Western Technologies
An RMA Company

GEOTECHNICAL EVALUATION REPORT

MULTI-FAMILY APARTMENTS

APN: 408-28-103F
2250 Shelby Drive
Sedona, Arizona
WT Job No. 25-224023-0

PREPARED FOR:

The Villas on Shelby, LLC
30 South Oak Street
London, Ohio 43140
Attn: Ms. Bonnie Harbage

March 26, 2024

Gregory L. E. Burr, P.E, R.G.
Geotechnical Department Manager

Craig P. Wiedeman, P.E.
Senior Geotechnical Engineer

Western Technologies
An RMA Company

March 26, 2022

The Villas on Shelby, LLC
30 South Oak Street
London, Ohio 43140

Attn: Ms. Bonnie Harbage

Re: Geotechnical Evaluation
Multi-Family Apartments
APN: 408-28-103F
2250 Shelby Drive
Sedona, Arizona

Job No. 25-224023-0

Western Technologies Inc. has completed the geotechnical evaluation for the proposed multi-family apartment complex to be located in Sedona, Arizona. This study was performed in general accordance with our proposal number 25-224023-P dated January 22, 2024. The results of our study, including the boring location diagram, laboratory test results, boring logs, and the geotechnical recommendations are attached.

We have appreciated being of service to you in the geotechnical engineering phase of this project and are prepared to assist you during the construction phases as well. If design conditions change, or if you have any questions concerning this report or any of our testing, inspection, design and consulting services, please do not hesitate to contact us. We look forward to working with you on future projects.

Sincerely,
WESTERN TECHNOLOGIES, INC.
Geotechnical Engineering Services

Gregory L. E. Burr, P.E., R.G.
Geotechnical Department Manager

Copies to: Addressee (emailed)

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GEOTECHNICAL EVALUATION
MULTI-FAMILY APARTMENTS
APN# 408-28-103F
2250 SHELBY DRIVE
SEDONA, ARIZONA
JOB NO. 25-224023-0

1.0 PURPOSE

This report contains the results of our geotechnical evaluation for the proposed multi-family apartment complex to be located at 2250 Shelby Drive in Sedona, Arizona. The purpose of these services is to provide information and recommendations regarding:

- foundation design parameters
- floor slab support
- lateral earth pressures
- earthwork
- on-site pavements
- drainage
- corrosivity to concrete

Results of the field exploration, field tests, and laboratory testing program are presented in the Appendices.

2.0 PROJECT DESCRIPTION

Based on information provided by Ms. Bonnie Harbage, the proposed project will consist of a three-story apartment building with an assumed plan area of approximately 6,500 square feet to be constructed on a 1.14-acre lot. The structure will use wood frame and masonry construction with a slab-on-grade first floor. Maximum wall and column loads for the structure are assumed to be 3 kips per linear foot and 45 kips, respectively. We anticipate no extraordinary slab-on-grade criteria and that the finished first floor level will be within about 2 to 3 feet of the existing site grade. On-site pavements will be included as part of the development. Should any of our information or assumptions not be correct, we request that the Client notify Western Technologies (WT) immediately.

3.0 SCOPE OF SERVICES

3.1 Field Exploration

Five borings were auger drilled to depths of about 4 to 7 feet below existing site grades at the approximate locations shown on the attached Boring Location Diagram. Logs of the borings are presented in Appendix A. Subsoils encountered during drilling were examined visually and sampled at selected depth intervals. A field log was prepared for each boring. These logs contain visual classifications of the materials encountered during excavation as well as interpolation of the subsurface conditions between samples. Final logs, included in Appendix A, represent our interpretation of the field logs and include modifications based on laboratory observations and tests of the field samples. The final logs describe the materials encountered, their thicknesses, and the locations where samples were obtained. The Unified Soil Classification System was used to classify soils. The soil classification symbols appear on the boring logs and are briefly described in Appendix A. Local and regional geologic characteristics were used to estimate the seismic design criteria and liquefaction potential.

3.2 Laboratory Analyses

Laboratory analyses were performed on representative soil samples to aid in material classification and to estimate pertinent engineering properties of the on-site soils for preparation of this report. Testing was performed in general accordance with applicable standard test methods. The following tests were performed and the results are presented in Appendix B.

- Water content
- Dry density
- Compression
- Sieve analysis
- Maximum density/optimum moisture (proctor)
- Remolded expansion potential
- Plasticity
- Soluble salts, sulfates and chlorides

Test results were utilized in the development of the recommendations contained in this report.

3.3 Analyses and Report

This geotechnical engineering report includes a description of the project, a discussion of the field and laboratory testing programs, a discussion of the subsurface conditions, and design recommendations as appropriate to the purpose. The scope of services for this project does not include, either specifically or by implication, any environmental assessment of the site, discovery of underground storage tanks or other underground structures, or identification of contaminated or hazardous materials or conditions. If there is concern about the potential for such contamination, other studies should be undertaken. We are available to discuss the scope of such studies with you.

4.0 SITE CONDITIONS

4.1 Surface

At the time of our field exploration, the site was generally vacant land. The site was bordered on the north and west by a wash about 20 feet wide and 5 to 10 feet deep that directs flow to the south, on the east by a developed commercial lot, and on the south by Shelby Drive. The ground surface consisted of about 1 to 2 feet of spread fill, and exhibited a gentle slope down to the south-southwest. Site surface drainage appeared to be fair by means of sheet flow to the south-southwest into the existing wash. Evidence of previous surface water ponding was observed in some portions of the site at the time of our field exploration. No water was present in the wash at the time of our field exploration. Sandstone was exposed in the bottom of the wash. Vegetation on the site consisted of a sparse growth of native weeds and grasses.

4.2 Subsurface

As presented on the borings logs, surface fill soils and native subsoils extending to the full depth of exploration included medium dense to dense, medium plasticity Clayey SANDS; medium dense to very dense, medium plasticity Silty, Clayey SANDS; and hard, medium to near-high plasticity Sandy CLAYS. All soils encountered contained random amounts of gravel, cobbles, and boulders. Refusal to auger penetration occurred in all borings at depths of about 4 to 7 feet on SANDSTONE. Groundwater was not encountered in any boring at the time of exploration. The logs in Appendix A show details of the subsurface conditions encountered during the field exploration.

The boring logs included in this report are indicators of subsurface conditions only at the specific location and date noted. Variations from the field conditions represented by the borings may become evident during construction. If variations appear, we should be contacted to re-evaluate our recommendations.

5.0 GEOTECHNICAL PROPERTIES AND ANALYSIS

5.1 Laboratory Tests

Laboratory test results (see Appendix B) indicate that on-site subsoils located near and below anticipated shallow foundation level exhibit low to high compressibility at existing water contents. Either high expansive pressure develops or low to high additional compression occurs when the water content is increased.

Near-surface soils contain medium to near-high plasticity fines. The higher plasticity soils exhibit moderate expansion potential when recompacted, confined by loads approximating floor loads and saturated in accordance with standard Arizona test methods. Slabs-on-grade supported on recompacted higher plasticity native soils have a moderate to high potential for heaving if the water content of the soil increases.

5.2 Field Tests

On-site native subsoils located near and below anticipated shallow foundation level exhibited moderate to high resistance to penetration using a ring-lined barrel sampler (ASTM D3550). Penetration resistance values exhibited some variability between test locations. This represents a potential for differential movement within a structure supported on existing soils in their present condition.

6.0 RECOMMENDATIONS

6.1 General

Recommendations contained in this report are based on our understanding of the project criteria described in Section 2.0 and the assumption that the soil and subsurface conditions are those disclosed by the explorations. Others may change the plans, final

elevations, number and type of structures, foundation loads, and floor levels during design or construction. Substantially different subsurface conditions from those described herein may be encountered or become known. Any changes in the project criteria or subsurface conditions shall be brought to our attention in writing.

6.2 Design Considerations

Existing spread fill was encountered on the site. We understand that no documentation is available regarding any field density testing that may have been performed during fill construction. Based on this lack of documentation and the overall condition of the fill observed, we consider the fill to be uncontrolled and recommend removal of the existing fill in all structural and pavement areas.

The borings indicate the presence of some near-high plasticity soils on the site. These soils will expand or swell with an increase in moisture content. The structure and related improvements situated on expansive soils will be subject to movements if the foundation soils experience an increase in moisture content. It should be understood that if moisture penetrates expansive soils, there will likely be heave and resultant cracking/distress of the proposed structure and related improvements. It should be noted that shallow foundation systems are not designed to resist soil movements resulting from sewer or plumbing leaks, excessive or leaking irrigation systems, poor drainage, or water ponding near the structure. Construction of site fences, screen walls and other miscellaneous improvements such as exterior slabs-on-grade that typically fall under building code guidelines will be susceptible to heave as well.

In addition, laboratory test results indicate that the site soils become weaker and more compressible with an increase in moisture content under typical foundation loading conditions. These soils are not considered suitable for support of foundations and concrete slabs in their present state and should be over-excavated as recommended in the **EARTHWORK** section of this report. Proper drainage should be provided to help prevent infiltration of moisture below the foundations and concrete slabs.

Cobbles and some boulders were encountered in some of the boring. These oversized materials, greater than 3 inches, could present construction difficulties for foundation, utility trenches and other excavations. In cut areas and excavations, exposed oversized materials should be removed.

6.3 Structure Foundations

The proposed structure can be supported by conventional shallow spread footings bearing on a minimum thickness of 2 feet of lean mix (2-sack) concrete backfill. If areas of shallow rock are encountered, provide a minimum thickness of 1 foot of lean mix concrete backfill below the bottom of the footing.

The above recommendations are provided assuming that all existing fill will be removed within the building areas down to the underlying native soils.

Total and differential settlement of foundation elements bearing on lean mix concrete backfill underlain by soils are estimated to be 1 inch and ¾ inch, respectively. Total and differential settlement of foundation elements bearing on lean mix concrete backfill underlain by rock are estimated to be nominal.

Footings should bear at least 2 feet below the lowest adjacent finished grade. Footings may be designed to impose a maximum dead plus live-load pressure of up to 3000 pounds per square foot.

Finished grade is the lowest adjacent grade for perimeter footings and floor level for interior footings. The design bearing capacity applies to dead loads plus design live load conditions. Recommended minimum widths of column and wall footings are 24 inches and 16 inches, respectively. The bearing value given is a net bearing value and the weight of the concrete in the footings may be ignored. All footings, stem walls and masonry walls should be reinforced to reduce the potential for distress caused by differential foundation movements. The use of joints at openings or other discontinuities in masonry walls is recommended.

We recommend that the geotechnical engineer or his representative observe the footing excavations before lean mix concrete backfill, reinforcing steel and concrete are placed. It should be determined whether the materials exposed are similar to those anticipated for support of the footings. Any soft, loose or unacceptable materials should be undercut to suitable materials and backfilled with either lean mix or structural concrete.

6.4 Lateral Design Criteria

For retaining walls located above any free water surface with no surcharge loads, recommended equivalent fluid pressures and coefficients of base friction for unrestrained elements are:

- Active:
  Undisturbed subsoil .....40 psf/ft
  Compacted granular backfill .....30 psf/ft
  Compacted site soils (low expansive potential) .....38 psf/ft
  Compacted clay/clayey site soils ..... not recommended for use

- Passive:
  Shallow wall footings .....220 psf/ft
  Shallow column footings.....350 psf/ft

- Coefficient of base friction.....0.30*

  * The coefficient of base friction should be reduced to 0.20 when used in conjunction with passive pressure.

Where the design includes restrained elements, the following equivalent fluid pressures are recommended:

- At-rest:
  Undisturbed subsoil .....68 psf/ft
  Compacted granular backfill .....55 psf/ft

These lateral earth pressures are not applicable for submerged soils. We should be consulted for additional recommendations if such conditions are to be included in the design. Any surcharge from adjacent loadings must also be considered. Walls below grade should be waterproofed.

We recommend a free-draining soil layer or manufactured geocomposite material, be constructed adjacent to the back of the retaining wall. A filter may be required between the soil backfill and drainage layer. This drainage zone should help prevent hydrostatic pressure buildup. This vertical drain should be tied into a gravity drainage system at the

base of the retaining wall. It is important that all backfill be properly placed and compacted. Backfill should be mechanically compacted in layers. Flooding or jetting should not be permitted. Care should be taken not to damage the walls when placing the backfill. Backfills should be inspected and tested during placement.

Fill against footings, stem walls and retaining walls should be compacted to densities specified in **EARTHWORK**. Medium to high plasticity clay soils should not be used as backfill against retaining walls. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Overcompaction may cause excessive lateral earth pressures which could result in wall movements.

6.5 Seismic Considerations

Structures should be designed in accordance with applicable building codes. The seismic design parameters presented in the following table, in accordance with the 2018 International Building Code and ASCE 7-16, are applicable to the project site:

Seismic Design Parameters International Building Code 2018, ASCE 7-16	
Soil Site Class	C
Mapped Spectral Response Acceleration at 0.2 sec period (S_s)	0.295g
Mapped Spectral Response Acceleration at 1.0 sec period (S_1)	0.093g
Site Coefficient for 0.2 sec period (F_a)	1.3
Site Coefficient for 1.0 sec period (F_v)	1.5
Design Spectral Response Acceleration at 0.2 sec period (S_{DS})	0.255g
Design Spectral Response Acceleration at 1.0 sec period (S_{D1})	0.093g

The soil site class is based upon conditions identified in shallow exploratory borings and local knowledge of the geotechnical conditions in the vicinity of the site. Conditions extending beyond the depth of our borings to a depth of 100 feet were assumed for the purposes of providing the information presented in the table. Based upon the density of the on-site soils, the relatively shallow rock conditions and lack of groundwater, the potential settlement and lateral spread due to liquefaction is not considered to be a significant concern on this site.

6.6 Slab-on-Grade Support

Following removal of all existing fill soils, slabs-on-grade should be supported on a minimum thickness of 2 feet of properly placed and compacted, imported, low expansive, engineered fill. For design of interior slabs-on-grade, we recommend using a modulus of subgrade reaction (k) of 200 pounds per cubic inch (pci) for the on-site soils and 225 pci for imported fill material, based on a 30-inch diameter plate. The slab subgrade should be prepared by the procedures outlined in this report. A minimum 4-inch thick layer of base course should be provided beneath all slabs to help prevent capillary rise and a damp slab. The use of vapor retarders is desirable for any slab-on-grade where the floor will be covered by products using water-based adhesives, wood, vinyl backed carpet, impermeable floor coatings (urethane, epoxy, acrylic terrazzo, etc.) or where the floor will be in contact with moisture sensitive equipment or product. When used, the design and installation should be in accordance with the guidance provided in ACI 302.1R and 302.2R. Final determination on the use of a vapor retarder should be left to the slab designer.

All concrete placement and curing operations should follow the American Concrete Institute manual recommendations. Improper curing techniques and/or high slump (water-cement ratio) could cause excessive shrinkage, cracking or curling. The plastic properties of the concrete should be documented at the time of placement and specimens should also be prepared for strength testing to verify compliance with project specifications. Concrete slabs should be allowed to cure adequately before placing vinyl or other moisture sensitive floor covering.

6.7 Drainage

The major cause of soil-related foundation and slab-on-ground problems is moisture increase in soils below structures. Properly functioning foundations and floor slabs-on-ground require appropriately constructed and maintained site drainage conditions. Therefore, it is extremely important that positive drainage be provided during construction and maintained throughout the life of the structure. It is also important that proper planning and control of landscape and irrigation practices be performed.

Infiltration of water into utility or foundation excavations must be prevented during construction. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to minimize the

possibility of moisture infiltration. If utility line trenches are backfilled with a granular material, then a clay or concrete plug should be placed in the trench adjacent to the structure to prevent water from following the trench back under the structure.

In areas where sidewalks, patios or driveways do not immediately adjoin the structure, protective slopes should be provided with an outfall of about 5 percent for at least 10 feet from perimeter walls. Scuppers and/or gutters and drain pipes should be designed to provide drainage away from the structure for a minimum distance of 10 feet. Planters or other surface features that could retain water adjacent to the structure should be avoided if at all possible. If planters and/or landscaping are adjacent to or near the structure, there will be a greater potential for moisture infiltration, soil movement and structure distress. As a minimum, we recommend the following:

- Grades should slope away from the structure.
- Planters should slope away from the structure and should not pond water. Drains should be installed in enclosed planters to facilitate flow out of the planters.
- Only shallow rooted landscaping should be used.
- Watering should be kept to a minimum. Irrigation systems should be situated on the far side of any planting and away from the structure to minimize infiltration beneath foundations from possible leaks.
- For areas with highly expansive soils, a minimum of 5 feet should be maintained between building foundations and the shallow rooted plants. In like manner, for deeper-rooted plants, a minimum of 10 feet should be maintained. These deeper-rooted plants should still have a low moisture requirement.
- Trees should be planted no closer than a distance equal to three-quarters of their mature height or 15 feet, whichever is greater.

It should be understood that these recommendations will help minimize the potential for soil movement and resulting distress, but will not eliminate this potential.

6.8 Corrosivity to Concrete

The chemical test results indicate that the site soils are negligibly corrosive to concrete. However, in order to be consistent with standard local practice and for reasons of material availability, we recommend that Type II portland cement be used for all concrete on and below grade.

6.9 Pavements

Based on existing subgrade conditions, the following pavement sections are recommended for the areas indicated:

Traffic Area	Asphalt Concrete Pavement (inches)	Base Course (inches)
Passenger car parking and drives (low traffic frequency)	3	6
Major access drives (medium traffic frequency)	4	4

Bituminous surfacing should be constructed of dense-graded, central plant-mix, asphalt concrete. Base course and asphalt concrete should conform with City of Sedona specifications.

Material and compaction requirements should conform to the recommendations presented under **EARTHWORK**. The gradient of paved surfaces should ensure positive drainage. Water should not pond in areas directly adjoining paved sections. The native subgrade soils will soften and lose stability if subjected to conditions which result in an increase in water content.

Due to the high static loads imposed by parked trucks in loading and unloading areas and at dumpster locations, we recommend that a rigid pavement section be considered for these areas. A minimum 6-inch thick concrete pavement over 4 inches of aggregate base course material is recommended.

6.9.1 Pavement Analyses

The recommended pavement sections are based on the following conditions. This firm should be contacted if any of these conditions change so that revised recommendations can be provided, if necessary.

a. A correlated R-value of 21 for the on-site soils which corresponds to a resilient modulus of approximately 7,500 pounds per square inch. Any required fills should be constructed using on-site or imported materials with subgrade support characteristics equal to or greater than the subgrade soils in the area being filled.

b. Structural coefficients of 0.40 for asphalt concrete and 0.12 for aggregate base course material.

c. A present serviceability index of 4.5, a terminal serviceability index of 2.5, an overall standard deviation of 0.35, a reliability factor of 85 percent, a drainage coefficient of 0.85, a seasonal variation factor of 2.4, and a design life of 20 years.

d. Assumed total 18-kip equivalent single axle loads (ESAL) of 25,000 for the passenger car parking/drive areas and 50,000 for the major access drives.

6.9.2 Pavements on Expansive Soils

Pavement design methods are intended to provide an adequate thickness of structural materials over a particular subgrade such that wheel loads are reduced to a level the subgrade can support. The support characteristics of the subgrade for pavement design do not account for shrink and swell movements of an expansive clayey subgrade such as the soils encountered on this project. Consequently, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell movement of the subgrade. It is therefore important to minimize moisture changes in the subgrade in order to reduce shrink/swell movements. The pavement surface, subbase surface, and adjacent areas should be well drained. Excessive watering of landscaped areas adjacent to pavements should be avoided. Proper maintenance should be performed on cracks in the pavement surface to prevent water from penetrating

through to the base or subbase material. Even with these precautions, some movement and related cracking may still occur, requiring periodic maintenance.

7.0 EARTHWORK

7.1 General

The conclusions contained in this report for the proposed construction are contingent upon compliance with recommendations presented in this section. Any excavating, trenching, or disturbance that occurs after completion of the earthwork must be backfilled, compacted and tested in accordance with the recommendations contained herein. It is not reasonable to rely upon our conclusions and recommendations if any future unobserved and untested trenching, earthwork activities or backfilling occurs.

7.2 Site Clearing

Strip and remove all existing fill material, vegetation, debris, trees, and any other deleterious materials from the building and pavement areas. The building area is defined as that area within the building footprint plus 5 feet beyond the perimeter of that footprint. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.

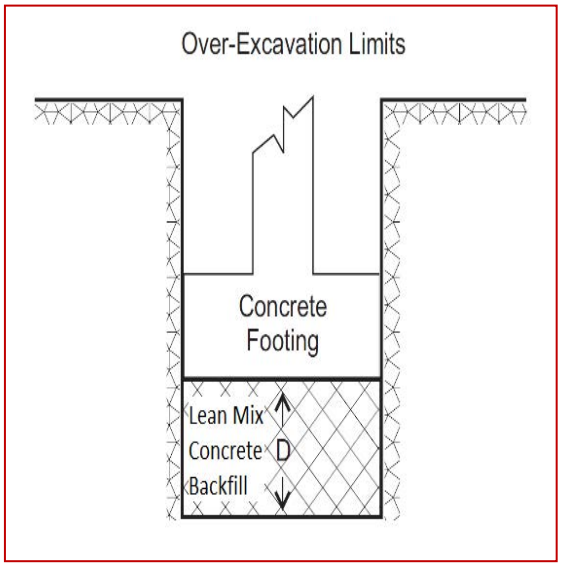
7.3 Excavation

We anticipate that excavations into the site soils for the proposed construction can be accomplished with conventional equipment. Any excavations penetrating the underlying sandstone will require the use of heavy-duty, specialized equipment, likely together with the use of large pneumatic hammers, to facilitate rock break-up and removal.

On-site soils will pump or become unworkable at high water contents. Workability may be improved by scarifying and drying. Overexcavation of wet zones and replacement with imported granular materials may be necessary. The use of lightweight excavation and compaction equipment may be required to minimize subgrade pumping.

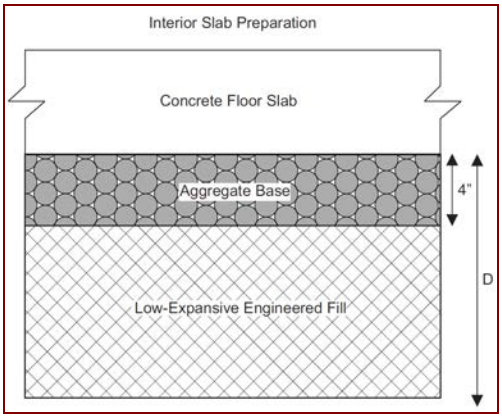
7.4 Foundation Preparation

Following removal of all existing fill material, remove existing soils to a minimum depth of 2 feet below the bottom of the footing (depth D in the diagram to the right). In any areas where both deeper soils and shallow rock conditions are encountered, provide a minimum thickness of 1 foot of lean mix concrete backfill below the bottom of the footings in the shallow rock areas. Removal should extend straight down along the sides of the footing. Replace the removed soils with properly consolidated, lean mix (2-sack) concrete backfill material.



