



Memo

To: Acme Township Board of Trustees and Planning Commission
From: Sharon E. Vreeland, Township Manager
Date: 04/22/11
Re: VGT-Phase I SUP #2009-1P Status Update

Today, in response to a request from VGT, the township provided to the applicant the attached evaluation of the current capacity of our sanitary sewer system to handle projected flows from a proposed Meijer store. The study indicates that the sanitary system as it exists today can handle the projected flows, but that we should monitor Sewer District 6 (most of M-72 East and a portion of the Resort) closely as future development occurs in that area. In the future a 10" pipe that crosses under Acme Creek will have to be upsized.

As part of the study, we had the DPW calculate the number of sewer benefits the proposed new Meijer store would be required to purchase under our current standards. The number is 123.90.

Later this morning (Friday, April 22) I will be observing a meeting between Terry Boyd of Gourdie Fraser, contractor to the VGT, and Dr. Chris Grobbel, subcontractor to township consultant, Beckett & Raeder. Terry apparently has some questions about the environmental impact report prepared by Dr. Grobbel relative to the Phase I application that he would like to discuss.

VGT traffic study contractor Progressive AE continues to work actively with MDOT staff in Lansing to make recommended revisions to the most recent version of their traffic impact study.

**SANITARY SEWER STUDY FOR DISTRICT 6
IN RESPONSE TO THE REQUEST BY
MEIJER, INC.**

PREPARED FOR:



APRIL 15, 2011

TABLE OF CONTENTS

Contents

1 INTRODUCTION	3
1.1 Purpose	3
2 DATA COLLECTION.....	3
2.1 Meijer: Flow Data.....	3
2.2 Record Drawings of Sewer Infrastructure.....	3
2.3 Lift Station Data	3
3 DESCRIPTION OF SANITARY SEWER SERVICE DISTRICTS.....	3
3.1 Acme 1	3
3.2 Acme 6	4
3.3 Acme 4	4
3.4 East Bay 2	4
4 CRITERIA FOR ANALYSIS.....	4
4.1 Focus Area	4
4.2 Standards for Analysis	4
4.3 Sewer Benefits or REU's	5
4.4 Peaking Factor.....	5
5 CAPACITY ANALYSIS.....	5
5.1 Acme 6 Collection System Maximum Capacity	5
5.2 Acme 6 Lift Station Capacity	5
5.3 Acme 6 Discharge/Conveyance Network Capacity	6
6 BENEFIT ANALYSIS.....	7
6.1 Current Benefit Capacity	7
6.2 Currently allocated Benefits within District 6	7
6.3 Benefit increase to District 6 from Meijer.....	7
6.4 Other Anticipated Benefit Increases to District 6	8
7 SUMMARY	8
8 CONCLUSION.....	8
9 APPENDIX	9
9.1 Overall Sewer Map	9
9.2 District 6 Sewer Map.....	10
9.3 Actual Flow Data Analysis.....	11
9.4 Meijer's Statement on Sewer Usage	12

1 INTRODUCTION

1.1 PURPOSE

Meijer is seeking to construct a new store that will be located at the intersection of Lautner and M-72. Meijer's consultant has requested that the Township provide a statement on the ability of the existing sewer collection system to handle the added flows anticipated from the proposed Meijer store. This report evaluates the sewer collection components that will be directly influenced by this development and provides an overall capacity statement with respect to the added flows.

2 DATA COLLECTION

Information was gathered for this analysis that includes:

2.1 MEIJER: FLOW DATA

2.1.1 Flow data provided by Meijer's consultant

Meijer provided Acme Township with their anticipated flows for this store.

2.1.2 Benefit calculation provided by Grand Traverse County DPW (DPW)

The DPW calculated the required number of benefits for the Meijer store based on the provided floor plan. The calculated flow based on the number of benefits was found to be greater than that provided by Meijer and as a result, the analysis used the calculated flow value.

2.2 RECORD DRAWINGS OF SEWER INFRASTRUCTURE

Acme Township provided the historical record drawing information for much of the Township's infrastructure.

2.3 LIFT STATION DATA

Information relating to Acme Lift Station #6 (Acme 6) was obtained through the Township. This included pump model and capacity and wet well operation parameters. The DPW provided current pump run history. The original basis of design was obtained from the Township for Acme 6.

