APPENDIX A

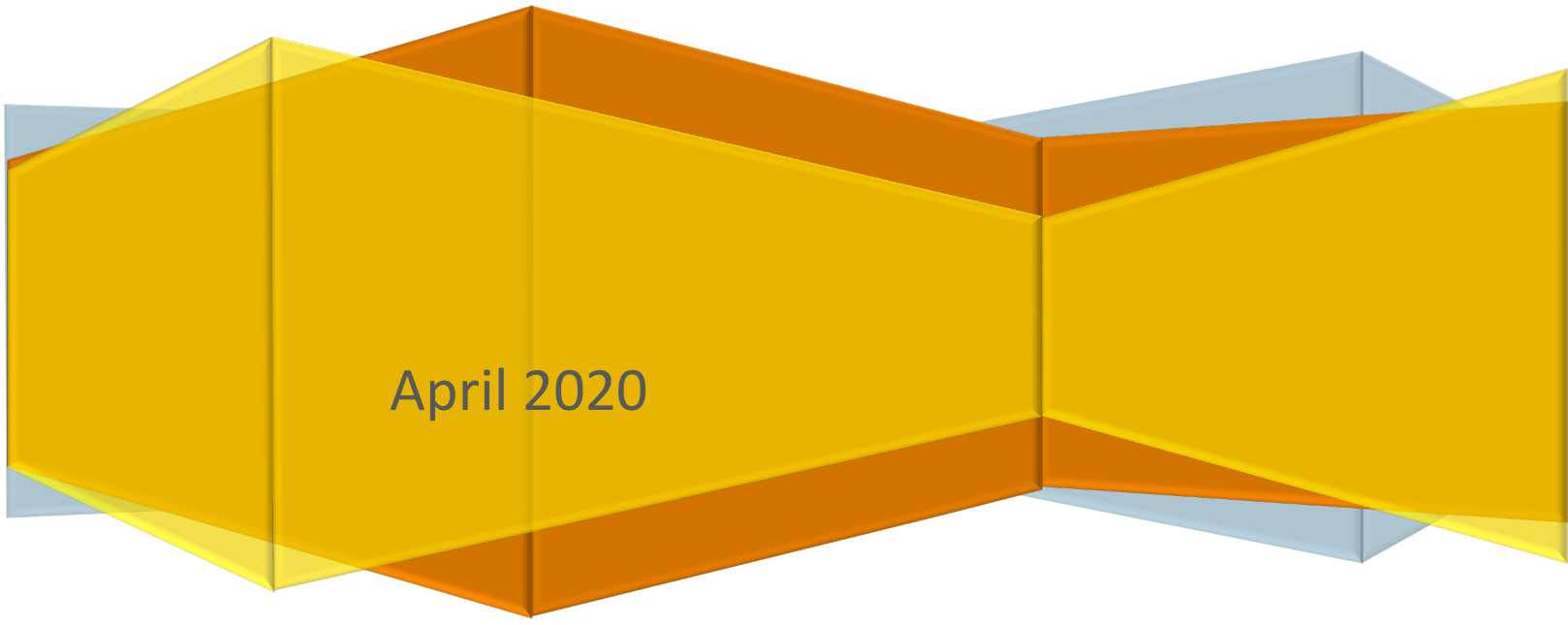
VILLAGES OF PASADENA HILLS DEVELOPMENT UTILITY MASTER PLAN

(PREPARED BY PASCO COUNTY APRIL 2020)

Villages of Pasadena Hills

Development Utility Master Plan

Pasco County Utilities Engineering and Contract Management



April 2020

Table of Contents

List of Figures

List of Tables

1. Introduction

Pasco County Utilities provides potable water, wastewater, solid waste and reclaimed water services to most of Pasco County residents and businesses. Our mission is to deliver clean and safe water, treat wastewater and reuse treated wastewater for irrigation. Our goal is to provide these services while expanding our system to keep pace with the ever-growing population.

The Villages of Pasadena Hills (VOPH) is a large-scale development planned for approximately 22,000 acres of eastern Pasco County as shown below in Figure 1. As of March 2020, this area is considered "undeveloped" with land currently occupied by small residential neighborhoods, citrus groves, and pasture lands. Extensive infrastructure construction is required before development may move forward.