7.5 Slab-on-Grade Preparation

Following removal of all existing fill material, slabs-on-grade should be founded on a minimum thickness of 2 feet of imported, low expansive, engineered fill material. Remove native soils, as necessary, to a minimum depth of 2 feet below the bottom of the slab (depth D in the diagram below). Following the removal, scarify, moisten or dry as required, and compact all subgrade soils to a minimum depth of 8 inches. Replace the removed soils with properly compacted, imported, low to non-expansive, engineered fill material. The aggregate base course below the slab may be included as part of the low to non-expansive engineered fill. In areas were dense sandstone is encountered, scarification and recompaction is not required.



The subgrade preparation should be accomplished in a manner that will result in uniform water contents and densities after compaction.

7.6 Exterior Slab Preparation

Some of the soils on this site have the potential to expand and shrink with changes in moisture content. In addition, frost penetration in the upper soils may cause surface heaving. Therefore, relatively lightweight exterior concrete flatwork such as sidewalks and patios may experience movements resulting in cracking or vertical offsets. To reduce the potential for damage, we recommend:

- Use of fill with low expansion potential
- Use of fill with low to negligible frost susceptibility
- Placement of effective control joints on relatively close centers
- Moisture-density control during placement of subbase fills
- Provision for adequate drainage in areas adjoining the slabs
- Use of designs which allow vertical movement between the exterior slabs and adjoining structural elements

It should be understood that these recommendations will help reduce the potential for soil movement and resulting distress, but will not eliminate this potential. Furthermore, the use of municipal specifications and details may not mitigate the potential for movements of the expansive or frost susceptible on-site soils.

7.7 Pavement Preparation

Prior to placement of fill and/or pavement materials, the exposed subgrade soils should be proof-rolled and observed by the geotechnical engineer or his qualified representative to verify that stable subgrade conditions exist. Any loose, soft, disturbed, or otherwise unsuitable materials should be over-excavated and replaced with engineered fill. The subgrade should then be scarified, moisture conditioned as required, and recompacted for a minimum depth of 8 inches. Scarification and recompaction is not required in areas where dense basalt is encountered at subgrade elevation.

7.8 Materials

a. Clean on-site soils with low expansive potentials and a maximum dimension of 6 inches or imported materials may be used as fill material for the following:

- Pavement areas
- Backfill
- Landscape areas

b. On-site clay/clayey soils are not recommended for use as subbase fill or structural backfill in the building areas or behind site retaining walls. Imported, low expansive, engineered fill should be used in these areas.

c. Frozen soils should not be used as fill or backfill.

d. Imported soils should conform to the following:

- Gradation (ASTM C136): percent finer by weight

6"	100
4"	85-100
¾"	70-100
No. 4 Sieve	50-100
No. 200 Sieve	40 (max)

- Maximum expansive potential (%)[1] 1.5

- Maximum soluble sulfates (%) 0.10

e. Base course should conform to current City of Sedona specifications.

[1] Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at about 3 percent below optimum water content. The sample is confined under a 100 psf surcharge and submerged.

7.9 Placement and Compaction

a. Place and compact fill in horizontal lifts, using equipment and procedures that will produce recommended water contents and densities throughout the lift.

b. Uncompacted lift thickness should not exceed 8 inches.

c. No fill should be placed over frozen ground.

d. Materials should be compacted to the following:

Material	Minimum Percent Compaction (ASTM D698)
• On-site soil, reworked:	
Below slabs-on-grade	90
Pavement areas	95
• All on-site soil, fill:	
Pavement areas	95
Landscape areas	85
• Imported soil, fill:	
Below slabs-on-grade	95
Pavement areas	95
• Aggregate base:	
Below slabs-on-grade	95
Pavement areas	100
• Structural backfill	95
• Nonstructural backfill	90

e. On-site clay and clayey soils should be compacted with a moisture content in the range of 1 percent below to 3 percent above optimum. On-site and imported soils with low expansive potential and aggregate base course materials should be

compacted with a moisture content in the range of 3 percent below to 3 percent above optimum.

7.10 Compliance

Recommendations for foundations, slabs-on-grade and pavements supported on compacted fills or prepared subgrade depend upon compliance with the **EARTHWORK** recommendations. To assess compliance, observation and testing should be performed under the direction of a WT geotechnical engineer. Please contact us to provide these observation and testing services.

8.0 ADDITIONAL SERVICES

The recommendations provided in this report are based on the assumption that a sufficient schedule of tests and observations will be performed during construction to verify compliance. At a minimum, these tests and observations should be comprised of the following:

- Observations and testing during site preparation and earthwork,
- Observation of foundation excavations, and
- Consultation as may be required during construction.

Retaining the geotechnical engineer who developed your report to provide construction observation is the best way to verify compliance and to help you manage the risks associated with unanticipated conditions.

9.0 LIMITATIONS

This report has been prepared assuming the project criteria described in **2.0 PROJECT DESCRIPTION**. If changes in the project criteria occur, or if different subsurface conditions are encountered or become known, the conclusions and recommendations presented herein shall become invalid. In any such event, WT should be contacted in order to assess the effect that such variations may have on our conclusions and recommendations. If WT is not retained for the construction observation and testing services to determine compliance with this report, our professional responsibility is accordingly limited.

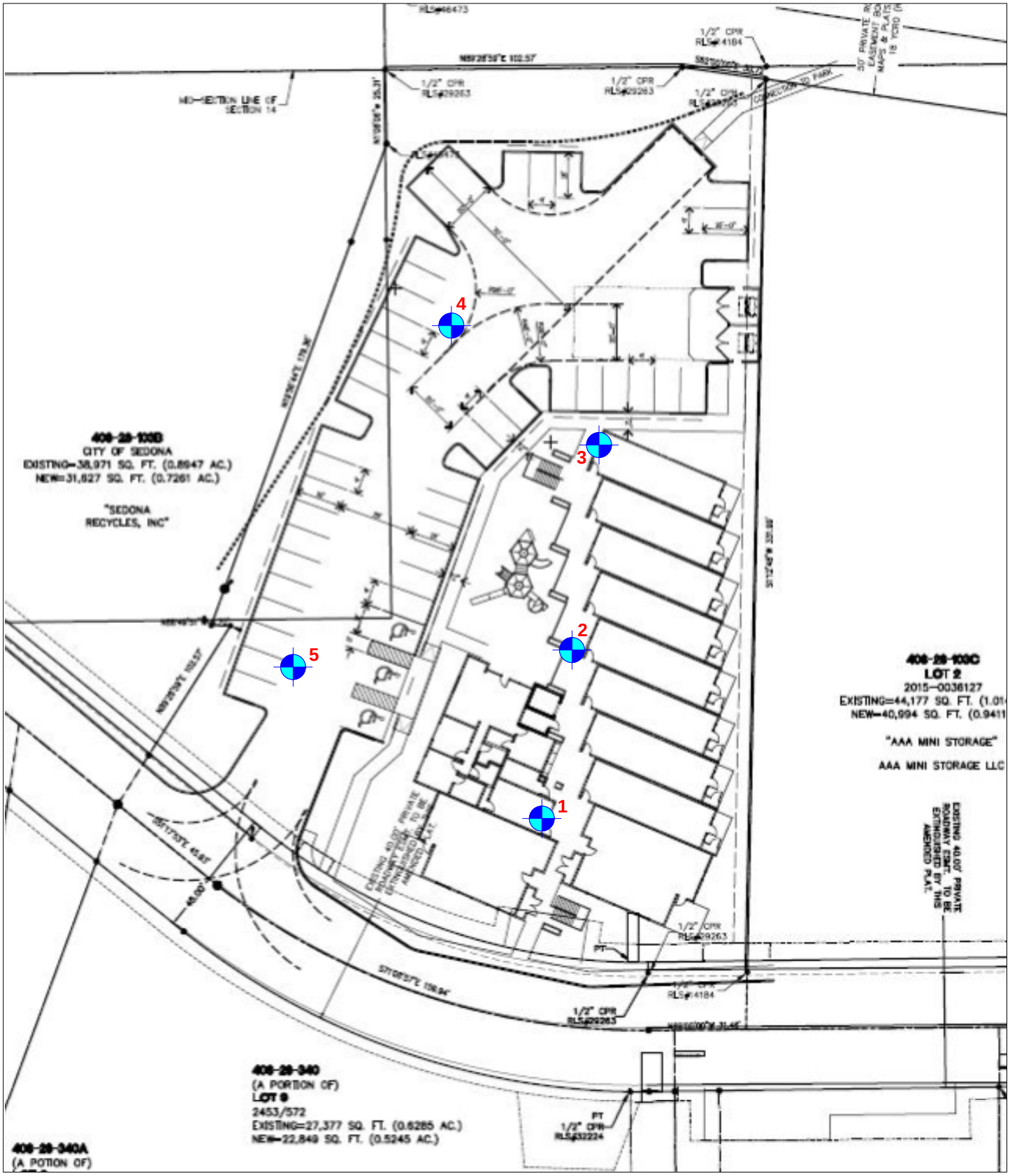
The recommendations presented are based entirely upon data derived from a limited number of samples obtained from widely spaced explorations. The attached logs are indicators of subsurface conditions only at the specific locations and times noted. This report assumes the uniformity of the geology and soil structure between explorations, however variations can and often do exist. Whenever any deviation, difference, or change is encountered or becomes known, WT should be contacted.

This report is for the exclusive benefit of our client alone. There are no intended third-party beneficiaries of our contract with the client or this report, and nothing contained in the contract or this report shall create any express or implied contractual or any other relationship with, or claim or cause of action for, any third party against WT.

This report is valid for the earlier of one year from the date of issuance, a change in circumstances, or discovered variations. After expiration, no person or entity shall rely on this report without the express written authorization of WT.

10.0 CLOSURE

We prepared this report as an aid to the designers of the proposed project. The comments, statements, recommendations and conclusions set forth in this report reflect the opinions of the authors. These opinions are based upon data obtained at the location of the explorations, and from laboratory tests. Work on your project was performed in accordance with generally accepted standards and practices utilized by professionals providing similar services in this locality. No other warranty, express or implied, is made.



Not to Scale

Approximate Test Boring Location

MULTI-FAMILY APARTMENTS

Boring Location Diagram

Western Technologies Inc.

Job No.: 25-224023-0

Plate: 1

Allowable Soil Bearing Capacity	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
Backfill	A specified material placed and compacted in a confined area.
Base Course	A layer of specified aggregate material placed on a subgrade or subbase.
Base Course Grade	Top of base course.
Bench	A horizontal surface in a sloped deposit.
Caisson/Drilled Shaft	A concrete foundation element cast in a circular excavation which may have an enlarged base (or belled caisson).
Concrete Slabs-On-Grade	A concrete surface layer cast directly upon base course, subbase or subgrade.
Crushed Rock Base Course	A base course composed of crushed rock of a specified gradation.
Differential Settlement	Unequal settlement between or within foundation elements of a structure.
Engineered Fill	Specified soil or aggregate material placed and compacted to specified density and/or moisture conditions under observations of a representative of a soil engineer.
Existing Fill	Materials deposited through the action of man prior to exploration of the site.
Existing Grade	The ground surface at the time of field exploration.
Expansive Potential	The potential of a soil to expand (increase in volume) due to absorption of moisture.
Fill	Materials deposited by the actions of man.
Finished Grade	The final grade created as a part of the project.
Gravel Base Course	A base course composed of naturally occurring gravel with a specified gradation.
Heave	Upward movement.
Native Grade	The naturally occurring ground surface.
Native Soil	Naturally occurring on-site soil.
Rock	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
Sand and Gravel Base Course	A base course of sand and gravel of a specified gradation.
Sand Base Course	A base course composed primarily of sand of a specified gradation.
Scarify	To mechanically loosen soil or break down existing soil structure.
Settlement	Downward movement.
Soil	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
Strip	To remove from present location.
Subbase	A layer of specified material placed to form a layer between the subgrade and base course.
Subbase Grade	Top of subbase.
Subgrade	Prepared native soil surface.

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DEFINITION OF TERMINOLOGY

PLATE

A-1

COARSE-GRAINED SOILS

LESS THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVEL OR WELL-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE
GP	POORLY-GRADED GRAVEL OR POORLY-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	
GM	SILTY GRAVEL OR SILTY GRAVEL WITH SAND, MORE THAN 12% FINES	
GC	CLAYEY GRAVEL OR CLAYEY GRAVEL WITH SAND, MORE THAN 12% FINES	
SW	WELL-GRADED SAND OR WELL-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE
SP	POORLY-GRADED SAND OR POORLY-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	
SM	SILTY SAND OR SILTY SAND WITH GRAVEL, MORE THAN 12% FINES	
SC	CLAYEY SAND OR CLAYEY SAND WITH GRAVEL, MORE THAN 12% FINES	

NOTE: Coarse-grained soils receive dual symbols if they contain 5% to 12% fines (e.g., SW-SM, GP-GC).

FINE-GRAINED SOILS

MORE THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	SILT, SILT WITH SAND OR GRAVEL, SANDY SILT, OR GRAVELLY SILT	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50
CL	LEAN CLAY OF LOW TO MEDIUM PLASTICITY, SANDY CLAY, OR GRAVELLY CLAY	
OL	ORGANIC SILT OR ORGANIC CLAY OF LOW TO MEDIUM PLASTICITY	
MH	ELASTIC SILT, SANDY ELASTIC SILT, OR GRAVELLY ELASTIC SILT	SILTS AND CLAYS LIQUID LIMIT MORE THAN 50
CH	FAT CLAY OF HIGH PLASTICITY, SANDY FAT CLAY, OR GRAVELLY FAT CLAY	
OH	ORGANIC SILT OR ORGANIC CLAY OF HIGH PLASTICITY	
PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

NOTE: Fine-grained soils may receive dual classification based upon plasticity characteristics (e.g. CL-ML).

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	Above 12 in.
COBBLES	3 in. – 12 in.
GRAVEL	No. 4 – 3 in.
Coarse	¾ in. – 3 in.
Fine	No. 4 – ¾ in.
SAND	No. 200 – No. 4
Coarse	No. 10 – No. 4
Medium	No. 40 – No. 10
Fine	No. 200 – No. 40
Fines (Silt or Clay)	Below No. 200

NOTE: Only sizes smaller than three inches are used to classify soils

CONSISTENCY

CLAYS & SILTS	BLOWS PER FOOT
VERY SOFT	0 – 2
SOFT	3 – 4
FIRM	5 – 8
STIFF	9 – 15
VERY STIFF	16 – 30
HARD	OVER 30

RELATIVE DENSITY

SANDS & GRAVELS	BLOWS PER FOOT
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

NOTE: Number of blows using 140-pound hammer falling 30 inches to drive a 2-inch-OD (1⅜-inch ID) split-barrel sampler (ASTM D1586).

PLASTICITY OF FINE GRAINED SOILS

PLASTICITY INDEX	TERM
0	NON-PLASTIC
1 – 7	LOW
8 – 20	MEDIUM
Over 20	HIGH

DEFINITION OF WATER CONTENT

DRY
SLIGHTLY DAMP
DAMP
MOIST
WET
SATURATED

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METHOD OF CLASSIFICATION

PLATE

A-2

The number shown in **"BORING NO."** refers to the approximate location of the same number indicated on the "Boring Location Diagram" as positioned in the field by pacing or measurement from property lines and/or existing features.

"DRILLING TYPE" refers to the exploratory equipment used in the boring wherein **HSA = hollow stem auger**, and the dimension presented is the outside diameter of the HSA used.

"R" in "BLOW COUNTS" refers to a 3-inch outside diameter ring-lined split barrel sampler driven into the ground with a 140 pound drop-hammer dropped 30 inches repeatedly until a penetration of 12 inches is achieved or until refusal. The number of blows required to advance the sampler 12 inches is defined as the "**R**" blow count. The "**R**" blow count requires an engineered conversion to an equivalent SPT N-Value. Refusal to penetration is considered more than 50 blows per foot. An **X** within the symbol indicates no sample recovery. A half-filled **X** within the symbol indicates sample disturbance.

"SAMPLE TYPE" refers to the form of sample recovery, in which **R** = Ring-lined sample and **G** = Grab sample.

"DRY DENSITY (LBS/CU FT)" refers to the laboratory-determined dry density in pounds per cubic foot.

"WATER (MOISTURE) CONTENT" (% of Dry Wt.) refers to the laboratory-determined water content in percent using the standard test method ASTM D2216.

"USCS" refers to the "Unified Soil Classification System" Group Symbol for the soil type as defined by ASTM D2487 and D2488. The soils were classified visually in the field, and where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

These notes and boring logs are intended for use in conjunction with the purposes of our services defined in the text. Boring log data should not be construed as part of the construction plans nor as defining construction conditions.

Boring logs depict our interpretations of subsurface conditions at the locations and on the date(s) noted. Variations in subsurface conditions and characteristics may occur between borings. Groundwater levels may fluctuate due to seasonal variations and other factors.

The stratification lines shown on the boring logs represent our interpretation of the approximate boundary between soil or rock types based upon visual field classification at the boring location. The transition between materials is approximate and may be more or less gradual than indicated.

Project: Multi-Family Apartments Project Number: 25-224023-0	**BORING NO. 1**	Western Technologies An RMA Company

Date(s) Drilled **3/4/24**	Logged By **E. Martinez**	Checked By **J. Quinlan**
Drilling Method **HSA**	Drill Bit Size/Type **7 In.**	Approximate Surface Elevation **Not Determined**
Drill Rig Type **CME-75**	Drilling Contractor **EDI**	
Groundwater Level and Date Measured **Not Encountered**	Location **See Location Diagram**	

Water Content, %	Dry Unit Weight, pcf	Sample Type	Sample	Sampling Resistance, blows/ft	Depth (feet)	Soil Type	Graphic Log	MATERIAL DESCRIPTION
			G		0	CL		Sandy Lean CLAY (FILL); some gravel, red, slightly damp
						CL		Sandy Lean CLAY; some gravel, cobbles and boulders, red, hard, slightly damp to damp
7.9	93		R	41				
					5			
12.6	96		R	50/7"				
								Auger Refusal at 7 Feet on SANDSTONE
					10			

Figure A-4

Project: Multi-Family Apartments Project Number: 25-224023-0	**BORING NO. 2**	Western Technologies An RMA Company

Date(s) Drilled **3/4/24**	Logged By **E. Martinez**	Checked By **J. Quinlan**
Drilling Method **HSA**	Drill Bit Size/Type **7 In.**	Approximate Surface Elevation **Not Determined**
Drill Rig Type **CME-75**	Drilling Contractor **EDI**	
Groundwater Level and Date Measured **Not Encountered**	Location **See Location Diagram**	

Water Content, %	Dry Unit Weight, pcf	Sample Type	Sample	Sampling Resistance, blows/ft	Depth (feet)	Soil Type	Graphic Log	MATERIAL DESCRIPTION
			G		0	SC		Clayey SAND (FILL); with gravel, red, damp
						SC		Clayey SAND; with gravel, cobbles and boulders, red, medium dense to dense, moist to damp
20.0	108		R	16				
					5			
16.4	112		R	41				
								Auger Refusal at 7 Feet on SANDSTONE
					10			

Figure A-5

Project: Multi-Family Apartments Project Number: 25-224023-0	**BORING NO. 3**	Western Technologies An RMA Company

Date(s) Drilled **3/4/24**	Logged By **E. Martinez**	Checked By **J. Quinlan**
Drilling Method **HSA**	Drill Bit Size/Type **7 In.**	Approximate Surface Elevation **Not Determined**
Drill Rig Type **CME-75**	Drilling Contractor **EDI**	
Groundwater Level and Date Measured **Not Encountered**	Location **See Location Diagram**	

Water Content, %	Dry Unit Weight, pcf	Sample Type	Sample	Sampling Resistance, blows/ft	Depth (feet)	Soil Type	Graphic Log	MATERIAL DESCRIPTION
			G		0	SC-SM		Silty, Clayey SAND (FILL); with gravel, red, damp
						SC-SM		Silty, Clayey SAND; with gravel, cobbles and boulders, red, very dense, damp
16.5	107		R	50/9"				
								Auger Refusal at 4 Feet on SANDSTONE
					5			
					10			

Figure A-6

Project: Multi-Family Apartments Project Number: 25-224023-0	**BORING NO. 4**	Western Technologies An RMA Company

Date(s) Drilled **3/4/24**	Logged By **E. Martinez**	Checked By **J. Quinlan**
Drilling Method **HSA**	Drill Bit Size/Type **7 In.**	Approximate Surface Elevation **Not Determined**
Drill Rig Type **CME-75**	Drilling Contractor **EDI**	
Groundwater Level and Date Measured **Not Encountered**	Location **See Location Diagram**	

Water Content, %	Dry Unit Weight, pcf	Sample Type	Sample	Sampling Resistance, blows/ft	Depth (feet)	Soil Type	Graphic Log	MATERIAL DESCRIPTION
			G		0	SC-SM		Silty, Clayey SAND (FILL); with gravel, red/brown, damp
15.6	113		R	50		SC-SM		Silty, Clayey SAND; with gravel, cobbles and boulders, red/brown, very dense, damp
								Auger Refusal at 4 Feet on SANDSTONE
					5			
					10			

Figure A-7

Project: Multi-Family Apartments Project Number: 25-224023-0	**BORING NO. 5**	Western Technologies An RMA Company

Date(s) Drilled **3/4/24**	Logged By **E. Martinez**	Checked By **J. Quinlan**
Drilling Method **HSA**	Drill Bit Size/Type **7 In.**	Approximate Surface Elevation **Not Determined**
Drill Rig Type **CME-75**	Drilling Contractor **EDI**	
Groundwater Level and Date Measured **Not Encountered**	Location **See Location Diagram**	

Water Content, %	Dry Unit Weight, pcf	Sample Type	Sample	Sampling Resistance, blows/ft	Depth (feet)	Soil Type	Graphic Log	MATERIAL DESCRIPTION
			G		0	SC-SM		Silty, Clayey SAND (FILL); with gravel, red/brown, damp
9.9	113		R	22		SC-SM		Silty, Clayey SAND; with gravel, cobbles and boulders, red/brown, medium dense, damp
					5			Boring Stopped at 5 Feet
					10			

Figure A-8

Boring No.	Depth (ft)	USCS Class.	Particle Size Distribution (%) Passing by Weight							Atterberg Limits		Laboratory Compaction Characteristics			Remarks
			3"	¾"	#4	#10	#40	#200	2µ	LL	PI	Dry Density (pcf)	Optimum Moisture (%)	Method	
1	0-5	CL		100	93	90	84	61.5		27	12				2
2	0-5	SC	100	93	76	72	66	49.2		35	22				2
4	0-5	SC-SM	100	97	75	65	54	33.3		21	6				2

NOTE: NP = Non-plastic
µ = microns (2µ = 0.002mm)

REMARKS

Classification / Particle Size / Moisture-Density Relationship

1. Visual
2. Laboratory Tested
3. Minus #200 Only
4. Test Method ASTM D698/AASHTO T99
5. Test Method ASTM D1557/AASHTO T180
6. From the ADOT Family of Curves

Western Technologies
An RMA Company

PROJECT: MULTI-FAMILY APARTMENT

JOB NO.: 25-224023-0

PLATE

B-1

SOIL PROPERTIES

Boring No.	Depth (ft.)	USCS Class.	Initial Dry Density (pcf)	Initial Water Content (%)	Laboratory Compaction Characteristics			Expansion Properties		Plasticity		Soluble		Remarks
					Dry Density(pcf)	Optimum Moisture(%)	Method	Surcharge (ksf)	Expansion (%)	LL	PI	Salts (ppm)	Sulfate (ppm)	
2	0-5	SC	106.6	11.5	116.2	14.2	A	0.1	2.4					1,2,3

Notes: Initial Dry Density and Initial Water Content are remolded.

