Well 2 – 16-inch bedrock
   c. Well 3 – 12-inch bedrock
   d. Well 4 – 8-inch bedrock
   e. Well 8 – 12-inch sand and gravel
   f. Well 9 – 12-inch sand and gravel

g. Well 10 – 12-inch sand and gravel
h. Well 14 – 16-inches sand and gravel
i. Well 15R – 16-inch sand and gravel
j. Well 16 – 20-inch sand and gravel

4. **Well Operating Capacity**:
   a. Well 1 – 1,250 gpm
   b. Well 2 – 1,000 gpm
   c. Well 3 – 750 gpm
   d. Well 4 – Offline
   e. Well 8 – 1,250 gpm
   f. Well 9 – 1,000 gpm
   g. Well 10 – 750 gpm
   h. Well 14 – 700 gpm
   i. Well 15R – 900 gpm
   j. Well 16 – 750 gpm
5. **Well house**:
   a. Well 1 – Yes
   b. Well 2 – Yes
   c. Well 3 – Yes
   d. Well 4 – Yes
   e. Well 8 – No
   f. Well 9 – Yes
   g. Well 10 – Yes
   h. Well 14 – Yes
   i. Well 15R – No
   j. Well 16 – No
6. **Aquifer type**:
   a. Richardt – Bedrock Aquifer
   b. Fort Harrison – Fall Creek Outwash Aquifer (sand and gravel)
   c. Indian Lake – Fall Creek Outwash Aquifer (sand and gravel)

3.03 **Emergency power**:

1. Richardt well field – standby diesel generator
2. Indian Lake well field – standby diesel generator
3. Fort Harrison well field – 3 standby diesel generators

PART 4 - FLOW METERS

4.01 **Type and Location**: Totalizers at all wells at Richardt well field, Mag meter for Richardt WTP discharge, mag meter for total flow from Fort Harrison well field, mag meter for Fort Harrison WTP discharge, mag meter for total flow from Indian Lake well field, and mag meter for Indian Lake WTP discharge.

PART 5 - TREATMENT

5.01 **Provide raw water analysis –** See attached.

5.02 Pumps

1. **Number**: 9 with room for 1 additional
2. **Operating Capacity**:
    a. Richardt:
        1) HSP 1 – 1,000 gpm
        2) HSP 2 – 1,000 gpm
        3) HSP 3 – 1,000 gpm
        4) Future HSP 4 – 1,000 gpm
    b. Fort Harrison:
        1) HSP 1 – 1,200 gpm
        2) HSP 2 – 1,200 gpm
        3) HSP 3 – 1,200 gpm
    c. Indian Lake:
        1) HSP 1 – 1,000 gpm
        2) HSP 2 – 1,000 gpm
        3) HSP 3 – 1,000 gpm

5.03 Clarification

1. Rapid mixing
    1) **Number**: N/A
    2) **Size**: N/A
    3) **Detention time**: N/A

2. Flocculation
    1) **Number**: N/A
    2) **Size**: N/A
    3) **Detention time**: N/A
    4) **Flocculation speed**: N/A
    5) **Velocity**: N/A

3. Sedimentation
    1) **Number**: N/A
    2) **Size**: N/A
    3) **Detention**: N/A
    4) **Baffle location**: N/A
    5) **Overflow rate**: N/A
    6) **Velocity**: N/A
    7) **Sludge removal**: N/A

5.04 Filtration

1. **Type**:
    a. Richardt: Horizontal Pressure
    b. Fort Harrison: Horizontal Pressure
    c. Indian Lake: Horizontal Pressure
2. **Number and size of units**:
    a. Richardt: 3 – 1,000 gpm with room for a fourth
    b. Fort Harrison: 3 – 1,000 gpm with room for a fourth
    c. Indian Lake: 4 – 486 gpm
3. **Peak flow rate**: 6.57 MGD
4. **Average flow rate**: 3.99 MGD
5. **Backwash rate**:
    a. Richardt: 15 gpm/ft^2
    b. Fort Harrison: 15 gpm/ft^2
    c. Indian Lake: 1,200 gpm
6. **Backwash pumps** (**number and capacity**): N/A
7. **Backwash tank capacity**:
    a. Richardt: 60,000 gallons
    b. Fort Harrison: 60,000 gallons
    c. Indian Lake: N/A
8. **Wastewater tank capacity**: N/A
9. **Method of cleaning**: Water wash
10. **Disposal of backwash solids**: Sanitary sewer

5.05 Aeration

1. **Type**:
    a. Richardt: Induced draft
    b. Fort Harrison: Induced draft
    c. Indian Lake: Induced draft
2. **Loading rate**:
    a. Richardt: Per manufacturer
    b. Fort Harrison: Per manufacturer
    c. Indian Lake: Per manufacturer