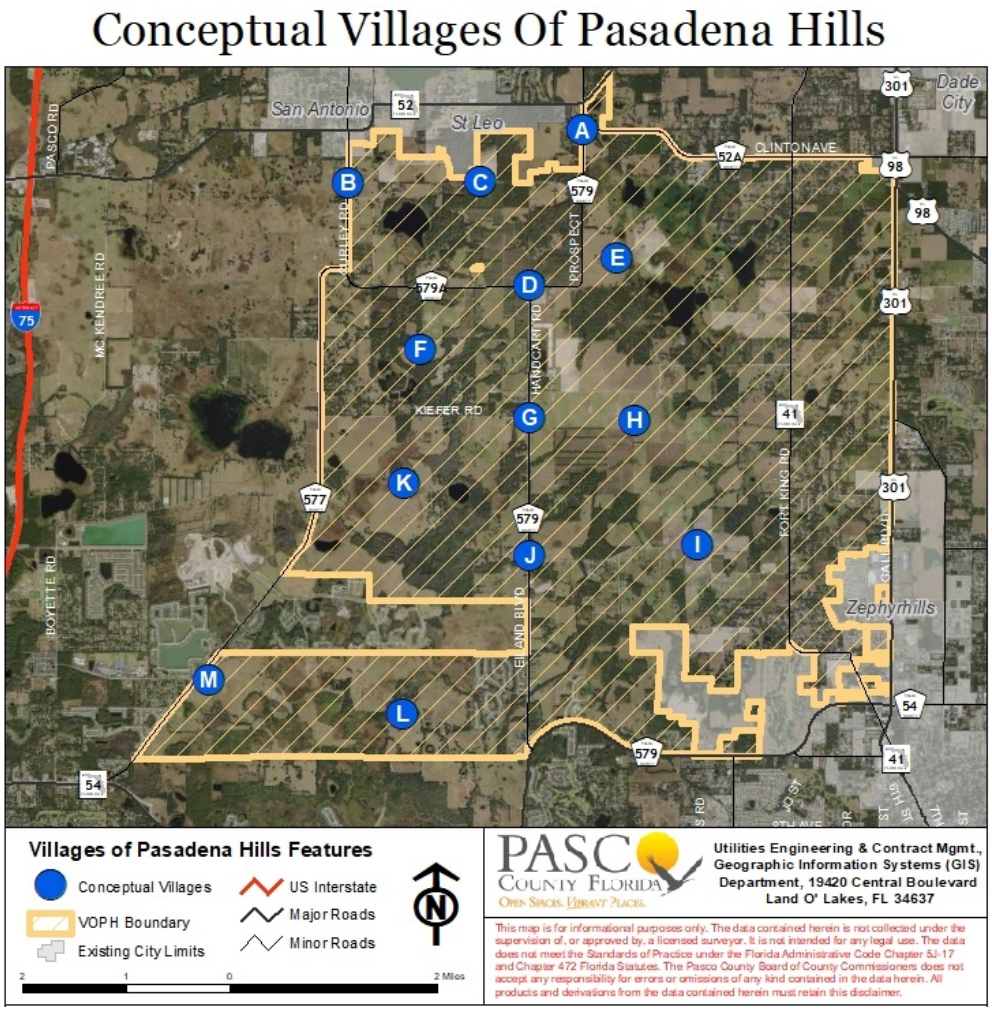


Figure 1. Villages of Pasadena Hills is a relatively large area of eastern Pasco County. (Map created by Max McAmis, Pasco County Utilities Engineering and Contracts Management, GIS Department. Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, the GIS User Community, and Pasco County GIS Data; ArcGIS Desktop 10.5.1. March 23, 2020. Path: C:\Users\ewalton\Documents\ArcGIS\Projects\VOPH_MasterPlan\VOPH_Overview.mxd.)

This report explains the potable, reclaimed, and wastewater services required to support projected growth. The development will be built in two main stages:

1. The Medium-Term Condition is the time between the start of construction when homes are occupied and businesses are up and running, but before build-out. Goals during this time depend on market forces.

2. The Build-Out Condition is when all land parcels are filled and used, and all necessary infrastructure is completed. For utility services, this means the commercial and residential development is at capacity.

The timing and progress of all infrastructure depend on what growth and market forces allow. Careful consideration by stakeholders is needed to time, fund, and organize each role in adding every component of the overall system. However, this report does not focus on these considerations, but on build-out. Thus, this report is not to be used as a detailed roadmap of construction planning or schedules.

2. Project Background

VOPH developers propose building approximately 42,000 single-family homes and 3 million square feet of commercial and office space split into 13 sections, currently identified as Villages A through M as shown in Figure 2.

Pasco County Utility (PCU) planners use the location of each village, their elevations, Pasco County's Highway Vision Plan, and flow requirements to develop a conceptual plan with the sizes and layout for the proposed infrastructure. Pasco County survey data is our source for land elevations. The Highway Vision Plan is the Pasco County Metropolitan Planning Organization's (MPO) plan for future transportation corridors. We base flow requirements for potable water, wastewater, and reclaimed water on proposed population and estimated water use for businesses per industry standards.

The utility infrastructure will include PVC pipes of various diameters, various valve types, well pumps, wastewater pump stations, and manholes. All utility structures are to be installed in the public rights of way and will be owned and maintained by the County.

2.1. Location

The proposed development is bounded by State Route 52 to the North, Eiland Boulevard to the South, Curly Road to the West, and US 301 to the East as shown in Figure 2. Village locations are preliminary and may change as development progresses.