Remarks

1. Compacted density (approx. 95% of ASTM D698 max. density at moisture content slightly below optimum.)
2. Submerged to approximate saturation.
3. Test Method ASTM D698/AASHTO T99
4. Test Method ASTM D1557/AASHTO T180
5. From the ADOT Family of Curves

Western Technologies
An RMA Company

PROJECT: MULTI-FAMILY APARTMENTS
JOB NO.: 25-224023-0

SOIL PROPERTIES

PLATE

B-2

Nortest Analytical
An RMA Company

Reported: 3/8/2024
Received: 3/5/2024

LABORATORY ANALYSIS REPORT

Project: 25-224023-0

Lab Number	Sample ID
24S0031	2(0-5)

Test Parameter

Test	*Method*	*Result*	*Units*
Soluble Salts	ARIZ 237b	391	ppm
Sulfate	ARIZ 733b	2	ppm
Chloride	ARIZ 736b	84	ppm

COMPRESSION TEST REPORT

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Swell Press. (ksf)	Clpse. %	e_o
Sat.	Moist.											
29.3 %	7.9 %	96.4			2.65						7.0	0.716

MATERIAL DESCRIPTION	USCS	AASHTO
SANDY LEAN CLAY	CL	

Project No. 25-224023-0 **Client:** THE VILLAS ON SHELBY, LLC

Project: MULTI-FAMILY APARTMENTS

Source: RING SAMPLE **Depth:** 2-3 FEET **Sample No.:** BORING 1

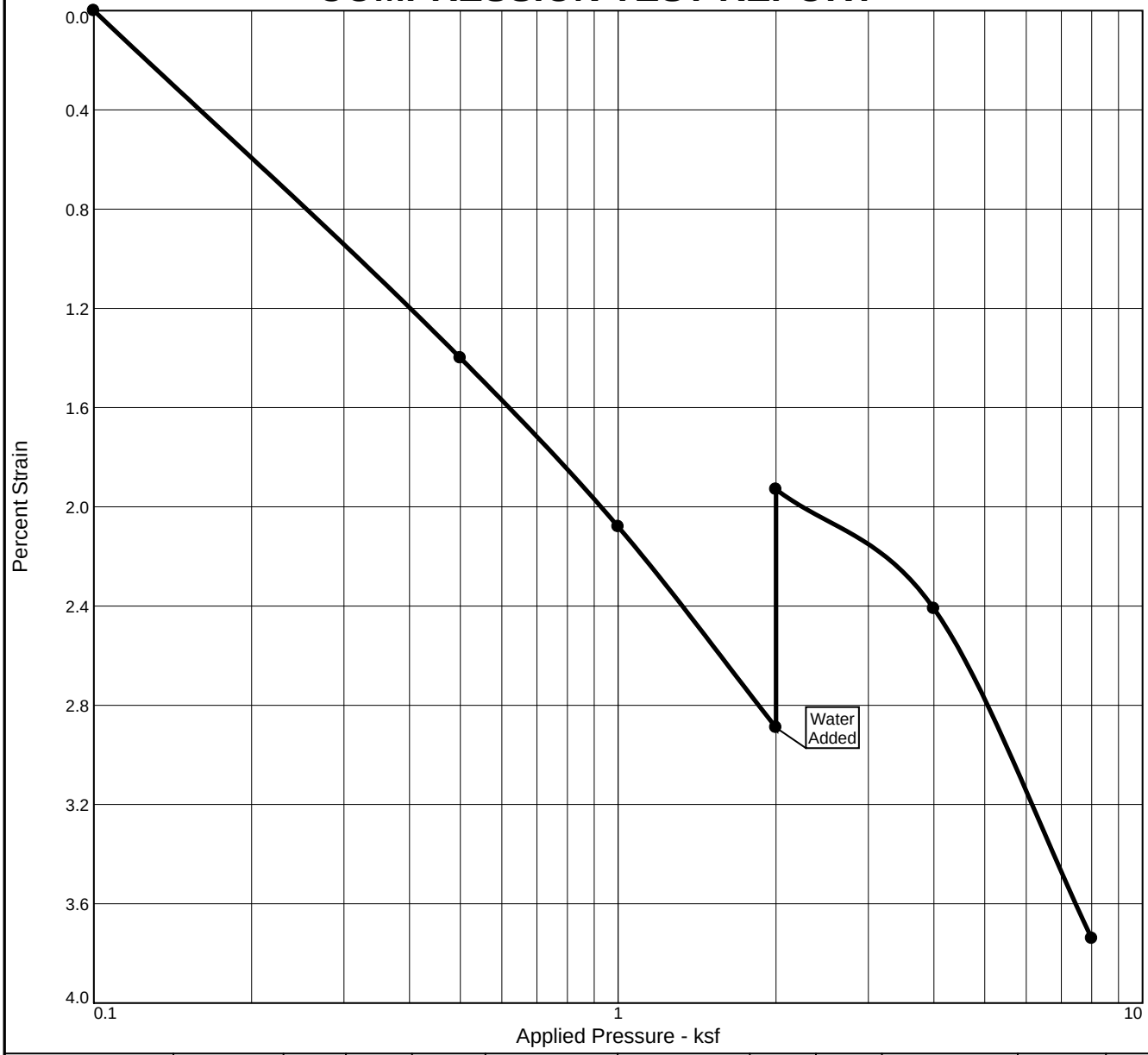
Remarks:

Western Technologies, Inc.

Flagstaff, AZ

Figure B-4

COMPRESSION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Swell Press. (ksf)	Swell %	e_o
Sat.	Moist.											
98.5 %	20.0 %	107.5			2.65		3.9	0.07		5.3	1.0	0.539

MATERIAL DESCRIPTION	USCS	AASHTO
CLAYEY SAND WITH GRAVEL	SC	

Project No. 25-224023-0 **Client:** THE VILLAS ON SHELBY, LLC

Project: MULTI-FAMILY APARTMENTS

Source: RING SAMPLE **Depth:** 2-3 FEET **Sample No.:** BORING 2

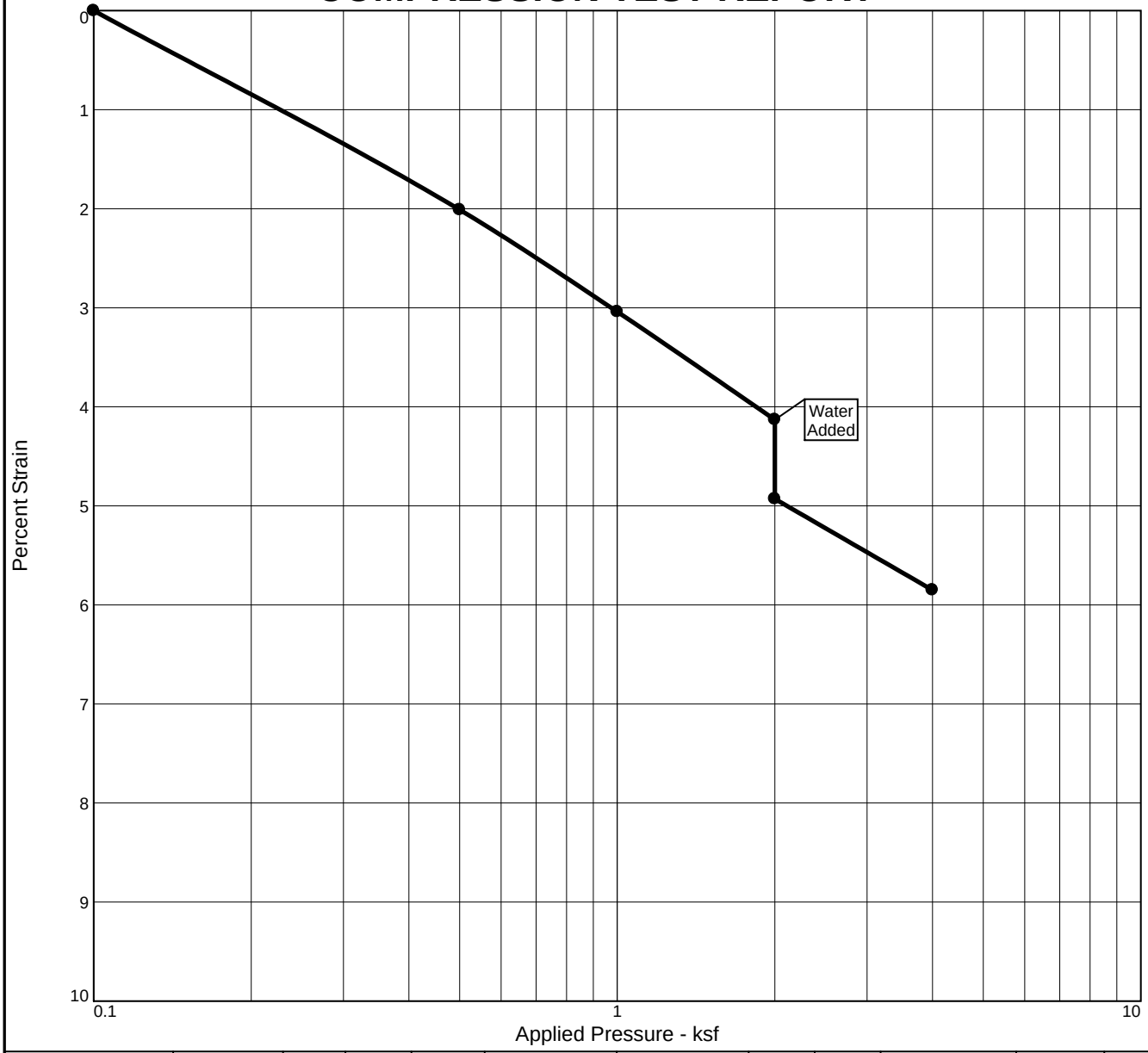
Remarks:

Western Technologies, Inc.

Flagstaff, AZ

Figure B-5

COMPRESSION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Swell Press. (ksf)	Clpse. %	e_o
Sat.	Moist.											
92.3 %	16.4 %	112.4			2.65						0.8	0.472

MATERIAL DESCRIPTION	USCS	AASHTO
CLAYEY SAND WITH GRAVEL	SC	

Project No. 25-224023-0 **Client:** THE VILLAS ON SHELBY, LLC

Project: MULTI-FAMILY APARTMENTS

Source: RING SAMPLE **Depth:** 5-6 FEET **Sample No.:** BORING 2

Remarks:

Western Technologies, Inc.

Flagstaff, AZ

Figure B-6

COMPRESSION TEST REPORT

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Swell Press. (ksf)	Clpse. %	e_o
Sat.	Moist.											
81.6 %	16.5 %	106.8			2.65						0.1	0.536

MATERIAL DESCRIPTION	USCS	AASHTO
SILTY, CLAYEY SAND WITH GRAVEL	SC-SM	

Project No. 25-224023-0 **Client:** THE VILLAS ON SHELBY, LLC

Project: MULTI-FAMILY APARTMENTS

Source: RING SAMPLE **Depth:** 2-3 FEET **Sample No.:** BORING 3

Remarks:

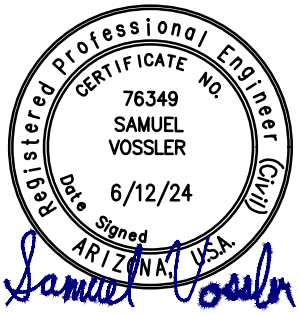
Western Technologies, Inc.

Flagstaff, AZ

Figure B-7

Villas on Shelby
2250 Shelby Drive
Sedona, AZ 86336

Preliminary Water Design Report



Date: June 11, 2024

Prepared for: **HS Development Partners, LLC**
Matt Shoemacher
30 South Oak St
London, Ohio 43140
P: 216-406-3683

Prepared By: **Burgess & Niple, Inc.**
Sam Vossler P.E.
2201 North Gemini Drive
Flagstaff, Arizona 86001
P: 928-395-1988

Table of Contents

List of Appendices

Abbreviations

AC – Asbestos Cement

ADD – Average Day Demand

APN – Assessor Parcel Number

AWC - Arizona Water Company

CA – Cement Asbestos

DIP – Ductile Iron Pipe

DREAM - Sedona Design Review, Engineering and Administrative Manual

GPD - Gallons Per Day

GPM - Gallons Per Minute

HGL – Hydraulic Grade Line

MMD – Maximum Daily Demand

PHD – Peak Hour Demmand

PSI – Pounds per Square Inch

100 INTRODUCTION

The purpose of this preliminary report is to provide preliminary engineering justification for domestic water and fire service to the proposed Villas on Shelby project site. This report will evaluate the existing infrastructure and outline methods that will be used in the final drainage report to determine if the proposed design will adequately support the calculated demands for the proposed development. A final water report and final modeling will be produced after fire flow testing has been completed. The Project will be designed and developed in accordance with the 2020 City of Sedona Design Review, Engineering and Administrative Manual (DREAM), Arizona Water Companies Standards and Specifications, and Yavapai County's current requirements.

The Villas on Shelby (Project) is on a parcel containing 1.1+/- acres (APN 408-28-103F) and is currently undeveloped. The Project site is located at 2250 Shelby Drive in City of Sedona (see ***Figure - 1 Vicinity Map*** *and* ***Figure - 2 Site Map below***). More Specifically Lot 1 within AAA Industrial Park located in section 14, township 17 north, range 5 east Gila and Salt River Meridian, Yavapai County, Arizona. The current project zoning is IN (Light Industrial). The Project is a proposed multi-family site to be composed of 1 three-story building with 30 Housing Units along with a leasing office area and gym. The site will contain 42 parking spaces, with an access drive connecting to the south on Shelby Drive. No phasing is proposed for the construction of the development's improvements. The Project is with Arizona Water Company's (AWC) Sedona service area. A Pressure Zone could not be provided by AWC when requested.

Figure 1 – Vicinity Map

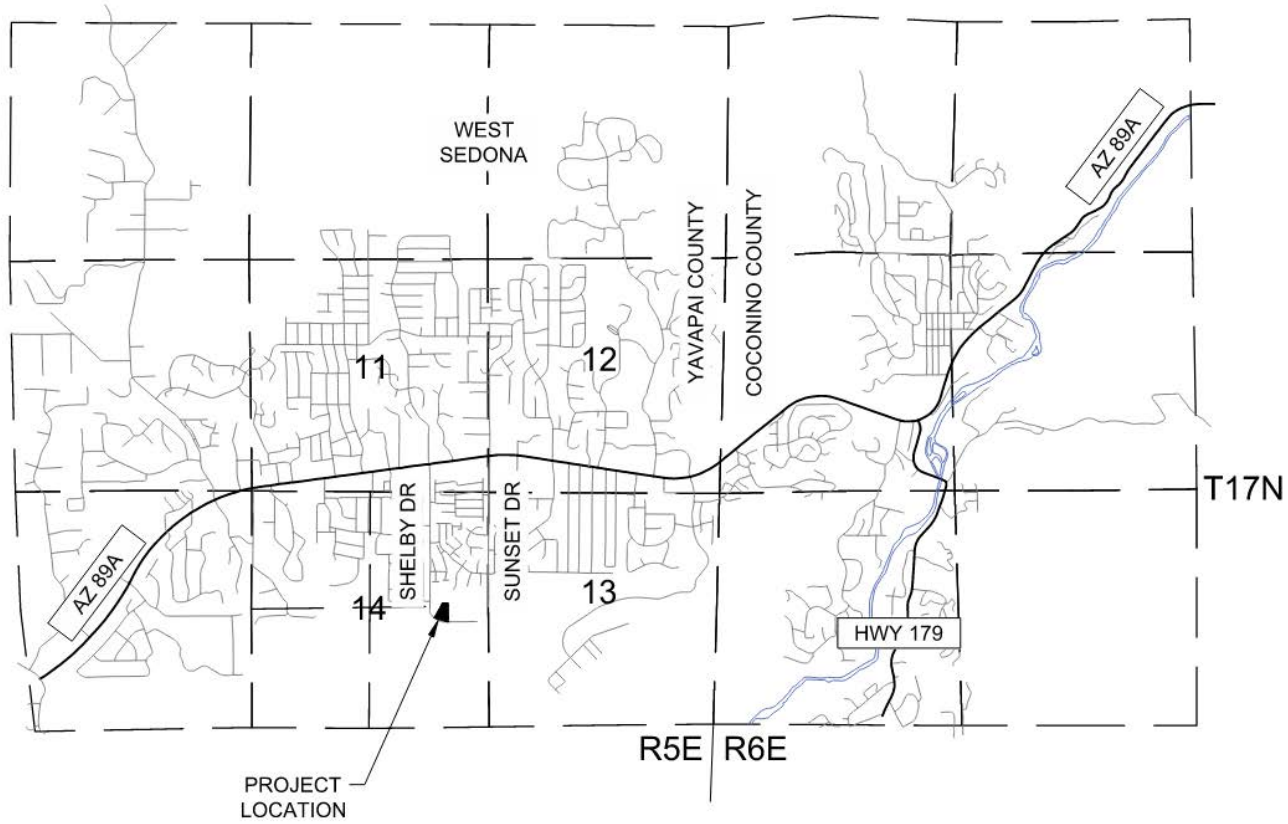


Figure 2 – Site Map

200 EXISTING WATER SYSTEM

The Site is currently vacant and there is an existing 6" CA (Asbestos Cement) water main in Shelby Drive as part of the Arizona Water Companies (AWC) facilities. GIS data from AWC along with As-built drawings by AWC dated 9/9/2013 titled *Replace 90 LF of 6" CA with 90 LF of DIP along Shelby Drive* verify this info. There were no found records of services or stubs to the project site. There is currently an existing dual service located on the adjacent property APN 408-28-265 with one unused connection, but this is assumed to not be available to our site and is undersized for the required demand of the project. Based on discussions with AWC, the property is located within the Sedona Certificate of Convenience and Necessity and a Will Serve Letter for the project has been obtained from AWC.

300 WATER ANALYSIS

300.1 Demand Calculation

The Project will include 24 1-bedroom units and 6 3-bedroom units. Per AWC use based generation requirements the usage is 240 Gallons Per Day Per Unit, therefore:

Average Day Demand : 240 GPD/Unit x 30 Unit = **7,200 GPD (or 5 GPM)**

Maximum Day Demand: Average Day Demand x 2.0 = **14,400 GPD (or 10 GPM)**

Peak Hour Demand: Average Day Demand x 3.0 = **21,600 GPD (or 15 GPM)**

300.2 Fire Flow Requirements

The Fire Flow Requirements for the site as required by the fire authority are 2,275 GPM for 3-hours with a minimum residual pressure of 20 PSI. An email documenting the requirements is in Appendix A. The Project proposes a new fire hydrant and new 6" fire service line to serve the building.

300.3 System Pressure

The Pressure Zone Hydraulic Grade Line (HGL) in the AWC Master Plan was not able to be provided by AWC.

300.4 Water Model

A water model will be prepared for the final report utilizing WaterGems Software and calibrated using a new Fire Flow Test for the project to be conducted by Wicked Fire Protection. The Project proposes a new fire hydrant, a new fire service and two new 1-1/2" services and meters.

The model will be built to analyze three demand scenarios:

- Average Day
- Maximum Day
- Peak Hour

Specific Criterion to be achieved in the modeling results include:

- Minimum Static Pressure is 55 PSI
- Pressure for all junctions for average day, maximum day, and peak hour scenarios are between 40 and 80 PSI.
- Minimum pressure during MMD plus fire flow is 20 PSI.
- Velocities for all water mains during MDD plus fire flow and PHD do not exceed 8-feet per second.
- Maximum headloss in transmission main does not exceed 6-feet per 1,000 feet.
- Maximum headloss in distribution main does not exceed 10-feet per 1,000 feet.
- Hazen Willams roughness coefficient for new water main is C=120

300.5 Fire Flow Model

Fire Flow Requirements: The model to be prepared with the final report will summarize results showing the fire flow requirements have been met.

400 CONCLUSION

This Preliminary Report is in support of the proposed Villas on Shelby Project. A final report will be prepared before final approval of the building plans and final approval from AWC.

Appendix A

Fire Flow Requirements and Will Serve Letter

Sam Vossler

From: Dori Booth <dbooth@sedonafire.org>
Sent: Tuesday, May 21, 2024 3:30 PM
To: Sam Vossler; Hanako Ueda; Kirk Riddell
Cc: Cari Meyer
Subject: RE: Villas on Shelby - Fire Flow Required by Fire Authority Letter

Sam,

Arizona Water usually provides you the form for us to sign in terms of Fire Flow; ADEQ is going to want to see it too. That being said, based on your description you will need the following at a minimum per Table B105.1 of the International Fire Code:
3500GPM for 3 hours with a minimum residual pressure of 20psi. That being said, this building is required to have Fire Sprinklers installed throughout which can reduce the Fire flow down to 2,275 gpm for 3 hours.

Respectfully,

Chief Booth

Dori Booth
Division Chief
Community Risk Reduction
Sedona Fire District
Office (928) 204-8926

From: Sam Vossler <sam.vossler@burgessniple.com>
Sent: Monday, May 20, 2024 2:30 PM
To: Hanako Ueda <HUeda@sedonaaz.gov>; Dori Booth <dbooth@sedonafire.org>; Kirk Riddell <KRiddell@sedonafire.org>
Cc: Cari Meyer <CMeyer@sedonaaz.gov>
Subject: RE: Villas on Shelby - Fire Flow Required by Fire Authority Letter

Dori,

It is a Type V-A construction type
It is 3 stories and 39’-0” in height and 37,274 SF

ARIZONA WATER COMPANY

3805 N. BLACK CANYON HIGHWAY, PHOENIX, AZ 85015-5351 • P.O. BOX 29006, PHOENIX, AZ 85038-9006
PHONE: (602) 240-6860 • FAX: (602) 240-6874 • TOLL FREE: (800) 533-6023 • www.azwater.com

March 16, 2023

Bonnie Harbage
HS Development Partners, LLC
30 S. Oak Street
London, OH 43140

Re: Domestic Water Service to APN 408-28-103C

Dear Ms. Harbage:

Arizona Water Company (the "Company") certifies that the above-described property is located within its Sedona Certificate of Convenience and Necessity in Sedona, Arizona, and that it will provide water service to the property in accordance with the Company's tariffs and the Arizona Corporation Commission's rules and regulations. It will be the responsibility of the developer to provide the funds to install the necessary water facilities, and the Company assumes no liability to install those facilities if the funds are not advanced by the developer.

The design of the water distribution system must comply with the Company's standard specifications that are on file at the Yavapai County Development Services. Both preliminary and final water system designs must be approved by the Company.

It will also be the responsibility of the developer to comply with all of the requirements of regulatory agencies having jurisdiction over Arizona subdivisions and of Arizona statutes applicable to subdivided or unsubdivided land, including, but not limited to, requirements relating to a Certificate of Assured Water Supply, as set forth in the Arizona Groundwater Management Act, A.R.S. §45-576.

