The Village at Southridge

Geotechnical Investigation Report
Geohazards Assessment

Sahhali Village Development
Kennewick, Washington

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CERTIFICATE OF ENGINEER

Geotechnical Investigation Report
Sahhali Village
Kennewick, Washington

The technical information and data contained in this report were prepared under the direction and supervision of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

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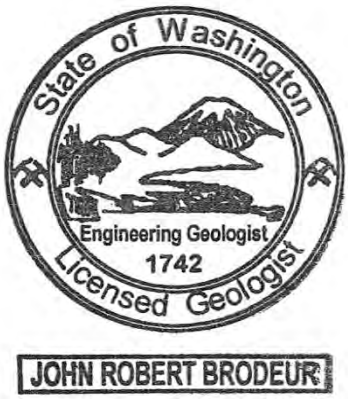

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1.0 INTRODUCTION

1.1 Project Background

HDJ Design Group, PLLC (HDJ) is pleased to present the results of our Geotechnical Investigation and Geohazards Assessment for the Sahhali Village development located on the south side of Ridgeline Drive and South Sherman Street in Kennewick, Washington (site). The site is shown in the attached Appendix A, Figure 1: Site Location Map.

Sahhali Village is a proposed residential development consisting of approximately 50 acres to be divided into several development phases as planned unit developments. The primary development area will be low-density residential. As development plans mature, group homes and other residential-type developments will be included in different phases.

This geotechnical report covers the entire 50-acre development site as shown on Figure 2: Site Exploration Map.

The HDJ investigation was accomplished by the excavation of seventeen exploration test pits to allow our field personnel to observe, sample, and test the soil to assess subsurface conditions.

This report presents the results of our geotechnical investigation and geohazards assessment for this site. The report provides descriptions of site soils and soil profiles, review of the regional and local geology, and description of local drainage systems and groundwater regime. This information was used to conduct a geohazards assessment of the site, focusing on the erosion hazards associated with the natural drainages. Geotechnical recommendations and specifications are provided for construction of the development, and construction of the homes in the development, in a manner that is consistent with standard International Building Code (IBC) criteria.

1.2 Scope of Services

The HDJ geotechnical investigation scope of services for the project was limited to the following:

- **Geologic and Geotechnical Literature Review:** Relevant, readily available, geologic information on the site and surrounding area was reviewed for information regarding geologic conditions and hazards at or near the site.
- **Surface mapping:** Surface slopes, drainage, and soil conditions on the property were measured and assessed for potential impacts on the proposed development; in particular, the impact on the site grading plans and drainage. Surface features generally reflect the underlying bedrock topography in this area.
- **Subsurface Exploration and Soil Sampling:** Seventeen exploration test pits were excavated at the site to observe, sample, and test the soil to determine subsurface conditions. The test pits were excavated using a backhoe. The test pits were logged, representative soil samples were collected, in-situ soil testing was conducted, and soil moisture conditions were determined by our geotechnical staff.
- **Laboratory Testing:** Soil samples collected during the investigation were returned to the geotechnical laboratory for characterization, classification, and testing using the Unified Soil Classification System (USCS), along with soil descriptions derived from the Burmister soil classification method. Laboratory tests included natural moisture contents and grain-size analysis on selected soil samples.

- **Geotechnical Engineering Studies:** The data collected during the subsurface exploration, literature research, and laboratory testing work was analyzed and specific geotechnical design parameters and construction recommendations were developed for the proposed project.
- **Report Preparation:** This report contains the results of HDJ's site exploration work, including a summary of the site soil profile and underlying geology. This report includes a geohazards assessment, as well as geotechnical specifications for site grading and development and general geotechnical specifications for the design and construction of homes in the development.

2.0 SITE INVESTIGATION

2.1 Field Investigation

The HDJ field investigation of the site included the excavation of seventeen exploration test pits at locations shown on Figure 2. The test pits allowed us to examine and sample the soils, perform in-situ soil testing, and assess the subsurface conditions while developing an understanding of the near-surface soil profile.

Seventeen exploration test pit logs, designated as TP-1 through TP-17, are provided in Appendix B.

All test pits except for TP-5, were excavated until bedrock was encountered resulting in practical refusal with the backhoe. Most test pits encountered bedrock within a few feet of the surface. Test pit TP-5 was extended to 11.5 feet below the ground surface (bgs) without hitting bedrock and a water infiltration test was subsequently conducted. The seventeen test pits were randomly spread around the site to obtain appropriate spatial coverage across the site, although we did not excavate any test pits within the center properties that are currently occupied by renters.

2.2 Literature Review

The literature review for this project included review of geotechnical reports from projects nearby, review of references on the geology of the area, and the collection and review of nearby groundwater well logs obtained from the State of Washington database.

Information about the basic geology of the Pasco Basin is provided in Lindsey (1996) and a discussion of the underlying Miocene-age basalt bedrock structure is provided in Reidel (et al., 1994).

Groundwater well logs from the area all show shallow bedrock with groundwater being drawn from one of the deep interbedded sand layers between basalt flows. One domestic well log located on the north side of Ridgeline Drive showed the typical subsurface soil profile as indicated in all the HDJ test pits where with basalt bedrock at 2 feet bgs.

3.0 LABORATORY TESTING AND ANALYSIS

Soil samples collected during the field investigation were returned to our geotechnical laboratory for characterization, classification, and testing. Soil testing for this site included dry sieve analyses and one wet sieve to determine the grain-size distribution of selected soil samples. Soil characterization and classification results are shown on the test pit logs. The test pit logs and Sieve Analysis Plot Results are provided in Appendix B.

4.0 SITE CONDITIONS

4.1 Regional and Local Geology

The site is located on the south flank of a synclinal depression in the basalt bedrock. To the north of the site is Thompson Hill which is located on the axis of a southeast- to northwest-trending anticlinal fold belt in the basalt bedrock that underlies the area. This fold belt extends from Wallula Gap at the southeast end, to Rattlesnake Mountain.

South of the site, the underlying bedrock rises as a monocline that eventually levels out at or south of the Interstate 82 (I-82) and forms the underlying structure of the Horse Heaven Hills. The valley that exists just north of the site is a synclinal depression in the basalt bedrock with the approximate center, or axis, of the synclinal depression located north of the site in the center of the valley.

The synclinal depression in the bedrock is the substructure that formed the local valley. This valley and the anticlinal uplift of Thompson Hill are part of a series of parallel fold belts that were created by northeast to southwest compression of the continental plate. Basalt bedrock within the fold belt is composed of the Elephant Mountain and Pomona members of the Miocene Age (8 - 17 Ma [age]) Columbia River Basalt Group (CRBG).

Most of the folding and tectonic activity that created the fold belt occurred during the Miocene time (greater than 5 M ybp [millions of years before present]) when the basalt lava flows were being deposited. This area is now considered to be tectonically quiet and stable.

Ringold Formation (Ringold) sediments typically overly the basalt bedrock; however, in the Pasco Basin, the Ringold sediments were deposited in valleys surrounded by the basalt uplifts. This site is located above the deposition elevation of most Ringold sediments.

The Ringold sediments that we do find at this site are the carbonate-cemented silt and massive carbonate (limestone) that formed at the top of the Ringold, just before the Pleistocene glaciation. These carbonate sediments were formed under drying lakebed conditions where annual runoff accumulates in the valleys and evaporates leaving the evaporite salts and carbonate along with silt and/or clay.

The carbonate unit at the top of the Ringold Formation is called the Plio-Pleistocene unit, or the Cold Creek member. The Plio-Pleistocene carbonate unit can be seen sitting on top of bedrock at the KID canal crossing over I-82 just west of this site. This unit was exposed during excavation of the bedrock for the interstate. The carbonate unit is present in the bottom of the synclinal valley to the north and it can be followed all along the base of the KID canal as the canal extends around the north side of Thompson Hill.

Remnants of this same carbonate unit were found in some of the test pits at the site, appearing as a thin layer covering the bedrock, or colluvial gravel layer, on top of the bedrock. This carbonate layer can seal the bedrock and cause groundwater to be perched on top of the bedrock, although the impermeable unit does not appear to be continuous across the site.

The carbonate layer on top of the bedrock becomes thicker to the north, toward the center of the valley. It was identified in exploration test pits excavated at the Moore property bordering the north side of the Sahhali property.

4.2 Site Description and Surface Conditions

The site was previously farmed and the west portion of the site is currently used for growing alfalfa hay. Undeveloped areas still contain native vegetation consisting of short brush and grass.

The surface soil at the site is a combination of late-Pleistocene (Holocene) glacio-fluvial (water deposited) and eolian (wind deposited) fine sand with some silt. The surface topography has a gentle slope to the north with well-developed wash channels that drain to the north toward a main drainage in the center of the valley.

The west side of the site has a steep drainage area that is designated as an erosion hazard area. This drainage, and others nearby, probably developed during some of the last flood events of the late Pleistocene when flood waters backed up in the Pasco Basin, flowed over the slope from the south and scoured the channels into the bedrock. The drainages represent the topographic contours of the underlying bedrock and did not develop by erosion of surface soil. Those drainages remain today but have not produced any runoff in the recent past. Smaller drainages are now blocked by I-82 and the KID canal adjacent to and downslope of the interstate.

Figure 3: Critical Areas Map is an overlay of the site boundaries on the City of Kennewick Critical Areas Map and shows areas of the site that are designated as Geologically Hazardous Areas due to the erosion hazards or to the presence of slopes that are greater than 15 percent. Please note that the steep slope area is limited to a small drainage on the north side of the property near South Sherman Street and the erosion hazard area on the far west side of the property.

4.3 Site Soil Profile

The basic soil profile at this site consists of near-surface fine sand and silt that sits on top of carbonate-cemented basalt bedrock, or colluvial basalt cobble and gravel. This profile is relatively consistent across the site; however, the depth to bedrock varies in an irregular manner from 2 feet bgs to greater than 11.5 feet bgs. The carbonate deposition on top of the bedrock was not present in all of the test pits.

The primary, near-surface soil that we encountered at the site is composed of light olive-brown, fine sand and silt. This soil is classified between **SM** for silty sand and **ML** for sandy silt, depending upon silt content. Two samples of this soil type were subjected to sieve analysis and showed silt content of 41 percent and 55 percent. One wet sieve analysis showed a silt content of 75 percent. The soil samples were generally in a dry condition, although samples from test pits TP-13 and TP-17 located within the irrigated area, showed moisture contents of 10.6 percent and 16.9 percent, respectively. There was no evidence of any subsurface water sources.

Dynamic penetrometer (DP) measures of soil strength in the test pits typically exceeded 10 standard blows, indicating the soil is in a medium dense condition. At this site, several DP test horizons showed DP measures that exceeded 20 standard blows, indicating these soil layers are in a dense condition. The primary reason for the high DP measures of the sandy silt soil is that the high-strength layers are highly cemented with carbonate cementation. This variability in the soil density and soil strength (DP) is the result of the soil deposition mechanism and the development of the pedogenic carbonate cementation.

The near-surface, silty sand soil is a combination of late Pleistocene lacustrine soil and post-Pleistocene eolian (wind deposited) soil.

The late Pleistocene lacustrine soil is primarily silt that was deposited under deep-water flood conditions on a temporary lake bottom after a significant flood episode.

In some areas of Kennewick, this late Pleistocene lacustrine silt soil formed as a loose soil matrix that is held together by carbonate cementation. Under those conditions, if the soil becomes wet and the carbonate cementation breaks down, the low-density soil can collapse into a higher density. This soil is, therefore, referred to as collapsible silt. Collapsible silt was not encountered in our test pit explorations.

The post-Pleistocene eolian soil is wind-deposited fine sand and silt that was deposited on, and mixed with, any late-Pleistocene lacustrine soil at the site.

The depth to bedrock is of primary concern for development of the site as it impacts the site grading design, design and construction of the sewage collection system, and design of the stormwater infiltration system. Bedrock depth is indicated next to the test pit designations on Figure 2.

The shallowest bedrock was found at test pits TP-1, TP-4, and TP-10, where it was only 1.5 feet deep. No evident trends in the bedrock depth could be identified across the site. This would be consistent with the concept that the bedrock surface contours resulted from Pleistocene-age flood erosion.

Shallow bedrock is to be expected at the site and will impact site grading and sewer line installation. E-MAC Construction (EMAC) has been working in this area and previously installed a new sewer line along South Sherman Street where they had to excavate the bedrock. According to E-MAC personnel, the rock could be removed with some difficulty using a large trackhoe and did not require blasting.

HDJ expects the same bedrock conditions at this site.

4.4 Infiltration Test Results

Infiltration tests were conducted in test pits TP-5 and TP-11, within the silty sand overburden above bedrock. Test pits for infiltration testing were excavated adjacent to the designated test pits into the overburden soil for infiltration testing and the results reflect the infiltration rate of the overburden soil.

Infiltration test results are plotted as drawdown curves versus time and are presented in Appendix B, on the Infiltration Test Results page.

A quasi-steady-state infiltration rate was achieved in both infiltration tests.

The lowest infiltration rate observed was in test pit TP-5, located in the northeast portion of the project site, where the bedrock was deeper than 11 feet bgs. The infiltration plot shows a steady-state infiltration rate of 6.6 inches per hour (in/hr). The infiltration rate observed in TP-11 was about 9 in/hr, which is considered too high for a silty sand soil, and we suspect some infiltration into the bedrock occurred at this test.

Recommendations for an infiltration rate for stormwater design are provided in Section 6.3 of this report.

4.5 Groundwater

The only groundwater well log that was found to be near the proposed development indicated that the groundwater below the site is found within permeable zones in the basalt bedrock at a depth of approximately 120 feet bgs. This is well below any depth of concern for residential development at the site. Copies of the nearby well logs are provided in Appendix B.

It is possible that a perched groundwater condition could develop on the site in the future if irrigation or infiltrated water from above becomes perched on a confining layer of carbonate above the bedrock. However, no perched water zones were found in any of the 17 test pits excavated at this site. If any perched water zones do develop in the future as the site becomes developed and stormwater and irrigation water infiltration increases, they are likely to be small local areas that can be drained by the stormwater collection system.

5.0 GEOHAZARDS ASSESSMENT

As presented on Figure 3: Critical Areas Map, the Kennewick geohazards map of this site showed the west side of the property having a natural drainage channel, identified in the green stippled area, indicating this area as an erosion hazard zone due to the potential for stormwater to flow down the channels as runoff.

This erosion hazard can only occur if runoff can build within the drainage. However, the original drainage channel extended across the KID Canal and across I-84. Both of these structures currently block the flow of any surface water from above and they limit the extent and size of the potential runoff area. The only historical surface water flowing in this channel has been overflow from an irrigation pond within the drainage.

During development of the site the existing irrigation pond will be removed, existing drainage will be filled in, and all stormwater from the development will be collected, controlled, and infiltrated on the site. This will eliminate any geologic hazards within the erosion hazard zone.

The only other geohazard at this site is associated with steep slopes (greater than 15 percent) is within small drainage channels in the north side of the site near South Sherman Street. This small drainage will also be filled in during site grading operations, eliminating the steep slopes and the geohazard.

6.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

6.1 Earthwork

6.1.1 Site Preparations

Clear and grub the site of any surface vegetation and use the grub material as landscape fill or remove it from the site. Remove all tree roots and organic material, loose or soft soil, and old topsoil from all areas to receive pavement, foundations, driveways, etc.

Positive drainage away from structures and pavement subgrade areas should be constructed and maintained throughout the project.

6.1.2 Excavations

The near-surface silty sand soil at this site is easily excavated with a conventional backhoe. The underlying basalt bedrock and/or basalt cobble and gravel colluvium can be excavated with a large trackhoe, but it is difficult and time consuming. Bedrock in this immediate area has historically not required blasting to excavate. However, portions of the Sagecrest development east of the site, did require blasting to install a sewer line.

A maximum slope of 1 vertical to 1.5 horizontal (1V:1.5H) is recommended for all excavation sidewalls at the site when shoring or bracing are not used to support the excavations That maximum excavation slope angle may need to be decreased depending upon the performance of the soil. Any trenching or excavations over 4 feet deep, such as basement excavations, will require the previously mentioned side slopes and/or shoring and bracing of the excavation.

The previously mentioned information on slope protection is based on Occupational Health and Safety Administration (OSHA) regulations and is provided entirely as a service to HDJ's Client. Under no circumstances should the Client, their contractors or subcontractors, interpret this information to mean, or otherwise imply, that HDJ Design Group, PLLC assumes responsibility for construction site safety and/or temporary slope stability, or the Contractor’s activities. Such responsibility is not implied and should not be inferred.

6.1.3 Structural Fill Placement and Compaction

All graded areas across this site are considered to be structural fill areas that require compaction to specified values.

For structural fill, use existing on-site soil or approved imported soil. The on-site soil can be used as structural fill, provided it is free of organics and boulders that are greater than 6 inches in diameter, and it is installed in lifts and compacted in place. Imported structural fill soil should be sand or gravel that is well graded from fine to coarse and contains less than 15 percent by weight passing the No. 200 Sieve (silt). Crushed gravel is the best structural fill for foundation subgrade areas.

All structural fill soil shall be installed in 8-inch, maximum loose lifts, moisture conditioned to optimum moisture content, and compacted to a dry density of at least 95 percent of its maximum dry density, as determined by the modified proctor test, ASTM International (ASTM) D1557.

Large, heavy, vibratory-roller compactors or wheel-roller compaction equipment generally produces the best soil compaction results for large areas. If light weight compaction equipment is used to compact the soil, the maximum lift thickness may need to be decreased.

Mass grading and soil placement and compaction shall be monitored with nuclear density gauge measurements. Due to the high variability of the silt content of the soil at the site, more than one proctor may be required to obtain the correct maximum soil density value.

Moisture requirements for soil compaction will vary as the silt content of the cut soil varies. It may be necessary to increase or decrease the water content during soil compaction to match the requirements of the soil.

6.2 Site Grading Design

Grading design for the development must consider the shallow depth to bedrock across the site to avoid deep cuts where the bedrock appears to be the shallowest. A very limited amount of soil fill is available at this site due to the shallow bedrock.

Grading design should fill the existing drainages and level the ground for home pads without having large cuts or fills.

Grading design should drain water down the natural slope, to the north, and into infiltration structures built into the soil where the depth to bedrock is the greatest.

Grading design for residential lots should be configured with level or gently sloping home pad areas on each lot, with transition slopes between lots set at a maximum grade of 1V:2H, to retain valuable level lot space. Lots can also be graded with a 10-foot-nominal slope in the middle of the lots to accommodate the construction of daylight basement homes.

All engineered cut or fill slopes should be set at a maximum slope angle of 1V:2H, or 50 percent. For areas where slopes greater than 50 percent are required, near-vertical retaining walls, or some other retaining structure, can be installed.

Grading design should attempt to provide a balance of the cut and fill and allow up to 20 percent shrinkage of the fill soil during placement.

Grading design should consider the IBC slope setback requirements from ascending or descending slopes for each lot to confirm the size and adequacy of the buildable areas on each lot.

6.3 Site Stormwater Infiltration and Management

The stormwater management for the residential development shall comply with the Eastern Washington Stormwater Management Manual (Ecology, 2004). Stormwater disposal/ infiltration devices are required to be registered with the Washington State Department of Ecology as Underground Injection and Control (UIC) facilities.

Stormwater disposal systems shall be designed for on-site retention and disposal of a 25-year, 24-hour storm, as per City of Kennewick requirements.

At this site, stormwater can only be infiltrated into the silty sand overburden in areas where that overburden is thick enough to provide soil treatment and retention of the water. Use shallow infiltration structures such as infiltration trenches or surface ponds and swales. The depth to bedrock should be confirmed at each infiltration structure by test pit excavation or seismic refraction survey.

For the design of stormwater systems that infiltrate into the near-surface silty sand overburden soil, we recommend using the lowest field infiltration test rate of 6 in/hr, divided by a correction factor of 2, for a net design infiltration rate of 3 in/hr. Please note that this infiltration rate is only for use when infiltrating into the overburden soil on top of bedrock.

HDJ recommends geotechnical engineering review of the stormwater disposal plan. Some additional site-specific exploration may be needed at each specific infiltration structure to verify depth of bedrock and to determine the general slope of the underlying bedrock topography. Understanding the bedrock topography can help to determine the potential for downgradient impacts for disposal of groundwater at each location.

6.4 Home Foundations

6.4.1 Design

Single-family homes and other residential structures can be supported on conventional spread footings in a manner consistent with IBC requirements. All footings should be supported on properly prepared subgrade in native soils, or on structural fill as previously discussed in this report.

Footings shall have minimum widths consistent with IBC Table 1805.3.1, and the bottom of the exterior footings shall be at least 24 inches below the lowest adjacent exterior grade for frost protection.

Foundations should bear on the surface fine sand and silt or on bedrock but not on both. If shallow bedrock is present, we recommend excavating to bedrock and backfilling with structural fill gravel as opposed to silty sand to prevent excessive differential settlement of the structure from dramatically different subgrade soil types.

Footings shall be sized to be consistent with the requirements of IBC Section 1804 and as summarized in Table 1804.2. For a silty sand soil type, foundations should exert a maximum soil bearing pressure of 1,500 pounds per square foot (lb/ft^2). Please note that this allowable soil bearing pressure assumes a minimum confinement depth, or depth of burial, of 2 feet. For a gravel soil or bedrock the bearing pressure can be increased depending upon subgrade soil conditions.

Continuous wall and isolated spread footings shall be a minimum of 12 inches wide for a one-story home and 15-inches wide for a two-story home; consistent with IBC Table 1805.4.2.

An assessment of loading on the foundation system should be completed by the structural engineer or home designer to verify that the footing sizes comply with the previously mentioned IBC requirements and the footings are correctly proportioned for the specified bearing capacity.

For consideration of short period seismic and wind pressures, the allowable footing bearing pressure may be increased by one-third. Use a dynamic bearing capacity of 1,950 lb/ft^2 when sizing footings for transient forces.

For lateral forces, use a friction coefficient of 0.25 between the base of the footings and the underlying subgrade soil.

6.4.2 Settlement

For a continuous wall footing bearing on the upper silty sand soil buried 2 feet deep and with a load of 80 percent of the allowable maximum bearing pressure (1,500 lb/ft^2), we estimate the maximum total settlement will be less than 0.25 inch with a maximum differential settlement of approximately 50 percent of the maximum settlement over 50

feet. This settlement estimate assumes that all foundation subgrade soil has been compacted in place or is composed of compacted structural fill as previously described in this report.

The settlement estimates described in the previous paragraph assume that no disturbance of the foundation soil would be permitted during excavation and construction and that footings are prepared as previously described.

6.4.3 Foundation Backfill

The clear space around the exterior of all foundations and between the stem walls and the footing trenches, shall be backfilled in lifts not exceeding 1 foot thick and compacted to 90 percent of maximum dry density as per ASTM D1557. Care must be taken with the backfilling operation to provide foundation subgrade soil confinement pressure and to densify the soil to help limit the infiltration and water-induced settlement around the foundation. Compaction of the soil around the stem walls and basement walls is particularly important on structures that do not have gutters.