2.2. Demands

After all building and development are complete, Table 1 shows what we expect the demands will be for the final build-out:

Table 1. **Estimated demands at build out**

Utility Service	Millions of Gallons per Day (mgd)
Potable Water Supplied	9.43
Reclaimed Water Supplied	21.10
Wastewater Received and Treated	8.81

3. Potable Water

3.1. Assumptions

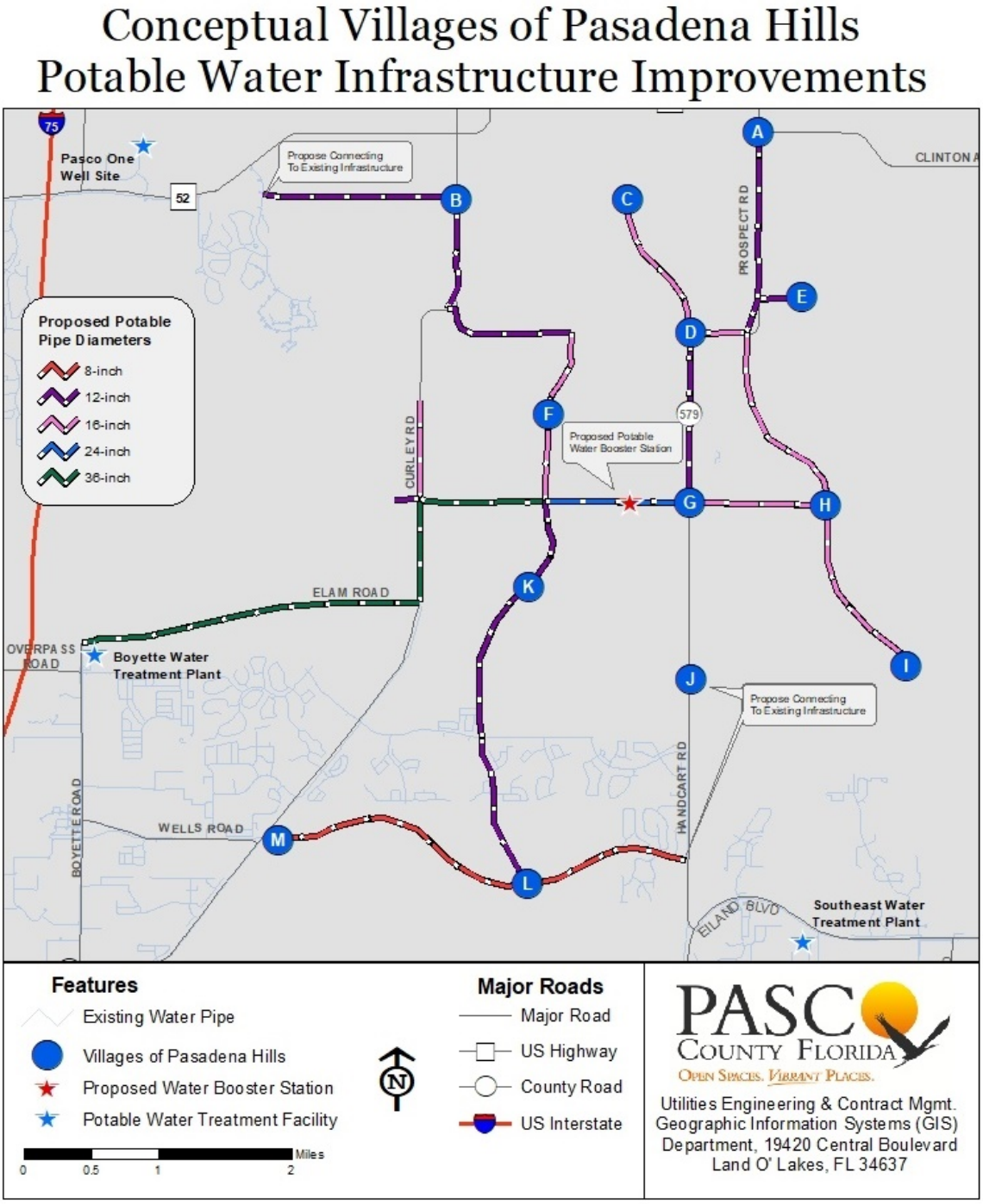
PCU planners calculated the potable water demand in Table 1 based on the following assumptions:

- Average daily flow (ADF) for residential areas is based on 215 gallons per day per equivalent residential unit (ERU). An ERU represents a unit of residential development equal to a single-family residence in terms of water use. Therefore, one ERU is equal to one single-family home.
- ADF for commercial properties is 0.15 gallons per day per square foot (gpd/sf).
- Engineers estimate pipe dimensions for peak conditions at buildout.
- A local raw water source, known as Pasco One Well (Fig. 3), can supply up to 1.44 mgd, which is the permitted capacity.
- Connection to the Boyette Water Treatment Plant (WTP) (Fig. 3) will be independent of any current discharge connections to existing infrastructure.
- Pasco One Well and the Southeast WTP will each provide 0.5 mgd to VOPH.
- This report only considers transmission pipes and does not include localized distribution and service lines to the individual single-family homes or commercial and office spaces.

To ensure safe water supply and consistent fire flows, PCU must keep potable water pressure above 20 pounds per square inch (psi). Higher pressures provide better flow to individual connections, but excessive pressures may damage pipes, and other equipment. The modeled pressures range from 45 to 90 psi. These are acceptable pressures in a public supply system. However, pipe materials will be selected to withstand pressures as high as 250 psi.