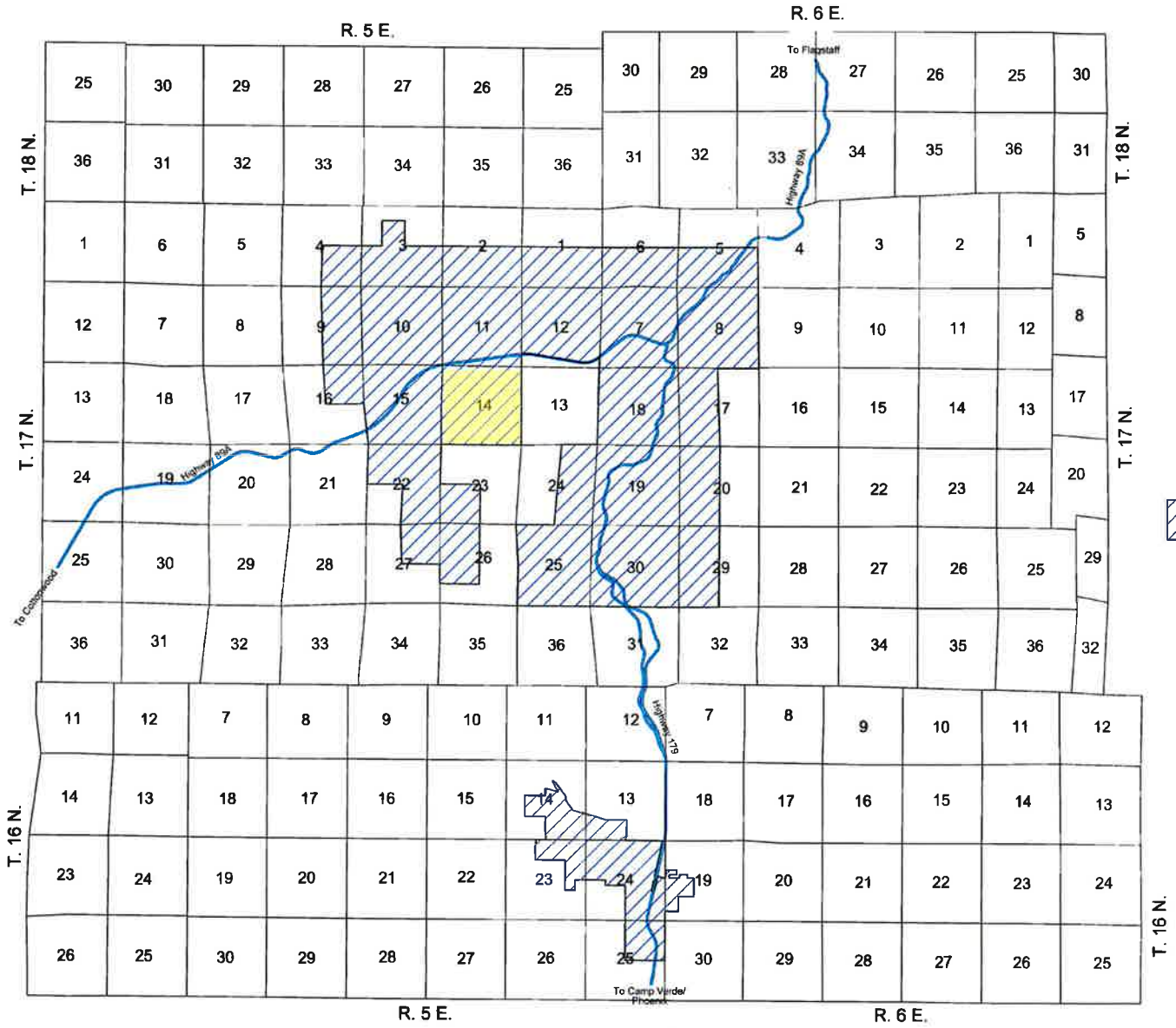
Please notify the Company if you will be proceeding with development of the property so the Company can prepare the necessary Agreement.

Very truly yours,

Andrew J. Haas

Andrew J. Haas, PE
Vice President - Engineering
developmentservices@azwater.com

sla



Area Covered By Present CCN

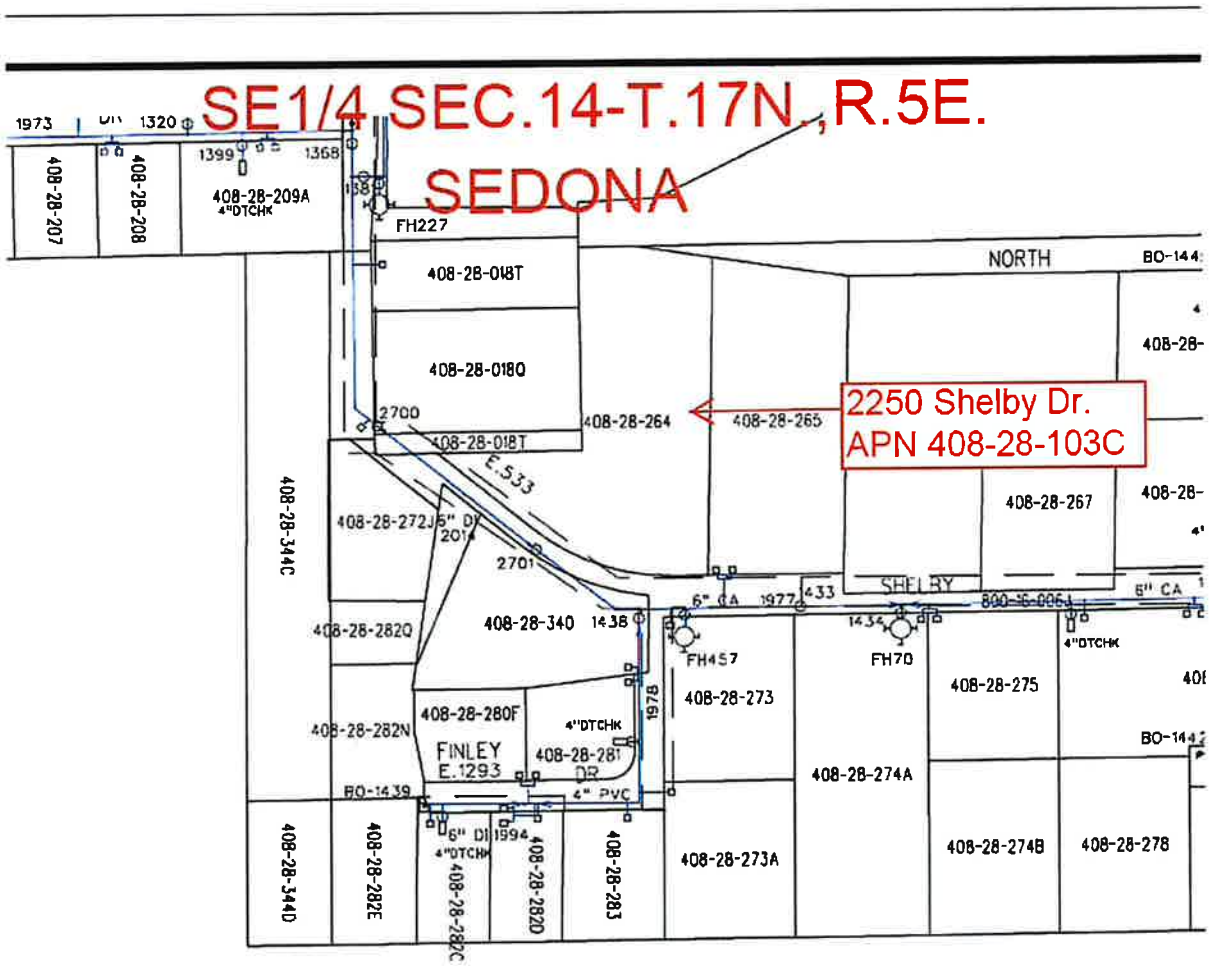
No.	Decision Date	Revision	By	Date
28				
27				
26				
25				
24				
23	11/05	Decision No. 68309 (VOC)	CS	1/06
22	4/04	Decision No. 66992	CS	4/04
21	7/99	Decision No. 61849 (VOC)	CS	4/00
20	3/98	Decision No. 60717 (VOC)	GRS	5/99
19	7/97	Decision No. 60265	GRS	5/99
18	1/95	Decision No. 59398 (VOC)	GRS	12/95
17	8/88	Decision No. 56108 (Trmtr/VOC)	GRS	1/89
16	9/86	Decision No. 55163 (DEL-VOC)	GRS	1/88
15	9/83	Decision No. 53757 (Trmtr VOC)	GRS	10/83
14	1/74	Decision No. 43913	RWH	1/74
13	8/73	Decision No. 43593 (+VOC)	MS	8/73
12	10/69	Decision No. 40253 (Trmtr)	CB	12/17
11	2/67	Decision No. 38825	RB	11/68
10	10/66	Decision No. 38577 (Trmtr)	RB	11/68
9	1/66	Decision No. 38009	RB	11/68
8	12/65	Decision No. 38226 (Trmtr)	RB	11/68
7	12/64	Decision No. 35087 (Trmtr)	RB	11/68
6	9/63	Decision No. 34756 (VOC)	RB	11/68
5	6/63	Decision No. 34510 (Trmtr)	RB	11/68
4	5/63	Decision No. 34532	RB	11/68
3	4/63	Decision No. 34162 (Trmtr)	RB	11/68
2	9/62	Decision No. 34382 (Trmtr)	RB	11/68
1	8/60	Decision No. 32356 (VOC)		11/68

ARIZONA WATER COMPANY

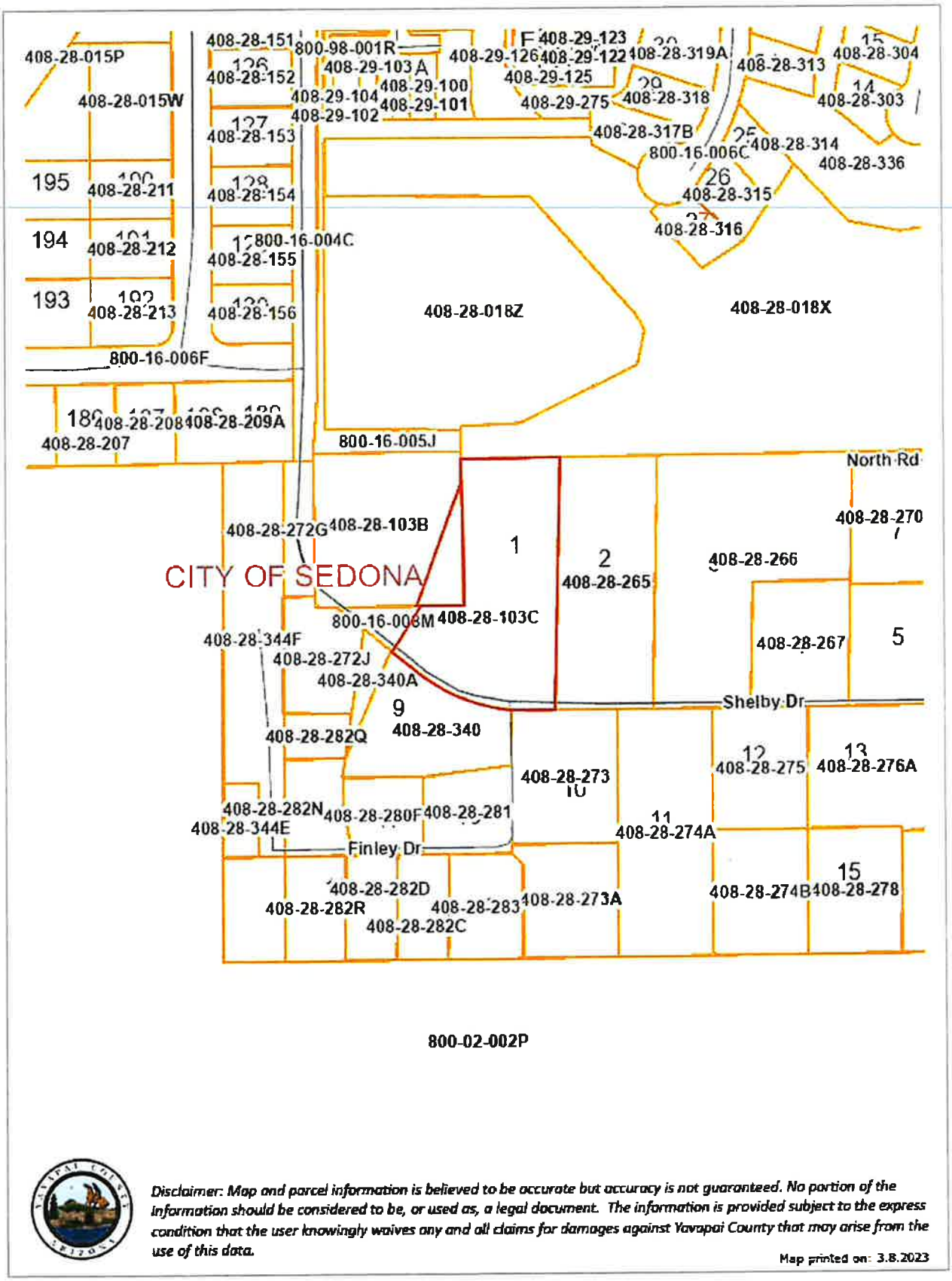
AREA COVERED BY PRESENT C.C.N.
AT
SEDONA

DATE: August 1960 | SCALE: 1" = 1 Mile

Sedona, Arizona – APN 408-28-103C



Map Disclaimer: This map is for general reference only. It does not replace a land survey and Arizona Water Company does not guarantee its thematic or spatial accuracy.



Disclaimer: Map and parcel information is believed to be accurate but accuracy is not guaranteed. No portion of the information should be considered to be, or used as, a legal document. The information is provided subject to the express condition that the user knowingly waives any and all claims for damages against Yavapai County that may arise from the use of this data.

Map printed on: 3.8.2023

Hydrant Flow Test Report

Test Date 6/27/2024 **Test Time** 9:00 AM

Location

2250 Shelby Dr
Sedona AZ 86336

Tested by

Wicked Fire Protection , Inc
Robert

Notes

Static/Residual Hydrant # 457
Flow Hydrant # 227

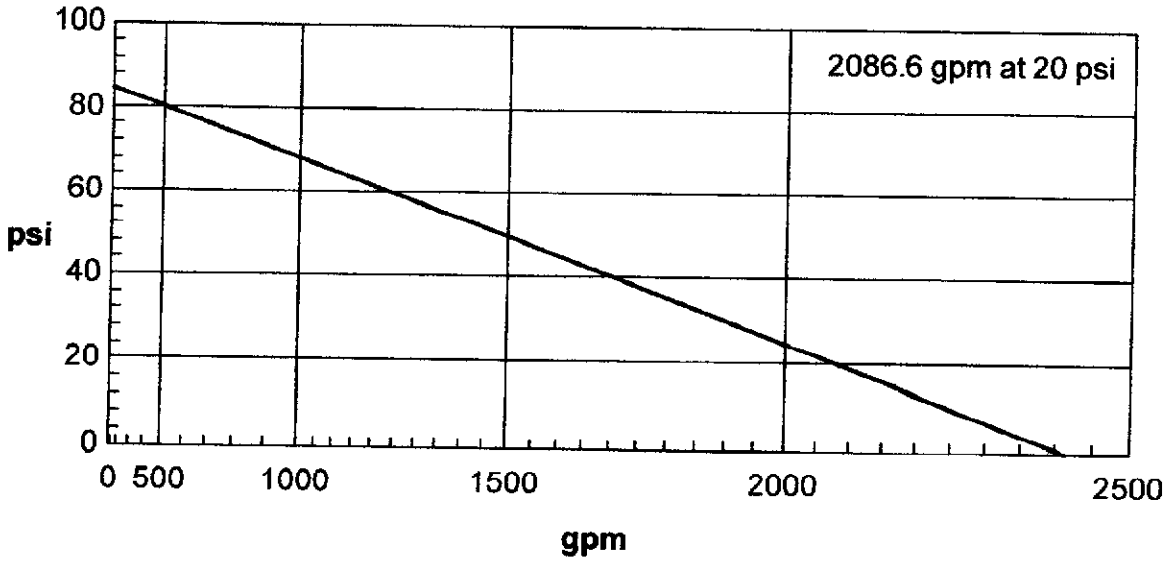
Read Hydrant

85 psi **static pressure**
62 psi **residual pressure**
hydrant elevation

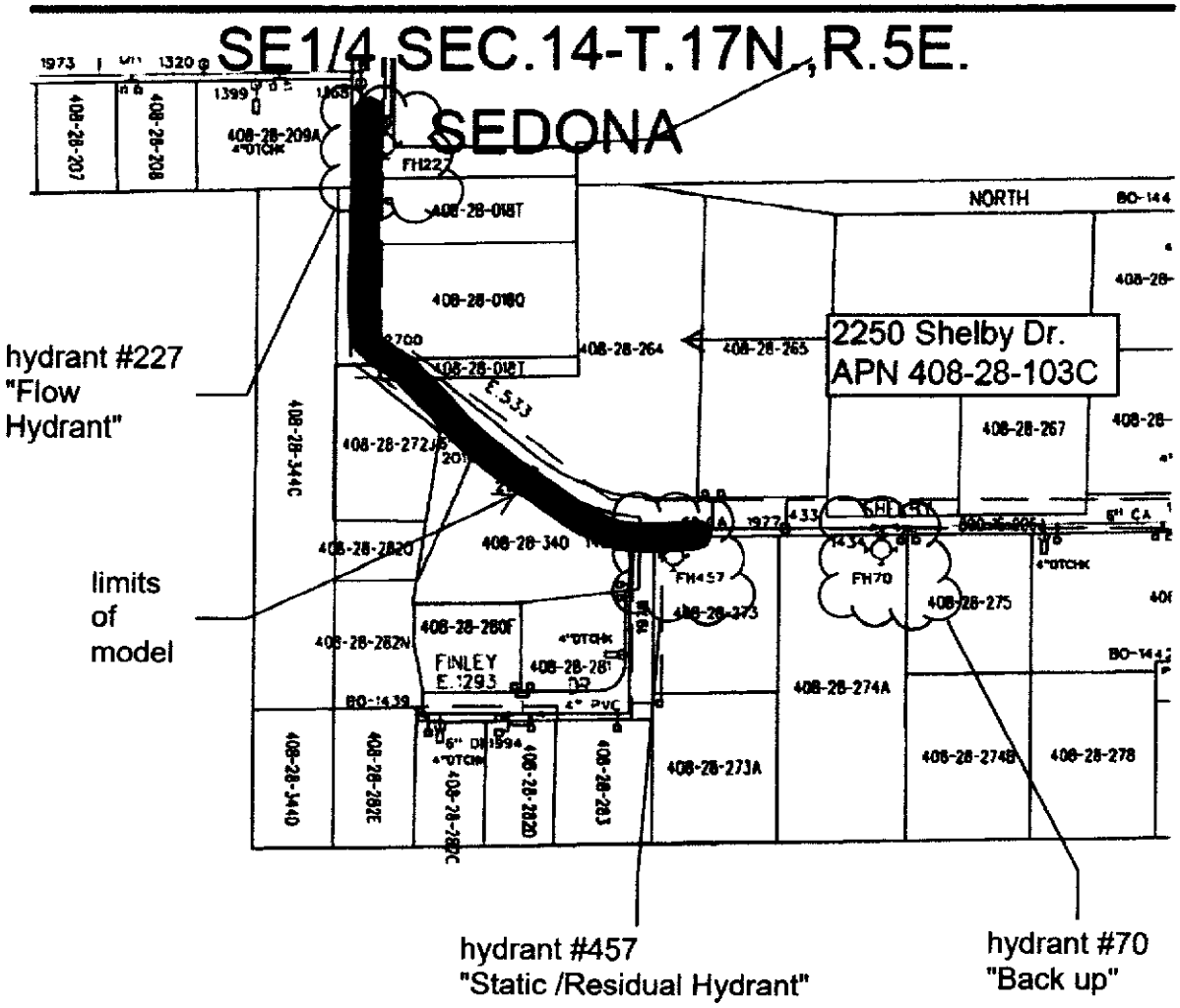
Flow Hydrant(s)

Outlet	Elev	Size	C	Pitot Pressure	Flow
#1		2.5	.9	50	1190 gpm

Flow Graph



Sedona, Arizona – APN 408-28-103C



Map Disclaimer: This map is for general reference only. It does not replace a land survey and Arizona Water Company does not guarantee its thematic or spatial accuracy.

BURGESS & NIPLE
2201 N. Gemini Drive
Suite 116
Flagstaff, AZ 86001

Exp. 6/30/26

May 20, 2024

Sedona Public Works Department
Building 104
102 Roadrunner Drive
Sedona, AZ 86336

Subject: Traffic Impact Statement for Villas on Shelby in Sedona, Arizona

Villas on Shelby is an approximate 1.14-acre proposed residential development in the City of Sedona, Arizona. The purpose of this Traffic Impact Statement (TIS) was to determine the impact of the site to the proposed site access driveway and surrounding area.

1.0 Existing Conditions

The site is located on the south end of Shelby Drive at address 2250 Shelby Drive, Sedona, Arizona 86336. The parcel number is APN 408-26-103F. A vicinity map showing the location of the proposed development and surrounding area is included as **Figure 1**.

1.1. Existing/Future Land Use

The parcel is currently zoned as light industrial. The surrounding area is light industrial, community services, vacant land, storage rentals, and a hotel. Sunset Park and residential neighborhoods are located just north of the site. The existing land use is shown in **Figure 2**. The parcel is a part of Sedona's Sunset Community Focus Area (CFA). The objectives of the Sunset Live/Work Community Focus Area Plan include affordable housing, economic diversification, mixed use development, and public lands access.

1.2. Existing Roadway Characteristics

Shelby Drive is a two-lane asphalt road functionally classified as a major collector per the 2014 Arizona Department of Transportation (ADOT) Sedona Functionally Classified Roads Map with a posted speed limit of 25 mph. There is curb, gutter, and sidewalk present on the east/north side of Shelby Drive. Curb, gutter, and sidewalk is discontinuous on the west/south side. There are no bike lanes or lighting present. Traffic control generally consists of minor street stop control. There are turn lanes and crosswalks present intermittently and a traffic signal at the intersection with State Route 89A (SR-89A). Shelby Drive between Sedona Recycles and Sunset Drive was previously a private roadway but is now owned and maintained by the city with dedicated 45' right-of-way.

Sunset Drive is a two-lane asphalt road functionally classified as a major collector per the 2014 ADOT Sedona Functionally Classified Roads Map with a posted speed limit of 25 mph. In general, there is curb, gutter, and sidewalk present on the west side of Sunset Drive. There are bike lanes present from Tanager Lane to approximately 300 feet south of SR-89A. There is no lighting present. Traffic control generally consists of minor street stop control, with a traffic signal at the intersection with SR-89A.

1.3. Existing Traffic Counts

Average annual daily traffic (AADT) was obtained from the ADOT Traffic Data Management System (TDMS); the available AADT of the existing roadway network is depicted in **Figure 3**.