6.4.4 Foundation Walls and Lateral Earth Pressure

For the design of foundation walls, we assume the on-site silty sand will be used as backfill soil around the foundation wall. Under these soil conditions, we recommend using the following foundation wall design parameters:

Assumed Soil Density (pounds per cubic foot)		=	110 lb/ft^3
Soil Internal Friction		=	30 degrees
Coefficient of At-Rest Pressure	Ko	=	0.5
At-Rest Earth Pressure Equivalent Fluid Density		=	55 lb\ft^3
Coefficient of Active Earth Pressure	Ka	=	0.33
Active Earth Pressure Equivalent Fluid Density		=	36 lb\ft^3
Coefficient of Passive Earth Pressure	Kp	=	3.0
Passive Earth Pressure Equivalent Fluid Density		=	330 lb\ft^3
Coefficient of Lateral Sliding		=	0.25

Basement foundation walls must be designed to conform to the at-rest lateral earth pressure as indicated in the previous data. Free-standing concrete walls that do not support structures can be designed to the active earth pressure.

For foundation walls that are backfilled with another soil type, we recommend consulting with geotechnical engineer to determine earth pressure design parameters.

Foundation wall backfill shall be placed in layers and compacted to at least 90 percent of the maximum dry density, as per ASTM D 1557, to fully mobilize the passive resistance of the wall. Backfill placed within 3 feet of the wall should be placed in lifts not exceeding 6 inches thick and compacted using hand-operated compaction equipment such as a jumping jack or a heavy plate wacker.

6.5 Seismic Design Criteria

The silty sand overburden on top of the bedrock at this site conforms to a seismic design Site Class E for a “soft soil” profile. However, the seismic design process allows averaging the soil conditions in the upper 100 feet of the soil profile. When considering the shallow bedrock at this site, we recommend the use of a seismic design Site Class C for a very dense soil and soft rock profile.

For this site, use the seismic design parameters as shown in the following Table 1.

Table 1: 2012 IBC Seismic Design Parameters

	Short Period	1 sec
Maximum Credible Earthquake Acceleration	$S_s = 0.420$	$S_1 = 0.162$
Site Class	C	
Site Coefficient	$F_a = 1.200$	$F_v = 1.638$
Adjusted Spectral Acceleration	$S_{MS} = 0.504$	$S_{M1} = 0.265$
Design Response Acceleration	$S_{DS} = 0.336$	$S_{D1} = 0.177$
Design Peak Ground Acceleration	0.14 g	

7.0 SUMMARY CONCLUSIONS

HDJ has completed a geotechnical investigation of the Sahhali Village development area. This investigation was completed by excavating 17 exploration test pits at different locations around the site, and by conducting two test pit infiltration tests.

Basic soil profile at this site consists of silty sand to sandy silt overburden sitting on top of dense basalt bedrock or basalt gravel and cobble colluvium.

The sandy silt layer on top of bedrock is a combination of late Pleistocene lacustrine soil and post-Pleistocene eolian soil and the measured silt content varied from 40 percent to 75 percent.

The thickness of the overburden, or the depth of the bedrock, at this site was generally shallow but at a few locations it exceeded 10 feet bgs. Depth to bedrock is shown on Figure 2. The surface of the bedrock was often covered and presumably sealed with carbonate cementation that we correlate with the pre-Pleistocene carbonate unit at the top of the Ringold Formation called the Plio-Pleistocene unit.

Local areas with groundwater perched on top of the bedrock were not found at this site. Domestic water has been provided to homes in the area by drilling deep into the water-bearing interbeds between the basalt flows.

The shallow bedrock at this site is a critical factor that must be considered in the site grading design, design and layout of the sewage collection system, and design of the stormwater infiltration scheme.

The mass grading design should avoid large grading cuts that will dig into the shallow bedrock; although, excavation of the bedrock will be unavoidable for installation of sewer lines.

Excavation of bedrock has been accomplished in this area using a large trackhoe and blasting was not necessary. However, we have no way of determining how difficult it will be to excavate the bedrock at this site.

The bedrock depth issue also affects the stormwater infiltration system design. Shallow infiltration trenches, or surface pond infiltration, will be the preferred infiltration methods. Additional site-specific exploration will be required to determine bedrock depth at each infiltration site.

Because the surface of the bedrock may be sealed with carbonate cementation, it is possible that local perched groundwater conditions could develop somewhere on a low spot in the bedrock topography.

A geohazards assessment of the site focused on the potential for soil erosion within the existing natural drainage on the west side of the property. Our assessment concluded that the potential for any stormwater flow within the existing drainages is very low and the drainages will be filled in during site grading operations. HDJ concludes that there will be no erosion hazards at this site after the site development.

General geotechnical recommendations for home construction are included for site grading design, stormwater infiltration design, and site grading operations. Geotechnical recommendations based on IBC standards for the previously discussed soil conditions, are also included in this report for the design and construction of the home structure foundations.

8.0 CONSTRUCTION OBSERVATION AND TESTING

Geotechnical engineering construction observation is required during mass grading construction of the development to observe soil conditions and document the soil placement and compaction operations.

For this project, the following construction observation and field verification program is required:

- Geotechnical engineering review of the construction plan and specifications
- Geotechnical engineering observation and monitoring of site grading operations, soil testing results and soil type and condition
- Geotechnical engineering approval of final site grading and drainage

Geotechnical engineering construction observation is not required for the construction of the homes within the development, provided soil conditions at each home construction site are consistent with the conditions described in this report. HDJ did not have an opportunity to determine the soil conditions at each lot and every home foundation location. Some variation in soil conditions are expected across the site.

If soil conditions are encountered at any of the home sites that are not consistent with the findings in this report, we recommend that the site where the unusual conditions occur be inspected and assessed by a geotechnical engineer to determine if any changes in our recommendations are warranted.

9.0 LIMITATIONS AND RESTRICTIONS

The opinions, discussion, and conclusions presented in this report are based on information obtained or collected in the conduct of this geotechnical investigation. Soil conditions that are encountered beyond our exploratory test pits may vary, and unanticipated soil conditions and seasonal soil moisture variations are commonly encountered and cannot be fully determined by

a few test pits or soil borings. Such variations may result in changes to our recommendations and may require that additional expenditures be made to attain a properly constructed project.

If there is a substantial lapse of time between submission of this report and the start of excavation work at the site; if site conditions have changed due to natural causes, or if the basic project scheme is significantly modified from that assumed in the preparation of this report, HDJ recommends that the report be reviewed to determine the applicability of the conclusions and recommendations.

This report was prepared exclusively for the Client and their architects and engineers for aiding in the design and construction of the proposed project and is not to be used for other projects of similar type or at a site in close proximity to this site. This report is not to be photographed, photocopied, or reproduced in total or in part, without the written consent of the Client and HDJ Design Group, PLLC.

10.0 REFERENCES

Lindsey, K.A. (1996). *The Miocene to Pliocene Ringold Formation and Associated Deposits of the Ancestral Columbia River System, South-Central Washington and North-Central Oregon.* Washington Department of Natural Resources, Division of Geology and Earth Resources, Open-File Report 96-8, 45 p., 4 Appendices.

Reidel, S.P., N.P., Campbell, K.R. Fecht, and K.A. Lindsey (1994). *Late Cenozoic Structure and Stratigraphy of South-Central Washington.* Bulletin 80, WA Div. Geol. Earth Resources, WA Dept. Nat. Resources

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Eastern Washington Stormwater Management Manual (Ecology, 2004)

APPENDIX A

Figure 1: Site Location Map
Figure 2: Site Exploration Map
Figure 3: Critical Areas Map

EXHIBIT 10

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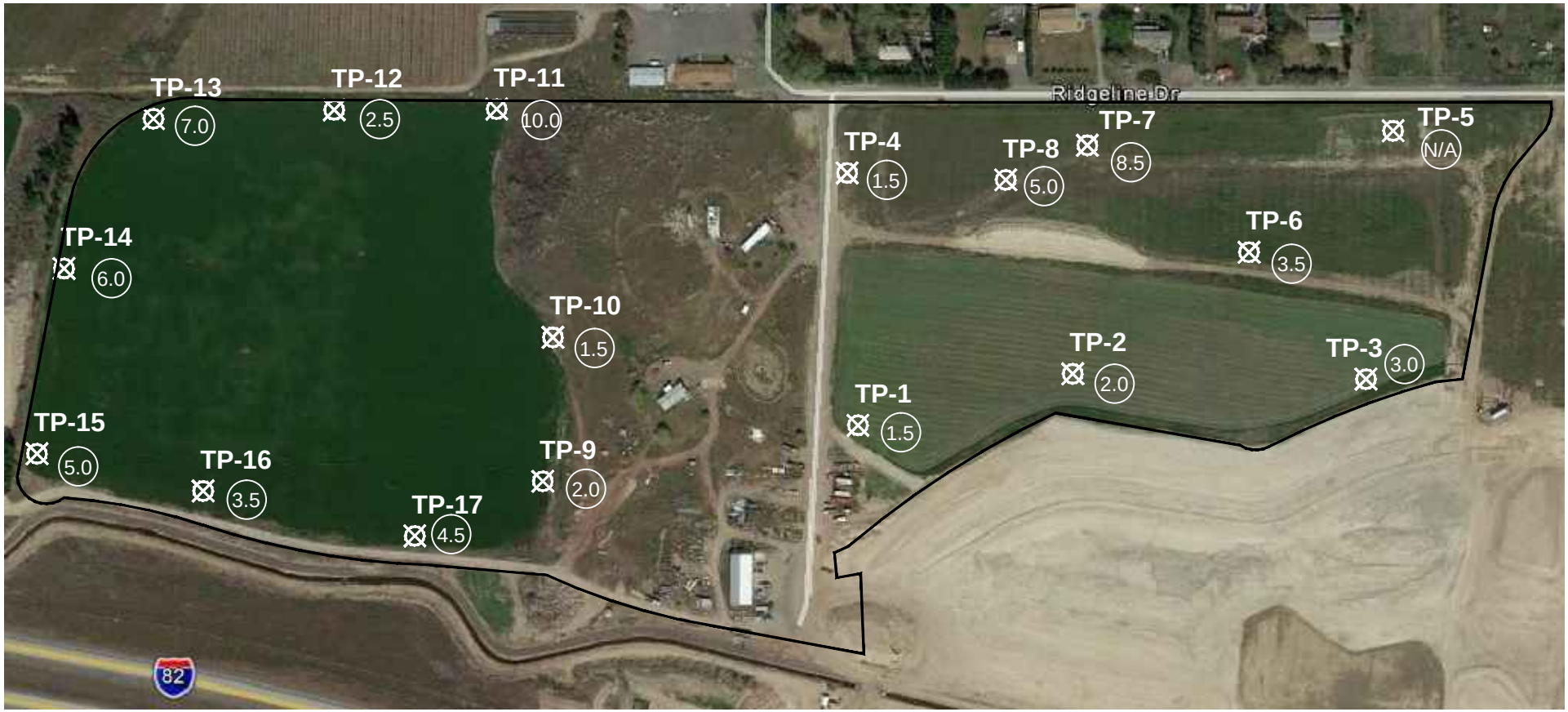
SITE LOCATION MAP

SAHHALI VILLAGE KENNEWICK, WA

DESIGNED:	SCALE:	FIGURE
JRB	H: N/A	1
DRAWN BY: AJJ	V: N/A	
CHECKED: JRB	OCT 2015	

EXHIBIT 10



⊠ TEST PIT LOCATIONS

(#) DEPTH TO BEDROCK IN FEET

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SITE EXPLORATION MAP

SAHHALI VILLAGE KENNEWICK, WA

DESIGNED: JRB	SCALE: H: N/A V: N/A	FIGURE
DRAWN BY: AJJ	OCT 2015	2
CHECKED: JRB	1126.001	

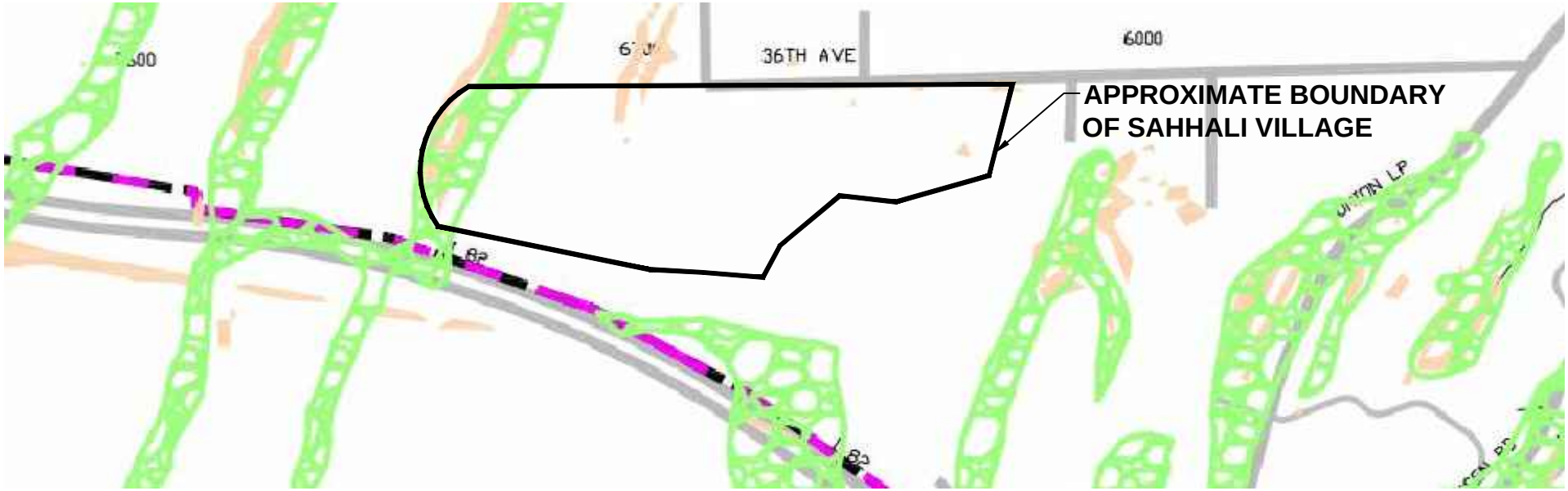

EXHIBIT 4

City of Kennewick
Critical Areas Map
Geologically Hazardous Areas

2007

HDR

- Steep Slopes* (>15%)
- Extreme Slope Hazard* (>40% Slope)
- Erosion Hazard**
- Landslide Hazard (Known)**
- City Limits
- UGA Boundary

* Derived from the United States Geological Survey 7.5-minute Digital Elevation Model

** Data taken from Soil Survey Benton County Area, Washington, July 1971. Provided by United States Department of Agriculture.

Disclaimer: This map is intended to be used as a reference and does not provide a final critical areas designation. All data presented should be considered advisory in nature and approximate in location, due to integration of multiple data types and variation in spatial accuracy of source data. Field inspection is advised to certify the presence of critical areas on a site-specific basis.

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CRITICAL AREAS MAP
SAHHALI VILLAGE KENNEWICK, WA

DESIGNED: JRB	SCALE: H: N/A V: N/A	FIGURE
DRAWN BY: AJJ	OCT 2015	3
CHECKED: JRB	1-2202	

APPENDIX B

Test Pit Logs TP-1 through TP-17
Infiltration Test Results
Sieve Analysis Plot Results
Nearby Groundwater Well Logs

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SAHHALI VILLAGE

TEST PITS

HDJ PROJECT NUMBER: 4126-00

DEPTH IN FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE	DYNAMIC PENETROMETER (DP) / STATIC PENETROMETER (SP) / MOISTURE CONTENT (%) / INDEX PROPERTIES (IP) / NUCLEAR DENSITY (ND) / DRY DENSITY (DD) / SIEVE (SIEV)	COMMENTS
TP-1						0 25 50	**FIGURE TP-1**
0.0		Dry, medium dense, light olive-brown, SILT and fine SAND	0.0				
1.0							
		Fractured, carbonate-stained BASALT BEDROCK	1.3 / 1.5				
2.0		Total depth: 1.5 feet bgs due to practical refusal					
3.0							
4.0							
5.0							
6.0							
7.0							
8.0							
9.0							

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

TP-2						0 25 50	**FIGURE TP-2**
0.0		Dry, medium dense to dense, light olive-brown, SILT and fine SAND; moderate cementation	0.0				
1.0				DP W%		20+	W% = .8%
2.0		Fractured, carbonate-stained BASALT BEDROCK	1.8 / 2.0				
3.0		Total depth: 2.0 feet bgs due to practical refusal					
4.0							
5.0							
6.0							
7.0							
8.0							
9.0							

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

EXCAVATION METHOD: Excavator EXCAVATED BY: E-Mac LOGGED BY: A. Swenson, PE

EXPLORATIONS - 2 PER PAGE 4126-00_TP1-17_102215.GPJ PRINT DATE 10/22/15

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SAHHALI VILLAGE

TEST PITS

HDJ PROJECT NUMBER: 4126-00

DEPTH IN FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE	DYNAMIC PENETROMETER (DP) / STATIC PENETROMETER (SP) / MOISTURE CONTENT (%) / INDEX PROPERTIES (IP) / NUCLEAR DENSITY (ND) / DRY DENSITY (DD) / SIEVE (SIEV)	COMMENTS

TP-3 — **FIGURE TP-3**

DEPTH IN FEET	MATERIAL DESCRIPTION	DEPTH
0.0	Dry, medium dense to dense, light olive-brown, SILT and fine SAND; moderate cementation	0.0
1.0		
2.0		
3.0	Fractured, carbonate-stained BASALT BEDROCK	2.8 / 3.0
4.0	Total depth: 3.0 feet bgs due to practical refusal	
5.0		
6.0		
7.0		
8.0		
9.0		

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

TP-4 — **FIGURE TP-4**

DEPTH IN FEET	MATERIAL DESCRIPTION	DEPTH
0.0	Dry, medium dense to dense, light olive-brown, SILT and fine SAND	0.0
1.0	Fractured, carbonate-stained BASALT BEDROCK	1.3 / 1.5
2.0	Total depth: 1.5 feet bgs due to practical refusal	
3.0		
4.0		
5.0		
6.0		
7.0		
8.0		
9.0		

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

EXCAVATION METHOD: Excavator EXCAVATED BY: E-Mac LOGGED BY: A. Swenson, PE

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SAHHALI VILLAGE

TEST PITS

HDJ PROJECT NUMBER: 4126-00

DEPTH IN FEET | GRAPHIC LOG | MATERIAL DESCRIPTION | DEPTH | TESTING | SAMPLE | DYNAMIC PENETROMETER (DP) / STATIC PENETROMETER (SP) / MOISTURE CONTENT (%) / INDEX PROPERTIES (IP) / NUCLEAR DENSITY (ND) / DRY DENSITY (DD) / SIEVE (SIEV) | COMMENTS

TP-5

FIGURE TP-5

Depth (feet)	Material description	Depth	Testing	Sample	Penetrometer (0–50)	Comments
0.0	Dry, medium dense to dense, light olive-brown, SILT and fine SAND	0.0				
2.0			DP		14	
4.0			DP W%	☒ ●	18	W% = 1.8%
6.0						
8.0						
10.0						
	Total depth: 11.5 feet bgs	11.5				

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

TP-6

FIGURE TP-6

Depth (feet)	Material description	Depth	Testing	Sample	Penetrometer (0–50)	Comments
0.0	Dry, medium dense to dense, light olive-brown, SILT and fine SAND	0.0				
1.0						
2.0						
3.0	Fractured, carbonate-stained BASALT BEDROCK	3.3				
		3.5				
4.0	Total depth: 3.5 feet bgs due to practical refusal					
5.0						
6.0						
7.0						
8.0						
9.0						

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

EXCAVATION METHOD: Excavator EXCAVATED BY: E-Mac LOGGED BY: A. Swenson, PE

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SAHHALI VILLAGE

TEST PITS

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DEPTH IN FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE	DYNAMIC PENETROMETER (DP) / STATIC PENETROMETER (SP) / MOISTURE CONTENT (%) / INDEX PROPERTIES (IP) / NUCLEAR DENSITY (ND) / DRY DENSITY (DD) / SIEVE (SIEV)	COMMENTS

TP-7 — **FIGURE TP-7**

DEPTH IN FEET	MATERIAL DESCRIPTION	DEPTH	TESTING	DYNAMIC PENETROMETER (DP)
0.0	Dry, medium dense to dense, light olive-brown, SILT and fine SAND	0.0		
2.0			DP	19
4.0	encountered one, angular, basalt boulder		DP	20+
6.0				
8.0	Dry, medium dense, light olive-brown, SILT and fine SAND; little angular carbonate-stained basalt cobble, massive bedding, pedogenic carbonate cementation	8.0		
		8.3		
	Carbonate-stained BASALT BEDROCK	8.5		
10.0	Total depth: 8.5 feet bgs due to practical refusal			

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

TP-8 — **FIGURE TP-8**

DEPTH IN FEET	MATERIAL DESCRIPTION	DEPTH	TESTING	DYNAMIC PENETROMETER (DP)
0.0	Dry, medium dense to dense, light olive-brown, SILT and fine SAND	0.0		
1.0				
2.0	Dry, dense, light olive-brown, SILT and fine SAND; light to moderate cementation	2.0	DP	20+
3.0				
4.0				
5.0	Fractured, carbonate-stained BASALT BEDROCK	4.8		
		5.0		
6.0	Total depth: 5.0 feet bgs due to practical refusal			
7.0				
8.0				
9.0				

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

EXCAVATION METHOD: Excavator EXCAVATED BY: E-Mac LOGGED BY: A. Swenson, PE

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SAHHALI VILLAGE

TEST PITS

HDJ PROJECT NUMBER: 4126-00

DEPTH IN FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE	◇ DYNAMIC PENETROMETER (DP) ⊠ STATIC PENETROMETER (SP) ● MOISTURE CONTENT (%) INDEX PROPERTIES (IP) NUCLEAR DENSITY (ND) DRY DENSITY (DD) SIEVE (SIEV)	COMMENTS

TP-9 — **FIGURE TP-9**

0 25 50

0.0 Dry, medium dense, light olive-brown, SILT and fine SAND

1.0

2.0 Fractured, carbonate-stained BASALT BEDROCK (1.8)

Total depth: 2.0 feet bgs due to practical refusal (2.0)

3.0 4.0 5.0 6.0 7.0 8.0 9.0

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

TP-10 — **FIGURE TP-10**

0 25 50

0.0 Dry, medium dense, light olive-brown, SILT and fine SAND

1.0

2.0 Fractured, carbonate-stained BASALT BEDROCK (1.3)

Total depth: 1.5 feet bgs due to practical refusal (1.5)