3 DESCRIPTION OF SANITARY SEWER SERVICE DISTRICTS

3.1 ACME 1

Acme Lift Station #1(Acme 1) is located at the base of Bunker Hill Road and US 31 and services the majority of the Township. Gravity flows in addition to pumped flows from Acme 2, Acme 3 and Acme 5 converge at Acme 1. In 2007, an independent 12" forcemain was installed that connects Acme 1 with East Bay #2 lift station via the railroad grade that parallels US 31. The flows from Acme 1 do not currently flow through this new forcemain due to metering issues and therefore flows from Acme 1 converge with that of Acme 6 in a gravity main along 5 Mile Road. Upon completion of the fix to the meter, flows from Acme 1 will be discharged through the new forcemain directly to East Bay #2.

For purposes of this study, the new forcemain is considered as the conveyance route for Acme 1 and therefore Acme 1 is not included in any portion of this analysis.

3.2 ACME 6

Acme Lift Station #6 (Acme 6) is located near Mt. Hope Road and M-72. This lift station services the business corridor east of this location along M-72. Additionally, it collects sewage from the area north of M-72 and east of Acme Creek and includes developments such as Singletree, Hilltop and the Resort Laundry Facility to name a few. Acme 6 also collects from Acme Lift Station #4 (Acme 4) located in Arrowhead.

Acme 6 will be the collection point for the waste streams generated by the proposed Meijer facility which is phase 1 of the Village at Grand Traverse (VGT).

Flows from Acme 6 proceed through a 8" forcemain along Mt. Hope Road to the crest of the hill where it enters the gravity main. This gravity main runs along the railroad grade paralleling US 31. Prior to the installation of the dedicated forcemain for Acme1, much of this line conveyed the sewage from both Acme 1 and Acme 6. This gravity line now services just Acme 6 along with flows from the Acme Village and portions of various residential neighborhoods including Scenic Hills and the area commonly known as Holiday Hills.

3.3 ACME 4

Acme Lift Station #4 (Acme 4) is located in the Arrowhead residential development. It provides service to the Arrowhead development which consists of 33 home sites. A previous sewer study identified the Acme 4 sewer district as unlikely to expand. Based on that, further evaluation of Acme 4 expansion is outside the scope of this study. Acme 4 lifts the sewage to the gravity main on Lautner Road. Sewage from Acme 4 then travels approximately 1 mile to Acme 6.

3.4 EAST BAY 2

East Bay Lift Station #2 (EB 2) is located at the terminus of Four Mile Road at East Grand Traverse Bay. It's service district includes all flows from Acme Township, east from the Holiday Hills area, south along Four Mile Road to Hammond and some of the areas to the west of Four Mile Road. It pumps sewage to East Bay Lift Station #1 (EB 1) which then conveys to the sewage treatment plant.

4 CRITERIA FOR ANALYSIS

4.1 FOCUS AREA

Based on the above description of the various service districts, this analysis focuses on Acme 6, its contributing collection network as well as the downstream impacts leading to EB 2. The primary reasons for this are as follows:

- Acme 6 is the collection point for sewage flows from the Meijer development.
- Acme 1 will eventually flow through the new forcemain which flows independently to EB 2. All existing and proposed flows into Acme 1 will not have an effect on the ability to convey sewage flows from the Meijer development.

4.2 STANDARDS FOR ANALYSIS

The development of this analysis follows the Recommended Standards for Wastewater Facilities (aka Ten States Standards). This standard is the basis for design and review from wastewater collection to wastewater treatment.

Lift stations are required to be designed such that each pump shall be capable of pumping at a rate greater than the peak incoming flow rate from the service district.

4.3 SEWER BENEFITS OR REU'S

Residential Equivalent Units (REU's) means a unit of wastewater which incurs the same costs for operation and maintenance as the average volume of domestic wastes discharged from a single-family residence. Each REU is equivalent to 260 gallons per day (gpd). The quantity of REU's available to any one district is limited by the infrastructure serving the district and/or capacity agreements.

For this study, the maximum allowable REU's for the district is based on the maximum capacity of the infrastructure.

It should be noted that REU's and benefits are used in this report interchangeably.