Figure 1: Vicinity Map

Figure 2: Existing Land Use

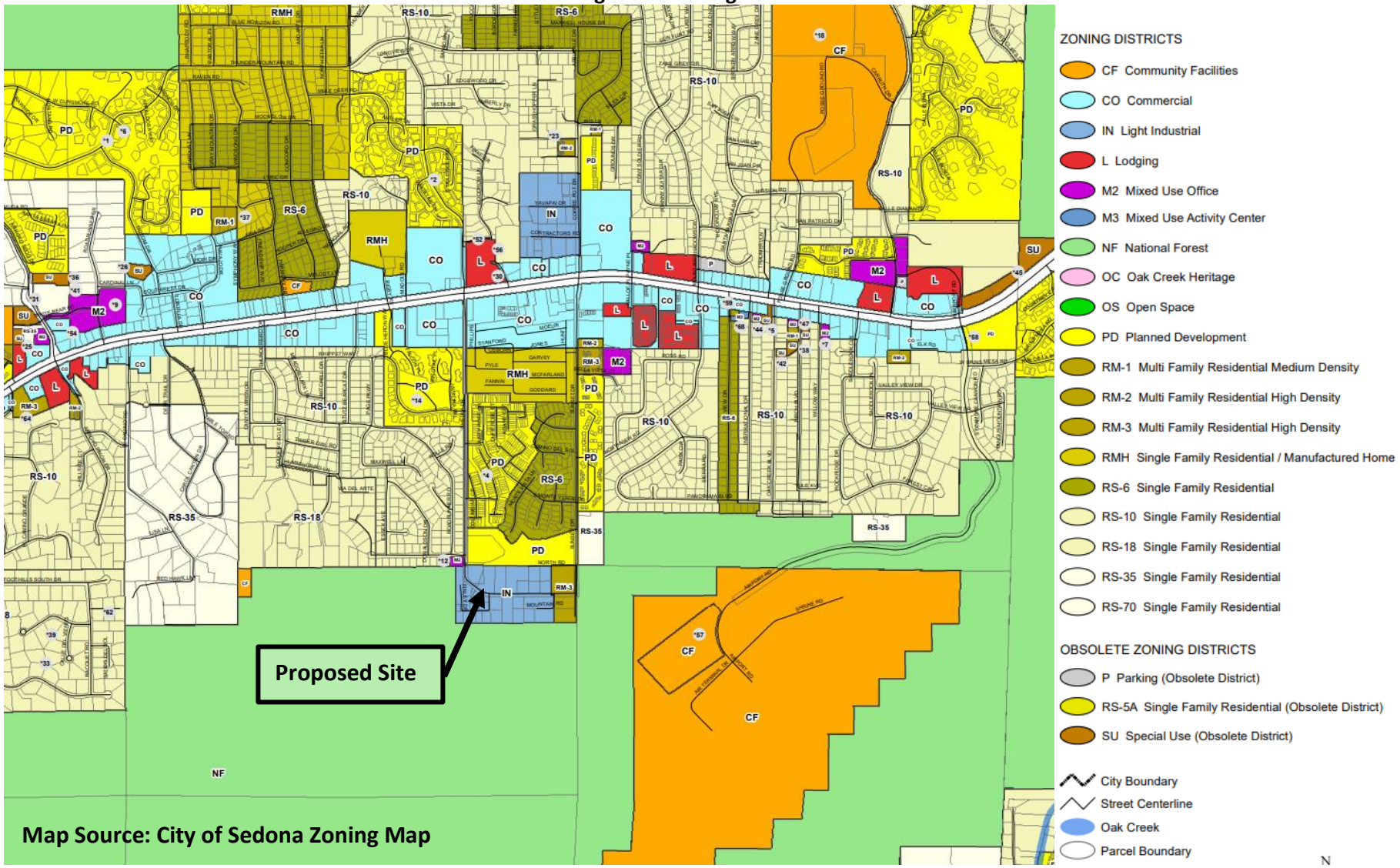


Figure 3: Existing AADT

XX 2022 AADT

XX 2023 AADT

2.0 Proposed Conditions

2.1. Proposed Land Use

Villas on Shelby is a proposed 3-story affordable housing development that aligns with the Sunset CFA plan. The development includes 24 single bedroom units and six three-bedroom units for a total of 30 units. The site plan is included in **Appendix A**.

2.2. Site Access

Primary access to the site is Shelby Drive. A full access private driveway is proposed.

2.3. Trip Generation

The Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition was used to estimate the number of vehicle trips the development is expected to generate. The manual contains average rates and best fit equations for calculating the number of trips expected for various land uses, tabulated by Land Use Code (LUC). The LUC selected for this development was LUC223: Affordable Housing with income limits. Trip generation by generator or adjacent street traffic was considered, and the larger calculated trip generation was utilized for a conservative estimate. Fitted curve equations are provided for LUC223; however, due to the limited data available for the selected code, the ITE Trip Generation Handbook 3rd Edition recommends using the average rate. The trip generation rates are summarized in **Table 1**. ITE Trip Generation data sheets LUC223 are included in **Appendix B**.

Table 1: Trip Generation Rates/Equations

Land Use Description (LUC)	AM Peak Hour		PM Peak Hour		Daily	
	Average Rate	In/Out (%)	Average Rate	In/Out (%)	Average Rate	In/Out (%)
Affordable Housing (223)	0.5	26/74	0.5	58/42	4.81	50/50

Daily (typical weekday), morning peak hour, and evening peak hour trips were estimated for the development are presented in **Table 2**. A total of 144 daily, 15 morning peak hour, and 15 evening peak hour trips were estimated.

Table 2: Expected Trip Generation

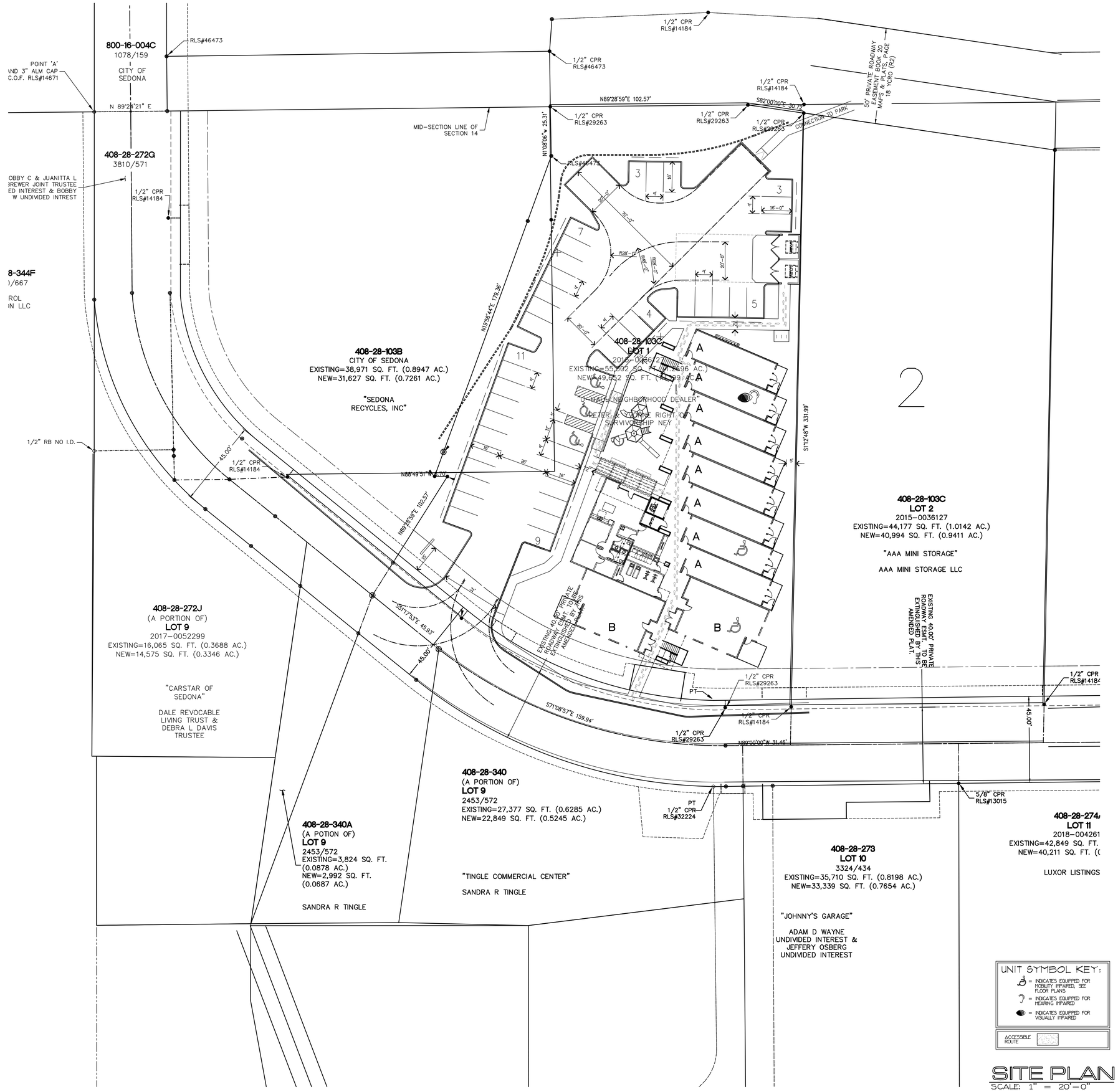
Land Use Description (LUC)	Size	AM Peak Hour			PM Peak Hour			Daily		
		Total	In	Out	Total	In	Out	Total	In	Out
Affordable Housing (223)	30 DU	15	4	11	15	9	6	144	72	72

3.0 Conclusion

Villas on Shelby is a proposed 30-unit affordable housing development in Sedona, Arizona. It is expected to generate 144 daily, 15 morning peak hour, and 15 evening peak hour trips. Due to the low expected trip generation, impacts to the surrounding roadway network are anticipated to be minimal. No traffic improvements are recommended as part of the development.

Appendix A

Site Plan



Address
South End of Shelby Drive
approx 2250 Shelby Drive
Sedona Arizona 86336

APN 408-26-103C

Site Area

Gross	55740 SF	Acres
Net	51037 SF	Acres

building Setbacks

Required	Required	Provided
Front	15 ft	15 ft
Side	0	5
Rear	0	0

unit count

Unit A (1-Bed)	24	SF Each
Unit B (3-Bed)	6	SF Each
Total	30	

density

Provided	30 units	
/	0 acres	
	#DIV/0! units/acre	

Parking

Required		
1.25 x	24 =	30
1.75 x	6 =	10.5
Required		40.5
Provided	42	

Bicycle Parking

Required	1 per 10 parking stalls	
	42 / 10	4.2
provided		5

ATHENA STUDIO, LLC
2801 E. Camelback 200
Phoenix, AZ 85016
602-274-5000

REGISTERED ARCHITECT
49779
PETER J. SWINGLE
ARIZONA U.S.A.
EXPIRES: 06/30/25

PRELIMINARY DRAWING
Not For Construction

Villas on Shelby
2250 Shelby Drive
Sedona, AZ 86336
HS Development Partners

Issue Date:
MARCH 2024

Revisions:

PROJECT NUMBER	2315.1
DRAWN BY	PS
REVIEWED BY	PS
START DATE	FEB 7, 2024
DATE PLOTTED	04/25/24
CAD FILE NAME	2315.1-SITE

SITE PLAN

S.1

Appendix B

ITE Trip Generation Sheets

Land Use: 223
Affordable Housing

Description

Affordable housing includes all multifamily housing that is rented at below market rate to households that include at least one employed member. Eligibility to live in affordable housing can be a function of limited household income and resident age. Multifamily housing (low-rise) (Land Use 220), multifamily housing (mid-rise) (Land Use 221), and multifamily housing (high-rise) (Land Use 222) are related land uses.

Land Use Subcategory

Data are presented for three subcategories for this land use: (1) sites with income limitations for its tenants (denoted as income limits in the data plots), (2) sites with both minimum age thresholds and income limitations for its tenants (denoted as senior in the data plots), and (3) sites designed for and occupied by residents with special needs, such as persons with physical and mental impairments, single mothers, recovering addicts and others living in a group setting.

Additional Data

For most study sites contained in this land use, all dwelling units in the development are classified as affordable units. For residential study sites that provide a mix of market value and affordable units, the study sites with at least 75 percent of the dwelling units designated as affordable are also included in this land use database.

It is expected that the number of bedrooms and number of residents are likely correlated to the trips generated by a residential site. To assist in future analysis, trip generation studies of all multifamily housing should attempt to obtain information on occupancy rate and on the mix of residential unit sizes (i.e., number of units by number of bedrooms at the site complex).

The sites were surveyed in the 1980s and 2010s in California, Ontario (CAN), and New Jersey.

Source Numbers

237, 918, 1003, 1004, 1046, 1057

Affordable Housing - Income Limits (223)

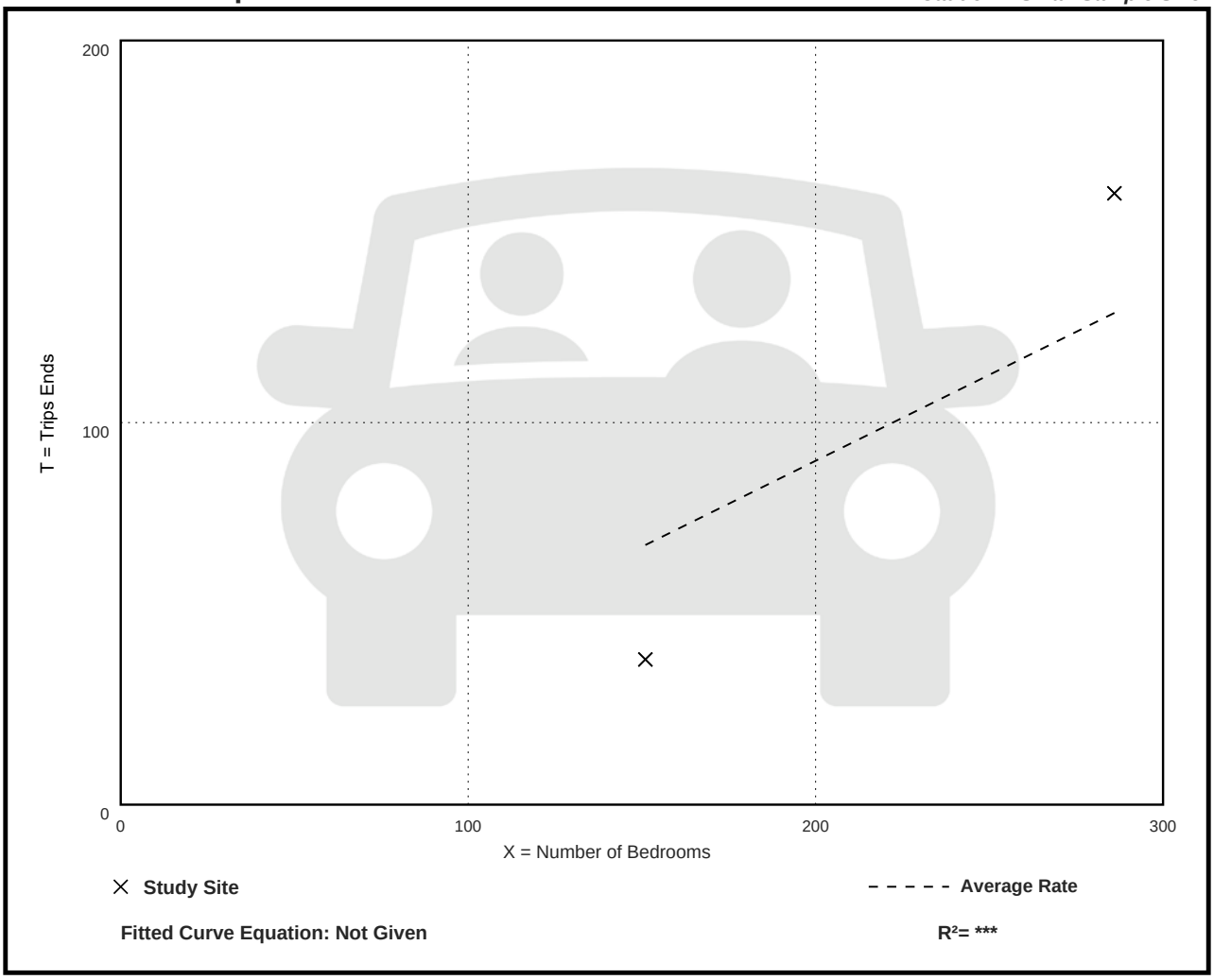
Vehicle Trip Ends vs: Bedrooms
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Bedrooms: 219
Directional Distribution: 37% entering, 63% exiting

Vehicle Trip Generation per Bedroom

Average Rate	Range of Rates	Standard Deviation
0.45	0.25 - 0.56	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits (223)

Vehicle Trip Ends vs: Bedrooms
On a: Weekday,
AM Peak Hour of Generator

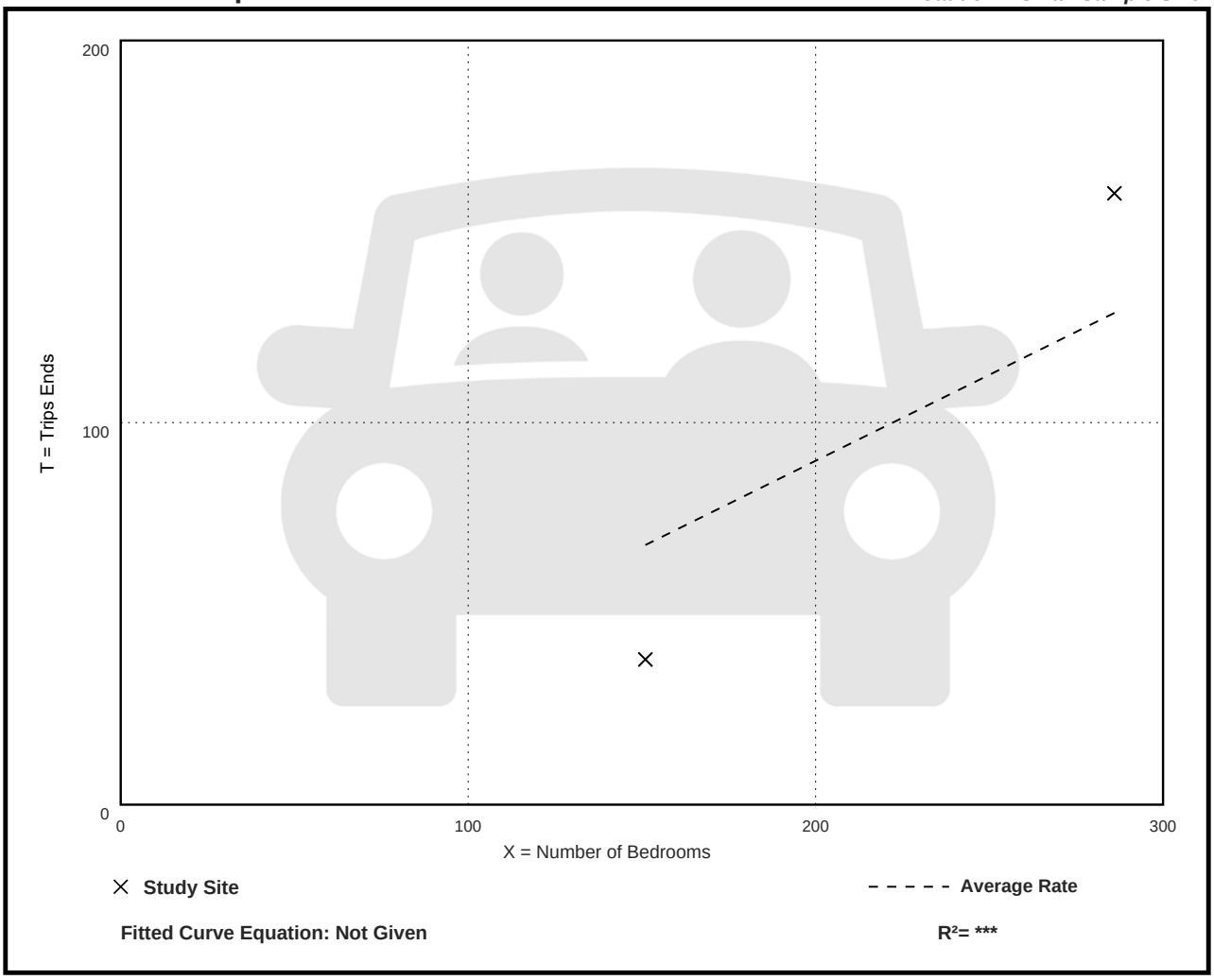
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Bedrooms: 219
Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Bedroom

Average Rate	Range of Rates	Standard Deviation
0.45	0.25 - 0.56	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= ***

Affordable Housing - Income Limits (223)

Vehicle Trip Ends vs: Bedrooms
On a: Weekday,
PM Peak Hour of Generator

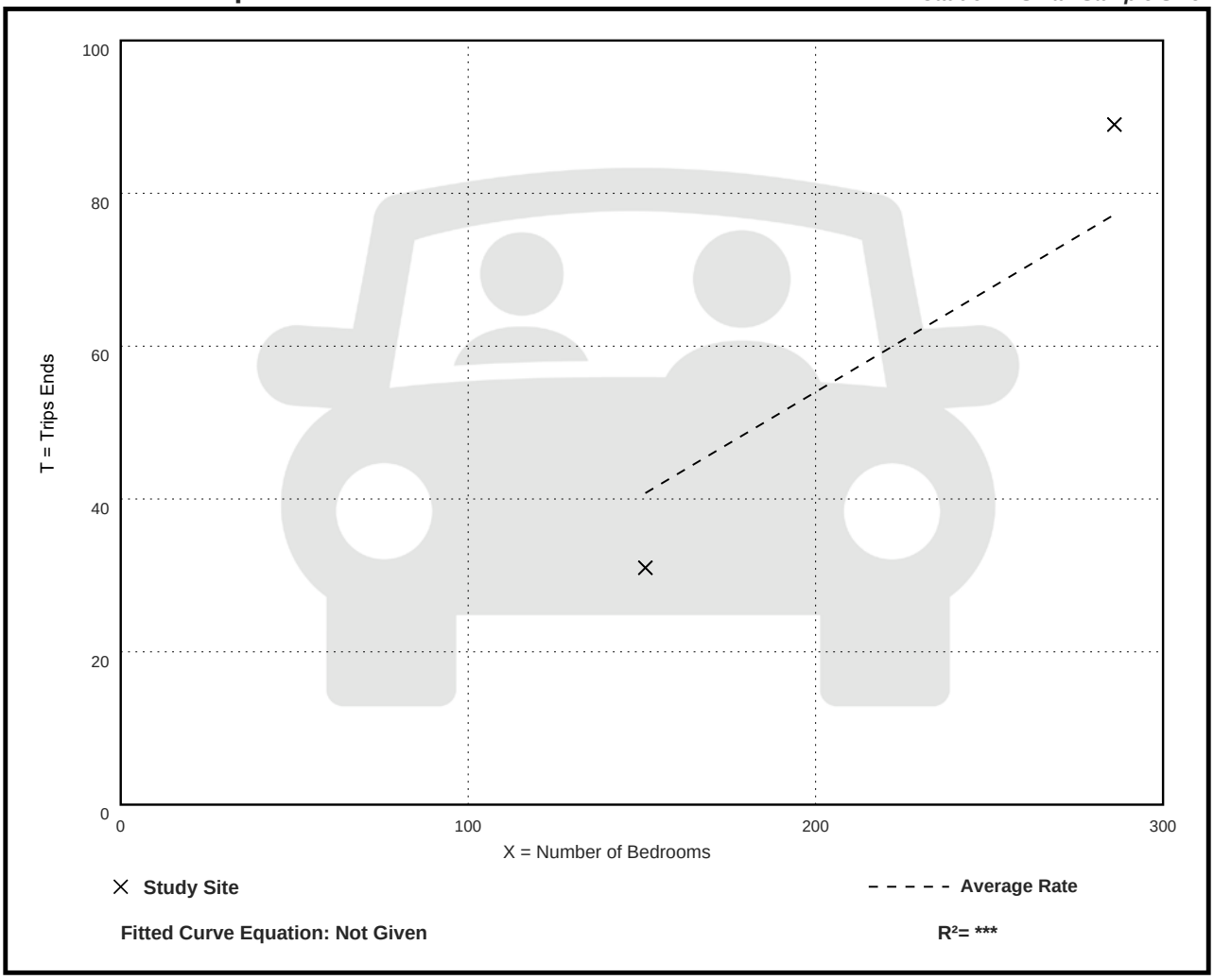
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Bedrooms: 219
Directional Distribution: 59% entering, 41% exiting