3.0 4.0 5.0 6.0 7.0 8.0 9.0

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

EXCAVATION METHOD: Excavator EXCAVATED BY: E-Mac LOGGED BY: A. Swenson, PE

EXPLORATIONS - 2 PER PAGE 4126-00_TP1-17_102215.GPJ PRINT DATE 10/22/15

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SAHHALI VILLAGE

TEST PITS

HDJ PROJECT NUMBER: 4126-00

DEPTH IN FEET | GRAPHIC LOG | MATERIAL DESCRIPTION | DEPTH | TESTING | SAMPLE | DYNAMIC PENETROMETER (DP) / STATIC PENETROMETER (SP) / MOISTURE CONTENT (%) / INDEX PROPERTIES (IP) / NUCLEAR DENSITY (ND) / DRY DENSITY (DD) / SIEVE (SIEV) | COMMENTS

TP-11

FIGURE TP-11

Depth (feet)	Material Description	Depth	Testing
0.0	Dry, medium dense to dense, light olive-brown, SILT and fine SAND	0.0	DP
5.0	Dry, medium dense to dense, light olive-brown, SILT and fine SAND; massive bedding, pedogenic carbonate with moderate cementation	5.0	
8.0	Dry, very dense, SILT and fine SAND; high cementation	8.0	
9.8	Fractured BASALT BEDROCK	9.8	
10.0	Total depth: 10.0 feet bgs due to practical refusal	10.0	

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

TP-12

FIGURE TP-12

Depth (feet)	Material Description	Depth	Testing
0.0	Dry, medium dense, light olive-brown, SILT and fine SAND	0.0	
2.3	Fractured BASALT BEDROCK	2.3	
2.5	Total depth: 2.5 feet bgs due to practical refusal	2.5	

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

EXCAVATION METHOD: Excavator EXCAVATED BY: E-Mac LOGGED BY: A. Swenson, PE

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SAHHALI VILLAGE

TEST PITS

HDJ PROJECT NUMBER: 4126-00

DYNAMIC PENETROMETER (DP)
STATIC PENETROMETER (SP)
MOISTURE CONTENT (%)
INDEX PROPERTIES (IP)
NUCLEAR DENSITY (ND)
DRY DENSITY (DD)
SIEVE (SIEV)

TP-13

FIGURE TP-13

DEPTH IN FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE	COMMENTS
0.0		Moist, medium dense, olive-brown, SILT and fine SAND	0.0			
1.0						
2.0						
3.0						
4.0						
5.0				W%	☒	W% = 10.6%
6.0						
7.0		BASALT BEDROCK	6.8			
		Total depth: 7.0 feet bgs due to practical refusal	7.0			
8.0						
9.0						

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

TP-14

FIGURE TP-14

DEPTH IN FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE	COMMENTS
0.0		Dry, medium dense, light olive-brown, SILT and fine SAND	0.0			
1.0						
		Damp, medium dense, olive-brown, SILT and fine SAND	1.5			
2.0						
3.0						
4.0						
5.0						
6.0		BASALT BEDROCK	5.8			
		Total depth: 6.0 feet bgs due to practical refusal	6.0			
7.0						
8.0						
9.0						

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

EXCAVATION METHOD: Excavator EXCAVATED BY: E-Mac LOGGED BY: A. Swenson, PE

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SAHHALI VILLAGE

TEST PITS

HDJ PROJECT NUMBER: 4126-00

DEPTH IN FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE	◇ DYNAMIC PENETROMETER (DP) ⊠ STATIC PENETROMETER (SP) ● MOISTURE CONTENT (%) INDEX PROPERTIES (IP) NUCLEAR DENSITY (ND) DRY DENSITY (DD) SIEVE (SIEV)	COMMENTS

TP-15 — **FIGURE TP-15**

DEPTH IN FEET	MATERIAL DESCRIPTION	DEPTH
0.0	Dry, medium dense, light olive-brown, SILT and fine SAND	0.0
1.0		
2.0		
3.0		
4.0		
5.0	BASALT BEDROCK	4.8
	Total depth: 5.0 feet bgs due to practical refusal	5.0
6.0		
7.0		
8.0		
9.0		

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

TP-16 — **FIGURE TP-16**

DEPTH IN FEET	MATERIAL DESCRIPTION	DEPTH
0.0	Dry, medium dense, light olive-brown, SILT and fine SAND	0.0
1.0		
2.0		
3.0	BASALT BEDROCK	3.3
	Total depth: 3.5 feet bgs due to practical refusal	3.5
4.0		
5.0		
6.0		
7.0		
8.0		
9.0		

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

EXCAVATION METHOD: Excavator EXCAVATED BY: E-Mac LOGGED BY: A. Swenson, PE

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SAHHALI VILLAGE

TEST PITS

HDJ PROJECT NUMBER: 4126-00

DYNAMIC PENETROMETER (DP)
STATIC PENETROMETER (SP)
MOISTURE CONTENT (%)
INDEX PROPERTIES (IP)
NUCLEAR DENSITY (ND)
DRY DENSITY (DD)
SIEVE (SIEV)

TP-17 **FIGURE TP-17**

DEPTH IN FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE	COMMENTS
0.0		Moist, medium dense, olive-brown, SILT and fine SAND	0.0			
1.0						
2.0						
3.0				W%	☒	W% = 16.9%
4.0						
		BASALT BEDROCK	4.3			
		Total depth: 4.5 feet bgs due to practical refusal	4.5			
5.0						
6.0						
7.0						
8.0						
9.0						

0 25 50

Date Completed: 10/6/2015 Exploration Location: (See Figure 2)

EXCAVATION METHOD: Excavator EXCAVATED BY: E-Mac LOGGED BY: A. Swenson, PE

EXPLORATIONS - 2 PER PAGE 4126-00_TP1-17_102215.GPJ PRINT DATE 10/22/15

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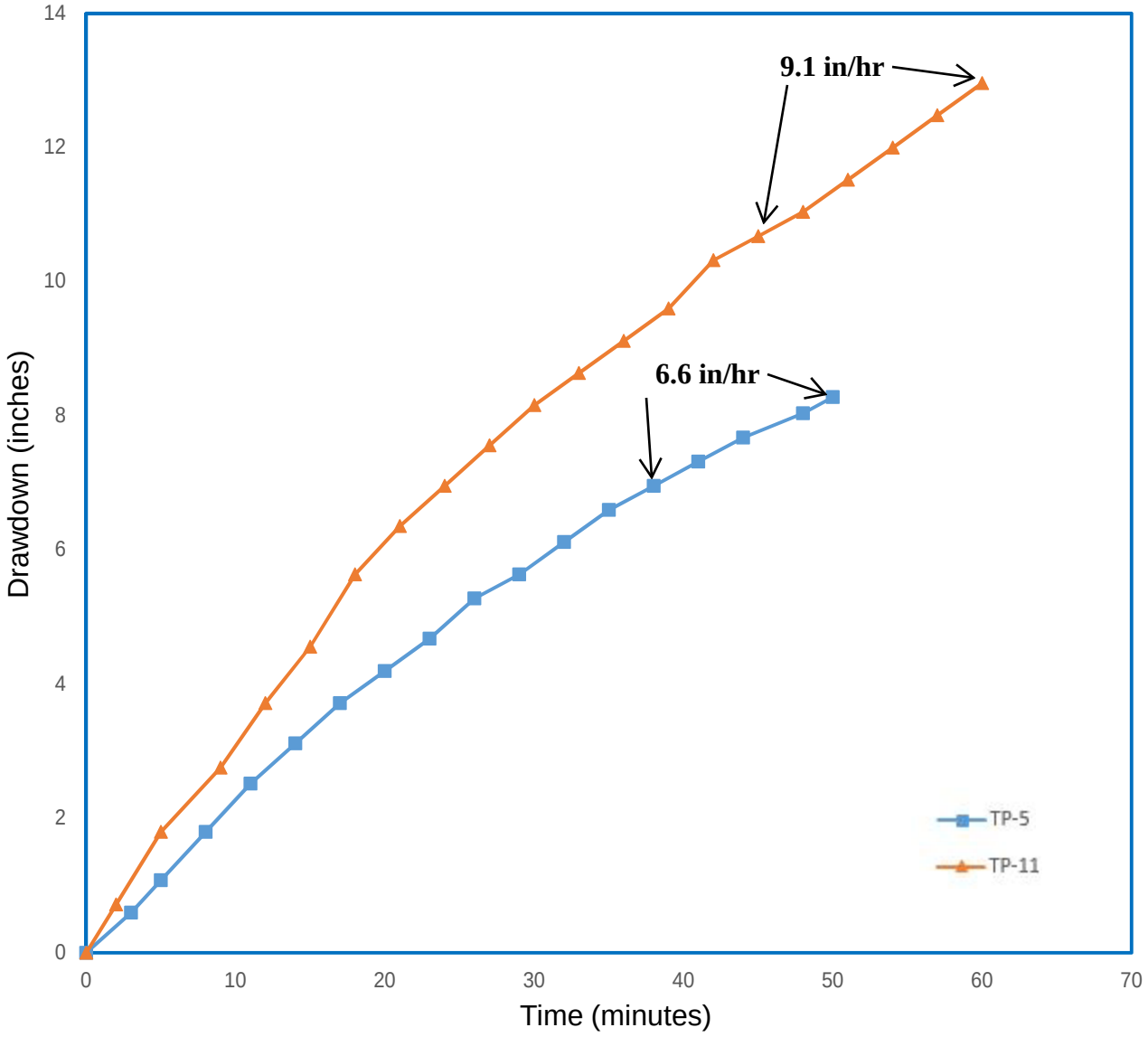
Infiltration Test Data
USBR 7300-89

Project
Sahhali Village
Ridgeline Dr. Kennewick, WA

Project No.
4126-00

Test Date
10/7/15
Tested By
AJJ
Checked By
JRB



Remarks
Some wall caving during test

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Particle-Size Distribution of Soils Using Sieve Analysis ASTM D 6913

Project
Sahhali Village
Ridgeline Dr. Kennewick, WA

Project No.
4126-00

Sample Location
Test Pit-2 @ 1.0 ft

Sample Description
dry, light olive brown fine sand and silt

USCS Classification
SM Silty SAND

Test Date
10/21/15

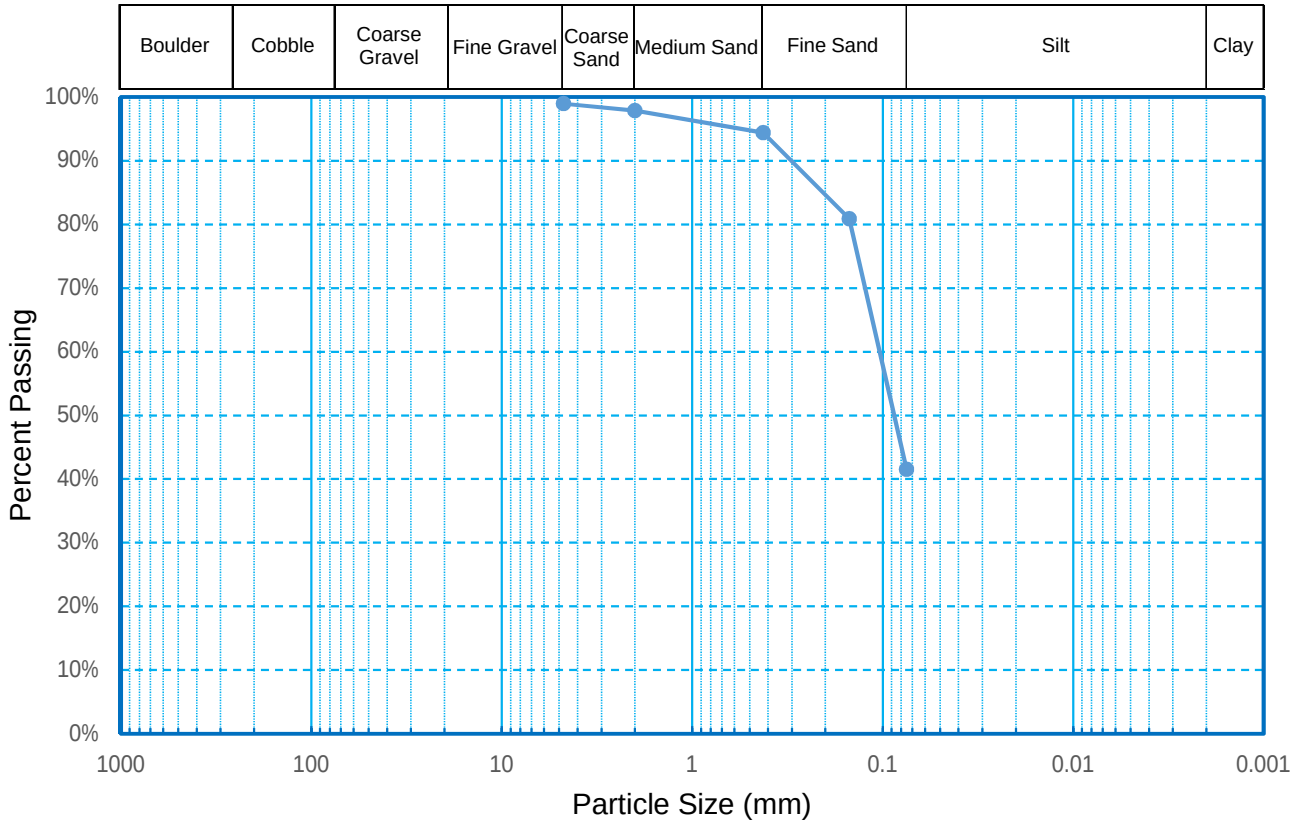
Tested By
AJJ

Checked By
JRB

Summary Results

	Coarse Gravel
1.0%	Fine Gravel
1.1%	Coarse Sand
3.5%	Medium Sand
52.9%	Fine Sand
41.5%	Silt/Clay

Soil Particle-Size Distribution



Remarks:

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Particle-Size Distribution of Soils Using Sieve Analysis ASTM D 6913

Project
Sahhali Village
Ridgeline Dr. Kennewick, WA

Project No.
4126-00

Sample Location
Test Pit-5 @ 4.0 ft

Sample Description
Dry, light olive brown silt and fine sand

USCS Classification
ML Sandy SILT

Test Date
10/21/15

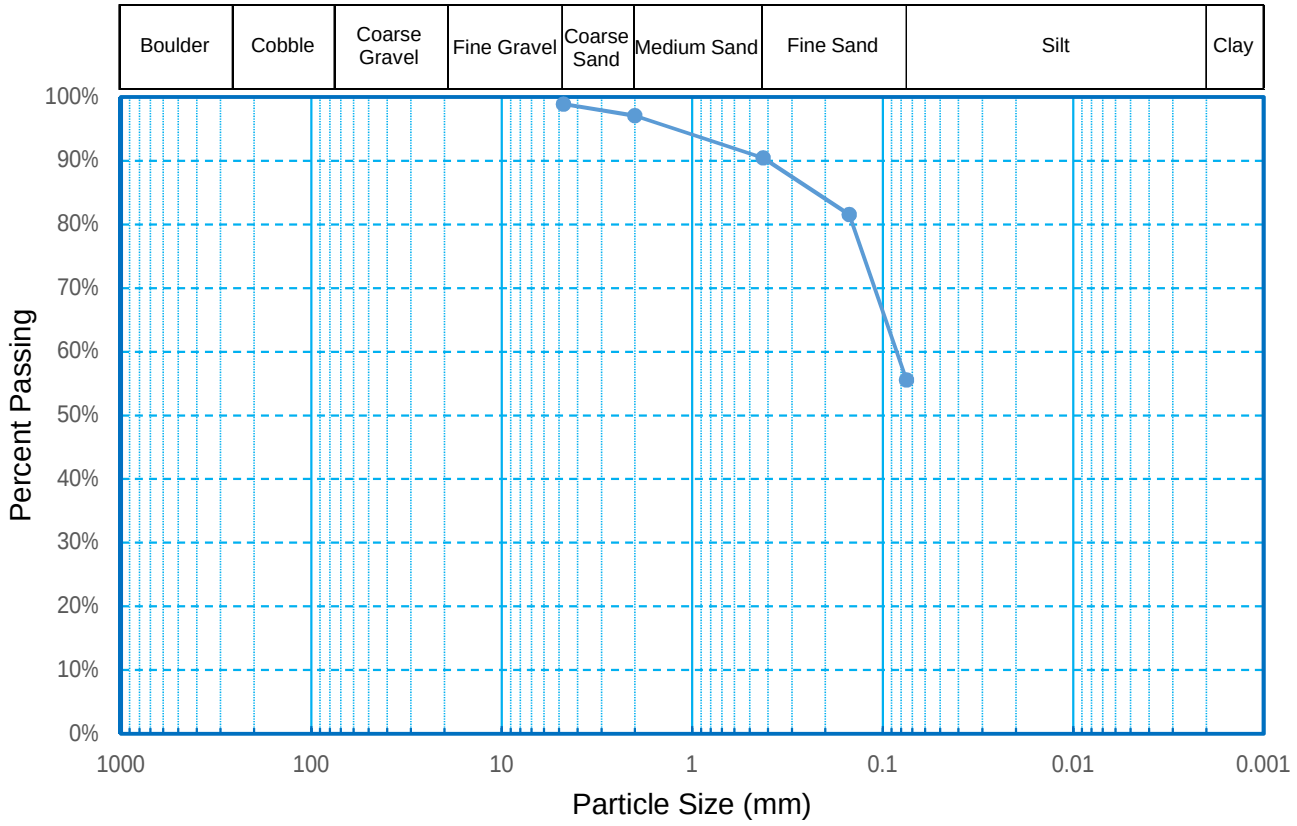
Tested By
AJJ

Checked By
JRB

Summary Results

	Coarse Gravel
1.1%	Fine Gravel
1.8%	Coarse Sand
6.6%	Medium Sand
34.9%	Fine Sand
55.5%	Silt/Clay

Soil Particle-Size Distribution



Remarks:

EXHIBIT 10

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No.
Permit No.

(1) OWNER: Name Charles Neal Tompkins Address Rt. 12, Box 12310, Kennewick, WA 99336

LOCATION OF WELL: County Benton — SE ¼ SE ¼ Sec. 17 T. 8 N., R. 29E W.M.
Bearing and distance from section or subdivision corner Lot 2, Short Plat 1264

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 480 ft. Depth of completed well 480 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +1 ft. to 19 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 19 ft.
Material used in seal bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 240 ft. below top of well Date 9/15/83
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: 15 gal./min. with ft. drawdown after hrs.
" ESTIMATED AIRLIFT " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top soil	0	2
Basalt, hard, black	2	80
Basalt, fractured, gray	80	140
Basalt, hard, gray	140	280
Basalt, fractured, gray	280	340
Basalt, hard, gray	340	440
Basalt, fractured, gray	440	480
NO PVC Liner Installed		
6" Drive Shoe Installed		

RECEIVED OCT 1 1983 DEPARTMENT OF ECOLOGY SPOKANE REGIONAL OFFICE

RECEIVED OCT 5 1983 DEPARTMENT OF ECOLOGY CENTRAL

Work started 9/14/ 83, 19 Completed 9/15/ 83, 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME PONDEROSA DRILLING & DEVELOPMENT INC. (Person, firm, or corporation) (Type or print)
Address E. 6010 Broadway, Spokane, WA 99212

[Signed] Keith Vermillion (Well Driller)
Keith Vermillion
License No. 1079 Date 9/15/ 83, 19

(USE ADDITIONAL SHEETS IF NECESSARY) 12-5-83

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Critical Area Report Supplement to the Geotechnical Report

The Village at Southridge

HDJ Project # 4190-00

The proposed development of Sahhali Village consists of approximately 50 acres that will be divided into several development phases as planned unit developments. The attached Figure 3 shows the proposed layout of Sahhali Village/The Village at Southridge in relation to the City of Kennewick Critical Areas Map.

Two areas within the proposed development are designated as critical areas due to a high erosion potential and/or steep slopes. Steep slopes, on this site, are characterized as slopes greater than 15% grade. These areas developed as the result of ancient drainage ways. Please note that many of these drainages are northeast trending drainages or ravines that extend from the south and cross US Interstate Highway 82 (I-82) and the Kennewick Irrigation District (KID) canal adjacent to the south boundary of the site.

When the Interstate and the KID canal were installed, culverts were not installed in the ravines. We assume that drainage calculations conducted by WSDOT showed that any potential surface water flowing down the drainages from the south and onto the right-of-way (ROW) would infiltrate on the south side of the ROW.

The portions of the critical areas that are within the area of the development have been used for agriculture purposes for many years and there is no sign of surface or subsurface saturation within these critical areas.

Site development plans call for the low areas to be filled to level the site and control all stormwater flow. Civil design plans are not finalized for the project areas but the design plans will include a grading plan map with roadways, stormwater drainage and infiltration facilities, and utilities.

In our geotechnical investigation we excavated test pits near the critical areas. Those areas are composed of silt and sand. This soil sits on top of relatively shallow bedrock as explained in the geotechnical investigation report. Soil within the entire 50-acre development area is in a dry to moist condition and a near-surface unconfined aquifer is not found at the site.

Geohazard Mitigation

The geohazard at this site is a potential erosion and/or flooding hazard that is to be avoided. It is not a critical area that is designated as such in an effort to protect a critical resource.

It is proposed that the erosion geohazard at this site shall be mitigated by the engineering design of the development. Site grading and drainage design will control all surface drainage, including any potential on-site stormwater flow. Mitigation of this geohazard by site grading design will essentially remove and eliminate the geohazard to a level that is less than the current pre-development condition.

Please note that the steep slopes associated with this geohazard zone will be graded in accordance with the Civil design plans, eliminating the steep slopes geohazard, and creating an inherently stable area.

In addition, no seeps nor springs exist within or near to the geohazard areas. Surface runoff is also absent from the geohazard zones.

A standard erosion and sediment control plan will be prepared as a part of the site development plans.

The mitigation plan for the erosion hazard at this site will be the standard engineering plans for the site which will include site grading and stormwater management plans. Beyond the site grading plan, no additional site-specific mitigation is required.

This Critical Area Report was prepared by:

Adam Swenson, PE,

MEMORANDUM

Engineering Division of Municipal Services

To: Wes Romine, Development Services Manager

From: Fernando Garcia, Utility Coordinator

Date: April 12, 2016

Re: Public Works Consolidated Comments

Project: PRD 16-01/PLN-2016-00841
The Village at Southridge

1. Developer will be required to provide construction of public roads, sidewalks, streetlights, storm drainage and designate sidewalk and utility easements all in conformance with AGR 2008-004878 and the latest City of Kennewick (COK) Standard Specifications and details.

2. The sum of eight hundred dollars ($800.00) shall be paid on each platted development lot above the 810-foot contour line at the time a building permit is issued to improve the lot per AGR 2008-004878 section 4.6, Water Reservoir Facility Contribution.

3. As part of all residential development construction plans, there shall be a separate schematic drawing which at a minimum, shows the power source(s), wiring diagram street light pole spacing and street permanent signing per COK Standard Specifications 6-02 and Specifications 7-10. Combine Signing, Striping, and Illumination Plans onto the same drawing with other elements left off.