4.4 PEAKING FACTOR

The peaking factor used in the original basis of design for Acme 6 was 2.1 times the daily flow rate. In a report by GFA from 2004, the peaking factor for the district was indicated as being 2.6. A discussion with the MDNRE regarding the development of our report indicated that a peaking factor closer to 3 should be considered to compensate for the pumping rate of Acme 4 which pumps at 350 gpm. For this analysis, we have used various peaking factors depending on the scenario being analyzed.

It should be noted that the peaking factor is an estimate based on the mix of uses within the district and it is at the discretion of the engineer followed by concurrence with the reviewing agency to determine this value for each district.

5 CAPACITY ANALYSIS

5.1 ACME 6 COLLECTION SYSTEM MAXIMUM CAPACITY

The collection system to Acme 6 is comprised of gravity sewer mains at various diameters and slopes. Calculations were performed for each pipe diameter with the shallowest slope noted on the plans. The most critical was identified to be a 10" diameter pipe at 0.41% slope. **This pipe has a maximum capacity of 630 gpm.** The location of the pipe is between the lift station and the Acme Creek crossing along M-72. This portion of the main is the final leg to Acme 6 and carries flows from all reaches that Acme 6 services. This pipe limits the district collection capacity to **1163 benefits** (assuming 260 gallons per benefit and a district peaking factor of 3.0). The segment of pipe lies between MH #44 and MH #45. The second limiting segment is between "New MH #1" (as denoted in the Acme 6 record drawings) and MH #44. This segment has a slope of 0.45% and a maximum capacity of 660 gpm.

5.2 ACME 6 LIFT STATION CAPACITY

Review of Acme 6 utilized the original basis of design completed by GFA at the time of submittal, the current log data kept by the DPW and various record drawings that indicated the operation and performance. The lift station was designed for an ultimate pumping capacity of 775 gpm but initially would be fitted with an impeller that would deliver approximately 400 gpm.

5.2.1 Basis of Design for Initial Condition (400 gpm impeller)

This information was taken from the basis of design prepared by GFA in 1994. This is the current performance capability of the lift station:

- Average daily flow of 260,000 gpd
- Estimated average daily flow rate of 180 gpm with an estimated peak flow rate of 378 gpm (peaking factor of 2.1)
- 6 cycles per hour
- 4.5 minute pump run time per cycle
- 990 gallons pumped per dose
- Pump flow rate of 400 gpm
- **738 REU Capacity**

5.2.2 Basis of Design for Maximum Capacity (775 gpm impeller)

This information was also taken from the basis of design prepared by GFA in 1994. The Acme 6 basis of design included an initial condition as well as a maximum capacity. As explained above, the pump was initially fitted with an impeller that would generate a flow rate of 400 gpm. An additional impeller was to be provided by the contractor at the time of construction and is believed to be shelved at the DPW. By swapping the impellers, the flow rate for the lift station would increase to 775 gpm. The discharge piping should be verified to determine if it is 8" diameter. A note in the basis of design indicated that 6" discharge piping would be installed initially and that it should be replaced with 8" at the time when the impellers are swapped out. However, the as-built plans for the lift station indicate that the discharge piping is 8".

- Average daily flow of 532,800 gpd
- Estimated average daily flow rate of 370 gpm with an estimated peak flow rate of 771 gpm (peaking factor of 2.1)
- 6 cycles per hour
- 4.8 minute pump run time per cycle
- 3720 gallons pumped per dose
- Pump flow rate of 775 gpm
- **1430 REU Capacity**

5.3 ACME 6 DISCHARGE/CONVEYANCE NETWORK CAPACITY

5.3.1 8" Forcemain

Acme 6 discharges through an 8" forcemain. This forcemain has been demonstrated in the basis of design as being suitably sized for both pumping rates meaning the flow velocity will be within the range of 2–8 feet per second which is required under the guidelines of the Ten States Standards.

5.3.2 15" Gravity Main from the crest of Mt. Hope to Bunker Hill

The forcemain discharges to a 15" gravity main at the crest of Mt. Hope Road and connects to an 18" gravity main at Bunker Hill Road. The shallowest slope identified on the record drawings is 0.15%.

- Maximum capacity: 973 gpm.
- Maximum benefits allowed to connect along sewer main segment: 438

Assumes Acme 6 pumping rate of 775 gpm and a peaking factor of 2.5 since the flow rate from Acme 6 was directly incorporated into the capacity evaluation: $973-775=198$ gpm available added flows. $198 \text{ gpm} = 438$ benefits at 2.5 peaking factor.