Vehicle Trip Generation per Bedroom

Average Rate	Range of Rates	Standard Deviation
0.27	0.21 - 0.31	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits (223)

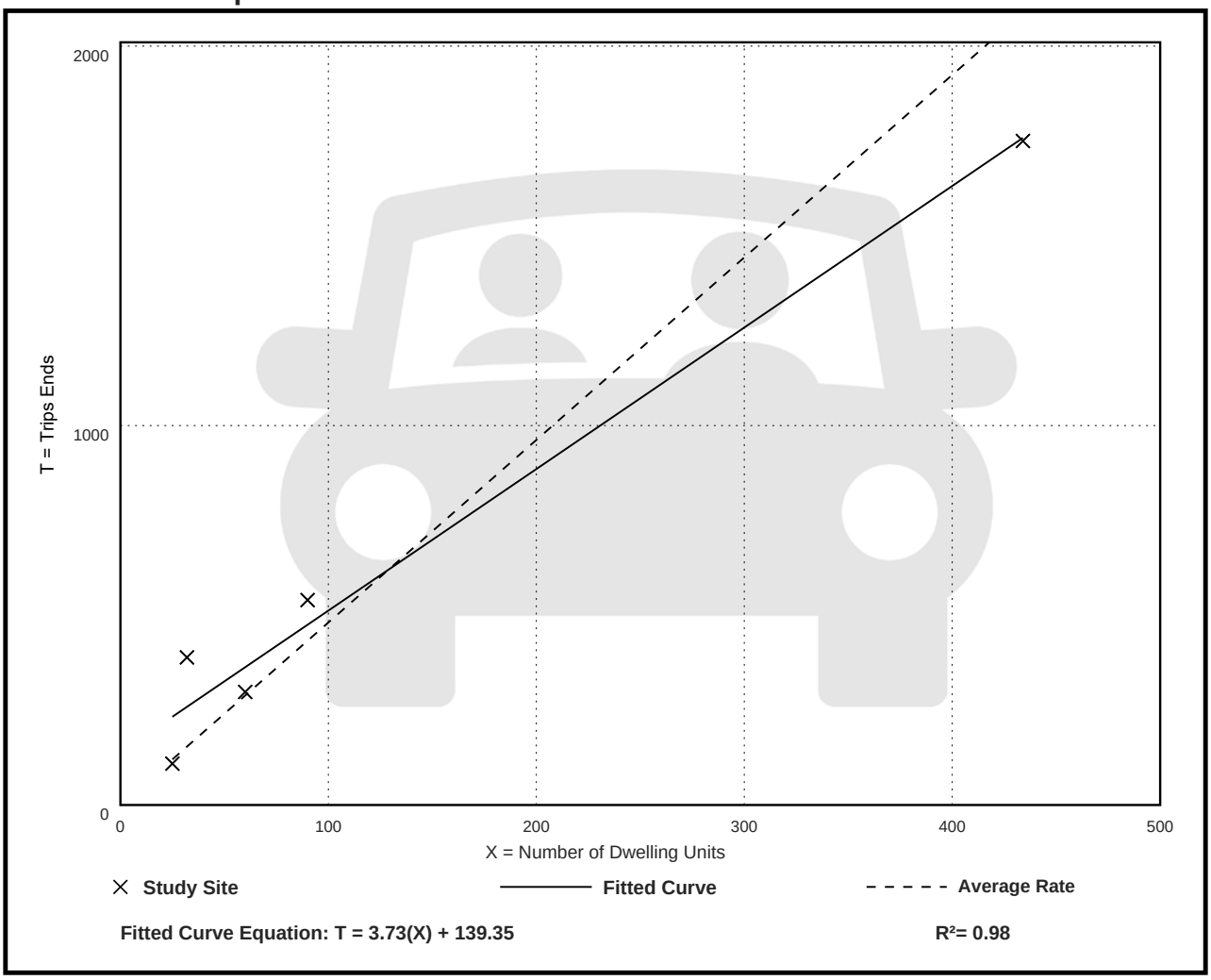
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 5
Avg. Num. of Dwelling Units: 128
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
4.81	4.03 - 12.16	2.03

Data Plot and Equation



Fitted Curve Equation: T = 3.73(X) + 139.35

R^2= 0.98

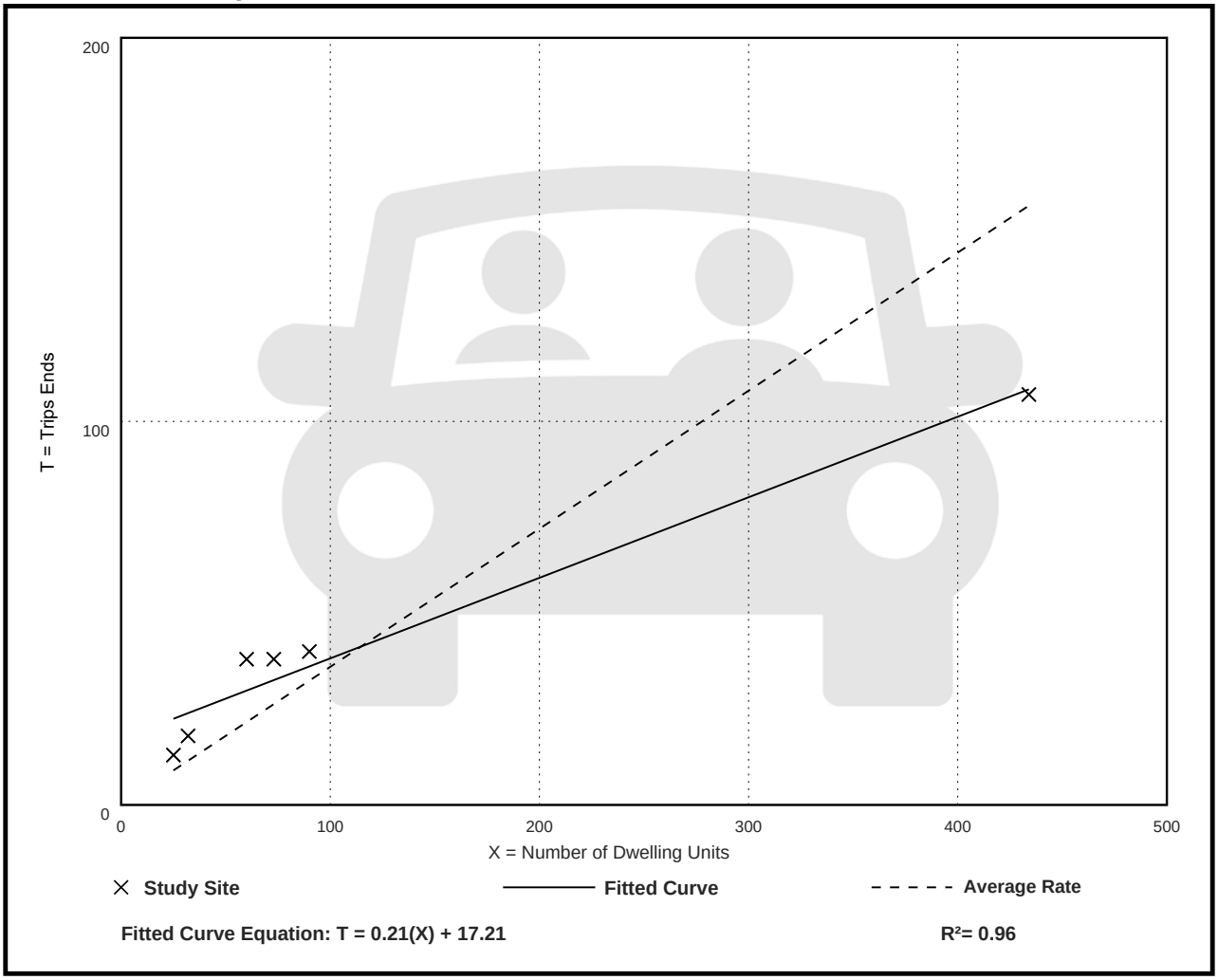
Affordable Housing - Income Limits
(223)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
Number of Studies: 6
Avg. Num. of Dwelling Units: 119
Directional Distribution: 29% entering, 71% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.36	0.25 - 0.63	0.16

Data Plot and Equation



Fitted Curve Equation: T = 0.21(X) + 17.21

R^2= 0.96

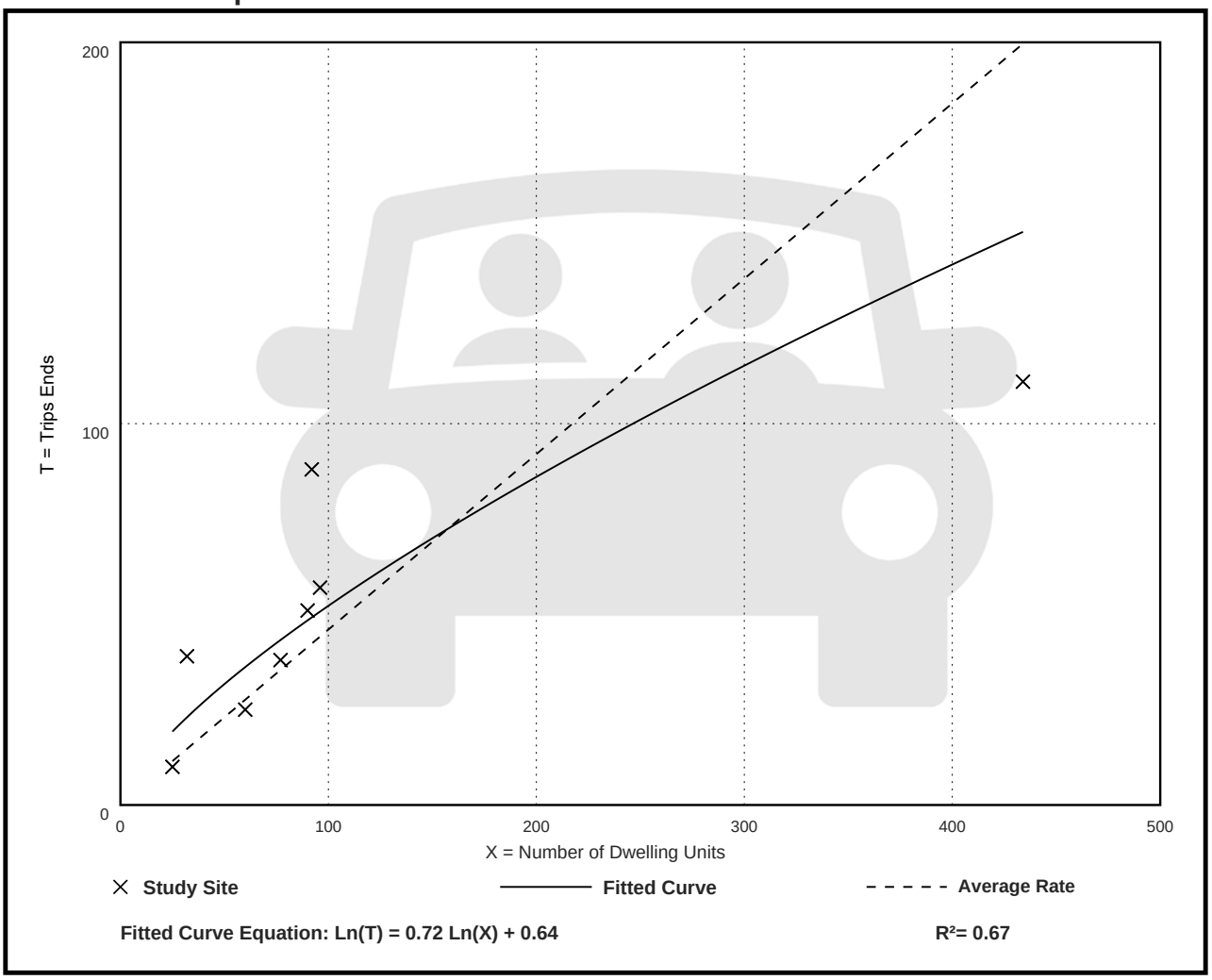
Affordable Housing - Income Limits (223)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 8
Avg. Num. of Dwelling Units: 113
Directional Distribution: 59% entering, 41% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.46	0.26 - 1.22	0.28

Data Plot and Equation



Affordable Housing - Income Limits (223)

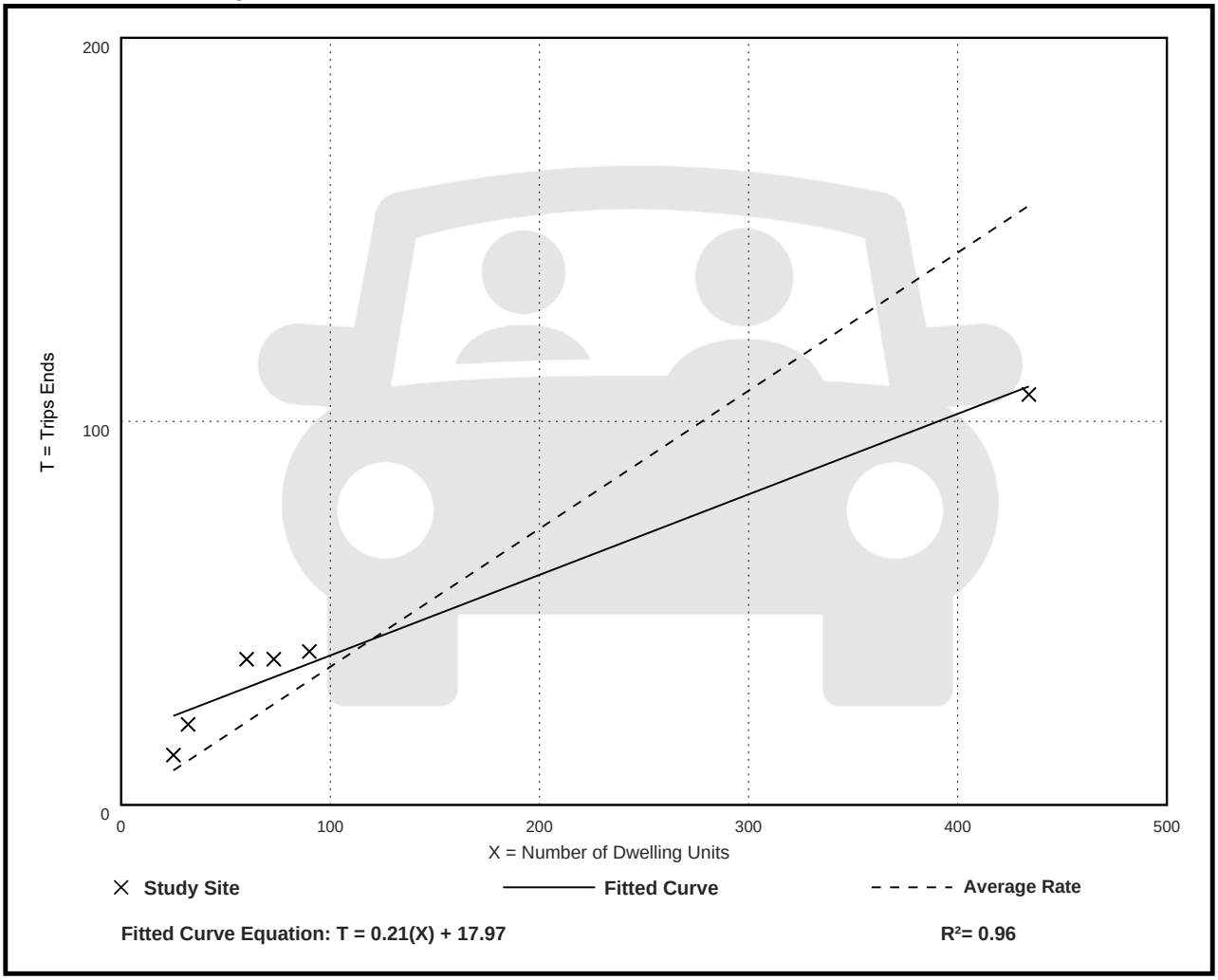
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
AM Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 6
Avg. Num. of Dwelling Units: 119
Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.36	0.25 - 0.66	0.16

Data Plot and Equation



Fitted Curve Equation: T = 0.21(X) + 17.97

R^2= 0.96

Affordable Housing - Income Limits (223)

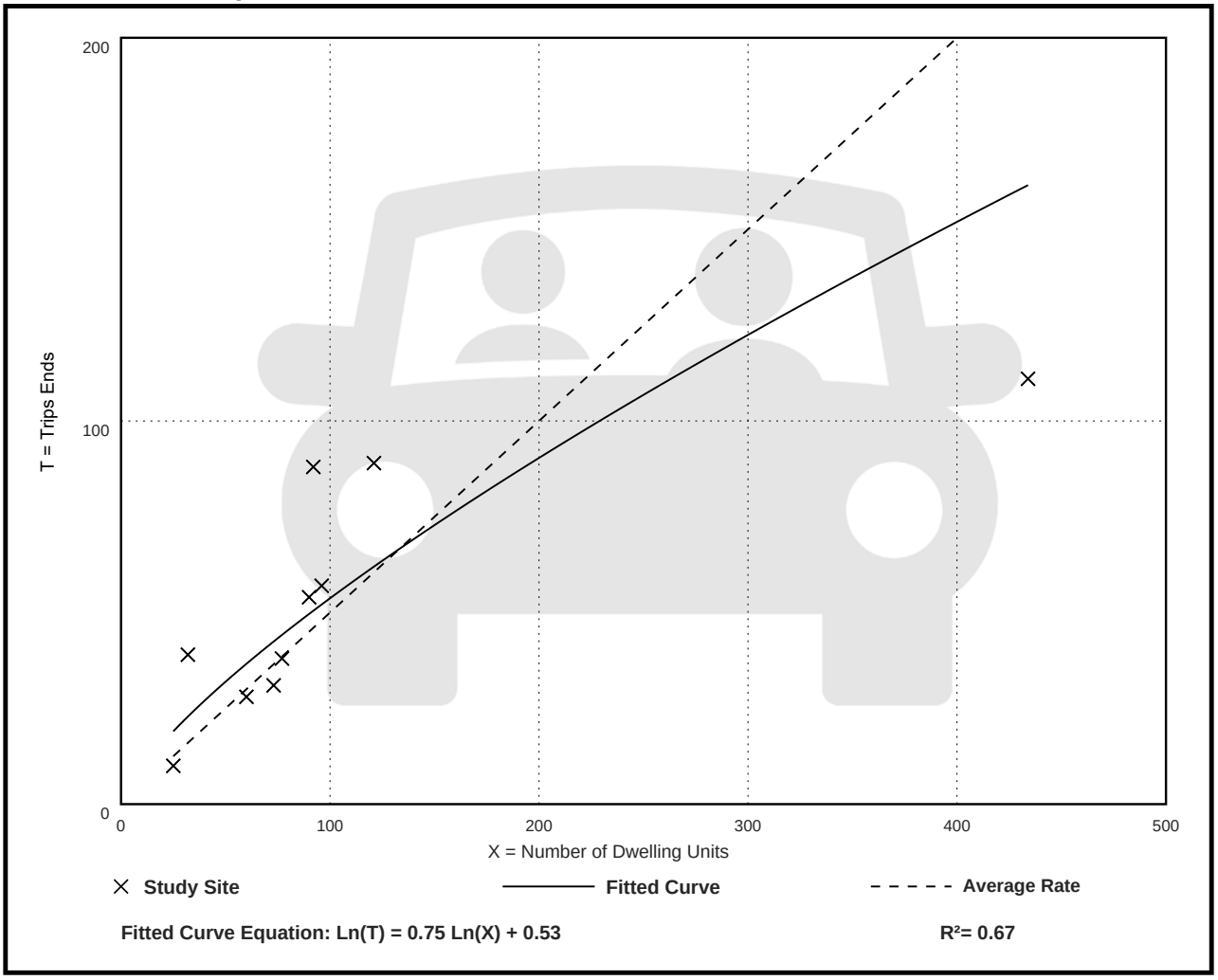
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
PM Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 10
Avg. Num. of Dwelling Units: 110
Directional Distribution: 58% entering, 42% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.50	0.26 - 1.22	0.27

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.75 Ln(X) + 0.53

R^2= 0.67

Affordable Housing - Income Limits (223)

Vehicle Trip Ends vs: Dwelling Units
On a: Saturday

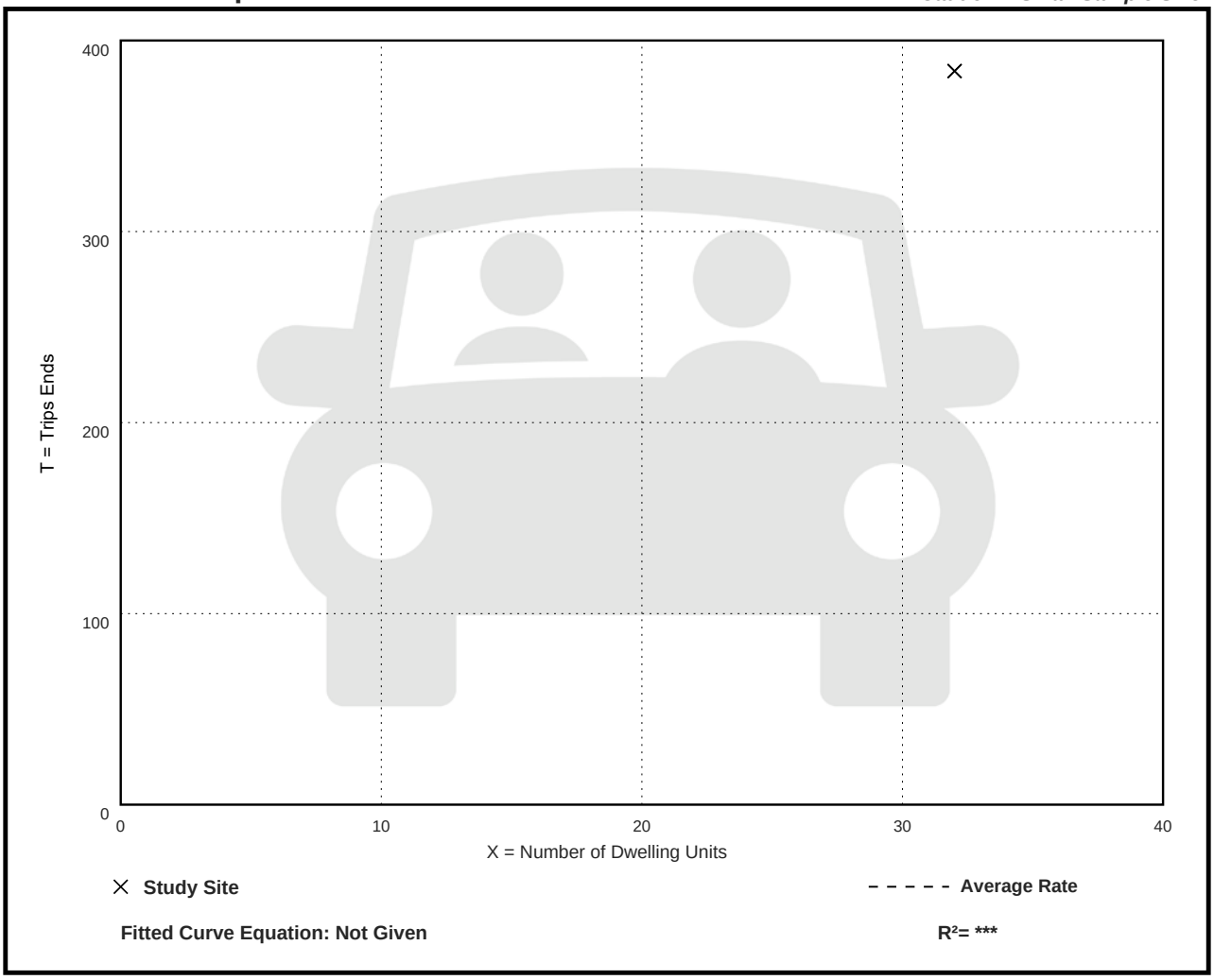
Setting/Location: General Urban/Suburban
Number of Studies: 1
Avg. Num. of Dwelling Units: 32
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
12.00	12.00 - 12.00	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits (223)