PCU monitors maximum velocity in pipes to avoid damaging system components. Lower water speeds have the added benefit of reducing noise in the system. PCU's 2020 Utility Standards state velocities in transmission pipes shall be slower than 6.5 feet per second (fps). Our models show water in the proposed distribution system moving below 6 fps.

Figure 2 shows a conceptual layout of the potable water pipes with modeling results.



This map is for informational purposes only. The data contained herein is not collected under the supervision of, or approved by, a licensed surveyor. It is not intended for any legal use. The data does not meet the Standards of Practice under the Florida Administrative Code Chapter 5J-17 and Chapter 472 Florida Statutes. The Pasco County Board of County Commissioners does not accept any responsibility for errors or omissions of any kind contained in the data herein. All products and derivations from the data contained herein must retain this disclaimer.

Figure 2. A Conceptual Layout of Potable Water Infrastructure needed to provide services to the Villages of Pasadena Hills. (Map created by Max McAmis, Pasco County Utilities Engineering and Contracts Management, GIS Department. Sources: Esri; Digital Globe; GeoEye; Earthstar Geographics; CNES/Airbus DS; AeroGRID; IGN and the GIS User Community; Pasco County GIS Department; USDA/NRCS - National Geospatial Center of Excellence; U.S. Department of Agriculture, Service Center Agencies; U.S. Census Bureau, Geography Division. ArcGIS Desktop 10.5.1. April 2, 2020. Path: U:\UTIL_ENG\Project Files- Planning\Development\Villages of Pasadena Hills (VOPH)\Documents\Maps\April 2020_VOPH_Potable_MasterPlan.mxd.)

3.2. Required Potable Water Infrastructure

To effectively serve the proposed VOPH with potable water, the following infrastructure improvements are required.

- The elevations in the proposed VOPH boundary are between 0 feet at sea level to 246 feet above sea level (Fig. 3). To overcome elevation differences between Villages F and G and the other Villages, PCU will need to install a booster pump station capable of pumping approximately 6,000 gpm at 60 psi.
- To reduce possible high-water pressures in the pipes, a pressure-reducing valve is required on Prospect Road south of Village E.

3.3. Proposed Infrastructure

The proposed infrastructure was modeled using fixed-head reservoirs and demand nodes. Demands were based on the ADF with a peaking factor of 1.67 for each village as shown in Table 2. The total length of proposed pipe is shown in Table 3.

Table 2. **Potable Average Daily Flow and Peak Flow**

Village	Total ADF[1] (mgd)	Peak Flow[2] (gpm)
A	0.23	300
B	0.72	800
C	0.60	700
D	1.00	1,200
E	0.21	200
F	1.00	1,200
G	1.20	1,400
H	1.20	1,300
I	0.98	1,100
J	0.71	800
K	0.62	700
L	0.50	600
M	0.46	500
Total	**9.43**	**10,800**

[1] Total ADF = Number of residential units (EDU) x 215 gpd divided by 1,000,000.

[2] Peak Flow = ADF x 1.67 (peak factor) divided by 1440 (number of minutes in a day). Results rounded up to nearest hundredth.