Acme 6's pumping rate was directly deducted from the total main capacity. In this case, the discharge point of Acme 6 is relatively close in distance to the constraining main segment and attenuation of sewage in the main will be minimal.

5.3.3 18" Gravity Main from Bunker Hill Road to MH #18 located along Five Mile Rd.

The 18" gravity main from Bunker Hill connects to MH #18 located along Five Mile Road. Record drawings indicate a minimum slope of 0.06%.

- Maximum capacity: 1210 gpm.
- Maximum upstream benefit capacity: 2233
- Maximum benefits allowed to connect along sewer main segment: 632

The benefit capacity upstream of Acme 6 lift station is controlled by the 10" main capable of supporting 1163 benefits (sec. 5.1). Benefit capacity along the 15" main (sec. 5.3.2) is 438. $1163+438 = 1601$. A peaking factor of 3 is used to account for the pumping rate of Acme 6 similarly to the method used for comparing the effect of Acme 4 on Acme 6.

5.3.4 15" Gravity Main from MH #18 to Acme Township line

The 18" main installed in 1992 connects to the original 15" main at MH #18 located 3300 feet south of Bunker Hill Road on Five Mile Road. MH #18 is also the terminus of the 8" forcemain that used to service Acme 1. As mentioned above in the report, Acme 1 is currently using this forcemain but within the next year will resume operation through the 12" by-pass forcemain. For calculations on capacity, Acme 1's flows through this main are not included.

The 15" main continues along Five Mile Road, crosses to US-31 and terminates at East Bay #2. The extent of the analysis stops at MH #1 located at the border of Acme and East Bay along US-31.

Record drawings indicated that the shallowest slope of 0.13% is between MH #8 & MH #9.

- Maximum capacity: 1040 gpm.
 - Maximum upstream benefit capacity: 1920
- Peaking factor of 3.*

6 BENEFIT ANALYSIS

6.1 CURRENT BENEFIT CAPACITY

The current benefit capacity of District 6 is 738 benefits.

6.2 CURRENTLY ALLOCATED BENEFITS WITHIN DISTRICT 6

It is estimated that there are currently 378 benefits already allocated within District 6.

6.3 BENEFIT INCREASE TO DISTRICT 6 FROM MEIJER

The new Meijer store will require the purchase of 124 benefits as calculated by the DPW. The district will be required to support 502 benefits which is less than the maximum capacity of 738.

6.4 OTHER ANTICIPATED BENEFIT INCREASES TO DISTRICT 6

Meijer is Phase 1 of the Village at Grand Traverse development. The Township has preliminarily estimated that an additional 900 benefits (not including Meijer) may be added to the District upon full build out of the development. The total estimated capacity will be 1402 benefits not including any growth in the other portions of District 6. Upgrades to the system will be necessary as the development progresses.

7 SUMMARY

The current capacity of the district is rated at 400 gpm or 738 benefits. The current district is serving approximately 378 benefits. Meijer will add 124 benefits to the district which will bring the total to 502 benefits which is less than the maximum of 738.

Therefore, the district will support the increased flows from Meijer without any infrastructure improvements within the Township.

However, as we look to the future capacity of the system to include the balance of the Village at Grand Traverse, upgrades will be necessary. It has been preliminarily estimated by the Township that VGT will require an additional 900 REU's bringing the total REU's for the District to 1402 which is greater than the current capacity.

The recommended fixes and subsequent capacity increases are as follows:

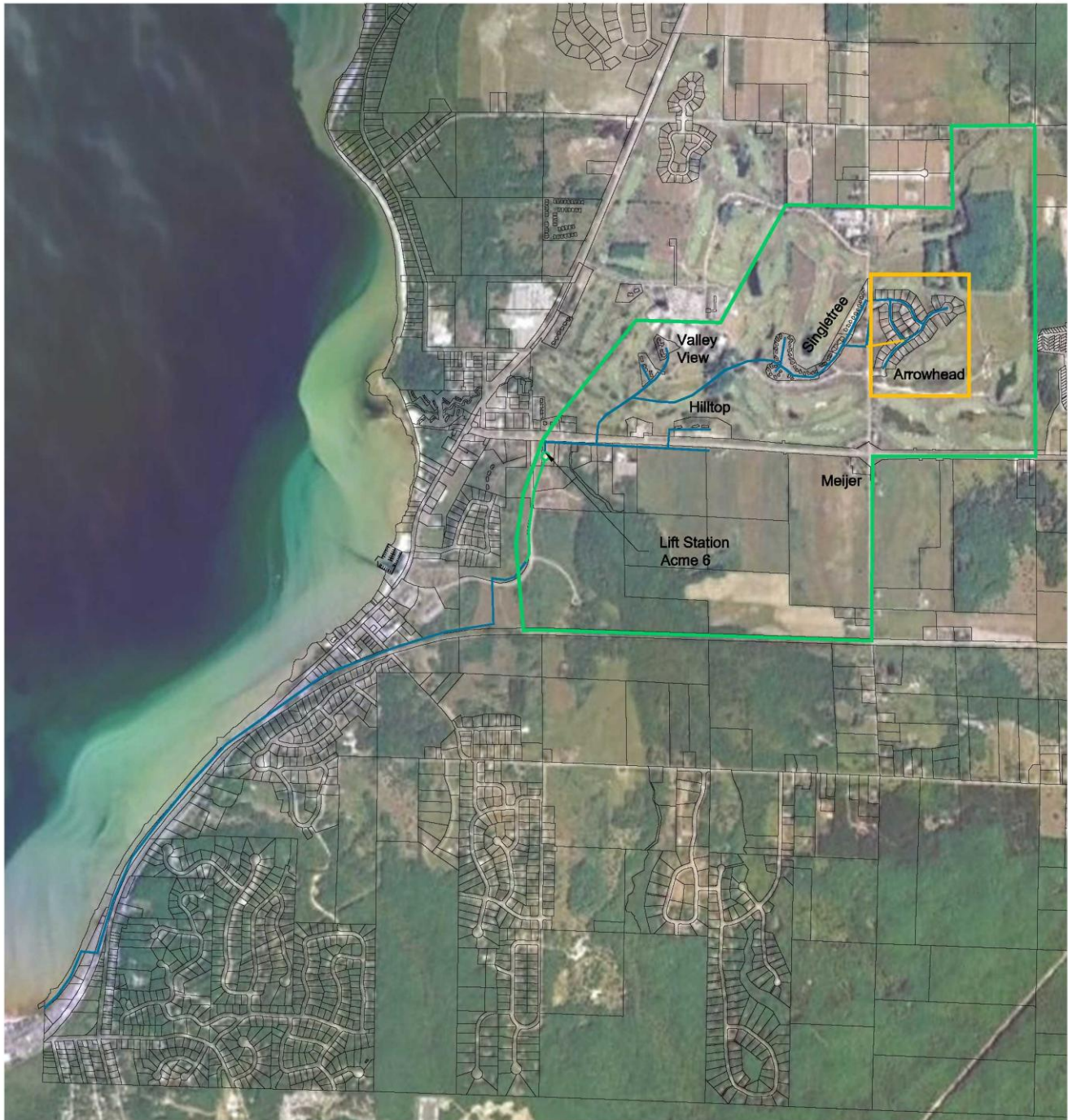
- The restriction to the capacity of the sewer system for Acme 6 is the pumping rate in the lift station. This is easily remedied by replacing the impeller on the pumps. This will increase the pumping capacity to 750 gpm but the district capacity will only be increased to 1163 as restricted by the 10" gravity collection main located up and downstream of MH #44 along M-72.
- This pipe segment limits the capacity of the district to a peak flow of 630 gpm or 1163 REU's. To overcome this restriction, the pipe segments will require upsizing. Since one of the segments is located under Acme Creek, the cost for this upsizing will not be typical.
- The capacity between Acme 6 and the Township line greatly exceeds the maximum pumping capacity of Acme 6.

8 CONCLUSION

This study revealed that the existing capacity of the sewer district will accommodate the flows from Meijer. Since Meijer is phase 1 of a larger project, the developer should understand that capacity constraints will need to be remedied as the overall project progresses. Since the peaking factor used in this determination is an estimate, subsequent phases of the development will require an updated analysis to be sure that capacity continues to be available.