4. Due to project phasing, any temporary dead end street 150-ft or greater from the street intersection will require construction of a temporary cul-de-sac constructed with 6-inches of base rock and 2-inches Hot Mix Asphalt (HMA).

5. There is an existing 12-inch water main to serve development above 810-ft elevation at the westerly end of W 38th Ave. The Developer will need to make provisions to install a 12-inch ductile iron main from S Sherman St and W 38th Ave to the west /northwest most point of the property to serve future growth to the west in Zone 5 service.

6. There is a 16" water main to serve development above 810-ft elevation west of S Penn Street inside a 20-ft waterline easement recording number EAS 2016-004553. Add easement on Plat drawing per Kennewick Municipal Code (KMC) 17.10.080.

7. Developer will be required to loop all water mains to avoid the buildup of stagnant water and be able to assist in minimizing bacteria re-growth and also taste and odor concerns associated with stagnant water. Per KMC 14.10.010.

8. A comprehensive water plan needs to be approved by the City for the entire plat prior to approval of phase 1 construction plans. Comprehensive Plan can be submitted with the Preliminary Civil plan review.

9. Water mains outside City of Kennewick (COK) right of way shall be in a 15-ft waterline easement centered over the new water main and 5-ft beyond fire hydrant runs. The document must be recorded with the Benton County Auditor, and include the property owner(s) signature. Dedication of the easement will be required prior to acceptance of the utility permit.

10. Potable water is not available for irrigation purposes. Provide irrigation water to irrigate proposed plat.

11. There is an existing 8-inch sanitary sewer at the intersection of S Penn St and Ridgeline and at the intersection of S Sherman St and W 33rd Pl the. Sanitary sewer extension to serve proposed developments will be constructed at Developer expense.

12. Sewer mains outside COK right of way shall be in a 15-ft wide sewer easement centered over the sewer main lines. For sewer lines that have manholes located in other than city right of way, a fifteen (15') foot wide by six (6") inch depth of compacted gravel access road shall be built over the top of the sewer main. The document must be recorded with the Benton County Auditor Office, and include the property owner(s) signature. Dedication of the easement will be required prior to acceptance of the utility permit.

13. A comprehensive sewer plan needs to be approved by the City for the entire plat prior to approval of phase 1 construction plans. Comprehensive Plan can be submitted with the Preliminary Civil plan review.

14. Residential sub-divisions shall be designed to retain and dispose of the calculated difference between a 25-year 24-hour event for the developed state and the 24-hour event for the natural pre-developed state. Detention ponds (control outlet) may be used only where it can be clearly demonstrated that infiltration, or retention, are not feasible per City of Kennewick Standard Specifications section 5-9.02.

15. A comprehensive storm plan needs to be approved by the city for the entire plat prior to approval of phase 1 construction plans. Dedication of storm easement will be required for any storm ponds outside the Preliminary Plat boundaries prior to acceptance of the utility permit.

16. Construction civil drawings shall include only the infrastructure proposed with the first phase of the project. Design Engineer has an option of showing phase 2 in a lighter line style to assure clarity for review, permitting and construction.

17. Sidewalks shall be widened an additional 18-inches when adjoining a wall or fence per COK detail 2-10 sheet 1 of 8, note 4.

18. Construction drawings shall include only the infrastructure proposed with the first phase of the project when constructed in phases. Design Engineer has an option of showing future phases in a lighter line style to assure clarity for review, permitting and construction.

19. For civil plan reviews submit the following:
    a. Application for Civil Review and Permitting
    b. One full size set (24" x 36") Xerox copy of the construction plans with Storm Calculations

c. One full size PDF copy of each shall be submitted to the Public Works Department for review.

20. Plan review and utility fees will be quoted from the construction cost from the Contractor selected by the Developer to construct the project, cost shall be paid in the amount of five percent (5%). The construction cost shall be determined by the actual bid document reviewed and approved by the City Engineer.

21. Property owners as well as their contractors, subcontractors, builders, suppliers, and other representatives shall follow all KMC's regarding storm water management, erosion sediment control, and illicit discharges. Failure to meet City Code can result in approval delays, fines, and a hold on permits per the following KMC's:
    a. KMC 14.29: Illicit Discharge
    b. KMC 18.72: Clearing and Grading
    c. KMC 17.20: Design and Construction
    d. KMC 18.75 and KMC 18.78: Residential & Commercial Design Standards.

MEMORANDUM

Engineering Division of Municipal Services

To: Wes Romine, Development Services Manager

From: Fernando Garcia, Utility Coordinator

Date: May 26, 2016

Re: Public Works Consolidated Comments

Project: Addendum to PRD 16-01/PLN-2016-00841 Dated April 2, 2016
The Village at Southridge

1. Planned Residential Development (PRD) Map includes proposed development east of S Sherman Street with proposed buildings on top of an existing 16-inch ductile iron water main.

2. Extend 16-inch water main from the intersection of S Nelson St (S Penn St) and W 37th Place to north side of Ridgeline Drive approximately 200 linear feet for future extension and to retain the integrity of S Penn Street to avoid cutting the new asphalt during The Village at Southridge Phase 2 development.

3. The City of Kennewick will not accept the existing 16-inch water main when located outside the City right of way. Existing 16-inch Zone 5 water main west of S Nelson St shall be relocated if proposed PRD 16-01 PH 2 east of S Sherman St is approved and Developer constructs buildings shown on PRD map. Plan accordingly and extend 16-inch outside the new construction to reroute it on Ridgeline Dr and intersect it east of S Sherman St on Ridgeline Dr.

4. Developer will be required to grind and overlay if water main is not extended before S Nelson St is paved, grind and overlay the full street width of S Nelson Street past the street cut required to extend the water main to the north side of Ridgeline Dr.

Municipal Services Department
210 W. 6th Avenue * PO Box 6108* Kennewick, WA 99336
509-585-4419 * 509-585-4451 Fax

MEMORANDUM

Traffic Engineering Division

To: Wes Romine, Development Services Manager

From: John Deskins, Traffic Engineer

Date: May 4, 2016

Re: Traffic Engineer's Comments for The Village at Southridge

Project: PRD 16-01/PLN-2016-00841

Conditions

Based upon review of the proposed development site plan, existing traffic conditions, the average weekday traffic volumes generated by similar types of developments (per current ITE Trip Generation Manual), traffic flow and safety, proximately to the intersection adjoining property access and in conformance with Kennewick Administrative Code (KAC) Chapter 13-46 "Highway Access Management", the conditions are as follows:

1. Provide right-of-way and easements along the Ridgeline Drive frontage to meet City of Kennewick Standard Drawing 2-4. This cross section has half-width of 24 feet of pavement, 26 feet of right-of-way, and 15 Public Sidewalk, Utility & Irrigation Easement. The section includes a minimum planter strip of 10'. Half-street improvements will be required in conjunction with the project to include roadway, curb and gutter, sidewalk, and streetlights. Provide signing & striping plans that will best utilize the new street section as constructed.
2. Reserve right-of-way for future roundabout intersection at Sherman Street & Ridgeline Drive. It should be large enough to support a 140 foot outside diameter plus sidewalks. A 125' chamfer from the center of the future intersection is probably a sufficient place to start for approval. This is a worst case scenario that appears to potentially impact as many as 8 parking stalls at the Clubhouse in the future on the southwest corner. There is no apparent significant impact on the southeast corner.
3. Sherman Street south of Ridgeline Drive should be a standard Local Roadway per Kennewick Standard Drawing 2-1 Sheet 2 of 4. Curb tight sidewalk would be allowed on the east side. The sidewalk on the west side will need to be constructed along with the roadway and the first phase of the project on the west side.
4. The roadway alignment for Road H should be centered. They appear to be offset which would mean a significant jog crossing the intersection to use the clubhouse.
5. A speed hump should be provided centered on the property line at Lots 5 & 6 or Lots 6 & 7 presuming the grades are under 8%. A speed hump should be provided

between Lots 1 & 2 or alternatively a raised crosswalk on the north side of Road H to serve the Clubhouse pedestrian traffic.

6. There needs to be an ultimate resolution to the areas east of Lot 9 which was originally planned a roadway access with a curb return, but now, as a result of this proposal is not. Coordinate with Sage Crest developer as necessary, or respond with resolution.
7. Need to define the usage of the area east of Lot 79 and south of W 38th Avenue. Will this be open space to be maintained by the development?
8. Stop and Yield signs on the private streets should be per Figure 5 of the Traffic Impact Study dated January 19th, 2016 with the exception of the intersection of Road C and Road D should be a Stop sign.
9. The orientation of the streetlights on Figure 5 will probably not be practical. Streetlights should be installed at City standard spacing of 300 feet maximum. Figure 5 does not include all streetlights.
10. The private streets have been previously approved at 28 feet wide with an approved cross section. This will require Fire Lane signage (effectively No Parking) on one side of the street per City of Kennewick Standard Drawing 7-5. Generally, the parking side will be adjacent to the sidewalk side.
11. Optional Traffic Calming on Private Internal Streets. Speed Humps are recommended for consideration on Roads B, C, D, and E. Traffic Circle is recommended at the intersection of Roads D and F. All optional, but if installed, should meet COK standards.
12. It seems awkward that there is no driver turn-around at the Dog Park, Tract E. If users drive there then they really have nowhere to park or turn around.
13. The estimated total Transportation Impact Fee (TIF) for this project is $105,813 based on the Traffic Impact Study, Table 2. In general the assumptions are reasonable and will be accepted for the Senior Detached (LUC 252) and Senior Attached (LUC 251) housing. The other units will be evaluated more closely at the individual site plans as to whether the proposed Nursing Home (LUC 620) or Assisted Living (LUC 254) is more appropriate. The final totals will be based on the actual building proposed. The Clubhouse will be exempted from the TIF since the trips to and from are anticipated to be effectively internal trips to the site. The final fees will be assessed at the building permit for the structures and is due prior to Certificate of Occupancy. For Residential single family and duplexes, the fee may be deferred until the time of closing of the sale of the unit by recording a covenant against the property.

If the developer disagrees with the assigned contributions for traffic impacts or traffic mitigation, the developer has the right to hire an independent Traffic Engineering Consultant to prepare a Traffic Impact Study to evaluate appropriate impacts and mitigations. No work should start on such a study until consulting with the City of Kennewick Traffic Engineer.

MEMORANDUM

Fire Department

To: Wes Romine, Development Services Manager

From: Joe Terpenning, Deputy Fire Marshal

Date: April 4, 2016

Re: 6831 Ridgeline Drive

Project: PLN 2016-00602

1. Install fire hydrants at intersections and average 500 foot spacing along roads. Water mains shall be looped and capable of providing 1,000 GPM in the single family residential development. Water flow requirements for the commercial buildings will be determined upon submittal of building construction plans.
2. Submit a phasing diagram to determine fire apparatus access requirements:
   a. Dead-ends over 150 feet shall have an approved turn around.
   b. Streets over 600 feet shall be provided with two access points.
3. The water system will need to be tied in to the water main on Brinkley road to loop the system. Contact public works to determine responsibility.

FIRE DEPARTMENT
210 W 6TH AVE * PO Box 6108* Kennewick, WA 99336
509-585-4563 * 509-585-4442 Fax

MEMORANDUM

Building Department

To: Wes Romine, Development Services

From: Thomas Woods Plans Examiner

Date: 3/31/2016

Re: Building Department comments

Project: Site Plan PLN-2016-00841

For both commercial and residential lots, a soils analysis report from a certified geo technical engineer is required if the existing natural slope is/was greater than 15%. This shall apply to any lot modifications including but not limited to the house footing, retaining walls, driveways and detached accessory structures.

A soils compaction report from a certified geo technical engineer is required for each lot after footings have been excavated and prior to scheduling a footing inspection.

The following shall apply to the all the common use buildings.

Please refer to the commercial building application checklist for all requirements prior to plans submittal.

The distance from the new construction to the lot line must comply with Tables 601 and 602 in the 2012 IBC.

All handicap parking stalls, aisles, ramps and signage must conform to COK currently adopted codes including ANSI A117.1

A delineated accessible route shall be provided from the ADA parking stalls to the nearest pedestrian entrance.

The residential structures shall comply with the 2012 IRC

Both commercial and residential plans will have to meet the 2015 IBC and IRC if submitted after July 1st 2016 as that is when those codes are adopted.

Building Department
210 W.6th Avenue, Kennewick * PO Box 6108* Kennewick, WA 99336
509-585-4281 * 509-585-4200 Fax

2015 South Ely Street
Kennewick, WA 99337
Phone 509-586-9111
FAX 509-586-7663
www.kid.org

RECEIVED
APR 25 2016
COMMUNITY PLANNING

KENNEWICK IRRIGATION DISTRICT
EST. 1917

April 20, 2016

Wes Romine
Development Services Manager
City of Kennewick
210 W. 6th Avenue
Kennewick, WA 99336

Subject: Review Comments PRD 16-01 The Village at Southridge

Dear Mr. Romine:

This letter provides Kennewick Irrigation District (KID) review comments on PRD No. 16-01 The Village at Southridge submitted by Don McIntosh of Trendz Real Estate, Inc., 13215 C-8 S.E. Mill Plain Blvd., Vancouver, WA 98684. The Parks is generally located south of Ridgeline Drive, and at the east & west of the future extension of S. Sherman Street and includes the following parcels:

- 1-1789-401-0857-011 (13.35 irrigable acres)
- 1-1789-400-0002-011 (9.89 irrigable acres)
- 1-1789-400-0002-012 (19.53 irrigable acres)

The properties identified on the proposed PRD are located within the KID boundaries. The properties within this PRD are classified as irrigable land and consist of **42.77 irrigable acres**. KID provides the following comments as a condition of approval by the legislative authority for R.C.W. 58.17.310:

1) The following are KID easement requirements:
    a. Dedicate to KID an irrigation easement 10 feet in width via a recorded deed to match any irrigation system components, centered on an irrigation pipe line.
    b. Dedicate to KID an irrigation easement 10 feet in width, five (5) feet in width if adjacent to a utility easement, along the road frontage of all lots.
        i. Within the City of Kennewick KID allows a "Sidewalk, Utility and Irrigation easement" and an "Access and Irrigation easement." Please change the easements to reflect this.

2) Please note that there exists a 60 foot USBR Right-of-Way (ROW) along the south property line. Please show this ROW on the preliminary plat. A copy of the ROW maps are available upon request.

a. *Deed subject to license*. At the time of final plat, Applicant must deed to KID/USBR a tract of land equal in dimension to the USBR ROW, subject to the Applicant and KID entering into a license under which Applicant agrees to construct and maintain fencing and landscaping.
b. At the time of final plat, Applicant must agree to install and maintain fencing along ROW.
c. Please add a note to the face of the plat that states: "No grading may be performed or any permanent structure built within KID right of way without an approved permit from the Kennewick Irrigation District and/or the United States Bureau of Reclamation, when applicable."
d. For each phase of the project, include a note on the face of the Final Plat stating as follows: "This property is located within the boundaries of the Kennewick Irrigation District and in the immediate vicinity of irrigation infrastructure. Please refer to www.kid.org for further information."
e. KID will require that Bureau of Reclamation signage be installed along the canal ROW prior to final plat approval of each phase abutting the canal.
f. No permanent structures are allowed within the USBR ROW.

3) The property owner or developer is required to install an irrigation distribution system for the Development that conforms to the most recent edition of the KID Standard Specifications pursuant to Resolution 86-15-A. This includes providing distribution pipelines adequate to provide individual pressurized irrigation services to each lot/tract within the PRD. This system will be dedicated to the KID upon completion, at the time of final plat.
   a. Please note, as an alternative to immediate construction the owner may choose to delay installation of the on-site irrigation system by entering into a facilities installation agreement with the KID. The owner must provide the KID with an irrigation system design that conforms to the most recent addition of the KID standard specifications. This irrigation system may be bonded and delayed up to five years. The facility installation agreement charge is $300.00. The owner must establish an approved bonding mechanism with the KID in an amount approved by KID.

4) This Development is within the Southridge Master Plan Benefit Area. Compliance with Southridge Master Irrigation Facilities Plan and KID Resolution No. 2016-4 is required.

5) The property owner or developer is required to submit an irrigation plan designed by a professional engineer for review and approval by the KID. The plan may be hand drawn or computer drafted. The plan shall be accurate and to a scale not to exceed one (1) inch = 50 feet. This is a vital step of the approval process. After approval of the plan, completion of all the facilities is required prior to KID signature on the Final Plat. Please contact me at 586-9111 for more information regarding this irrigation plan.
   a. In addition, this plan shall ensure all reasonable measures are taken to protect any easements, ROW's, and facilities. In the event any KID facilities are damaged

during construction, the damage must be fully repaired to KID's then-existing standards.

b. For each phase of the Project, KID review and approval of construction and grading plans is required to allow KID to assure all reasonable measures to protect any easements and ROW's. Such review and approval will be coordinated as part of the City's review and Final Plat approval process.

c. No permanent structures are allowed within KID's ROW.

6) The KID must inspect any new irrigation system installations or modifications. The property owner or developer shall contact the KID to arrange an inspection at least 48 hours in advance of the desired inspection date.

7) Prior to approval of each phase, the current year's assessment must be paid. If the final plat is submitted for review after May 31st of a given year or submitted for review prior to May 31st but not submitted for final approval prior to June 15th, the next year's estimated assessment (125% of the current year's assessment) must be paid prior to plat approval.

8) Prior to approval of the first phase, the United States Bureau of Reclamation (USBR) construction loan for **all parcels** owned by the property owner within the boundaries of the KID must be paid and all other USBR requirements associated with this payout must be completed.

9) The Review and Inspection fees in place at the time of each review request must be paid. At the time of application the review fees are as follows:

a. A Preliminary Plat review fee of $750.00 which must be paid prior to scheduling for final plat approval at a KID Board meeting for the first phase.

b. For each Phase an inspection fee $300 for the first 20 lots/tracts plus $20 per lot/tract after 20 lots/tracts.

c. Final Plat review fee for each phase of $200.00.

10) Per KID Policy 4.17, "Irrigable Land Recalibration Principles," as land within the boundaries of the KID is subdivided or developed; KID will remove the irrigation water allocation from the impermeable surfaces, such as streets, from the plats.

11) In order to receive KID irrigation water delivery, a Watermaster (or point of contact) for the subdivision must be appointed. This water master can be appointed by the Home Owners Association (or similar organization) officers, or must be elected from among the property owners within the boundary of this proposed subdivision. If no HOA (or similar organization) is organized, than an election method similar to the attached document is required.

12) Prior to approval of each phase, an electronic file (AutoCAD 2004 format) and hard copy (6-mil mylar, sealed by a professional engineer) of construction as-builts must be provided to KID.

13) All subdivisions of land are required to be approved by the KID Board of Directors during a KID Board Meeting. KID Board Meetings are regularly scheduled on the first and third Tuesdays of each month. All conditions must be completed prior to submittal to KID for final approval. The submittal for final approval must be received by KID a minimum of two weeks prior to a regularly scheduled Board Meeting in order to be considered at that meeting.

14) Conditions Related to Design, Grading, and Construction
    a. Pursuant to RCW 58.17.310 (1), the KID would like to inform the City of Kennewick that portion of the development lies below an unlined earthen canal section (A). Unlined earthen canal sections are more likely to have a canal embankment breach occur than lined sections. Should a canal embankment breach occur near this development, there is potential for the public safety to be at risk. In order to mitigate this risk, the KID will require:
        i. Rights-of-Way that shall include all reasonably necessary features to allow the KID to operate, maintain and replace the irrigation system. Features shall include drainage systems and/or features that will carry irrigation return flows from up gradient water users, excess water and/or flood waters away from the irrigation water distribution system should a canal failure and/or breach occur.
        ii. As an alternative to i (above), pursuant to KID Policy 4.3, "Developer Risk Mitigation", plat developers may enter into a written agreement with the KID to provide other acceptable means of protecting persons and property. This may include the lining or piping of canals where appropriate. In instances where the KID agrees that canals may be lined or piped as an alternate to providing drainage, the KID Board of Directors may negotiate a cost share or contribution to the expense of lining.
    b. For each phase of the Project, KID review and approval of construction plans is required to allow KID to assure all reasonable measures to protect any easements and ROWs. Such review and approval will be coordinated as part of the City's review and Final Plat approval process.

15) Conditions Related to Residential Use, The Applicant Shall:
    a. Include the potential failure of KID system components in its public offering statement for the plat pursuant to RCW 58.19.055(1)(r), which requires a public offering statement to include "[a] list of any physical hazards known to the developer which particularly affect the development or the immediate vicinity in which the developer is located and which are not readily ascertainable by the purchaser"; and
    b. Post signs in appropriate areas with KID's easements and ROW's identifying KID's facilities (with locations and design approved by KID)

16) Future review, KID reserves the following rights regarding future review of the plat:

a. KID reserves the right to provide review comments under RCW 58.17.330(1) and RCW 58.17.330(2) in response to future design submittals by the Applicant prior to final plat approval. The scope of these reviews will be limited to Phases that are adjacent to the District's Rights of Way. KID review of construction plans will be consistent with the City of Kennewick's plan review timelines.
b. KID reserves the right to review and comment on the Applicant's plat line revisions for potential additional revisions to protect KID system components for Phases that are adjacent to KID's easements or ROWs.
c. KID reserves the right to review and comment on the Applicant's CC&Rs to evaluate whether they should include any terms regarding protection of KID system components after construction and fencing requirements.
d. KID reserves the right to submit additional comments during the City's review process under the State Environmental Policy Act (SEPA).
e. All subdivisions of land are required to be approved by the KID Board of Directors.

Please provide notice to KID of any Public meeting or hearing where this project will be an agenda item. If you have any questions regarding these comments, please contact me at the address/phone number listed below.

Sincerely,

Jason McShane, P.E.
Engineering/Operations Manager

Enc: Sample Water Master Information
C: LB\correspondence\File: [17-8-29]
R:\Development\The Village at Southridge

2015 South Ely Street
Kennewick, WA 99337
Phone 509-586-9111
FAX 509-586-7663
www.kid.org

June 15, 2016

Wes Romine
Development Services Manager
City of Kennewick
210 W. 6th Avenue
Kennewick, WA 99336

Subject: PP 16-03 The Village at Southridge Phases 1-4 Review Comments

Dear Mr. Romine:

This letter provides Kennewick Irrigation District (KID) review comments on PP 16-03 The Village at Southridge Phases 1-4 / PLN-2016-01360 submitted by Jason Mattox of HDJ Design Group for William Smith Properties, Inc. (Matt Smith) and Golden Pacific Lifestyles, LLC (Scott Espedal). The proposed Preliminary Plat is located south of the future extension of Ridgeline Drive and west of the future extension of S. Sherman Street and includes the following parcels:

- 1-1789-400-0002-011 (9.89 irrigable acres)
- 1-1789-400-0002-012 (19.53 irrigable acres)

The properties identified on the proposed preliminary plat are located within the KID boundaries. The properties within this preliminary plat are classified as irrigable land and consist of **29.42 irrigable acres**. KID provides the following comments as a condition of approval by the legislative authority for R.C.W. 58.17.310:

1) The following are KID easement requirements:
    a. Dedicate to KID an irrigation easement 10 feet in width via a recorded deed to match any irrigation system components, centered on an irrigation pipe line.
    b. Dedicate to KID an irrigation easement 10 feet in width, five (5) feet in width if adjacent to a utility easement, along the road frontage of all lots.
        i. Within the City of Kennewick KID allows a "Sidewalk, Utility and Irrigation easement" and an "Access and Irrigation easement." Please change the easements to reflect this.