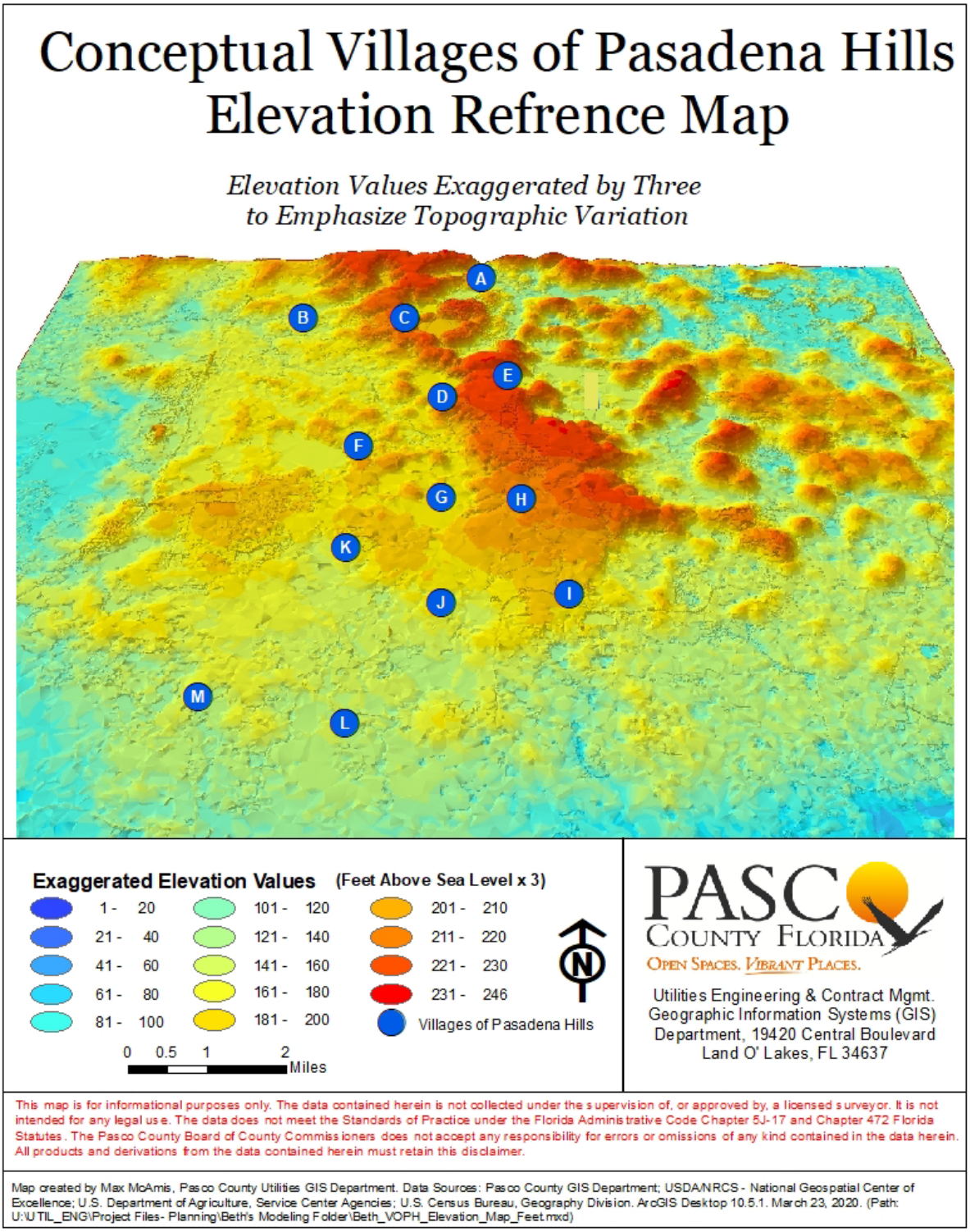


Figure 2. Exaggerated Elevation to illustrate differences in topography. Note: National Elevation Data was used to model the map above. (Map created by Pasco County Utilities Engineering and Contracts Management, GIS Department. Sources: Esri; Digital Globe; GeoEye; Earthstar Geographics; CNES/Airbus DS; AeroGRID; IGN and the GIS User Community; Pasco County GIS Department; USDA/NRCS - National Geospatial Center of Excellence; U.S. Department of Agriculture, Service Center Agencies; U.S. Census Bureau, Geography Division. ArcGIS Desktop 10.5.1. April 2, 2020. Path: U:\UTIL_ENG\Project Files- Planning\Development\Villages of Pasadena Hills (VOPH)\Documents\Maps\April 2020_VOPH_Potable_MasterPlan.mxd.)

Table 3. Required Potable Water Transmission Mains

Pipe Diameter (inches)	Approximate Length[1] (miles)
8	3.3
12	9.1
16	7.6
24	1.1
36	4.3
Total	**25.4**

[1] Length calculated from GIS computer models of proposed pipe routes.

3.4. Results

A total of 25.4 miles of potable water transmission pipe is expected to be installed. See the potable water infrastructure map in Figure 2.

4. Wastewater

4.1. Assumptions

PCU planners calculated the wastewater demand in Table 4 based on the following assumptions:

- Engineers use ADF based on 200 gpd per ERU for residential parcels and 0.15 gpd/sf for commercial properties.
- Engineers use an updated peaking factor of 3.0 when estimating Peak Flow.
- County design standards require a minimum of 2 feet per second (fps) flow to keep the pipes clean.

4.2. Proposed Infrastructure

PCU planners use the location of each village, elevations, the transportation MPO Highway Vision Plan, and flow requirements for each development to conceptually size and layout the routes for the proposed infrastructure.

Computer modeling was used for testing the proposed infrastructure and estimating required pipe size and capacity. The ADF demands used by the model for each village are shown in Table 4. A standard peaking factor of 3.8 based on demand was used to calculate pipe capacity to hydraulically remote areas of the project.

A peak factor is used for modeling and design of utility systems to estimate maximum flow at certain times of day. PCU recently updated the utility standards, lowering the peak factor from 3.8 to 3.0.

Table 4. Wastewater Average Daily Flow and Peak Flow

Village	Total ADF[1] (mgd)	Peak Flow[2] (gpm)
A	0.22	400
B	0.67	1,400
C	0.56	1,200
D	0.95	2,000
E	0.20	400
F	0.94	2,000
G	1.15	2,400
H	1.08	2,300
I	0.91	1,900
J	0.66	1,400
K	0.58	1,200
L	0.47	1,000
M	0.42	900
Total	**8.81**	**18,500**

[1] Total ADF = Number of residential units (EDU) x 200 gpd divided by 1,000,000.

[2] Peak Flow = ADF x 3.68 (peak factor) divided by 1440 (number of minutes in a day). Results rounded up to nearest hundred.

Table 5 shows proposed lengths of pipes.

Wastewater from VOPH will be treated at the Southeast Wastewater Treatment Plant (WWTP) and Wesley Center WWTP, requiring an increase in their capacity to handle 8 mgd and 1 mgd, respectively. Figure 4 shows additional capacity on existing force main pipes. Existing utility infrastructure will serve Village M, as shown in Figure 5.