9 APPENDIX

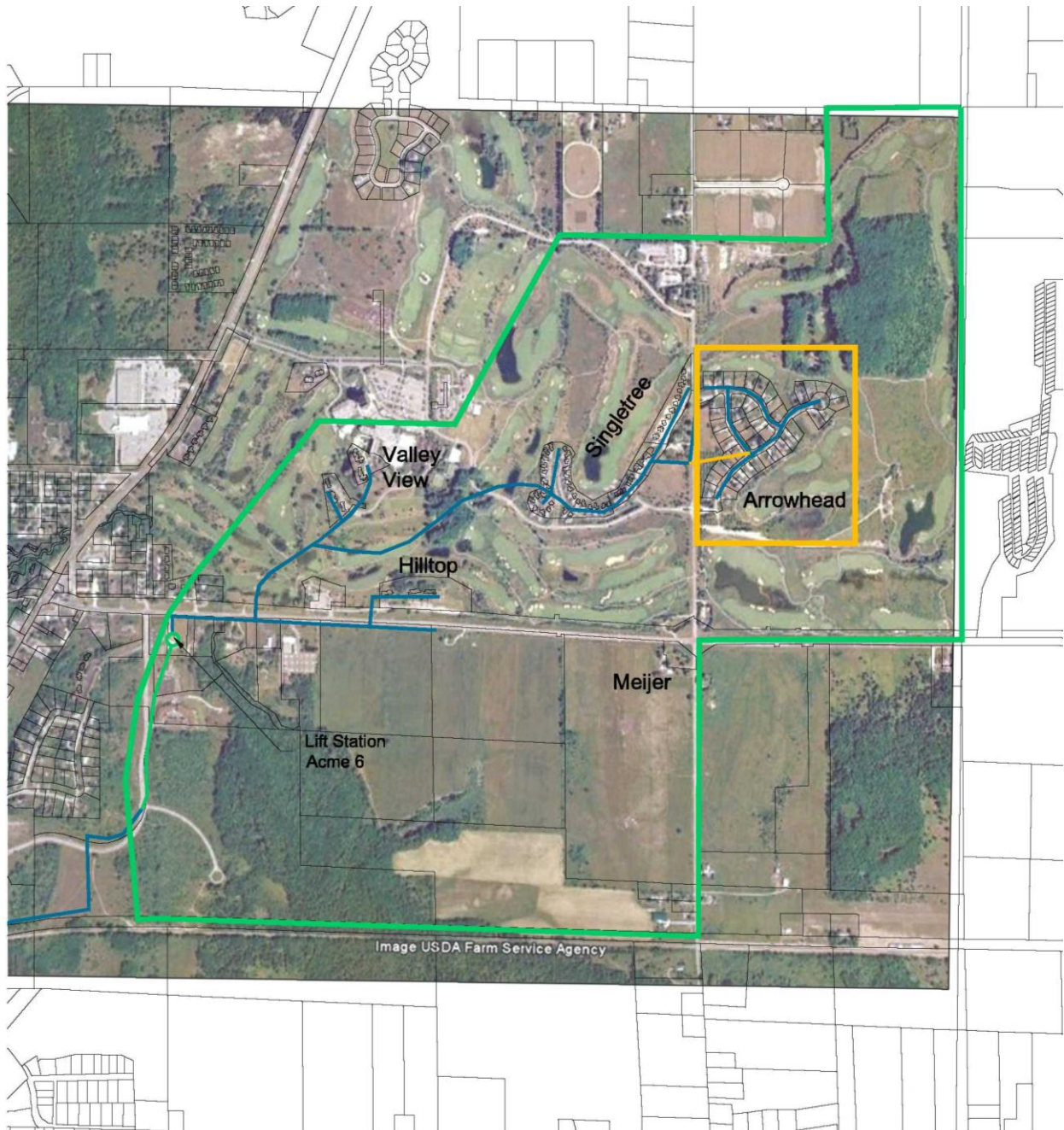
9.1 OVERALL SEWER MAP



 Acme 6 Service District Boundary

 Acme 4 Service District Boundary

9.2 DISTRICT 6 SEWER MAP



-  Acme 6 Service District Boundary
-  Acme 4 Service District Boundary

9.3 ACTUAL FLOW DATA ANALYSIS

9.3.1 DPW Data (current)

This data was provided by the DPW and was taken from log readings from the lift station. This data was provided to us verbally.