2) Please note that there exists a 60 foot USBR Right-of-Way (ROW) known as the Amon Pump Lateral along the south property line and a 20 foot USBR ROW known as the Lateral AP-2.9. Please show these ROWs on the preliminary plat. A copy of the ROW maps are available upon request.

a. Please note that Lateral AP-2.9 is shown on the plat map as crossing lots 1 through 9. No permanent structures are allowed over the easement unless the applicant wishes to relocate the existing KID facilities within this ROW and abandon the easement. In addition, KID has plans to install a booster pump station within this ROW. KID would consider other locations such as tract F in order to allow vacation and abandonment of this ROW provided the applicant grants to KID an easement for the booster pump station.
b. *Deed subject to license*. At the time of final plat, Applicant must deed to KID/USBR a tract of land equal in dimension to the USBR ROW's.
c. At the time of final plat, Applicant must install and maintain fencing along canal ROW. Fencing and landscaping maintenance may be completed through applicants CCR's for the Subdivision.
d. Please add a note to the face of the plat that states: "No grading may be performed or any permanent structure built within KID right of way without an approved permit from the Kennewick Irrigation District and/or the United States Bureau of Reclamation, when applicable."
e. For each phase of the project, include a note on the face of the Final Plat stating as follows: "This property is located within the boundaries of the Kennewick Irrigation District and in the immediate vicinity of irrigation infrastructure. Please refer to www.kid.org for further information."
f. KID will require that Bureau of Reclamation signage be installed along the canal ROW prior to final plat approval of each phase abutting the canal.
g. No permanent structures are allowed within the USBR ROW.

3) This Development is within the Southridge Master Plan Benefit Area. Compliance with Southridge Master Irrigation Facilities Plan and KID Resolution No. 2016-4 is required.

4) The property owner or developer is required to install an irrigation distribution system for the Development that conforms to the most recent edition of the KID Standard Specifications pursuant to Resolution 86-15-A. This includes providing distribution pipelines adequate to provide individual pressurized irrigation services to each lot/tract within the PP. This system will be dedicated to the KID upon completion, at the time of final plat.
   a. Please note, as an alternative to immediate construction the owner may choose to delay installation of the on-site irrigation system by entering into a facilities installation agreement with the KID. The owner must provide the KID with an irrigation system design that conforms to the most recent addition of the KID standard specifications. This irrigation system may be bonded and delayed up to five years. The facility installation agreement charge is $300.00. The owner must establish an approved bonding mechanism with the KID in an amount approved by KID.

5) The property owner or developer is required to submit an irrigation plan designed by a professional engineer for review and approval by the KID. The plan may be hand drawn

or computer drafted. The plan shall be accurate and to a scale not to exceed one (1) inch = 50 feet. This is a vital step of the approval process. After approval of the plan, completion of all the facilities is required prior to KID signature on the Final Plat. Please contact me at 586-9111 for more information regarding this irrigation plan.

a. In addition, this plan shall ensure all reasonable measures are taken to protect any easements, ROW's, and facilities. In the event any KID facilities are damaged during construction, the damage must be fully repaired to KID's then-existing standards.
b. For each phase of the Project, KID review and approval of construction and grading plans is required to allow KID to assure all reasonable measures to protect any easements and ROW's. Such review and approval will be coordinated as part of the City's review and Final Plat approval process.
c. No permanent structures are allowed within KID's ROW.

6) The KID must inspect any new irrigation system installations or modifications. The property owner or developer shall contact the KID to arrange an inspection at least 48 hours in advance of the desired inspection date.

7) Prior to approval of each phase, the current year's assessment must be paid. If the final plat is submitted for review after May 31st of a given year or submitted for review prior to May 31st but not submitted for final approval prior to June 15th, the next year's estimated assessment (125% of the current year's assessment) must be paid prior to plat approval.

8) Prior to approval of the first phase, the United States Bureau of Reclamation (USBR) construction loan for **all parcels** owned by the property owner within the boundaries of the KID must be paid and all other USBR requirements associated with this payout must be completed.

9) The Review and Inspection fees in place at the time of each review request must be paid. At the time of application the review fees are as follows:
   a. A Preliminary Plat review fee of $750.00 which must be paid prior to scheduling for final plat approval at a KID Board meeting for the first phase.
   b. For each Phase an inspection fee $300 for the first 20 lots/tracts plus $20 per lot/tract after 20 lots/tracts.
   c. Final Plat review fee for each phase of $200.00.

10) Per KID Policy 4.17, "Irrigable Land Recalibration Principles," as land within the boundaries of the KID is subdivided or developed; KID will remove the irrigation water allocation from the impermeable surfaces, such as streets, from the plats.

11) In order to receive KID irrigation water delivery, a Watermaster (or point of contact) for the subdivision must be appointed. This water master can be appointed by the Home Owners Association (or similar organization) officers, or must be elected from among the property owners within the boundary of this proposed subdivision. If no HOA (or similar

organization) is organized, than an election method similar to the attached document is required.

12) Prior to approval of each phase, an electronic file (AutoCAD 2004 format) and hard copy (6-mil mylar, sealed by a professional engineer) of construction as-builts must be provided to KID.

13) All subdivisions of land are required to be approved by the KID Board of Directors during a KID Board Meeting. KID Board Meetings are regularly scheduled on the first and third Tuesdays of each month. All conditions must be completed prior to submittal to KID for final approval. The submittal for final approval must be received by KID a minimum of two weeks prior to a regularly scheduled Board Meeting in order to be considered at that meeting.

14) Conditions Related to Design, Grading, and Construction
    a. Pursuant to RCW 58.17.310 (1), the KID would like to inform the City of Kennewick that portion of the development lies below an unlined earthen canal section (A). Unlined earthen canal sections are more likely to have a canal embankment breach occur than lined sections. Should a canal embankment breach occur near this development, there is potential for the public safety to be at risk. In order to mitigate this risk, the KID will require:
        i. Rights-of-Way that shall include all reasonably necessary features to allow the KID to operate, maintain and replace the irrigation system. Features shall include drainage systems and/or features that will carry irrigation return flows from up gradient water users, excess water and/or flood waters away from the irrigation water distribution system should a canal failure and/or breach occur.
        ii. As an alternative to i (above), pursuant to KID Policy 4.3, "Developer Risk Mitigation", plat developers may enter into a written agreement with the KID to provide other acceptable means of protecting persons and property. This may include the lining or piping of canals where appropriate. In instances where the KID agrees that canals may be lined or piped as an alternate to providing drainage, the KID Board of Directors may negotiate a cost share or contribution to the expense of lining.
    b. For each phase of the Project, KID review and approval of construction plans is required to allow KID to assure all reasonable measures to protect any easements and ROWs. Such review and approval will be coordinated as part of the City's review and Final Plat approval process.

15) Conditions Related to Residential Use, The Applicant Shall:
    a. Include the potential failure of KID system components in its public offering statement for the plat pursuant to RCW 58.19.055(1)(r), which requires a public offering statement to include "[a] list of any physical hazards known to the developer which particularly affect the development or the immediate vicinity in

which the developer is located and which are not readily ascertainable by the purchaser"; and

b. Post signs in appropriate areas with KID's easements and ROW's identifying KID's facilities (with locations and design approved by KID)

16) Future review, KID reserves the following rights regarding future review of the plat:

a. KID reserves the right to provide review comments under RCW 58.17.330(1) and RCW 58.17.330(2) in response to future design submittals by the Applicant prior to final plat approval. The scope of these reviews will be limited to Phases that are adjacent to the District's Rights of Way. KID review of construction plans will be consistent with the City of Kennewick's plan review timelines.
b. KID reserves the right to review and comment on the Applicant's plat line revisions for potential additional revisions to protect KID system components for Phases that are adjacent to KID's easements or ROWs.
c. KID reserves the right to review and comment on the Applicant's CC&Rs to evaluate whether they should include any terms regarding protection of KID system components after construction and fencing requirements.
d. KID reserves the right to submit additional comments during the City's review process under the State Environmental Policy Act (SEPA).
e. All subdivisions of land are required to be approved by the KID Board of Directors.

Please provide notice to KID of any Public meeting or hearing where this project will be an agenda item. If you have any questions regarding these comments, please contact me at the address/phone number listed below.

Sincerely,

Jason McShane, P.E.
Engineering/Operations Manager

Enc: Sample Water Master Information
C: LB\correspondence\File: [17-8-29]
R:\Development\The Village at Southridge\Phase 1-4

DOUG CARL • *Capital Projects Director*
622 N. KELLOGG. • KENNEWICK, WA 99336
P: (509) 222-7667 • F: (509) 222-5057
DOUG.CARL@KSD.ORG • WWW.KSD.ORG

June 29, 2016

Wes Romine
Development Services Manager
City of Kennewick
210 W. 6th Ave.
Kennewick, WA 99336

Wes,

This memo is written in regards to your request for the Kennewick School District #17 to address capacity questions in regards to The Village at Southridge Preliminary Plat application. The school district was asked to identify the boundary schools for this development and state if each of the schools were within walking zones or received bussing. The boundary schools for this development are Sagecrest Elementary (Walking Zone), Chinook Middle School (Bussing Zone) and Southridge High School (Walking Zone).

The Kennewick School District has a Ten-Year Plan in place that forecasts future growth. It is impossible to know exactly where pockets of growth may occur, but the district works closely with the City of Kennewick and Benton County to make sure that we own property near projected areas of growth. Having property near potential growth areas allows us to add schools where the students are living, and to avoid additional bussing or redistricting of our boundaries. That being said, we do occasionally have to redistrict to keep our schools within our preferred enrollment numbers.

The Kennewick School District has the capacity to add students at all levels and at the three schools mentioned in this letter. Forecasted growth in additional boundary areas of the Kennewick School District makes it difficult to know if any redistricting could result because of this proposed development.

Sincerely,

Doug Carl

Wes Romine

From: Lorenz,Stephanie E (BPA) - TERR-TRI CITIES RMHQ <selorenz@bpa.gov>
Sent: Thursday, May 26, 2016 3:45 PM
To: Wes Romine
Subject: FW: Preliminary Plat Application PP 16-03/PLN-2016-01360
Attachments: Vicinity Map.pdf; Preliminary Plat Drawing.pdf

Hi Wes,

This proposed development project includes BPA easement area. The applicant recently made application to BPA.
I will be in touch after BPA internal review to discuss the plat provisions that will be applicable to this project.
Thanks!

Stephanie Lorenz
Realty Specialist
Real Property Field Services – TERR/Tri-Cities RMHQ
Bonneville Power Administration
2211 N. Commercial Ave.
Pasco, WA 99301
selorenz@bpa.gov
509.544.4748 or 509.590.7658

From: Rodgers,Deborah (CONTR) - TERR-TRI CITIES RMHQ
Sent: Thursday, May 26, 2016 2:44 PM
To: Lorenz,Stephanie E (BPA) - TERR-TRI CITIES RMHQ
Subject: FW: Preliminary Plat Application PP 16-03/PLN-2016-01360

Thank you,

Deborah Rodgers
Realty Technician |Contractor, ieSolutions
Bonneville Power Administration
Real Property Field Services| TERR/W Richland
2211 North Commercial Avenue, Pasco, WA 99301
509.544.4749

From: Wes Romine [mailto:Wes.Romine@ci.kennewick.wa.us]
Sent: Thursday, May 19, 2016 2:05 PM
To: Alex Sligar Benton Clean Air; Ben Franklin Transit - Kevin Sliger; Ben Franklin Transit Tony Kalmbach; Benton Clean Air Authority - Rob Rodger; Benton Clean Air Authority - Tyler Thompson; Benton County - Mike Shuttleworth; Benton Franklin Health Dept - Rick Dawson; Benton PUD - Bob Roe; Benton PUD - Dave Smith; Benton PUD - Jeff Vosahlo; Benton PUD - Ken Klander; Benton PUD - Rick Sunford; Benton-Franklin Health Dept. - Justin Gerber; Rodgers,Deborah (CONTR) - TERR-TRI CITIES RMHQ; Cottrell II,Joseph E (BPA) - TERR-TRI CITIES RMHQ; Lorenz,Stephanie E (BPA) - TERR-TRI CITIES RMHQ; Cascade Natural Gas - Arnie Garza; Charter Communication - Dean Kelley; Charter Communication - Tyler Chappell; City of Richland - Rick Simon; Columbia Irrigation District; Consolidated Tribes of Umatilla Indian Reservation - Audie Huber; Consolidated Tribes of Umatilla Indian Reservation - Carey L. Miller; Department of Ecology SEPA UNIT; Dept of Fish & Wildlife; Dept of Fish & Wildlife - Michael Ritter; Dept of Natural Resources SEPA Center; Dustin Fisk - Kennewick School District (dustin.fisk@ksd.org); Frontier - Gary Taylor; Frontier -

Gregory Goodwin; Frontier - Randy Lee; Kenewick Irrigation District - Jason McShane; Kennewick Irrigation District - Ben Woodard; Kennewick School District - Doug Carl; Mike Blatman; US Army Corps of Engineers; Williams Pipeline - Audie Neuson; WSDOT - Paul Gonseth; WSDOT - Rick Holmstrom; Yakama Nation - Thalia Sachtleban
Subject: Preliminary Plat Appliction PP 16-03/PLN-2016-01360

Project description:
A Preliminary Plat application has been submitted by Jason Mattox of HDJ Design Group for William Smith Properties, Inc. (Matt Smith) and Golden Pacific Lifestyles, LLC (Scott Espedal). The proposed Preliminary Plat is located south of the future extension of Ridgeline Drive and west of the future extension of S. Sherman Street. The preliminary plat area consists of portions of 3 parcels that total 36.20 acres in size, and is proposed to be divided into 152 lots. The smallest lot size is 5,154 square feet, the largest lot size is 23,221 square feet, and the average lot size is 6,216 square feet. The site is zoned Residential Medium Density (RM). RM zoning districts allow a minimum lot size of 4,000 square feet, however **a Planned Residential Development (PRD 16-01) is currently being processed that covers the preliminary plat area and will allow flexibility with the development standards. A Mitigated Determination of Non-significance (ED #16-16) was issued for PRD 16-01**. The Comprehensive Plan designation is Medium Density Residential.

Please review and submit your comments to the Development Services Division, 210 W. 6th Avenue, Kennewick, WA 99336 or via e-mail, on or before June 2, 2016. The project is tentatively scheduled for the July 11, 2016 Hearing Examiner public hearing.

Thank you,

Wes Romine A.I.A.
Development Services Manager

City of Kennewick
210 W. 6th Avenue
Kennewick, WA 99336
509.585.4558
wes.romine@ci.kennewick.wa.us

January 19, 2016

John Deskins, Traffic Engineer
City of Kennewick
210 W 6th Ave.
Kennewick, WA 99336

RE: The Village at Southridge – Traffic Impact Analysis Letter

This traffic impact analysis (TIA) letter is for The Village at Southridge subdivision to calculate the trip generation, distribution, and assignment as directed in the City of Kennewick's TIA guidelines. The traffic impact fees (TIF) are determined by the number lots and their associated land use. At City staff's direction, a limited scope TIA has been prepared that analyzes the S Sherman Street / Ridgeline Drive intersection.

Project Description

The project proposes an approximately 188 lot Planned Unit Development (PUD). The PUD is a mixture of senior residences, short and long term care facilities. The proposed PUD is located south of Ridgeline Drive and both west and east of S Sherman Street. See Figure 1 for the vicinity map and Figure 2 for the site plan. The PUD proposes 159 detached dwellings, 32 attached dwellings, a mid-rise 120 unit apartment building, and short and long term care facilities. The PUD also includes a club house, scenic overlook, dog park, and walking trails.

The PUD is comprised of Tract A and Tract B. Tract A contains only detached dwelling units, the clubhouse, and dog park. Tract B contains attached dwelling units, an apartment building, care facilities, and the scenic overlook.

The first phase of the PUD will consist of 75 detached dwelling units and is scheduled for completion in 2017. The second phase will include: 84 detached dwelling units, 32 attached dwelling units, a mid-rise 120 unit apartment building, and short and long term care facilities with 180 beds. The second phase will be completed based on the housing market, but we assume 10 years (2027).

The access points are from private streets, with the exception of the nine units that front S Sherman Street that will access directly onto the street. The private streets in Track A are gated, restricting access to the public. The private streets in Track A connect to S Sherman Street at W 38th Street and at Park Boulevard. The proposed private street through Track B, Park Boulevard, is not access restricted and provides connection across Track B from S Sherman Street to Penn Street. See Figure 2 for the access points and internal street system.

Trip Generation

Trip generation estimates were prepared based on the average trip rate for 159 senior adult detached housing units (land use code 252), 32 senior adult attached housing units (land use code 251), 120 senior apartment units (using land use code 252 to capture the senior age restriction), and 180 beds for the short and long term care facilities (620 land use code) from the *ITE Trip Generation Manual,* 9th Edition. The supporting calculations are attached. No adjustments were made for transit, pass-by, or diverted links for the number of trips generated by the proposed development, and are shown in Tables 1 through 8. The trip generation assumptions were reviewed with City staff.

Table **1** – Tract **A** Phase 1– Trip Generation for Senior Detached

Land Use:	252	
Independent Variable:	Dwelling	
Size:	75	
Average Weekday	258	
Total Trips	AM	PM
In	5	10
Out	10	9
Phase **1** Total	15	19

Table **2** – Tract **A** Phase 2– Trip Generation for Senior Detached

Land Use:	252	
Independent Variable:	Dwelling	
Size:	84	
Average Weekday	289	
Total Trips	AM	PM
In	6	11
Out	11	10
Total	17	21

Table **3** – Tract **A** Total - Senior Detached

Land Use:	252	
Independent Variable:	Dwelling	
Size:	159	
Average Weekday	547	
Total Trips	AM	PM
In	11	21
Out	21	19
Tract **A** Total Trips	32	40

Table **4** Tract **B** – Phase **2** - Trip Generation for Senior Attached Cottages

Land Use:	251	
Independent Variable:	Dwelling	
Size:	32	
Average Weekday	118	
2Total Trips	AM	PM
In	2	5
Out	5	4
Total	**7**	**9**

Table **5** – Tract **B** – Phase **2** - Trip Generation for ALF/MC and Rehab

Land Use:	620	
Independent Variable:	Bed	
Size:	180	
Average Weekday	493	
Total Trips	AM	PM
In		13
Out		27
Total		40

Nursing home used – No AM distribution provided by ITE

Table **6** Tract **B** – Phase **2** - Trip Generation for Independent Living Facility (ILF)

Land Use:	251	
Independent Variable:	Dwelling	
Size:	120	
Average Weekday	442	
Total Trips	AM	AM
In	9	20
Out	17	12
Total	26	32

No senior apartments in ITE – Senior housing attached used

Table **7** – Tract **B** – Total Trips

Land Use:	Various	
Independent Variable:	Various	
Size:	Various	
Average Weekday	1,053	
2Total Trips	AM	PM
In	12	38
Out	22	43
Tract **B** Total Trips	33	81

Table **8** - Development Total Trips

Land Use:	Various	
Independent Variable:	Various	
Size:	Various	
Average Weekday	1,600	
Total Trips	AM	PM
In	21	59
Out	43	62
Development Total Trips	64	121

Trip Distribution

The trip distribution for the proposed project is shown on Figure 3. It is based on the PUD senior housing usage, and discussions with City staff. The major assumptions used for the trip distribution are as follows:

- The development is an age restricted community.
- The majority of the residents no longer work outside the home.
- 60% of the trips are attracted toward the highway system, commercial, and medical office land use along US 395.
    1. The remaining 40% will be destine towards commercial land use in the vicinity of W Clearwater Avenue and Columbia Center Boulevard.
    2. Trips from Tract B will be accessing S Sherman Street and the soon to be constructed Penn Street via a private street shown on the site plan as "Park Boulevard."
    3. The City directed the applicant to analyze the S Sherman Street / Ridgeline Drive intersection to identify the proper traffic control and lane configuration to maintain an acceptable level of service (LOS). The LOS includes impacts due to in-process development and the proposed project. Due to the incomplete network and state of in-process trips, the analysis only considers the five year (2022) and 10 year (2027). The 2022 analysis assumes:
        - Bob Olsen Boulevard is complete
        - In-process projects are complete
        - Phase 1 of the project is complete

        The 2027 analysis assumes:
        - Ridgeline Drive is complete to S Clodfelter Road
        - Phase II of the project is complete
- In 2027, the in-process trips go through the S Sherman Street / Ridgeline Drive intersection. The trips originating and destine to the north and east are split 40/60 between S Sherman Street and Ridgeline Drive.

Key Intersections

The PM peak hour project generated trips were distributed to key intersections within one mile for 2022 and 2027. See Figure 3 for trip assignment to key intersections.

Proposed Infrastructure

The project will be extending S Sherman Street. The extension will be full width, including curb, gutter, sidewalks, and raised crosswalks. There will be frontage improvements along Ridgeline Drive, east of S Sherman Street, with ½ street improvements including curb, gutter, and sidewalks. There will be an internal private street network that connects to S Sherman Street on the west and east, W 38th Street on the south, and Penn Street on the east. See Figure 2.

Traffic control will consist of a combination of STOP and YIELD. Street name signs will be placed on top of the STOP or YEILD sign per City Standard Drawing No. 7-2. The type and location of traffic control is noted on Figure 5, with street name signs placed accordingly.

Illumination will be installed with each phase. The proposed luminaire locations are noted on Figure 5.

The S Sherman Street /Ridgeline Drive intersection was checked for the need for auxiliary (right or left turn) lanes. The left turn lanes are typically recommended based on LOS improvements and the analysis concluded a single, right/through/left lane meets acceptable standards. WSDOT Design Manual criteria was used to verify a right turn lane was not needed.

In-Process Projects in the Vicinity

The in-process projects noted by the City, and included in this analysis are: Southridge Terrace, Ridgeline subdivisions, Sage Crest subdivisions (Phases 1, 2A, 2B 3 and 4), Southridge Estates, Southridge Development, The Park, Sage Crest Elementary School, and South Cliff subdivision. The in-process trips were used in place of existing traffic counts and all projects are assumed complete by 2022. The trip distribution was adjusted for 2027 assuming Ridgeline Drive will be complete. The projects and in-process trips through the S Sherman Street / Ridgeline Drive intersection are shown on Figure 4. See the attached in-process tables for 2022 and 2027 for the derived turning movement counts through the S Sherman Street / Ridgeline Drive intersection.