Table 5. Required Wastewater Force Mains

Diameter (inches)	Approximate Length[1] (miles)
8	1.6
12	8.0
16	8.1
24	1.0
Total	**18.7**

[1] Length calculated from GIS maps of computer models of proposed pipe routes.

4.3. Results

Computer modeling results and a conceptual layout of the wastewater water system pipes can be found in Figure 4.

This map is for informational purposes only. The data contained herein is not collected under the supervision of, or approved by, a licensed surveyor. It is not intended for any legal use. The data does not meet the Standards of Practice under the Florida Administrative Code Chapter 5J-17 and Chapter 472 Florida Statutes. The Pasco County Board of County Commissioners does not accept any responsibility for errors or omissions of any kind contained in the data herein. All products and derivations from the data contained herein must retain this disclaimer.

Figure 3. A Conceptual Layout of Wastewater Infrastructure required to provide services to the Villages of Pasadena Hills including additional capacity on existing force main pipes is shown; existing utility infrastructure will serve Village M. (Map created by Max McAmis, Pasco County Utilities Engineering and Contracts Management, GIS Department. Sources: Esri; Digital Globe; GeoEye; Earthstar Geographics; CNES/Airbus DS; AeroGRID; IGN and the GIS User Community; Pasco County GIS Department; USDA/NRCS - National Geospatial Center of Excellence; U.S. Department of Agriculture, Service Center Agencies; U.S. Census Bureau, Geography Division. ArcGIS Desktop 10.5.1. April 2, 2020. Path: U:\UTIL_ENG\Project Files- Planning\Development\Villages of Pasadena Hills (VOPH)\Documents\Maps\April 2020_VOPH_Wastewater_MasterPlan.mxd.)

As with the potable water system, high pressures and sudden pressure changes can damage the wastewater infrastructure. The risk is unacceptable if forces reach above 90 psi, requiring corrective action. Typically, a well-functioning system will have pressures below 60 psi. Computer models show that even at peak conditions, pressures in the pipes will remain within an acceptable range of 9 to 63 psi.

5. Reclaimed Water

5.1. Assumptions

PCU planners base their reclaimed water calculations on the following assumptions:

- An adequate amount of reclaimed water is available.
- VOPH will require approximately 21 mgd of reclaimed water for irrigation purposes.
- VOPH will produce about 9 mgd of wastewater to be treated and reused for irrigation. The Pasco County Master Reuse System (PCMRS) will use repump stations and storage reservoirs to supply the remaining 13 mgd.
- An existing reclaimed repump station, known as Price Altman, will provide reclaimed water for Villages A, C, D, E, H, I, St. Leo, and the Lake Jovita Subdivision. Price Altman's current storage tank and pumps will need extensive upgrades so it can supply an estimated 10 mgd to VOPH.
    - The Pasco County Master Reuse System (PCMRS) will fill the Price Altman storage tank during non-watering hours.
- PCMRS will provide reclaimed water to Villages B, F, G, J, K, L, and M directly from the regional pipe system.
    - This source provides the remaining 12 mgd of reclaimed water.
- An average daily flow (ADF) based on 500 gpd/du for residential homes.
    - Commercial developments were excluded, due to minimal impact on pipe sizes and irrigation demands.
- Peak flow is based on $PF = Homes \times 15 \frac{gpm}{zone} \times 0.20 \times 0.25$
    - Peak flows based on 20 percent of households watering each day, with a 25 percent overlap of watering schedules.

  - Landscaping contractors divide irrigation areas into zones, which are specific areas served by certain types of sprinkler heads and are used to calculate the demand. In this case, each home lot is a single zone.

- If parallel pipes where proposed, they will be modeled as a single pipe for simplicity. For example, planners will model two 4-inch diameter pipes in parallel as one 6-inch diameter pipe. The capacities are not equal, but close enough for modeling purposes.

- Computer modeling accounted for other large subdivisions and commercial developments, Mirada, EPCO Ranch North, and Epperson Ranch South at build-out conditions.

- PCU planners will not include other known developments south of the Southeast Wastewater Treatment Plant (WWTP).

  - Existing utility infrastructure is at capacity.

5.2. Required Infrastructure

To effectively serve reclaimed water to the proposed VOPH and the developments referenced in section 5.1, the following infrastructure and storage improvements are required:

- PCU needs to expand its Southeast WWTF. Afterwards, it can store and provide 6 mgd of reclaimed water to VOPH.

- PCU should expand the Boyette High-Service Pump (HSP) station by 15,000 gpm. HSPs operate under higher pressures and are used to pump water to higher elevations, usually water storage tanks.

- The Price Altman site will need an additional 8.0 MG of storage and an additional 15,000 gpm HSP station.

- To relieve possible high pressures in pipes, a pressure-reducing valve is required on Prospect Road, just south of Village E.

5.3. Proposed Infrastructure

The proposed infrastructure was modeled using fixed-head reservoirs and demand nodes. Demands were based on the peak flows for each village as shown in Table 6. The total length of proposed pipe is shown in Table 7.