Vehicle Trip Ends vs: Dwelling Units
On a: Saturday, Peak Hour of Generator

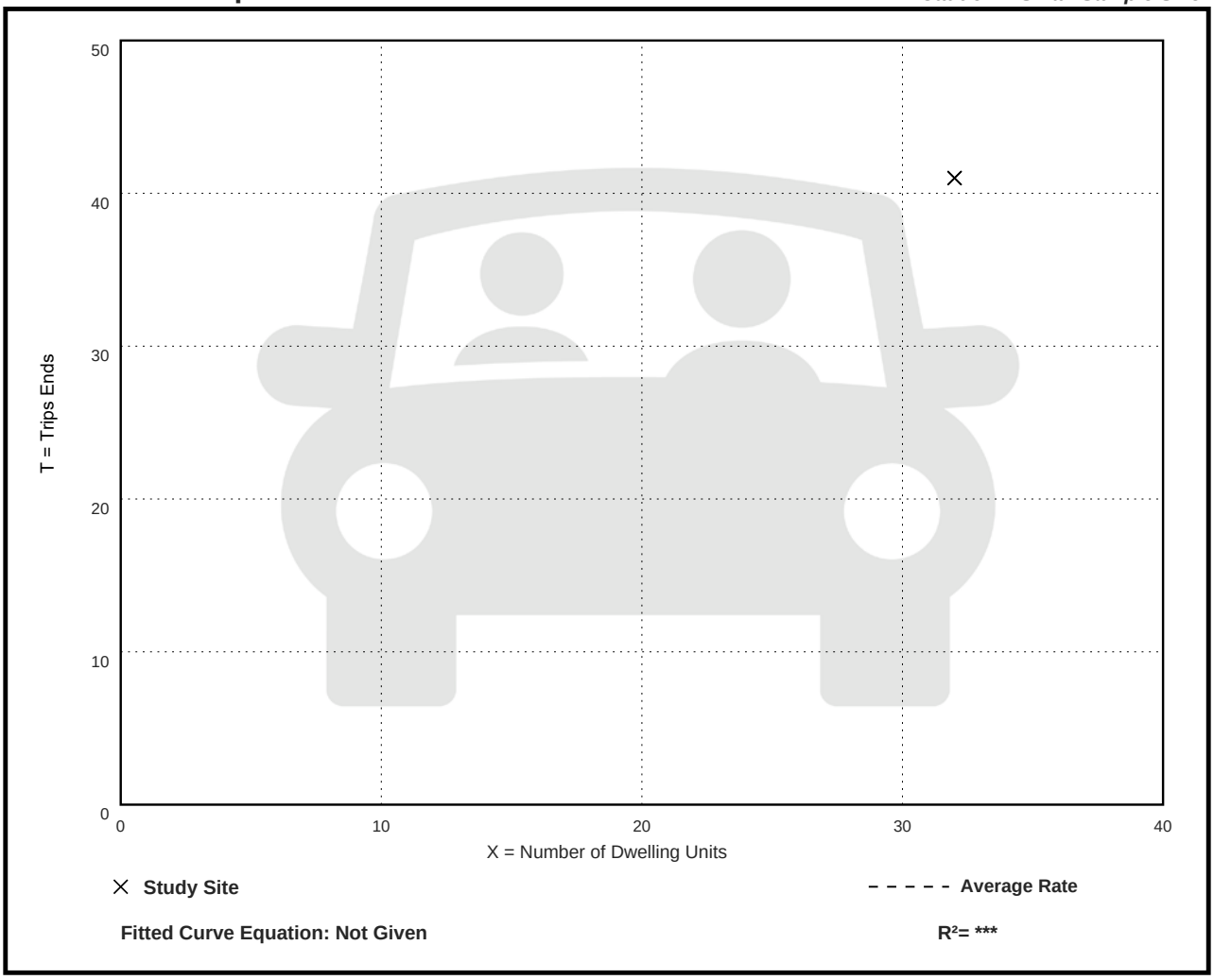
Setting/Location: General Urban/Suburban
Number of Studies: 1
Avg. Num. of Dwelling Units: 32
Directional Distribution: 59% entering, 41% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
1.28	1.28 - 1.28	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits (223)

Vehicle Trip Ends vs: Dwelling Units
On a: Sunday

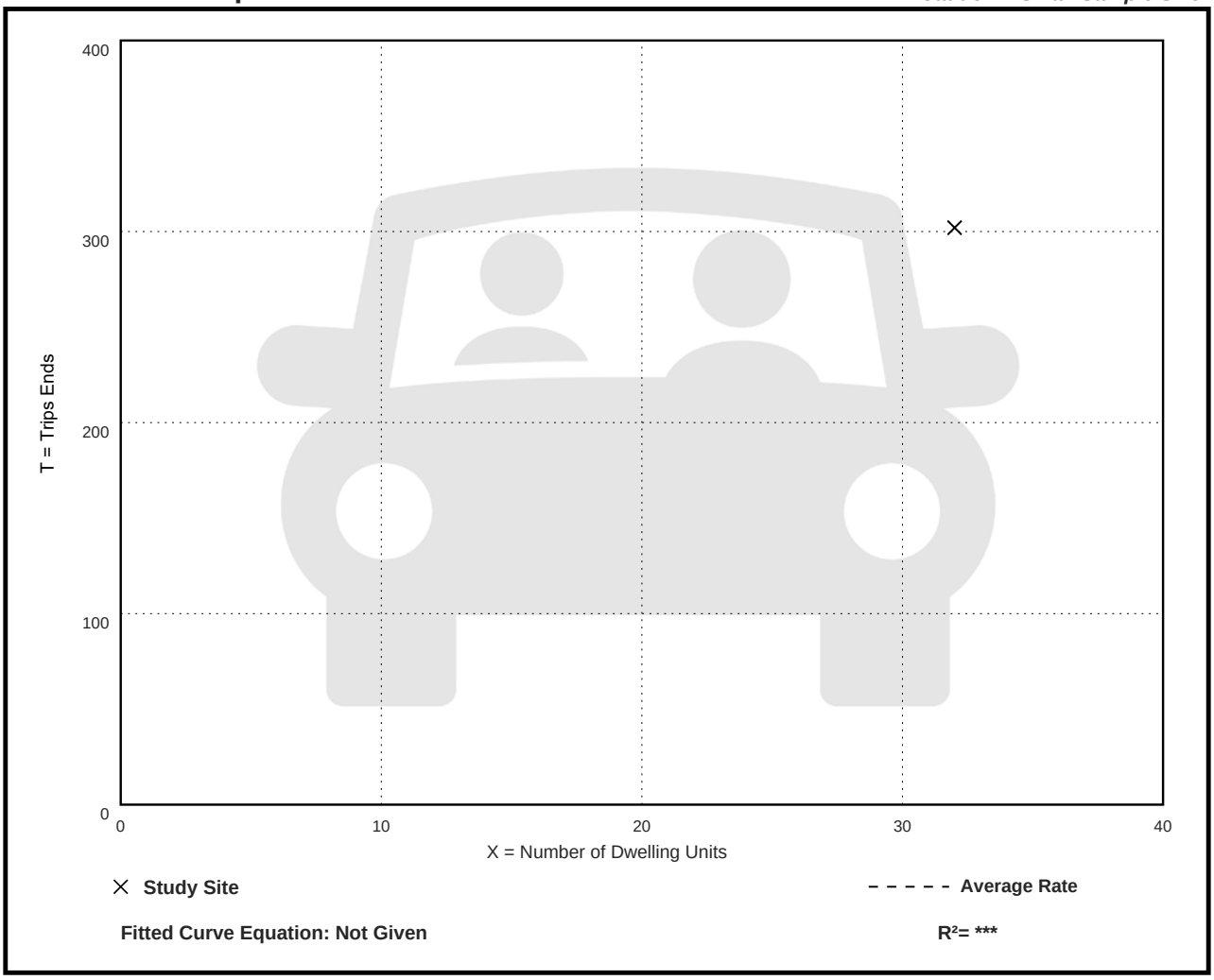
Setting/Location: General Urban/Suburban
Number of Studies: 1
Avg. Num. of Dwelling Units: 32
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	9.44 - 9.44	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits (223)

Vehicle Trip Ends vs: Dwelling Units
On a: Sunday, Peak Hour of Generator

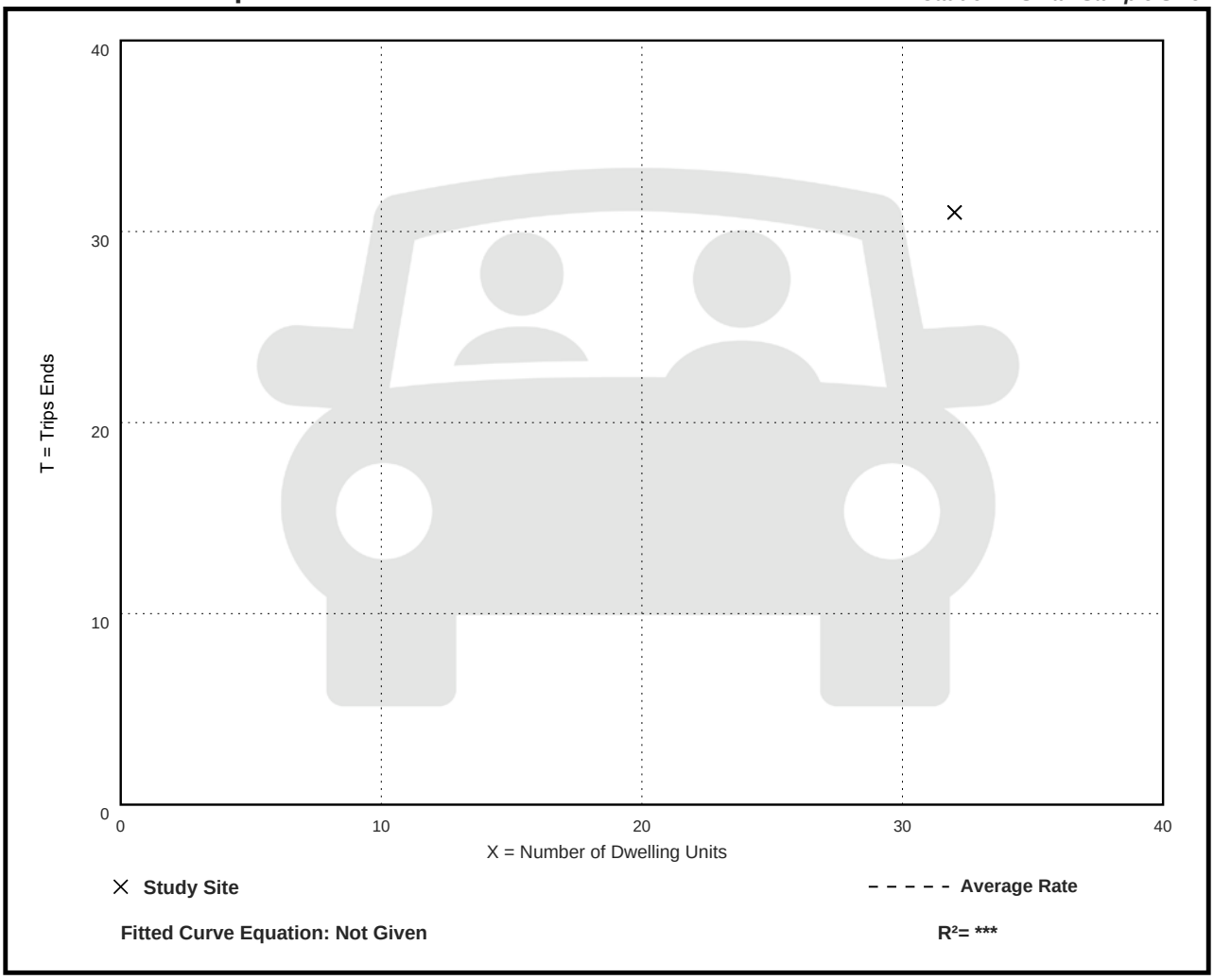
Setting/Location: General Urban/Suburban
Number of Studies: 1
Avg. Num. of Dwelling Units: 32
Directional Distribution: 52% entering, 48% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.97	0.97 - 0.97	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits (223)

Vehicle Trip Ends vs: Residents
On a: Weekday

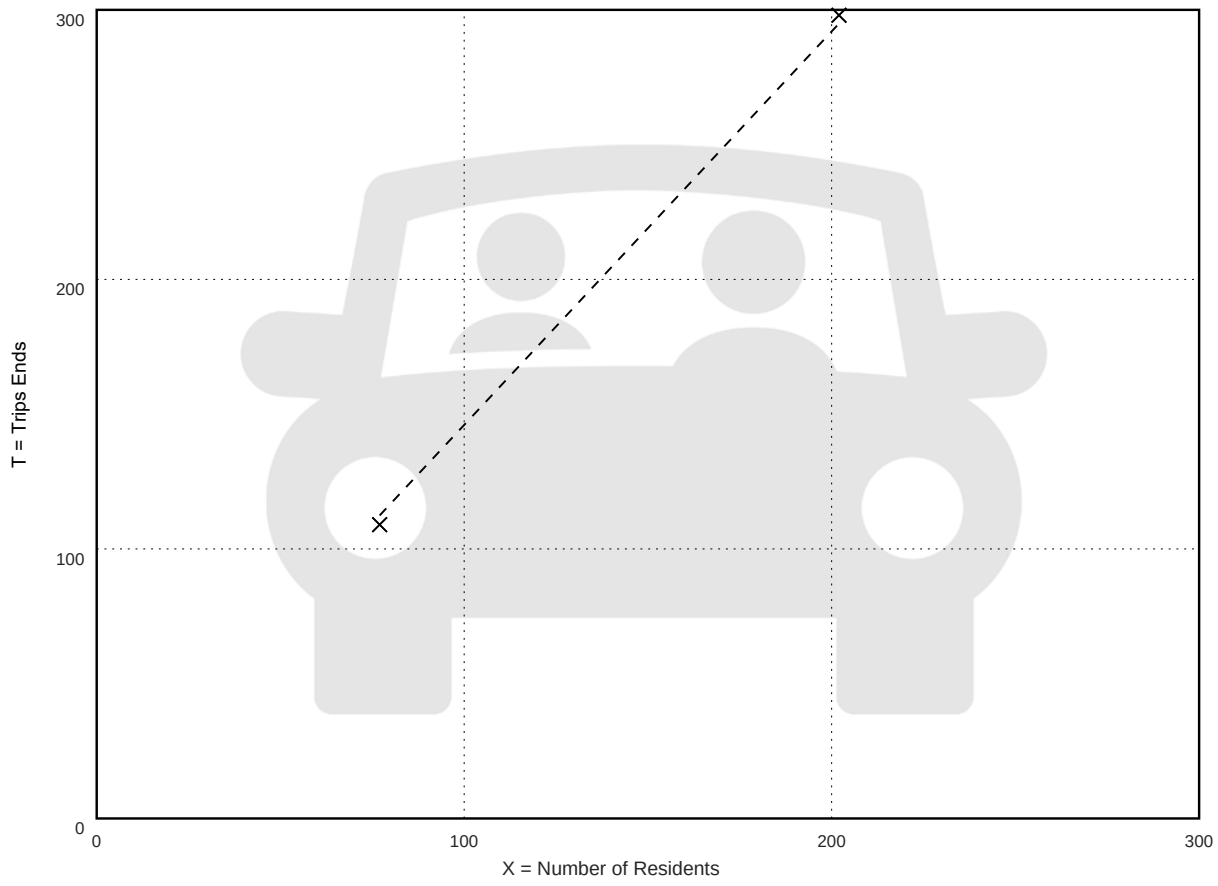
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Residents: 140
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
1.46	1.42 - 1.48	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits (223)

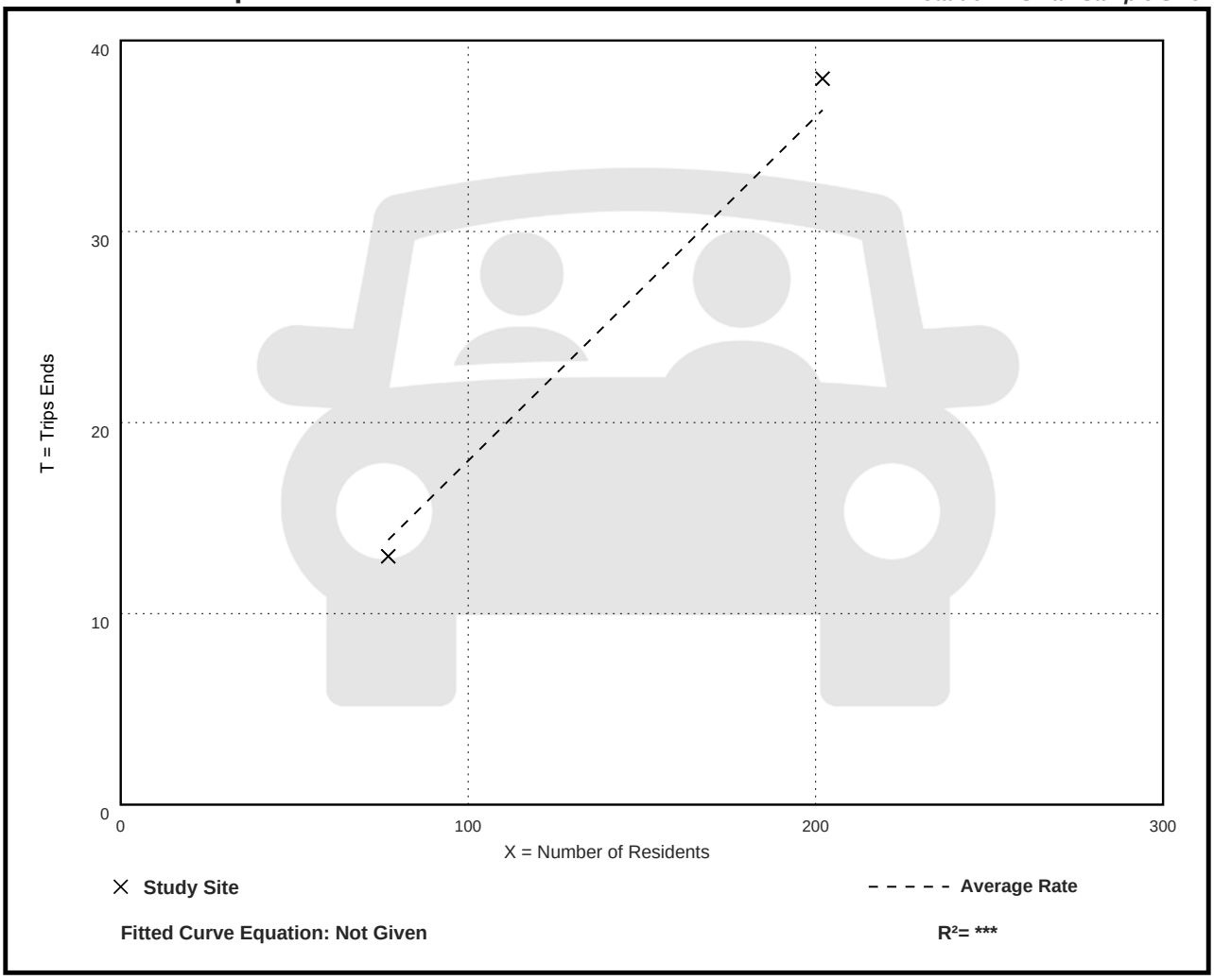
Vehicle Trip Ends vs: **Residents**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 2
Avg. Num. of Residents: 140
Directional Distribution: 31% entering, 69% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.18	0.17 - 0.19	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits (223)

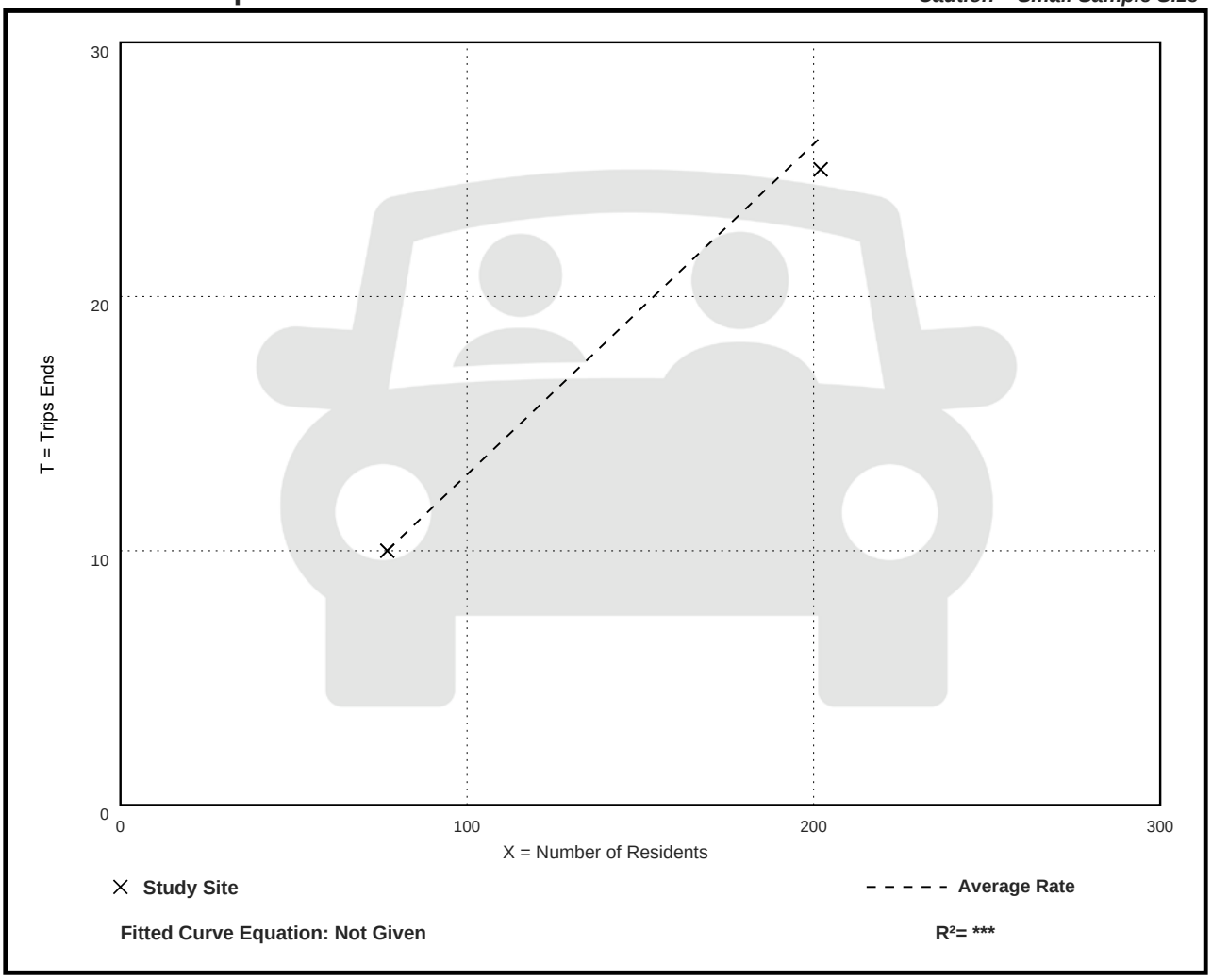
Vehicle Trip Ends vs: **Residents**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 2
Avg. Num. of Residents: 140
Directional Distribution: 71% entering, 29% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.13	0.12 - 0.13	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits (223)