Capacity Analysis

The project has analyzed the intersection of S Sherman Street / Ridgeline Drive for Level of Service (LOS) at five and 10 years out from the start of construction. No year of opening analysis was performed. Due to the type of development (age restricted) and incomplete transportation system in the vicinity of the project, no other intersections will be analyzed. See Figure 5 for the 2022 and 2027 volumes entering the S Sherman Street / Ridgeline Drive intersection. The LOS results are show in Table 1.

Table 1
Estimated 2022 and 2027 Level of Service
For Study Area Intersection

INTERSECTION *(critical movement for STOP controlled intersections)*	**2022 Weekday PM Level of Service**					
	W/O Project			**With Project**		
	LOS	***Delay (sec)***	***Queue***	***LOS***	***Delay (sec)***	***Queue***
S Sherman Street / Ridgeline Drive – (SB through)	B	11.5	25’	B	11.8	25’
	2027 Weekday PM Level of Service					
	W/O Project			**With Project**		
S Sherman Street / Ridgeline Drive – (SB through)	B	11.5	25’	B	12.0	25’

The intersection was analyzed using two-way STOP control for the north-south movement on S Sherman Street. Table 1 notes the estimated 2022 level of service conditions for the intersection of S Sherman Street / Ridgeline Drive is within the City of Kennewick LOS standards. It also shows that the estimated 2027 level of service conditions for the intersection of S Sherman Street / Ridgeline Drive is within the City of Kennewick LOS standards.

2022 Design Year Level of Service Mitigation

The intersection operates at an acceptable 2022 level of service, LOS B. No project mitigation is recommended for the 2022 design year.

2027 Design Year Level of Service Mitigation

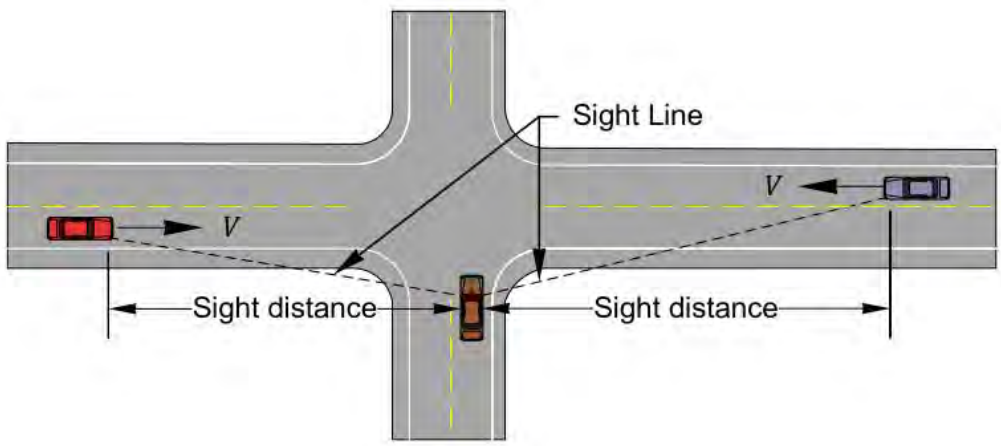
The intersection operates at an acceptable 2027 level of service, LOS B. No project mitigation is recommended for the 2027 design year.

Analysis Limitations

The LOS analysis accounts for existing projects in-process, the proposed project, and known roadway extensions of Bob Olsen Boulevard and Ridgeline Drive. It does not account for trips tributary to Ridgeline Drive west of S Sherman Street, previously proposed Urban Growth Area expansion, or possible new I-82 interchanges between Badger Road and US 395. This analysis is beyond the scope of this study, but a subarea analysis is recommended to better anticipate the transportation system in the area, including the final build out width of Ridgeline Drive.

Sight Distance at Site Access Locations

The proposed site accesses onto S Sherman Street will need to have a minimum of 275 feet of sight distance to the north and south, with an assumed speed limit of 25 MPH. A typical sight distance triangle for the access driveways onto S Sherman Street and the newly constructed intersections has been provided.



No sight distance issues are anticipated with the site access points. As none of the access points currently exist, when the project and the associated access points are constructed, they will need to meet the AASHTO sight distance requirements. If the posted speed limit for any of the future streets are greater than 25 MPH, the sight distance will need to be increased per AASHTO requirements. The final design should assure the sight distance triangle remains unrestricted.

Traffic Calming

Traffic calming was investigated as a component of this traffic analysis. One raised crosswalk is being proposed just north of the proposed Park Boulevard at an uncontrolled pedestrian crossing. Midway between Park Boulevard and the S Sherman Street / W 38th Avenue intersection, an additional traffic calming measure, in the form of a "speed cushion" (an emergency vehicle friendly speed hump) is recommend to address safety concerns of residential land use fronting a collector arterial and a school walk route. Figure 4 shows the calming plan based on staff comments and professional judgment.

Traffic Impact Fees

The project impact fees are noted in Table 2, based on the number and type of lot proposed by the development.

Table 2 – Traffic Impact Fees

Land Use:	ITE Code	Type	Number		Cost	Total
Senior Detached – Tract A – Phase 1	252	Dwelling	66		$243	$16,038
Senior Detached – Tract A – Phase 2	252	Dwelling	84		$243	$20,412
Senior Detached – Tract A – 9 Lots	252	Dwelling	9		$243	$2,187
Senior Attached – Tract B	251	Dwelling	32		$243	$7,776
ALF/MC	620	Bed	120		$198	$23,760
Rehab	620	Bed	60		$198	$11,880
ILF	251	Unit	120		$243	$23,760
					Total Project TIF fees	$105,813

Conclusions

The project impacts, in combination with the in-process trips, does not require traffic control beyond the minimum two-way STOP control. To maintain an acceptable LOS, no auxiliary additional lanes are needed. Full buildout of the intersection should be based on traffic growth associated with the completion of Ridgeline Drive.

Recommendations

The following traffic improvements are recommended:

- S Sherman Street / Ridgeline Drive Intersection – Construct intersection with 2-way STOP controls on S Sherman Street.
- S Sherman Street between Ridgeline Drive and W 38th Avenue – Construct standard collector roadway with traffic calming as described above to maintain moderate speed traffic on S Sherman Street.
- The S Sherman Street / W 38th Avenue intersection / private street should only be STOP controlled on the private street approach.
- The internal private street intersections should be STOP or YIELD control as shown on Figure 5.
- Street lights should be installed based on the locations shown on Figure 5.
- The City of Kennewick should consider preparing a subarea study for the area tributary to Ridgeline Street.

If you have any questions or comments, feel free to contact me at my email address manixj@HDJDG.com or my cell phone at 360-607-1854.

Respectfully,
John Manix, PE

HDJ Design Group, PLLC

1/19/16

Attachments:

- Trip Generation Calculation Summary
- Figure 1 – Vicinity Map
- Figure 2 – Site Plan
- Figure 3 – Trip Distribution
- Figure 4 – In-Process Trips
- In-process Trips – 2022 Trip Distribution
- In Process Trips – 2027 Trip Distribution
- Figure 5 – Traffic Calming, Signing and Illumination
- Level of Service
    - 2022 without project
    - 2022 with project
    - 2027 without project
    - 2027 with project

ITE Trip Generation

Trip Generation Based on Weighted Average Rates

HDJ Design Group

General			
Land Use Code	Senior Adult Housing Detached (dw)		
Independent Variable	Dwellings		
Size (X)		75	
Land Use Code		252	

Date:	Analyst:	Project:
1/11/2016	Sharar	Village @ Southridge

	In	Out	Total
Average Weekday	129	129	258
New Trips	129	129	258
Weekday AM Peak	5	10	15
New Trips	5	10	15
Weekday PM peak	10	9	19
New Trips	10	9	19

Per Trip Generation Manual, 9th Edition

Analysis Period	Weekday		
Average Rate	**Rate**		**Trips**
	3.44		258
Entering / Exiting			
% Entering	50%		129
% Exiting	50%		129
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		129	129
Internal Trips		0	0
Passby Trips	0	0	0
New Trips		129	129

Analysis Period	Weekday AM Peak for adjacent streets		
Average Rate	**Rate**		**Trips**
	0.2		15
Entering / Exiting			
% Entering	34%		5
% Exiting	66%		10
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		5	10
Internal Trips		0	0
Passby Trips		0	0
New Trips		5	10

Analysis Period	Weekday PM peak for adjacent s		
Average Rate	**Rate**		**Trips**
	0.25		19
Entering / Exiting			
% Entering	54%		10
% Exiting	46%		9
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		10	9
Internal Trips		0	0
Passby Trips		0	0
New Trips		10	9

ITE Trip Generation

Trip Generation Based on Weighted Average Rates

HDJ Design Group

General			
Land Use Code	Senior Adult Housing Detached (dw)		
Independent Variable	Dwellings		
Size (X)		84	
Land Use Code		252	

Date:	Analyst:	Project:
1/11/2016	Sharar	Village @ Southridge

	In	Out	Total
Average Weekday	144	144	289
New Trips	144	144	289
Weekday AM Peak	6	11	17
New Trips	6	11	17
Weekday PM peak	11	10	21
New Trips	11	10	21

Per Trip Generation Manual, 9th Edition

Analysis Period	Weekday		
Average Rate	**Rate**		**Trips**
	3.44		289
Entering / Exiting			
% Entering	50%		144
% Exiting	50%		144
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		144	144
Internal Trips		0	0
Passby Trips	0	0	0
New Trips		144	144

Analysis Period	Weekday AM Peak for adjacent streets		
Average Rate	**Rate**		**Trips**
	0.2		17
Entering / Exiting			
% Entering	34%		6
% Exiting	66%		11
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		6	11
Internal Trips		0	0
Passby Trips		0	0
New Trips		6	11

Analysis Period	Weekday PM peak for adjacent s		
Average Rate	**Rate**		**Trips**
	0.25		21
Entering / Exiting			
% Entering	54%		11
% Exiting	46%		10
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		11	10
Internal Trips		0	0
Passby Trips		0	0
New Trips		11	10

ITE Trip Generation

Trip Generation Based on Weighted Average Rates

HDJ Design Group

General			
Land Use Code	Senior Adult Housing Attached (dw)		
Independent Variable	Dwellings		
Size (X)		32	
Land Use Code		251	

Date:	Analyst:	Project:
1/11/2016	Sharar	Village @ Southridge

	In	Out	Total
Average Weekday	59	59	118
New Trips	59	59	118
Weekday AM Peak	2	5	7
New Trips	2	5	7
Weekday PM peak	5	3	9
New Trips	5	3	9

Per Trip Generation Manual, 9th Edition

Analysis Period	Weekday		
Average Rate	**Rate**		**Trips**
	3.68		118
Entering / Exiting			
% Entering	50%		59
% Exiting	50%		59
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		59	59
Internal Trips		0	0
Passby Trips	0	0	0
New Trips		59	59

Analysis Period	Weekday AM Peak for adjacent streets		
Average Rate	**Rate**		**Trips**
	0.22		7
Entering / Exiting			
% Entering	35%		2
% Exiting	65%		5
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		2	5
Internal Trips		0	0
Passby Trips		0	0
New Trips		2	5

Analysis Period	Weekday PM peak for adjacent s		
Average Rate	**Rate**		**Trips**
	0.27		9
Entering / Exiting			
% Entering	61%		5
% Exiting	39%		3
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		5	3
Internal Trips		0	0
Passby Trips		0	0
New Trips		5	3

ITE Trip Generation

Trip Generation Based on Weighted Average Rates

HDJ Design Group

General

Land Use Code	Nursing Home		
Independent Variable		Beds	
Size (X)		180	
Land Use Code		620	

Date:	Analyst:	Project:
1/11/2016	Sharar	Village @ Southridge

	In	Out	Total
Average Weekday	247	247	493
New Trips	247	247	493
Weekday AM Peak	######	#####	31
New Trips	######	#####	#VALUE!
Weekday PM peak	13	27	40
New Trips	13	27	40

Per Trip Generation Manual, 9th Edition - No AM distribution is provided

Analysis Period	Weekday		
Average Rate	**Rate**		**Trips**
	2.74		493
Entering / Exiting			
% Entering	50%		247
% Exiting	50%		247
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		247	247
Internal Trips		0	0
Passby Trips	0	0	0
New Trips		247	247

0

Analysis Period	Weekday AM Peak for adjacent streets		
Average Rate	**Rate**		**Trips**
	0.17		31
Entering / Exiting			
% Entering			#VALUE!
% Exiting			#VALUE!
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		#####	#VALUE!
Internal Trips		#####	#VALUE!
Passby Trips		#####	#VALUE!
New Trips		#####	#VALUE!

Analysis Period	Weekday PM peak for adjacent		
Average Rate	**Rate**		**Trips**
	0.22		40
Entering / Exiting			
% Entering	33%		13
% Exiting	67%		27
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		13	27
Internal Trips		0	0
Passby Trips		0	0
New Trips		13	27

ITE Trip Generation

Trip Generation Based on Weighted Average Rates

HDJ Design Group

General			
Land Use Code	Senior Adult Housing Attached (dw)		
Independent Variable	Dwellings		
Size (X)		120	
Land Use Code		251	

Date:	Analyst:	Project:
1/11/2016	Sharar	Village @ Southridge

	In	Out	Total
Average Weekday	221	221	442
New Trips	221	221	442
Weekday AM Peak	9	17	26
New Trips	9	17	26
Weekday PM peak	20	13	32
New Trips	20	13	32

Per Trip Generation Manual, 9th Edition - No Weekday distribution data is provided - Senior Attached is assumed

Analysis Period	Weekday		
Average Rate	**Rate**		**Trips**
	3.68		442
Entering / Exiting			
% Entering	50%		221
% Exiting	50%		221
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		221	221
Internal Trips		0	0
Passby Trips	0	0	0
New Trips		221	221

Analysis Period	Weekday AM Peak for adjacent streets		
Average Rate	**Rate**		**Trips**
	0.22		26
Entering / Exiting			
% Entering	35%		9
% Exiting	65%		17
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		9	17
Internal Trips		0	0
Passby Trips		0	0
New Trips		9	17

Analysis Period	Weekday PM peak for adjacent s		
Average Rate	**Rate**		**Trips**
	0.27		32
Entering / Exiting			
% Entering	61%		20
% Exiting	39%		13
New Trips			
% internal	0		
% pass by	0		
		In	Out
Total Trips		20	13
Internal Trips		0	0
Passby Trips		0	0
New Trips		20	13

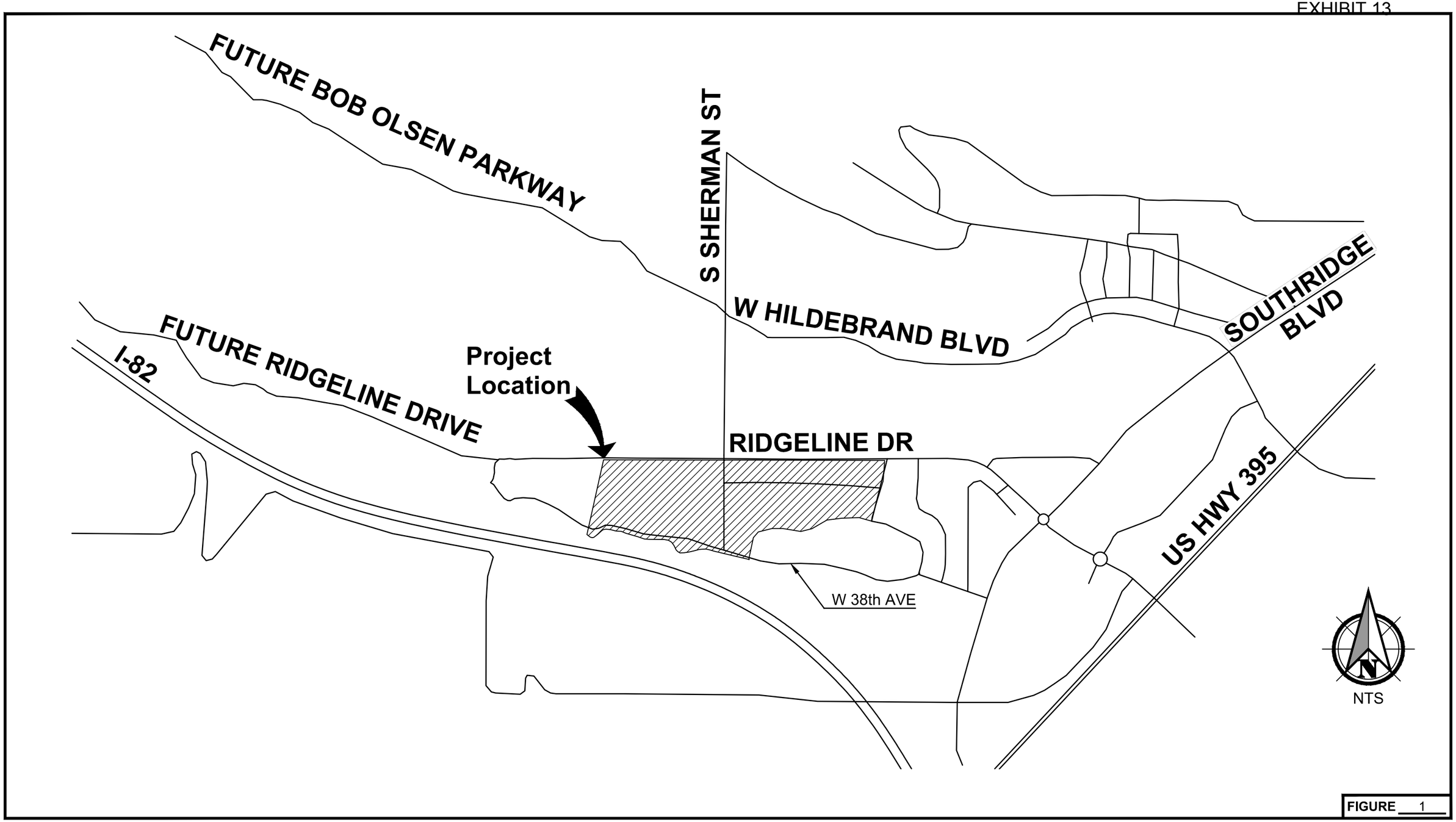


FIGURE 1

HDJ DESIGN GROUP PLLC
engineers | landscape architects | planners | surveyors
314 W 15th Street
Vancouver, WA 98660-2927
360/695-3488
503/924-4005
360/695-8767 fax
Internet: www.hdjdg.com

Vicinity Map
The Village at Southgate

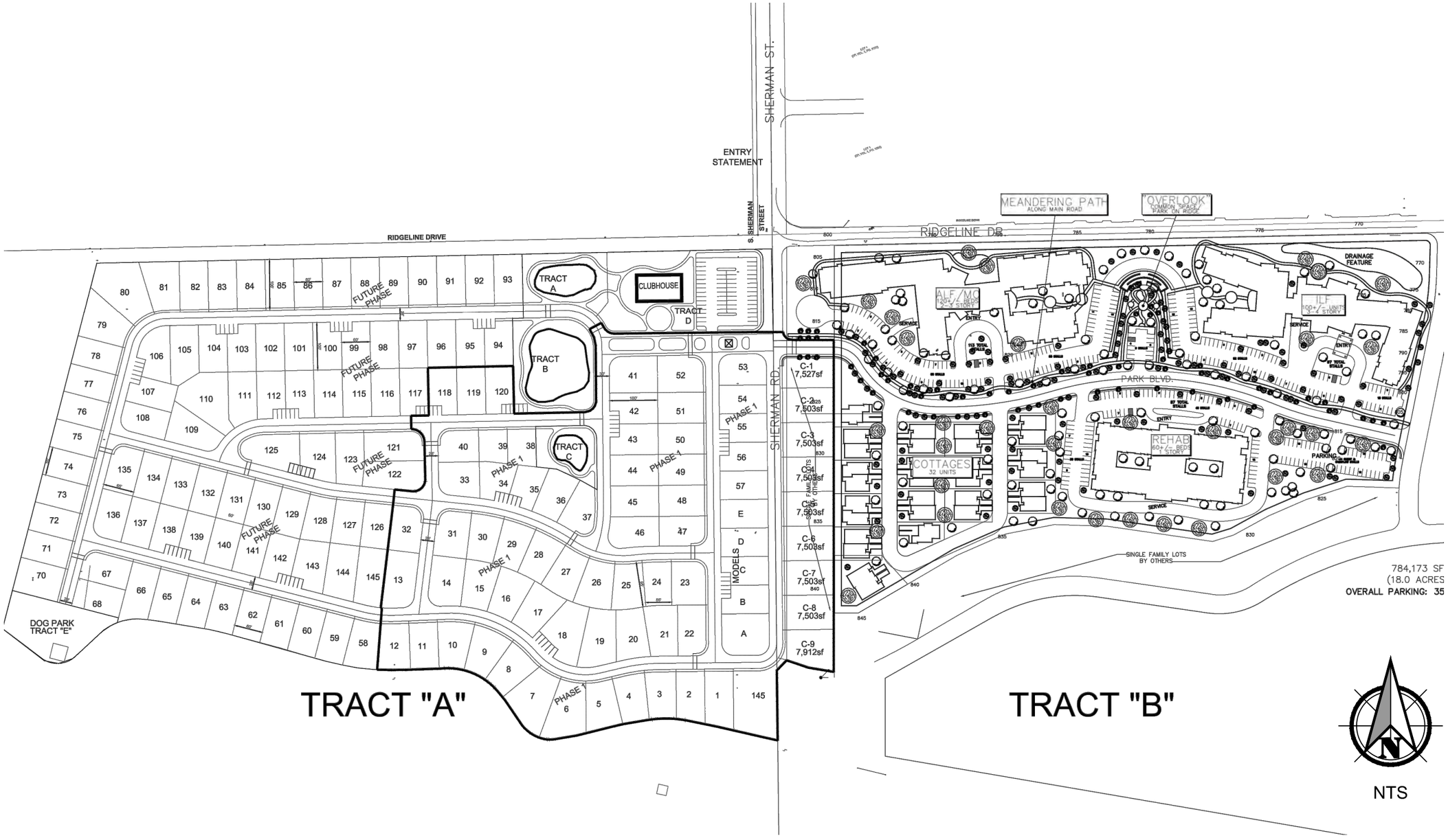


FIGURE 2

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Vancouver, WA 98660-2927
360/695-3488
503/924-4005
360/695-8767 fax
Internet: www.hdjdg.com