Table 6. Reclaimed Water Daily Demand and Peak Flow Villages A to M

Village	Total ADF[1] (mgd)	Peak Flow[2] (gpm)
A	0.45	700
B	1.64	2,500
C	1.30	2,000
D	2.10	3,200
E	0.500	800
F	2.30	3,500
G	2.70	4,000
H	2.70	4,000
I	2.20	3,300
J	1.60	2,400
K	1.40	2,200
L	1.16	1,800
M	1.05	1,600
Total	**21.10**	**32,000**

[1] Total ADF = number of residential units (EDU) x 300 gpd divided by 1,000,000. Result rounded.

[2] Peak flow = number of EDUs x 15 gpm per zone x 20 percent x 25 percent. Result is rounded up to nearest hundred.

Table 7. Required Reclaimed Water Transmission Mains

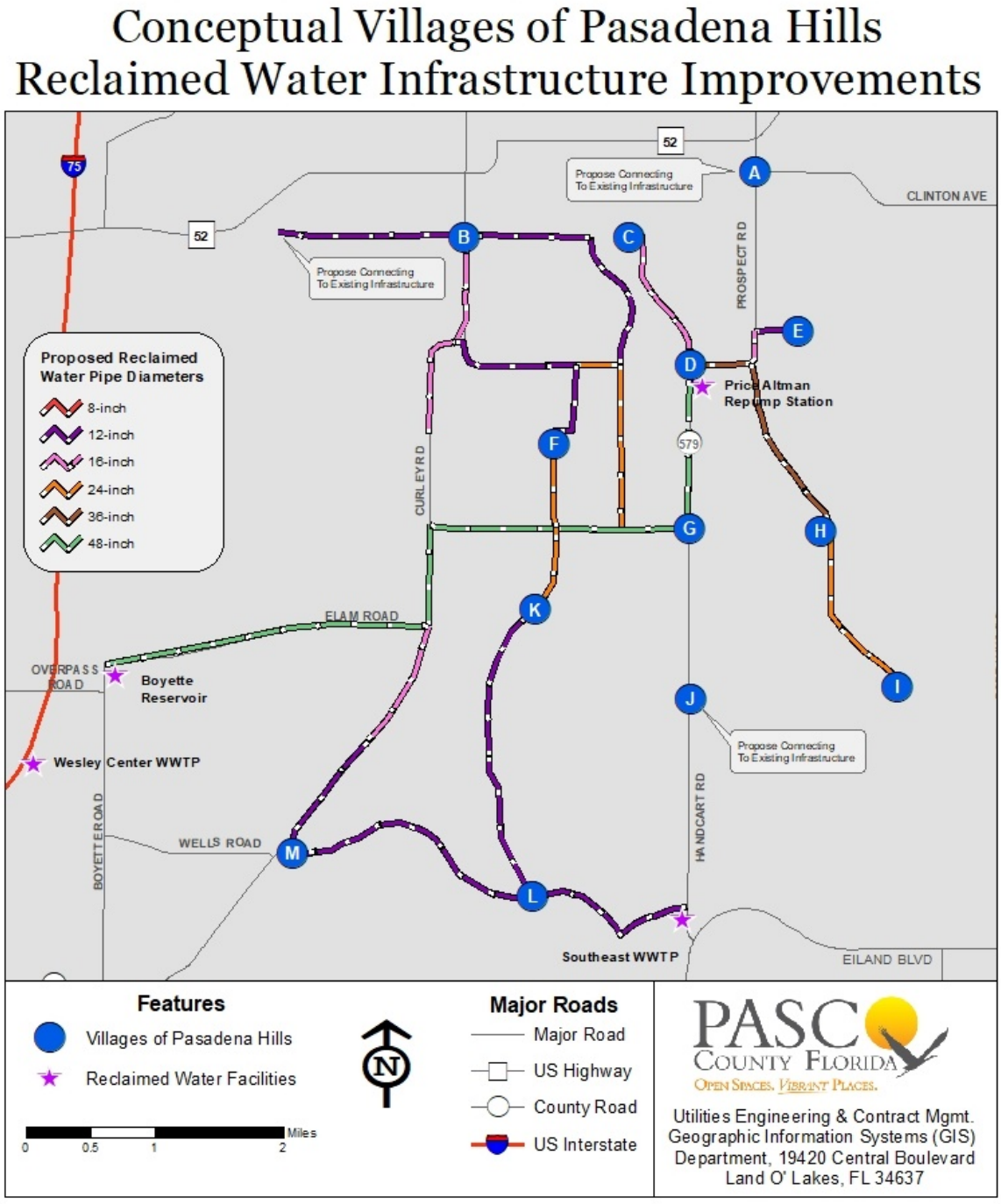
Diameter (inches)	Approximate Length[1] (miles)
12	12.9
16	2.5
24	4.4
36	1.9
48	6.2
Total	**27.9**

1 Length calculated from GIS maps of computer models of proposed pipe routes.

5.4. Results

Figure 7 contains the modeling results and a conceptual layout of the reclaimed water mains.