5.06 Iron and Manganese Control

1. **Type**:
    a. Richardt: Aeration, detention, filtration
    b. Fort Harrison: Aeration, detention, filtration
    c. Indian Lake: Aeration, detention, filtration

5.07 Softening

1. **Type**: N/A
2. **Chemical feed location**: N/A
3. **Sludge removal and disposal method**: N/A
4. **Number and size of brine tank**: N/A
5. **Brine waste disposal**: N/A

PART 6 - DISINFECTION

6.01 **Type of disinfectant used**: 12.5% Bulk Sodium Hypochlorite

6.02 **Type of chemical feed system**:

1. Richardt: metering pump
2. Fort Harrison: metering pump
3. Indian Lake: metering pump

6.03 **Capacity**:

1. Richardt: 120 gpd
2. Fort Harrison: 120 gpd
3. Indian Lake: 120 gpd

6.04 **Disinfectant dosage**:

1. Richardt: 20-30 gpd
2. Fort Harrison: pre-filtration – 20-30 gpd & post-reservoir – 5-10 gpd
3. Indian Lake: pre-filtration - 20-30 gpd & post-filtration – 10-15 gpd

6.05 **Contact time**:

1. Richardt: 30 minutes
2. Fort Harrison: 72 hours
3. Indian Lake: 30 minutes

6.06 **Point of application**: Chlorine is added at each of the treatment plants.

1. Richardt: Post-filtration
2. Fort Harrison: pre-filtration and post-reservoir
3. Indian Lake: Pre-filtration and post-filtration

6.07 **Automatic switchover**: N/A

6.08 **Ventilation provided**: None

6.09 **Safety equipment**: PPE

6.10 **Testing equipment**: Hach DR3900

6.11 **Housing**: Bulk tanks and day tanks

PART 7 - CONTROLS

7.01 **Type**: System-wide PLC-centric SCADA system

1. Richardt and Fort Harrison WTPs are controlled based on the level of the 52nd St. elevated tank.

2. Indian Lake WTP is controlled based on the level of the Oaklandon Road elevated tank.

PART 8 - WATER STORAGE

8.01 **Type**: Elevated and ground

8.02 **Number**: 2 elevated and 2 ground

8.03 **Capacity**:

1. 52^{nd} St. elevated tank – 0.50 MG
2. Oaklandon Rd. elevated tank – 0.50 MG
3. Fort Harrison ground storage reservoir – 3 MG
4. Winding Ridge ground storage tank – 1.10 MG

8.04 **High and low water level**:

1. 52^{nd} St. elevated tank: High – 996.50 Low – 966.50’
2. Oaklandon Rd. elevated tank: High – 996.50’ Low – 959.00’
3. Fort Harrison ground storage reservoir: High – 869.00’ Low – 849.00’
4. Winding Ridge ground storage tank: High – 854.00’ Low – 824.00’

8.05 **Elevation at bottom of tank**:

1. 52^{nd} St. elevated tank: 860.00’
2. Oaklandon Rd. elevated tank: 850.00’
3. Fort Harrison ground storage reservoir: 849.00’
4. Winding Ridge ground storage tank: 824.00’

8.06 **Available pressure**: 50-75 psi

8.07 **Booster pump**:

1. Winding Ridge Booster Station: 2 booster pumps rated at 1,000 gpm

PART 9 - DISTRIBUTION SYSTEM

9.01 **Type of pipe material**: Ductile iron, PVC, Cast Iron

9.02 **Diameter and lengths**: 217 miles including 3”, 4”, 6”, 8”, 10”, 12”, 14”, 16”, 20”

9.03 **Number of hydrants**: 2,160

9.04 **Number and size of valves**: 4,540 including 3”, 4”, 6”, 8”, 10”, 12”, 16”, 20”

9.05 **Separation distance from sanitary sewers**: varies

9.06 **Separation distance from other water mains**: varies

9.07 **Fire protection**: Fire department via fire hydrants

PART 10 - MISCELLANEOUS

10.01 **Laboratory equipment**: Hach DR3900, Hach SC200 analyzers

10.02 **Safety equipment**: Air monitors, Chemical PPE

Tested 11/2/16

Indian Lake

	Well 14	Well 15	Well 16
Iron	1.29	1.77	1.15
Manganese	0.146	0.237	0.177
Ammonia	0.16	0.80	0.21
pH	7.84	7.53	7.45
Temp	66.4	69.6	69.1
Turbidity	1.70	2.89	2.94
Fluoride	0.21	0.15	0.40

Richardt

Well 1	Well 2	Well 3
2.01	1.56	1.45
0.090	0.085	0.064
0.34	0.52	0.54
7.42	7.71	7.34
60.6	64.8	60.2
2.66	2.53	2.77
0.45	0.54	0.67

Fort

Well 8	Well 9	Well 10
1.69	0.52	0.08
0.184	0.144	0.03
0.20	0.04	0.03
7.65	7.65	7.57
64.9	66.0	67.8
0.44	3.02	0.58
0.23	0.16	0.22

Lawrence Utilities LLC
Purification Dept.