Site Plan
The Village at Southgate

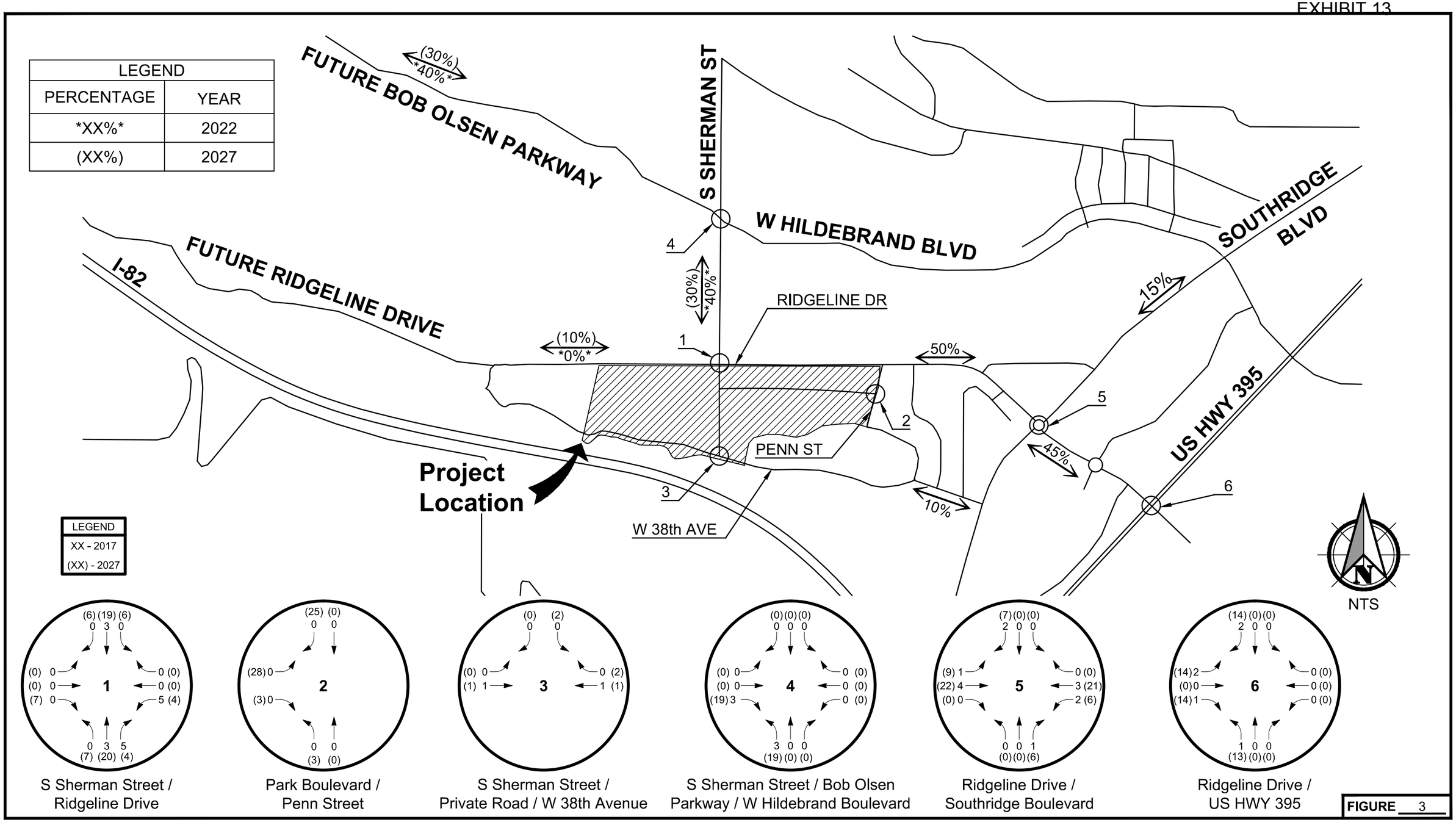

FIGURE 3

HDJ DESIGN GROUP PLLC
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Vancouver, WA 98660-2927
360/695-3488
503/924-4005
360/695-8767 fax
Internet: www.hdjdg.com

Trip Distribution & Trip Assignment

The Village at Southgate

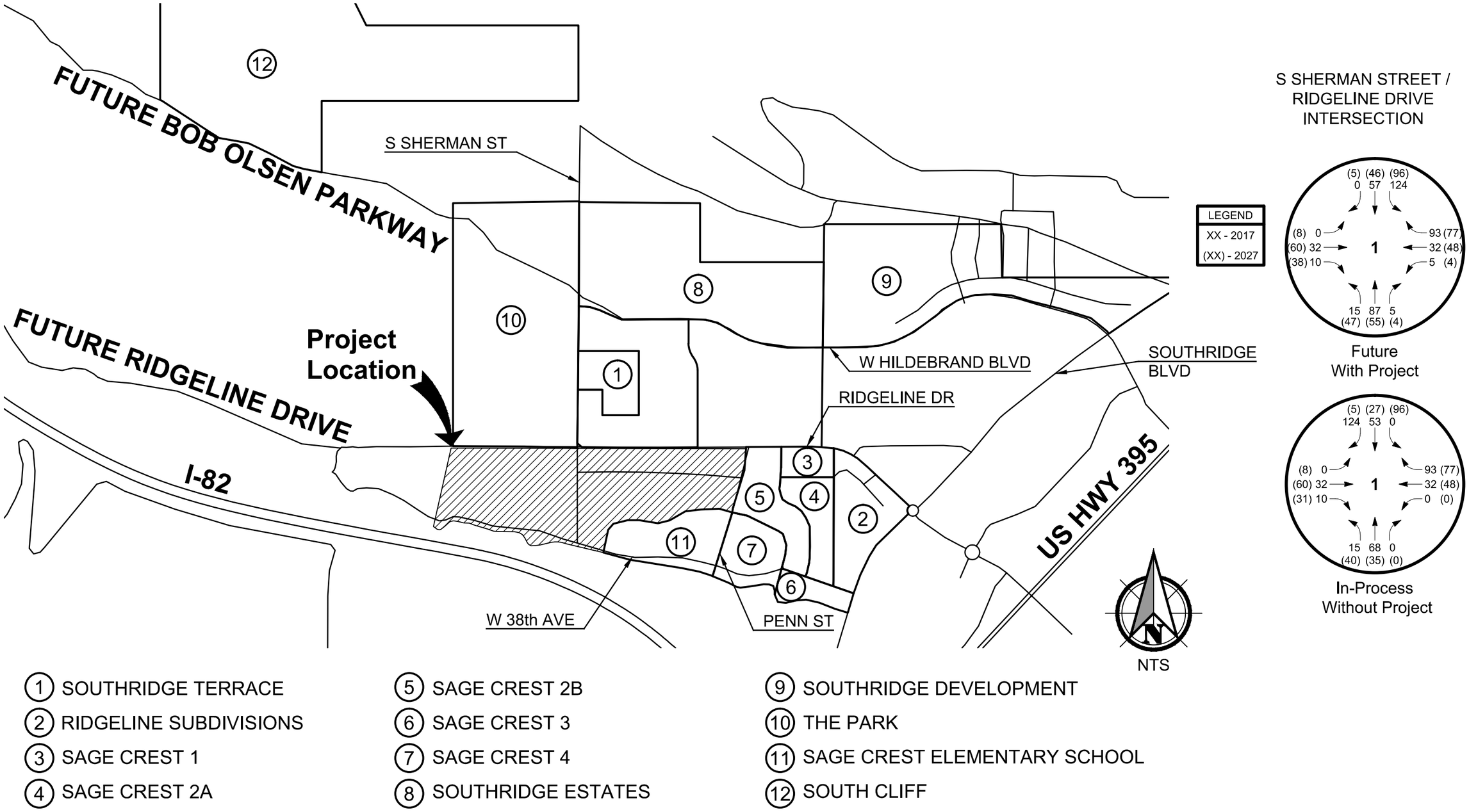

FIGURE 4

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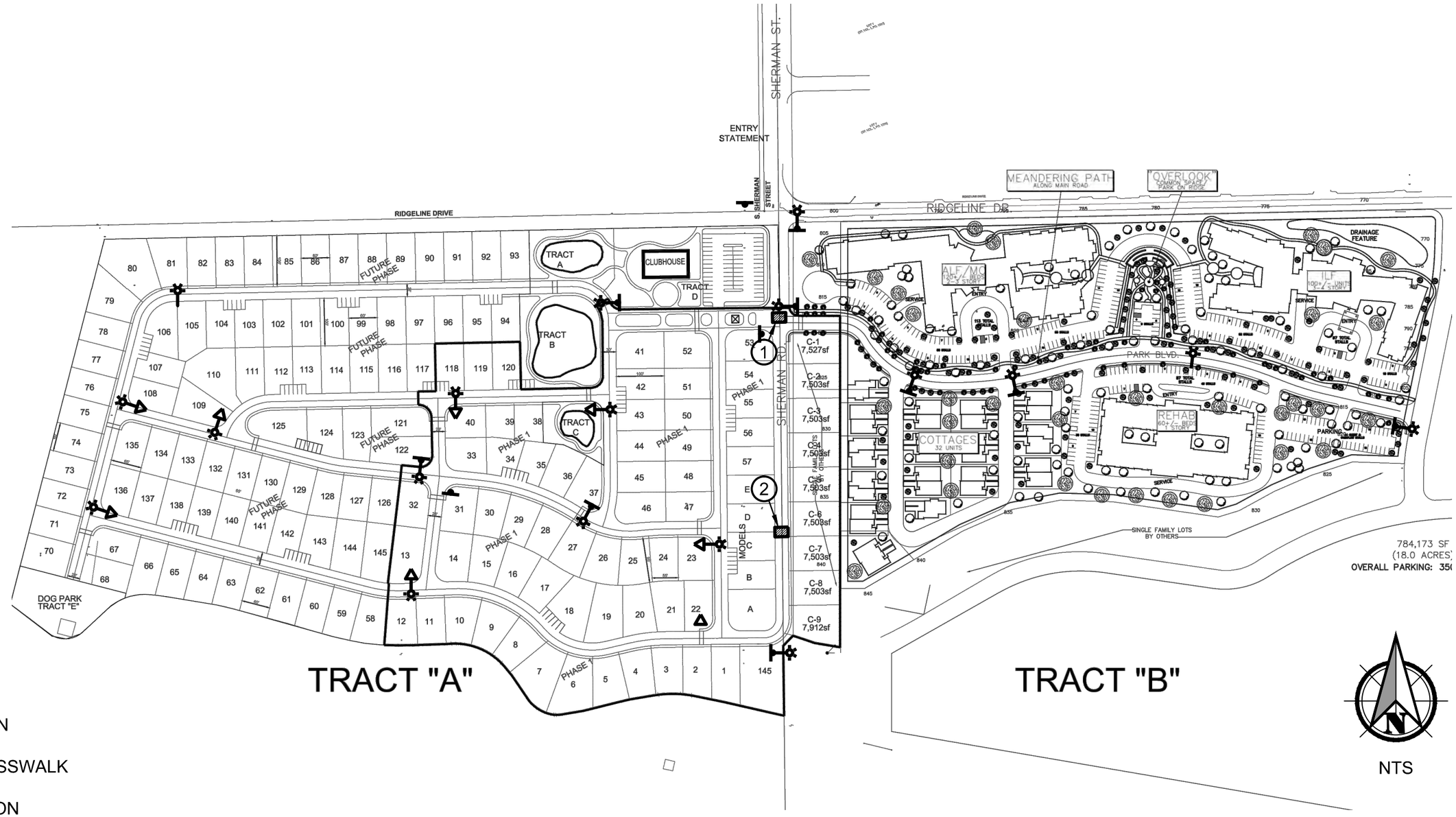
503/924-4005
360/695-8767 fax
Internet: www.hdjdg.com

In-Process Trips
The Village at Southgate

2022 Trip Distribution
Assume Ridgeline is NOT complete

Development	Number	Number of units	Total PM Trips		Percent Trips Through Intersection	NB			SB			EB			WB			Comments
	on Map	and type	In	out		R	T	L	R	T	L	R	T	L	R	T	L	
Southridge Terrace	1	30 homes	22	13	23%	0	0	0	0	0	3	0	0	0	5	0	0	Based on Trip Gen letter
Ridgeline Subdivision	2	46 homes and 30 apt	41	24	35%	0	0	0	0	0	14	0			8		0	TA split 50/50 at intersction
Sage Crest 1	3	16 homes	11	7	35%	0	0	0	0	0	4	0	0	0	2	0	0	TA split 50/50 at intersction
Sage Crest 2A	4	19 homes	12	7	35%	0	0	0	0	0	4	0	0	0	2	0	0	TA split 50/50 at intersction
Sage Crest 2B	5	19 homes	12	7	35%	0	0	0	0	0	4	0	0	0	2	0	0	TA split 50/50 at intersction
Sage Crest 3	6	39 homes	25	14	35%	0	0	0	0	0	8	0	0	0	4	0	0	TA split 50/50 at intersction
Sage Crest 4	7	27 homes	17	10	35%	0	0	0	0	0	6	0	0		4	0	0	TA split 50/50 at intersction
Southridge Estates	8	269 homes	169	100	10%	0	0	0	0	0	16	0	0	0	10	0	0	TA split 50/50 at intersction
Southridge Development	9	262 homes	165	97	5%	0	8	0	0	5	0	0	0	0	0	0	0	TA split 50/50 at intersction
The Park	10	553 homes	320	185	20%	0	0	0	0	0	32	0	32	0	32	32	0	Based on Trip Gen letter
Sage Crest Elementary	11	5,694 SF	78	99	75%	0	60	15	0	48	0	10	0	0	0	0	0	Based on Trip Gen letter
SouthCliff	12	414 homes	261	153	Varies	0	0	0	0	0	33	0	0	0	24	0	0	Based on Trip Gen letter
		776 homes			Total TMC	0	68	15	0	53	124	10	32	0	93	32	0	
	TA - Trip assignment				Sum of TMC		83			177			42			125		

Development	Number	Number of units	Total PM Trips		Percent Trips Through Intersection	NB			SB			EB			WB			Comments
	on Map	and type	In	out		R	T	L	R	T	L	R	T	L	R	T	L	
Southridge Terrace	1	30 homes	22	13	23%	0	0	0	0	0	3	0	0	0	5	0	0	Based on Trip Gen letter
Ridgeline Subdivision	2	46 homes and 30 apt	41	24	35%	0	0	0	0	0	7	0	7		4	4	0	TA split 50/50 at intersction
Sage Crest 1	3	16 homes	11	7	35%	0	0	0	0	0	2	0	2	0	1	1	0	TA split 50/50 at intersction
Sage Crest 2A	4	19 homes	12	7	35%	0	0	0	0	0	2	0	2	0	1	1	0	TA split 50/50 at intersction
Sage Crest 2B	5	19 homes	12	7	35%	0	0	0	0	0	2	0	2	0	1	1	0	TA split 50/50 at intersction
Sage Crest 3	6	39 homes	25	14	35%	0	0	0	0	0	4	0	4	0	2	2	0	TA split 50/50 at intersction
Sage Crest 4	7	27 homes	17	10	35%	0	0	0	0	0	3	0	3		2	2	0	TA split 50/50 at intersction
Southridge Estates	8	269 homes	169	100	10%	0	0	0	0	0	8	0	8	0	5	5	0	TA split 50/50 at intersction
Southridge Development	9	262 homes	165	97	5%	0	0	0	5	0	0	0	0	8	0	0	0	TA split 50/50 at intersction
The Park	10	553 homes	320	185	20%	0	0	0	0	0	32	0	32	0	32	32	0	Based on Trip Gen letter
Sage Crest Elementary	11	5,694 SF	78	99	75%	0	35	40	0	27	0	31	0	0	0	0	0	Based on Trip Gen letter
SouthCliff	12	414 homes	261	153	Varies	0	0	0	0	0	33	0	0	0	24	0	0	Based on Trip Gen letter
		776 homes			Total TMC	0	35	40	5	27	96	31	60	8	77	48	0	
	TA - Trip assignment				Sum of TMC	75			128			99			125			



LEGEND

- STOP SIGN
- YIELD SIGN
- ILLUMINATION
- (1) RAISED CROSSWALK
- (2) SPEED CUSION

STREET NAME SIGNING, SIGN PLACEMENT, AND POST TYPE PER CITY STANDARD DRAWINGS 7-1 AND 7-2.

FIGURE 5

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Internet: www.hdjdg.com

Traffic Calming, Signing and Illumination Plan
The Village at Southgate

Scenario Report

Scenario:	2022 Future PM w/o project
Command:	W/O Project
Volume:	PM
Geometry:	Default Geometry
Impact Fee:	Default Impact Fee
Trip Generation:	PM
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	Default Configuration

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2022 Future PM w/o project Fri Jan 15, 2016 12:43:24 Page 2-1

Turning Movement Report
PM

Volume	Northbound			Southbound			Eastbound			Westbound			Total
Type	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Volume
#1 Ridgeline Dr/ S Sherman St													
Base	15	68	0	124	53	0	0	32	10	0	32	93	427
Added	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	15	68	0	124	53	0	0	32	10	0	32	93	427

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2022 Future PM w/o project Fri Jan 15, 2016 12:43:24 Page 3-1

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in D/V
# 1 Ridgeline Dr/ S Sherman St	B	11.5	0.000	B	11.5	0.000	+ 0.000

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```
2022 Future PM w/o project Fri Jan 15, 2016 12:43:24                Page 4-1
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
                      Level Of Service Computation Report
           2000 HCM Unsignalized Method (Future Volume Alternative)
*******************************************************************************
Intersection #1 Ridgeline Dr/ S Sherman St
*******************************************************************************
Average Delay (sec/veh):      6.8       Worst Case Level Of Service: B[ 11.5]
*******************************************************************************
Street Name:           S Sherman St                     Ridgeline Dr.
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign       Uncontrolled     Uncontrolled
Rights:           Include          Include          Include          Include
Lanes:        0  1  0  0  0    0  1  0  0  0    0  0  0  1  0    0  0  0  1  0
------------|---------------||---------------||---------------||---------------|
Volume Module:PM Peak Hour
Base Vol:      15   68     0   124   53     0     0   32    10     0   32    93
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   15   68     0   124   53     0     0   32    10     0   32    93
Added Vol:      0    0     0     0    0     0     0    0     0     0    0     0
In-Process:     0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:   15   68     0   124   53     0     0   32    10     0   32    93
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.92 0.92  0.92  0.92 0.92  0.92  0.92 0.92  0.92  0.92 0.92  0.92
PHF Volume:    16   74     0   135   58     0     0   35    11     0   35   101
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
FinalVolume:   16   74     0   135   58     0     0   35    11     0   35   101
Critical Gap Module:
Critical Gp:  7.1  6.5 xxxxx   7.1  6.5 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
FollowUpTim:  3.5  4.0 xxxxx   3.5  4.0 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
------------|---------------||---------------||---------------||---------------|
Capacity Module:
Cnflict Vol:  154  176 xxxxx   163  131 xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
Potent Cap.:  817  721 xxxxx   807  763 xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
Move Cap.:    770  721 xxxxx   744  763 xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
Volume/Cap:  0.02 0.10  xxxx  0.18 0.08  xxxx  xxxx xxxx  xxxx  xxxx xxxx  xxxx
------------|---------------||---------------||---------------||---------------|
Level Of Service Module:
2Way95thQ:   xxxx xxxx xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
Control Del:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
LOS by Move:   *    *     *     *    *     *     *    *     *     *    *     *
Movement:     LT - LTR - RT    LT - LTR - RT    LT - LTR - RT    LT - LTR - RT
Shared Cap.:  729 xxxx xxxxx   750 xxxx xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
SharedQueue:  0.4 xxxx xxxxx   1.0 xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shrd ConDel: 10.6 xxxx xxxxx  11.5 xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shared LOS:    B    *     *     B    *     *     *    *     *     *    *     *
ApproachDel:      10.6             11.5           xxxxxx           xxxxxx
ApproachLOS:        B                B                *                *
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```

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2022 Future PM w/o project Fri Jan 15, 2016 12:43:24 Page 5-1

Base Queue Report (cars)

Node	Intersection	Northbound L	Northbound -- T	Northbound -- R	Southbound L	Southbound -- T	Southbound -- R	Eastbound L	Eastbound -- T	Eastbound -- R	Westbound L	Westbound -- T	Westbound -- R
#1	[2Way95thQ]:	0.4	0.4	xxxx	1.0	1.0	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx

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Future Queue Report (cars)

Node	Intersection	Northbound L	Northbound -- T	Northbound -- R	Southbound L	Southbound -- T	Southbound -- R	Eastbound L	Eastbound -- T	Eastbound -- R	Westbound L	Westbound -- T	Westbound -- R
#1	[2Way95thQ]:	0.4	0.4	xxxx	1.0	1.0	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx

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Scenario Report

Scenario:	2022 Future PM
Command:	W/ Project
Volume:	PM
Geometry:	Default Geometry
Impact Fee:	Default Impact Fee
Trip Generation:	PM
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	Default Configuration

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2022 Future PM Fri Jan 15, 2016 13:48:46 Page 2-1

Trip Generation Report
PM Trip Generation from ITE Trip Generation Manual
Forecast for PM

Zone #	Subzone	Amount	Units	Rate In	Rate Out	Trips In	Trips Out	Total Trips	% Of Total
1	Phase 1	1.00	Senior Housing	10.00	9.00	10	9	19	100.0
	Zone 1 Subtotal					10	9	19	100.0
TOTAL						10	9	19	100.0

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2022 Future PM Fri Jan 15, 2016 13:48:46 Page 3-1

Trip Distribution Report
Trip Distribution
Percent Of Trips Default

Zone	To Gates 1	2	3	4
1	0.0	40.0	50.0	10.0

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2022 Future PM Fri Jan 15, 2016 13:48:46 Page 4-1

Turning Movement Report
PM

Volume	Northbound			Southbound			Eastbound			Westbound			Total
Type	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Volume
#1 Ridgeline Dr/ S Sherman St													
Base	15	68	0	124	53	0	0	32	10	0	32	93	427
Added	0	4	5	0	4	0	0	0	0	5	0	0	18
Total	15	72	5	124	57	0	0	32	10	5	32	93	445

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2022 Future PM Fri Jan 15, 2016 13:48:46 Page 5-1

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in D/V
# 1 Ridgeline Dr/ S Sherman St	B	11.5	0.000	B	11.8	0.000	+ 0.333