In order to ensure a reliable reclaimed water supply, reclaimed water pressure must stay above 35 psi during watering hours. Higher internal pressures provide better flow to individual connections, but excessive pressures may damage pipes and other equipment. Computer models show pressures in the reclaimed pipes between 40 and 80 psi, this is an acceptable range for a public utility system. Even so, as per industry practice, pipe material will be selected to withstand pressures as high as 250 psi.



This map is for informational purposes only. The data contained herein is not collected under the supervision of, or approved by, a licensed surveyor. It is not intended for any legal use. The data does not meet the Standards of Practice under the Florida Administrative Code Chapter 5J-17 and Chapter 472 Florida Statutes. The Pasco County Board of County Commissioners does not accept any responsibility for errors or omissions of any kind contained in the data herein. All products and derivations from the data contained herein must retain this disclaimer.

Figure 4. A Conceptual Layout of Reclaimed Water Infrastructure required to provide services to the Villages of Pasadena Hills. (Map created by Max McAmis, Pasco County Utilities Engineering and Contracts Management, GIS Department. Sources: Esri; Digital Globe; GeoEye; Earthstar Geographics; CNES/Airbus DS; AeroGRID; IGN and the GIS User Community; Pasco County GIS Department; USDA/NRCS - National Geospatial Center of Excellence; U.S. Department of Agriculture, Service Center Agencies; U.S. Census Bureau, Geography Division. ArcGIS Desktop 10.5.1. April 2, 2020. Path: U:\UTIL_ENG\Project Files- Planning\Development\Villages of Pasadena Hills (VOPH)\Documents\Maps\April 2020_VOPH_Wastewater_MasterPlan.mxd.)

Table 8. Conceptual High Service Pump Requirements (Model Inputs)

Location	Elevation (ft)	Flow (gpm)	Setting (psi)
Boyette Reservoir	122	20,870	70
Price Altman	209	14,361	65
Southeast WWTP	106	4,034	70

6. Summary and Conclusions

Based on the above computer modeling results, PCU's planning team has determined that significant infrastructure improvements will be required to provide utility services to VOPH. Overall, close to 72 miles of water, wastewater, and reclaimed pipes will be installed once the project is completed. These improvements are summarized below.

6.1. Potable Water Requirements

- Construction of a Booster Pump Station to move water to higher elevations
- Install multiple hydraulic control valves
- We need to verify that County water sources, Pasco One Well and Southeast WTP, can supply 500,000 gpd to meet the new demand.
- Install about 26 miles of water pipes in various sizes

6.2. Wastewater Requirements

- Expand the Southeast WWTF to handle up to 14.0 mgd
- Expand the Wesley Chapel WWTF with an additional 1.0 mgd capacity
- Install about 19 miles of force main pipes and gravity sewer pipes

6.3. Reclaimed Water Requirements

- Expand the Southeast WWTF Ground Storage Tank (GST) and HSP stations
- Expand the Boyette Reservoir HSP station by 15,000 gpm
- Expand of the Price Altman GST by an additional 8 mg and add an HSP station capable of 15,000 gpm
- Install multiple hydraulic control valves
- Installation of approximately 28 miles of various diameter reclaimed mains

Table 9. Summary of Pipe Infrastructure Requirements

Pipe Diameter[1]	Potable[2]	Wastewater[2]	Reclaimed Water[2]	Total[2]
8	3.3	1.6		**4.90**
12	9.1	8.0	12.9	
16	7.6	8.1	2.5	
24	1.1	1.0	4.4	
36	4.3		1.9	
48			6.2	
TOTALS:	**25.4**	**18.7**	**27.9**	**72.00**

[1] In Inches
[2] Length in miles

References

Florida Administrative Code, Rule Chapter 64E-6 Standards for Onsite Treatment and Disposal Systems Located at: https://www.flrules.org/gateway/ChapterHome.asp?Chapter=64E-6. Accessed on April 6, 2020.

Pasco County 2025 Comprehensive Plan, Chapter 10. Located at: https://www.pascocountyfl.net/DocumentCenter/View/11371/CP-ch10-PublicFacilities-7_25_13?bidId=. Accessed on April 6, 2020.

Pasco County GIS Department. Located at: https://www.pascocountyfl.net/338/Geographic-Information-Services-GIS. Accessed on April 1, 2020.

Pasco County, FL. (2013). Standards for Design and Construction of Water, Wastewater, Fiber Optics and Reclaimed Water facilities for Pasco County Utilities Department. Revised March 2018. Located at: https://pascocountyfl.net/DocumentCenter/View/454/Utilities-Standards-for-Design-and-Construction-?bidId=. Accessed on April 1, 2020.

United States Census Bureau, Geography Division. Located at: https://www.census.gov/. Accessed on April 1, 2020.

United States Department of Agriculture, Service Center Agencies. Located at: https://www.usda.gov/our-agency/agencies. Accessed on April 1, 2020.

United States Department of Agriculture/Natural Resources Conservation Service (USDA/NRCS) National Geospatial Center of Excellence. Located at: https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/ngce/. Accessed on April 1, 2020.

PASADENA HILLS

FINANCIAL PLAN

HEIDT DESIGN
WWW.HEIDTDESIGN.COM

PASCO COUNTY FLORIDA
OPEN SPACES. VIBRANT PLACES.