- 18-22 cycles per day
- Pump runs for 9-10 minutes per cycle
- Flow rate is 400 gpm (not confirmed from field test)

9.3.2 Current usage summary derived from DPW Data

Incorporating the parameters of operation from sec. 9.3.1, the information below was computed.

- The current average daily flow rate is approximately 50 gpm
- Average daily flow is 72,000 gpd
- Volume pumped during dose is approximately 3800 gallons
- Applying a peaking factor of 3, the peak flow is estimated to currently be 150 gpm

9.3.3 Projected Wastewater flows from Meijer (provided by Meijer)

This information was provided by Meijer (see 9.4)

- 5000 gpd (20 REU's)
- 40 gpm peak flow

9.3.4 Total Projected flows for District upon completion of Meijer

The information below combines the current usage (see 9.3.2) and the added flows from Meijer (see 9.3.3)

- Average daily flow is projected to be 77,000 gpd
- Average daily flow rate is projected to be 54 gpm.
- Peak flow rate is projected to be 190 gpm

9.3.5 Impact to Existing Lift Station (Actual Data)

- It is anticipated that the lift station cycles will increase from one cycle per 1.2 hours to one cycle per 1.1 hours.
- Total pump run time will increase from approximately 180 minutes per day to approximately 193 minutes per day.
- Projected peak incoming flow rate will not exceed current pump capacity.
- Lift stations are required to be designed such that each pump shall be capable of pumping at a rate greater than the peak incoming flow rate from the service district. The current lift station condition with a 400 gpm impeller meets Ten States Standards for the projected flow based on actual inflow data and projected sewer usage provided by Meijer.

9.4 MEIJER'S STATEMENT ON SEWER USAGE



Request for a Sanitary sewer Availability Letter information Sheet

Date: 12/22/10

Date that we need the Availability letter: 1/17/2011

Project Name: The Village at Grand Traverse-Phase I Meijer's

Project Address: The South West corner of Lautner Road and M-72, Acme Township, MI 49690

Letter addressed to: Steve Schooler

Company Name: The Village at Grand Traverse, LLC
3805 Edwards Road- Cincinnati, OH 45209

Contact Name: Steve Schooler

Contact E-mail: sschooler@anderson-realestate.com

Contact Phone Number: 513-366-3530

Contact Fax Number: 513-241-2637

Special Notes: Attached please find the Meijer utility summary capacity needed for Phase I of our development. At this time we are requesting a letter from your company that states the utility capacity for the Meijer Store can be met utilizing your current utility. Included is a site plan that locates the site at the proper road intersections. Please call with any further questions at the number above. Thanks in advance for your help.

Village at Grand Traverse - Phase I

UTILITY SUMMARY

STORE:
ELECTRIC: STD TRNF 1500 KVA, SECONDARY 277/480V, 3PH, 4W GRD WYE
PHONE: 100 PAIR COPPER OR EQUIVALENT FIBER OPTIC ENTRANCE CABLE
GAS: 10,000 CFH @ 5 PSI IF AVAILABLE (2 PSI MIN.)
WATER: 4" DIA. PIPE WITH 3 1/2" METER, 10,000 GPD SUMMER, 5,000 GPD WINTER 80 GPM PEAK USE, 55 PSI AFTER BACKFLOW PREVENTER
FIRE PROTECTION: 10" DIA. MIN., 1,575 GPM @ 35 PSI AT BASE OF RISER
SANITARY SEWER: (1) 8" DIA. AND (1) 8" DIA., 5,000 GPD AVG., 40 GPM PEAK FLOW



AREA	SQ.FT.
MERCANTILE	147,390
ASSEMBLY	2,055
WORK/PREP AREAS	5,800
BUSINESS	5,400
STORAGE/MECH.	23,100
GARDEN CENTER	25,826
RESTROOMS	2 EACH
FAMILY RESTROOM	1

Mercantile	147,390				
Meat & Produce	9%	13,265.10	2.50	per 1,000	33.1628
Grocery	20%	29,478.00	1.00	per 1,000	29.4780
	71%	<u>104,646.90</u>	0.50	per 1,000	52.3235
		147,390.00			
Assembly		2,055.00			
Work Prep		5,800.00			
Business		<u>5,400.00</u>			
		13,255.00	0.50	per 1,000	6.6275
Storage/Mechanical		23,100.00	0.10	per 1,000	2.3100
Garden Center outside so not calculated					
					123.9017