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```
2022 Future PM             Fri Jan 15, 2016 13:48:46                 Page 6-1
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
                       Level Of Service Computation Report
           2000 HCM Unsignalized Method (Future Volume Alternative)
*******************************************************************************
Intersection #1 Ridgeline Dr/ S Sherman St
*******************************************************************************
Average Delay (sec/veh):      7.1       Worst Case Level Of Service: B[ 11.8]
*******************************************************************************
Street Name:           S Sherman St                     Ridgeline Dr.
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign       Uncontrolled     Uncontrolled
Rights:           Include          Include          Include          Include
Lanes:        0  0  1! 0  0    0  1  0  0  0    0  0  0  1  0    0  0  1! 0  0
------------|---------------||---------------||---------------||---------------|
Volume Module:PM Peak Hour
Base Vol:      15   68     0   124   53     0     0   32    10     0   32    93
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   15   68     0   124   53     0     0   32    10     0   32    93
Added Vol:      0    4     5     0    4     0     0    0     0     5    0     0
In-Process:     0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:   15   72     5   124   57     0     0   32    10     5   32    93
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.92 0.92  0.92  0.92 0.92  0.92  0.92 0.92  0.92  0.92 0.92  0.92
PHF Volume:    16   78     5   135   62     0     0   35    11     5   35   101
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
FinalVolume:   16   78     5   135   62     0     0   35    11     5   35   101
Critical Gap Module:
Critical Gp:  7.1  6.5   6.2   7.1  6.5 xxxxx xxxxx xxxx xxxxx   4.1 xxxx xxxxx
FollowUpTim:  3.5  4.0   3.3   3.5  4.0 xxxxx xxxxx xxxx xxxxx   2.2 xxxx xxxxx
------------|---------------||---------------||---------------||---------------|
Capacity Module:
Cnflict Vol:  167  187    40   178  142 xxxxx  xxxx xxxx xxxxx    46 xxxx xxxxx
Potent Cap.:  801  711  1037   788  753 xxxxx  xxxx xxxx xxxxx  1575 xxxx xxxxx
Move Cap.:    749  709  1037   716  750 xxxxx  xxxx xxxx xxxxx  1575 xxxx xxxxx
Volume/Cap:  0.02 0.11  0.01  0.19 0.08  xxxx  xxxx xxxx  xxxx  0.00 xxxx  xxxx
------------|---------------||---------------||---------------||---------------|
Level Of Service Module:
2Way95thQ:   xxxx xxxx xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx   0.0 xxxx xxxxx
Control Del:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx   7.3 xxxx xxxxx
LOS by Move:   *    *     *     *    *     *     *    *     *     A    *     *
Movement:     LT - LTR - RT    LT - LTR - RT    LT - LTR - RT    LT - LTR - RT
Shared Cap.: xxxx  728 xxxxx   726 xxxx xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
SharedQueue:xxxxx  0.5 xxxxx   1.1 xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shrd ConDel:xxxxx 10.7 xxxxx  11.8 xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shared LOS:    *    B     *     B    *     *     *    *     *     *    *     *
ApproachDel:      10.7             11.8           xxxxxx           xxxxxx
ApproachLOS:        B                B                *                *
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```

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2022 Future PM Fri Jan 15, 2016 13:48:46 Page 7-1

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Future Volume Alternative

Intersection #1 Ridgeline Dr/ S Sherman St

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
HevVeh:	0%	0%	0%	0%
Grade:	0%	0%	0%	0%
Peds/Hour:	0	0	0	0
LaneWidth:	12 feet	12 feet	12 feet	12 feet

Pedestrian Walk Speed: 4.00 feet/sec
Time Period: 0.25 hour

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2022 Future PM Fri Jan 15, 2016 13:48:46 Page 8-1

Project Trips Report
PM

Node Intersection	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R
Zone #1: Phase 1												
1 Ridgeline Dr/	0	4	5	0	4	0	0	0	0	5	0	0

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2022 Future PM Fri Jan 15, 2016 13:48:46 Page 9-1

Base Queue Report (cars)

Node	Intersection	Northbound L	Northbound -- T	Northbound -- R	Southbound L	Southbound -- T	Southbound -- R	Eastbound L	Eastbound -- T	Eastbound -- R	Westbound L	Westbound -- T	Westbound -- R
#1	[2Way95thQ]:	0.4	0.4	xxxx	1.0	1.0	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx

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2022 Future PM Fri Jan 15, 2016 13:48:46 Page 10-1

Future Queue Report (cars)

Node	Intersection	Northbound L	Northbound --	Northbound T	Northbound --	Northbound R	Southbound L	Southbound --	Southbound T	Southbound --	Southbound R	Eastbound L	Eastbound --	Eastbound T	Eastbound --	Eastbound R	Westbound L	Westbound --	Westbound T	Westbound --	Westbound R
#1	[2Way95thQ]:	0.5	0.5	0.5	1.1	1.1	xxxx	xxxx	xxxx	xxxx	0.0	xxxx	xxxx								

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Scenario Report

Scenario:	2027 Future w/o project - PM
Command:	W/ Project
Volume:	PM
Geometry:	Default Geometry
Impact Fee:	Default Impact Fee
Trip Generation:	PM
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	Default Configuration

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2027 Future w/o project - PTue Jan 19, 2016 14:53:05 Page 2-1

Trip Generation Report
PM Trip Generation from ITE Trip Generation Manual
Forecast for PM

Zone #	Subzone	Amount	Units	Rate In	Rate Out	Trips In	Trips Out	Total Trips	% Of Total
1	Phase 1	1.00	Senior Housing	10.00	9.00	10	9	19	100.0
	Zone 1 Subtotal					10	9	19	100.0
TOTAL						10	9	19	100.0

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Trip Distribution Report
Trip Distribution
Percent Of Trips Default

Zone	To Gates 1	2	3
1	20.0	40.0	40.0

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2027 Future w/o project - PTue Jan 19, 2016 14:53:06 Page 4-1

Turning Movement Report
PM

Volume	Northbound			Southbound			Eastbound			Westbound			Total
Type	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Volume
#1 Ridgeline Dr/ S Sherman St													
Base	40	35	0	96	27	5	8	60	31	0	48	77	427
Added	2	4	4	0	4	0	0	0	2	4	0	0	20
Total	42	39	4	96	31	5	8	60	33	4	48	77	447

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2027 Future w/o project - PTue Jan 19, 2016 14:53:06 Page 5-1

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 1 Ridgeline Dr/ S Sherman St	B	11.3	0.000	B	11.5	0.000	+ 0.289 D/V

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2027 Future w/o project - PTue Jan 19, 2016 14:53:06 Page 6-1

Signal Warrant Summary Report

Intersection	Base Met [Del / Vol]	Future Met [Del / Vol]
# 1 Ridgeline Dr/ S Sherman St	??? / ???	No / No

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```
2027 Future w/o project - PTue Jan 19, 2016 14:53:06                Page 7-1
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
                      Peak Hour Delay Signal Warrant Report
********************************************************************************
Intersection #1 Ridgeline Dr/ S Sherman St
********************************************************************************
Future Volume Alternative: Peak Hour Warrant NOT Met
------------|---------------||---------------||---------------||---------------|
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign       Uncontrolled     Uncontrolled
Lanes:        0  0  1! 0  0    0  0  1! 0  0    0  0  1! 0  0    0  0  1! 0  0
Initial Vol:   42   39     4    96   31     5     8   60    33     4   48    77
ApproachDel:      11.0             11.5           xxxxxx           xxxxxx
------------|---------------||---------------||---------------||---------------|
Approach[northbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.3]
   FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=85]
   FAIL - Approach volume less than 100 for one lane approach.
Signal Warrant Rule #3: [approach count=4][total volume=447]
   FAIL - Total volume less than 650 for intersection
          with less than four approaches.
--------------------------------------------------------------------------------
Approach[southbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.4]
   FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=132]
   SUCCEED - Approach volume greater than or equal to 100 for one lane approach.
Signal Warrant Rule #3: [approach count=4][total volume=447]
   FAIL - Total volume less than 650 for intersection
          with less than four approaches.
--------------------------------------------------------------------------------
SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an
"indicator" of the likelihood of an unsignalized intersection warranting
a traffic signal in the future.  Intersections that exceed this warrant
are probably more likely to meet one or more of the other volume based
signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace
a rigorous and complete traffic signal warrant analysis by the responsible
jurisdiction.  Consideration of the other signal warrants, which is beyond
the scope of this software, may yield different results.
```

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2027 Future w/o project - PTue Jan 19, 2016 14:53:06 Page 7-2

Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Ridgeline Dr/ S Sherman St

Future Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L -	T -	R	L -	T -	R	L -	T -	R	L -	T -	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Lanes:	0 0	1! 0	0	0 0	1! 0	0	0 0	1! 0	0	0 0	1! 0	0
Initial Vol:	42	39	4	96	31	5	8	60	33	4	48	77

Major Street Volume: 230
Minor Approach Volume: 132
Minor Approach Volume Threshold: 611

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

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```
2027 Future w/o project - PTue Jan 19, 2016 14:53:06                Page 8-1
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
                      Level Of Service Computation Report
           2000 HCM Unsignalized Method (Future Volume Alternative)
*******************************************************************************
Intersection #1 Ridgeline Dr/ S Sherman St
*******************************************************************************
Average Delay (sec/veh):      5.7       Worst Case Level Of Service: B[ 11.5]
*******************************************************************************
Street Name:           S Sherman St                     Ridgeline Dr.
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign       Uncontrolled     Uncontrolled
Rights:           Include          Include          Include          Include
Lanes:        0  0  1! 0  0    0  0  1! 0  0    0  0  1! 0  0    0  0  1! 0  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 1 Jan 2027 << PM Peak Hour
Base Vol:      40   35     0    96   27     5     8   60    31     0   48    77
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   40   35     0    96   27     5     8   60    31     0   48    77
Added Vol:      2    4     4     0    4     0     0    0     2     4    0     0
In-Process:     0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:   42   39     4    96   31     5     8   60    33     4   48    77
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.92 0.92  0.92  0.92 0.92  0.92  0.92 0.92  0.92  0.92 0.92  0.92
PHF Volume:    46   42     4   104   34     5     9   65    36     4   52    84
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
FinalVolume:   46   42     4   104   34     5     9   65    36     4   52    84
Critical Gap Module:
Critical Gp:  7.1  6.5   6.2   7.1  6.5   6.2   4.1 xxxx xxxxx   4.1 xxxx xxxxx
FollowUpTim:  3.5  4.0   3.3   3.5  4.0   3.3   2.2 xxxx xxxxx   2.2 xxxx xxxxx
------------|---------------||---------------||---------------||---------------|
Capacity Module:
Cnflict Vol:  223  245    83   227  221    94   136 xxxx xxxxx   101 xxxx xxxxx
Potent Cap.:  737  660   982   733  681   968  1461 xxxx xxxxx  1504 xxxx xxxxx
Move Cap.:    700  655   982   689  675   968  1461 xxxx xxxxx  1504 xxxx xxxxx
Volume/Cap:  0.07 0.06  0.00  0.15 0.05  0.01  0.01 xxxx  xxxx  0.00 xxxx  xxxx
------------|---------------||---------------||---------------||---------------|
Level Of Service Module:
2Way95thQ:   xxxx xxxx xxxxx  xxxx xxxx xxxxx   0.0 xxxx xxxxx   0.0 xxxx xxxxx
Control Del:xxxxx xxxx xxxxx xxxxx xxxx xxxxx   7.5 xxxx xxxxx   7.4 xxxx xxxxx
LOS by Move:   *    *     *     *    *     *     A    *     *     A    *     *
Movement:     LT - LTR - RT    LT - LTR - RT    LT - LTR - RT    LT - LTR - RT
Shared Cap.: xxxx  688 xxxxx  xxxx  693 xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
SharedQueue:xxxxx  0.5 xxxxx xxxxx  0.8 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shrd ConDel:xxxxx 11.0 xxxxx xxxxx 11.5 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shared LOS:    *    B     *     *    B     *     *    *     *     *    *     *
ApproachDel:      11.0             11.5           xxxxxx           xxxxxx
ApproachLOS:       B                B                *                *
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************


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```

2027 Future w/o project - PTue Jan 19, 2016 14:53:06 Page 9-1

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Future Volume Alternative

Intersection #1 Ridgeline Dr/ S Sherman St

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
HevVeh:	0%	0%	0%	0%
Grade:	0%	0%	0%	0%
Peds/Hour:	0	0	0	0
LaneWidth:	12 feet	12 feet	12 feet	12 feet

Pedestrian Walk Speed: 4.00 feet/sec
Time Period: 0.25 hour

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Project Trips Report
PM

Node	Intersection	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R
Zone #1: Phase 1													
1	Ridgeline Dr/	2	4	4	0	4	0	0	0	2	4	0	0

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Base Queue Report (cars)

Node	Intersection	Northbound L	Northbound --	Northbound T	Northbound --	Northbound R	Southbound L	Southbound --	Southbound T	Southbound --	Southbound R	Eastbound L	Eastbound --	Eastbound T	Eastbound --	Eastbound R	Westbound L	Westbound --	Westbound T	Westbound --	Westbound R
#1	[2Way95thQ]:	0.4		0.4	xxxx		0.7		0.7		0.7	0.0	xxxx	xxxx	xxxx	xxxx	xxxx				

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2027 Future w/o project - PTue Jan 19, 2016 14:53:06 Page 12-1

Future Queue Report (cars)

Node	Intersection	Northbound L	Northbound --	Northbound T	Northbound --	Northbound R	Southbound L	Southbound --	Southbound T	Southbound --	Southbound R	Eastbound L	Eastbound --	Eastbound T	Eastbound --	Eastbound R	Westbound L	Westbound --	Westbound T	Westbound --	Westbound R
#1	[2Way95thQ]:	0.5	0.5	0.5	0.8	0.8	0.8	0.0	xxxx	xxxx	0.0	xxxx	xxxx								

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Scenario Report

Scenario:	2027 Future - PM
Command:	W/ Project
Volume:	PM
Geometry:	Default Geometry
Impact Fee:	Default Impact Fee
Trip Generation:	PM
Trip Distribution:	Default Trip Distribution
Paths:	Default Path
Routes:	Default Route
Configuration:	Default Configuration

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2027 Future - PM Fri Jan 15, 2016 13:51:05 Page 2-1

Trip Generation Report
PM Trip Generation from ITE Trip Generation Manual
Forecast for PM

Zone #	Subzone	Amount	Units	Rate In	Rate Out	Trips In	Trips Out	Total Trips	% Of Total
1	Phase 1	1.00	Senior Housing	10.00	9.00	10	9	19	15.7
	Zone 1 Subtotal					10	9	19	15.7
2	Phase 2	1.00	Senior Housing	49.00	53.00	49	53	102	84.3
	Zone 2 Subtotal					49	53	102	84.3
TOTAL						59	62	121	100.0

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Trip Distribution Report
Trip Distribution
Percent Of Trips Default

Zone	To Gates 1	2	3	5
1	20.0	40.0	40.0	0.0
2	10.0	30.0	0.0	60.0

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Turning Movement Report
PM

Volume	Northbound			Southbound			Eastbound			Westbound			Total
Type	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Volume
#1 Ridgeline Dr/ S Sherman St													
Base	40	35	0	96	27	5	8	60	31	0	48	77	427
Added	7	20	4	0	19	0	0	0	7	4	0	0	61
Total	47	55	4	96	46	5	8	60	38	4	48	77	488

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Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 1 Ridgeline Dr/ S Sherman St	B	11.3	0.000	B	12.0	0.000	+ 0.763 D/V

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Signal Warrant Summary Report

Intersection	Base Met [Del / Vol]	Future Met [Del / Vol]
# 1 Ridgeline Dr/ S Sherman St	??? / ???	No / No

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```
2027 Future - PM           Fri Jan 15, 2016 13:51:05                 Page 7-1
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
                     Peak Hour Delay Signal Warrant Report
*******************************************************************************
Intersection #1 Ridgeline Dr/ S Sherman St
*******************************************************************************
Future Volume Alternative: Peak Hour Warrant NOT Met
------------|---------------||---------------||---------------||---------------|
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign       Uncontrolled     Uncontrolled
Lanes:        0  0  1! 0  0    0  0  1! 0  0    0  0  1! 0  0    0  0  1! 0  0
Initial Vol:   47   55     4    96   46     5     8   60    38     4   48    77
ApproachDel:      11.5             12.0           xxxxxx           xxxxxx
------------|---------------||---------------||---------------||---------------|
Approach[northbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.3]
   FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=106]
   SUCCEED - Approach volume greater than or equal to 100 for one lane approach.
Signal Warrant Rule #3: [approach count=4][total volume=488]
   FAIL - Total volume less than 650 for intersection
          with less than four approaches.
-------------------------------------------------------------------------------
Approach[southbound][lanes=1][control=Stop Sign]
Signal Warrant Rule #1: [vehicle-hours=0.5]
   FAIL - Vehicle-hours less than 4 for one lane approach.
Signal Warrant Rule #2: [approach volume=147]
   SUCCEED - Approach volume greater than or equal to 100 for one lane approach.
Signal Warrant Rule #3: [approach count=4][total volume=488]
   FAIL - Total volume less than 650 for intersection
          with less than four approaches.
-------------------------------------------------------------------------------
SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an
"indicator" of the likelihood of an unsignalized intersection warranting
a traffic signal in the future.  Intersections that exceed this warrant
are probably more likely to meet one or more of the other volume based
signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace
a rigorous and complete traffic signal warrant analysis by the responsible
jurisdiction.  Consideration of the other signal warrants, which is beyond
the scope of this software, may yield different results.
```

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Peak Hour Volume Signal Warrant Report [Urban]

Intersection #1 Ridgeline Dr/ S Sherman St

Future Volume Alternative: Peak Hour Warrant NOT Met

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L -	T -	R	L -	T -	R	L -	T -	R	L -	T -	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Lanes:	0 0	1! 0	0	0 0	1! 0	0	0 0	1! 0	0	0 0	1! 0	0
Initial Vol:	47	55	4	96	46	5	8	60	38	4	48	77

Major Street Volume: 235
Minor Approach Volume: 147
Minor Approach Volume Threshold: 606

SIGNAL WARRANT DISCLAIMER
This peak hour signal warrant analysis should be considered solely as an "indicator" of the likelihood of an unsignalized intersection warranting a traffic signal in the future. Intersections that exceed this warrant are probably more likely to meet one or more of the other volume based signal warrant (such as the 4-hour or 8-hour warrants).

The peak hour warrant analysis in this report is not intended to replace a rigorous and complete traffic signal warrant analysis by the responsible jurisdiction. Consideration of the other signal warrants, which is beyond the scope of this software, may yield different results.

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```
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-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
                      Level Of Service Computation Report
           2000 HCM Unsignalized Method (Future Volume Alternative)
*******************************************************************************
Intersection #1 Ridgeline Dr/ S Sherman St
*******************************************************************************
Average Delay (sec/veh):      6.3       Worst Case Level Of Service: B[ 12.0]
*******************************************************************************
Street Name:           S Sherman St                     Ridgeline Dr.
Approach:      North Bound      South Bound       East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Stop Sign        Stop Sign       Uncontrolled     Uncontrolled
Rights:           Include          Include          Include          Include
Lanes:        0  0  1! 0  0    0  0  1! 0  0    0  0  1! 0  0    0  0  1! 0  0
------------|---------------||---------------||---------------||---------------|
Volume Module: >> Count Date: 1 Jan 2027 << PM Peak Hour
Base Vol:      40   35     0    96   27     5     8   60    31     0   48    77
Growth Adj:  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
Initial Bse:   40   35     0    96   27     5     8   60    31     0   48    77
Added Vol:      7   20     4     0   19     0     0    0     7     4    0     0
In-Process:     0    0     0     0    0     0     0    0     0     0    0     0
Initial Fut:   47   55     4    96   46     5     8   60    38     4   48    77
User Adj:    1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00  1.00 1.00  1.00
PHF Adj:     0.92 0.92  0.92  0.92 0.92  0.92  0.92 0.92  0.92  0.92 0.92  0.92
PHF Volume:    51   60     4   104   50     5     9   65    41     4   52    84
Reduct Vol:     0    0     0     0    0     0     0    0     0     0    0     0
FinalVolume:   51   60     4   104   50     5     9   65    41     4   52    84
Critical Gap Module:
Critical Gp:  7.1  6.5   6.2   7.1  6.5   6.2   4.1 xxxx xxxxx   4.1 xxxx xxxxx
FollowUpTim:  3.5  4.0   3.3   3.5  4.0   3.3   2.2 xxxx xxxxx   2.2 xxxx xxxxx
------------|---------------||---------------||---------------||---------------|
Capacity Module:
Cnflict Vol:  234  248    86   238  227    94   136 xxxx xxxxx   107 xxxx xxxxx
Potent Cap.:  725  658   978   720  676   968  1461 xxxx xxxxx  1497 xxxx xxxxx
Move Cap.:    675  652   978   663  670   968  1461 xxxx xxxxx  1497 xxxx xxxxx
Volume/Cap:  0.08 0.09  0.00  0.16 0.07  0.01  0.01 xxxx  xxxx  0.00 xxxx  xxxx
------------|---------------||---------------||---------------||---------------|
Level Of Service Module:
2Way95thQ:   xxxx xxxx xxxxx  xxxx xxxx xxxxx   0.0 xxxx xxxxx   0.0 xxxx xxxxx
Control Del:xxxxx xxxx xxxxx xxxxx xxxx xxxxx   7.5 xxxx xxxxx   7.4 xxxx xxxxx
LOS by Move:   *    *     *     *    *     *     A    *     *     A    *     *
Movement:     LT - LTR - RT    LT - LTR - RT    LT - LTR - RT    LT - LTR - RT
Shared Cap.: xxxx  671 xxxxx  xxxx  672 xxxxx  xxxx xxxx xxxxx  xxxx xxxx xxxxx
SharedQueue:xxxxx  0.6 xxxxx xxxxx  0.9 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shrd ConDel:xxxxx 11.5 xxxxx xxxxx 12.0 xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx
Shared LOS:    *    B     *     *    B     *     *    *     *     *    *     *
ApproachDel:      11.5             12.0           xxxxxx           xxxxxx
ApproachLOS:        B                B                *                *
*******************************************************************************
Note: Queue reported is the number of cars per lane.
*******************************************************************************
```

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Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Future Volume Alternative

****

Intersection #1 Ridgeline Dr/ S Sherman St

****

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
HevVeh:	0%	0%	0%	0%
Grade:	0%	0%	0%	0%
Peds/Hour:	0	0	0	0
LaneWidth:	12 feet	12 feet	12 feet	12 feet

Pedestrian Walk Speed: 4.00 feet/sec
Time Period: 0.25 hour

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Project Trips Report
PM

Node Intersection	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R
Zone #1: Phase 1												
1 Ridgeline Dr/	2	4	4	0	4	0	0	0	2	4	0	0
Zone #2: Phase 2												
1 Ridgeline Dr/	5	16	0	0	15	0	0	0	5	0	0	0

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Base Queue Report (cars)

Node	Intersection	Northbound L	Northbound --	Northbound T	Northbound --	Northbound R	Southbound L	Southbound --	Southbound T	Southbound --	Southbound R	Eastbound L	Eastbound --	Eastbound T	Eastbound --	Eastbound R	Westbound L	Westbound --	Westbound T	Westbound --	Westbound R
#1	[2Way95thQ]:	0.4	0.4	xxxx	0.7	0.7	0.7	0.0	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx

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Future Queue Report (cars)

Node	Intersection	Northbound L	Northbound -- T	Northbound -- R	Southbound L	Southbound -- T	Southbound -- R	Eastbound L	Eastbound -- T	Eastbound -- R	Westbound L	Westbound -- T	Westbound -- R
#1	[2Way95thQ]:	0.6	0.6	0.6	0.9	0.9	0.9	0.0	xxxx	xxxx	0.0	xxxx	xxxx

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