Average Value mg/l

Raw Well Water

Well #	Rich St.1	Rich St.2	Rich St.3&4	FT8	FT9	FT10	FT7	IL 15	IL14	IL 16
Analyte	Value mg/l	Value mg/l	Value mg/l	Value mg/l	Value mg/l	Value mg/l	Value mg/l	Value mg/l	Value mg/l	Value mg/l
Turbidity	5.80			16	2.2	0.83	11.0		12.0	
Alkalinity	289	284	307	271	282	231	260	264	245	264
pH	7.53	7.46	7.42	7.09	7.33	7.47	7.42	7.45	7.45	6.8
Calcium	84	85	83	80	100	89	100	87	82	106
Total Hardness	344	337	360		338	306	352	324	312	322
Odor	musty		musty		musty	stale	lit sulfur	sulfur	musty	
Chloride	44.5	40.5	48	64.1	39	50	53	26	32	
Fluoride	0.53	0.545	0.47	0.25	0.23	0.20	0.19	0.35	0.39	
Nitrite		<0.04	<.08			0.02	<.06	<.02	<.08	
Nitrate		<0.04	<.08	nd	0.2	0.915	0.08	<.02	<.08	
Sulfate	44	42	40		36.5	44.5	58.0	56	53	
Ammonia	0.84	0.8	1.2	.28	0.055	0.05	0.27	0.30	0.30	
Silica	14.2	14.2	14.5		10.25	7.6	9.60	12.3	13.0	
Conductivity	669	715	795	786	580	700	750	650	680	
Magnesium	35.3	35	42.5	24.2	29	26.5	30	30	30	
VOCs										
SVOCs										
Potassium	1.39	1.5	1.45		1.7	2.15	1.80	1.90	1.70	
Arsenic	0.0019	0.0021	0.0018	nd	0.0005	0.001	0.0010	0.0022	0.00	
Barium	0.50	0.2045	0.215	0.155	0.048	0.055	0.114	0.156	0.15	
Cadmium	0.00	<0.0005	0.0001	nd	0.0003	0.0002	0.0000	0.0005	0.00	
Copper	0.02	<0.02	<.02		0.015	0.015	0.03	<.02	0.01	
Iron	1.26	1.395	1.41	1.39	0.3	0.145	1.12	1.14	1.02	0.43
Lead	0.00	0.0029	<.001		0.001	0.001	0.001	<.001	<.001	0.061
Manganese	0.05	0.055	0.0375	0.091	0.15	0.065	0.18	0.11	0.11	
Selenium	0.00	0	0.0004	nd	0.0017	0.002	0.0010	<.003	<.001	
Sodium	27	26	29		9.6	24.5	22.0	19.0	18.0	
TOC										

Bacteriology:

Plate Count	6		11		0	0	0	0	0	0
Coliform	0/0		0/0		0/0	0/0	0/0	0/0	0/0	0/0

INDIANAPOLIS WATER COMPANY
Purification Dept. Laboratory

Date: March 14, 2001

Sample Description: Lawrence Richardt Well #5 *NEW WELL*

Sample Number: L-20453

Collected By: Paul Johnson

Date: March 14, 2001

Analyte	Value	Test Date	Analyte	Value	Test Date
Alkalinity	284	3/14/01	Potassium	1.4	3/14/01
pH	7.44	3/14/01	Sodium	28	3/14/01
Calcium	82	3/14/01	Ammonia	0.92	3/14/01
Magnesium	36	3/14/01	Arsenic	0.0052	3/19/01
Total Hardness(calc)	353	3/14/01	Barium	0.222	4/5/01
Total Hardness	352	3/14/01	Cadmium	<.0005	4/4/01
Turbidity			Copper	<.02	3/15/01
Odor	Strong Sulfur	3/14/01	Iron	5.02	3/15/01
Chloride	49	3/14/01	Lead	<.001	3/15/01
Bromide	<.04	3/14/01	Manganese	0.05	3/15/01
Fluoride	0.64	3/14/01	Mercury	<.0005	3/22/01
Nitrite	<.04	3/14/01	Antimony	<.002	4/30/01
Nitrate	<.04	3/14/01	Selenium	<.003	3/20/01
Sulfate	49	3/14/01	Chromium	<.0015	5/1/01
Silica	13.9	3/14/01	Nickel	<.01	5/3/01
Conductance	710	3/15/01	Thallium	<.001	5/4/01
			Zinc	0.006	5/1/01
			Beryllium	<.001	5/1/01
SVOCs					

Bacteriology:

Plate Count	6				
Coliform	0/0				

H:\IWCSERV\MONTHLY WELL SAMPLING\LAWRENCE WATER\Lr 5\MAR 2001\8/14/01\1:15 PM\SBE

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