Vehicle Trip Ends vs: Residents
On a: Weekday,
AM Peak Hour of Generator

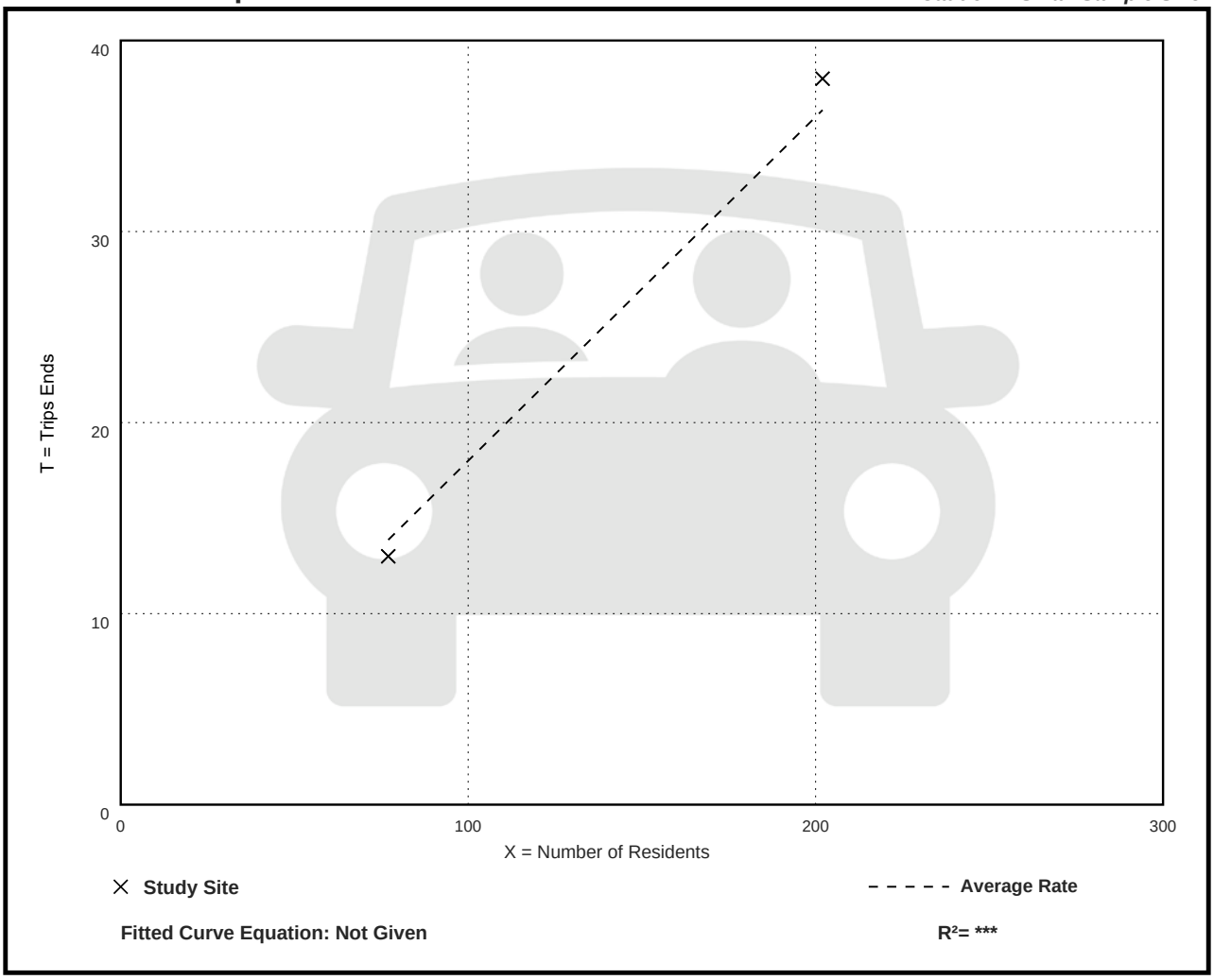
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Residents: 140
Directional Distribution: 31% entering, 69% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.18	0.17 - 0.19	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits (223)

Vehicle Trip Ends vs: Residents
On a: Weekday,
PM Peak Hour of Generator

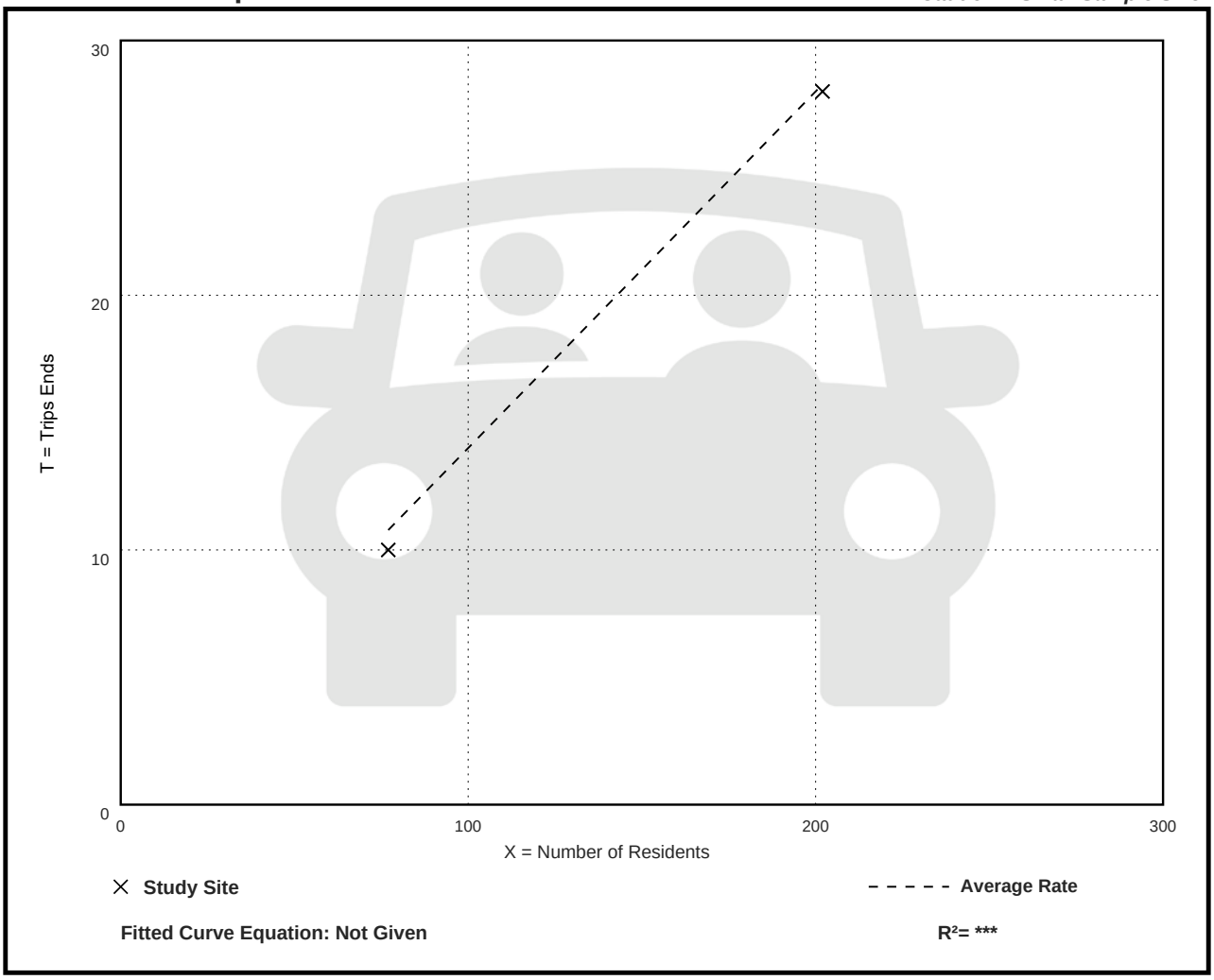
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Residents: 140
Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.14	0.13 - 0.14	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

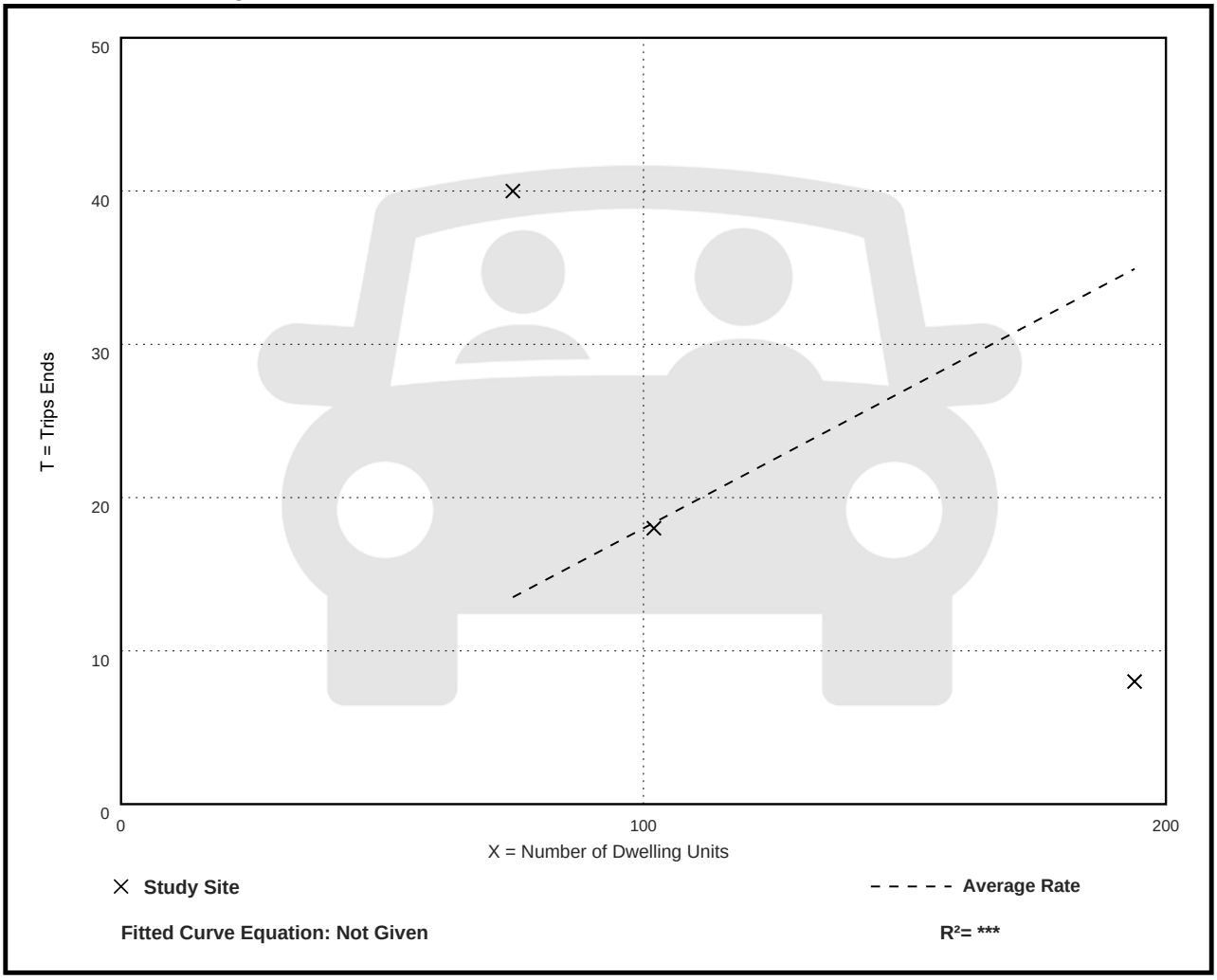
Affordable Housing - Senior
(223)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
Number of Studies: 3
Avg. Num. of Dwelling Units: 124
Directional Distribution: 58% entering, 42% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.18	0.04 - 0.53	0.23

Data Plot and Equation



Affordable Housing - Senior
(223)

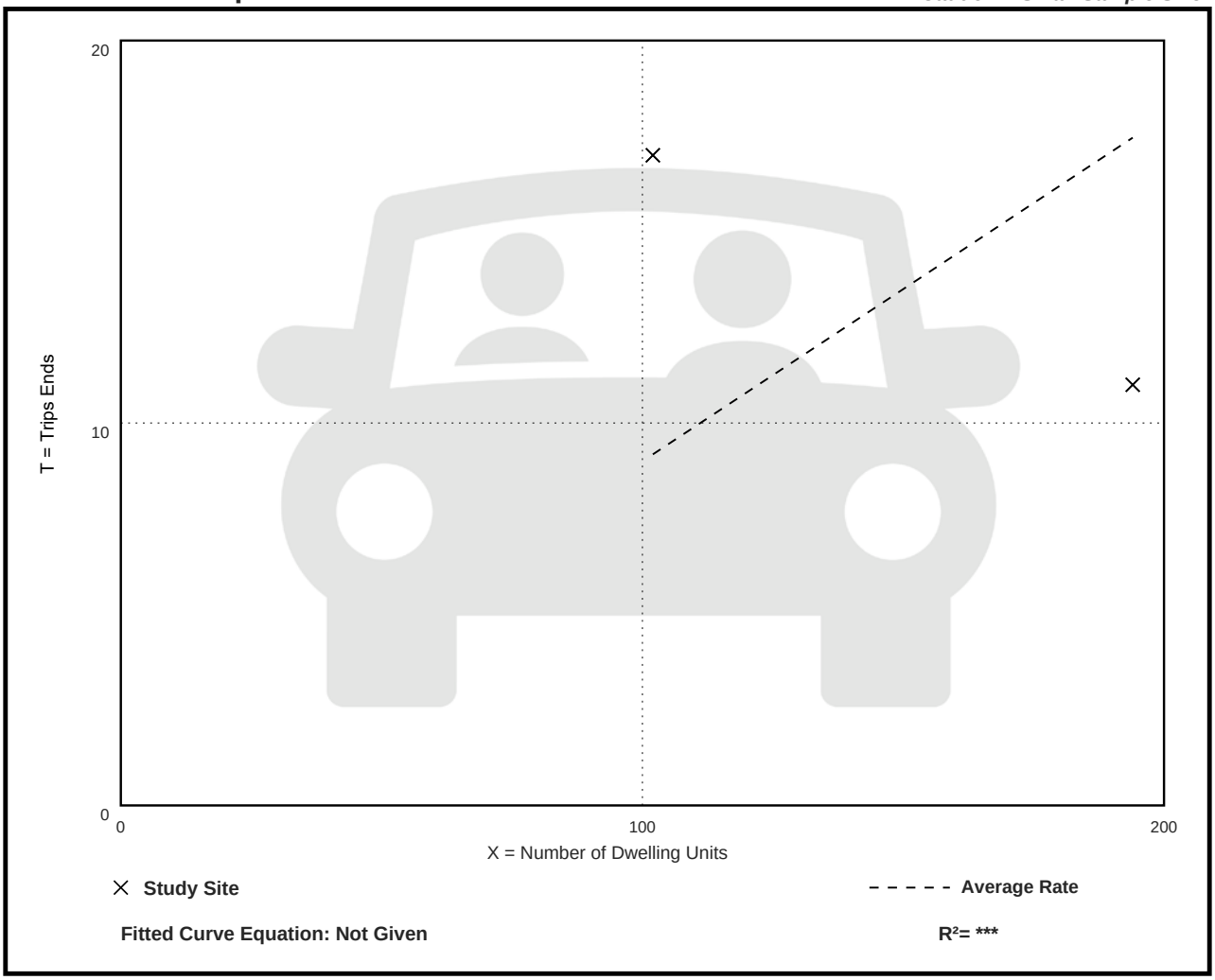
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Dwelling Units: 148
Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.09	0.06 - 0.17	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Senior
(223)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
PM Peak Hour of Generator

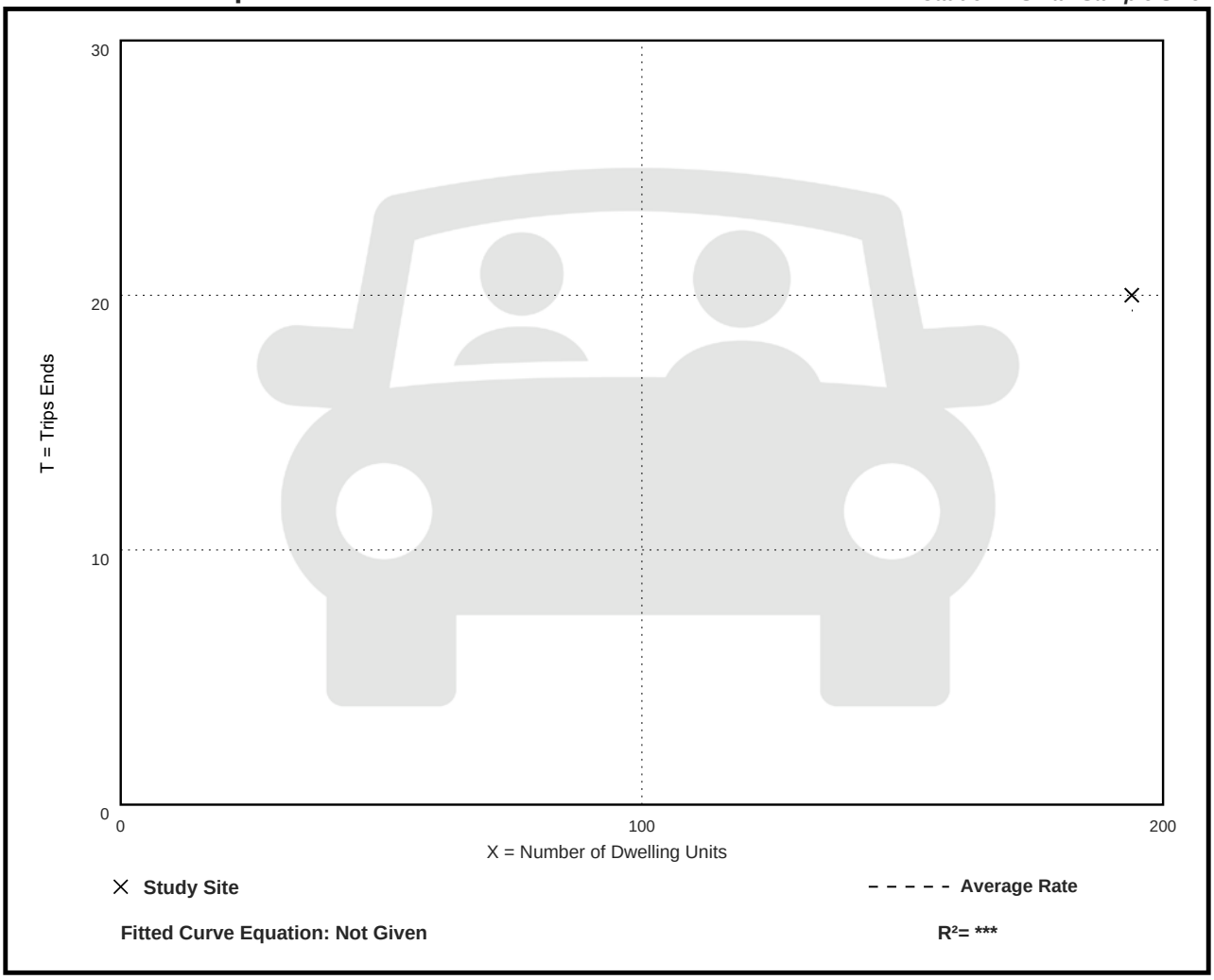
Setting/Location: General Urban/Suburban
Number of Studies: 1
Avg. Num. of Dwelling Units: 194
Directional Distribution: 64% entering, 36% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.10	0.10 - 0.10	***

Data Plot and Equation

Caution – Small Sample Size

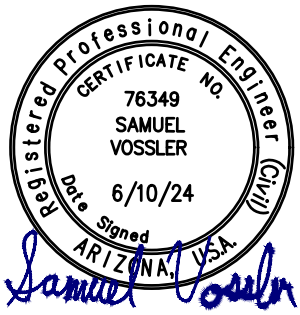


Fitted Curve Equation: Not Given

R^2= *

Villas on Shelby
2250 Shelby Drive
Sedona, AZ 86336

Basis of Sewer Design Report



Date June 10, 2024

Prepared for: **HS Development Partners, LLC**
Matt Shoemacher
30 South Oak St
London, Ohio 43140
P: 216-406-3683

Prepared By: **Burgess & Niple, Inc.**
Sam Vossler PE
2201 North Gemini Drive
Flagstaff, Arizona 86001
P: 928-395-1988

Table of Contents

List of Appendices

100 INTRODUCTION

The purpose of this report is to provide the basis of design for the sewer service to the proposed Villas on Shelby Project. This report will evaluate the existing infrastructure and determine if the proposed design will adequately support the calculated demands for the proposed development. The Project will be designed and developed in accordance with the 2020 City of Sedona Design Review, Engineering and Administrative Manual (DREAM), Sedona Current adopted Building Code, Arizona Administrative Code Title 18 Chapter 9, and Yavapai County's current requirements.

100.1 Site Description

The Villas on Shelby Project is proposed on a parcel containing 1.1+/- acres (APN 408-28-103F) and is currently undeveloped. The site is located at 2250 Shelby Drive in City of Sedona (see ***Figure 1*** below). The current project zoning is IN (Light Industrial). No phasing is proposed for the construction of the development's improvements.

Figure 1 – Project Location Map

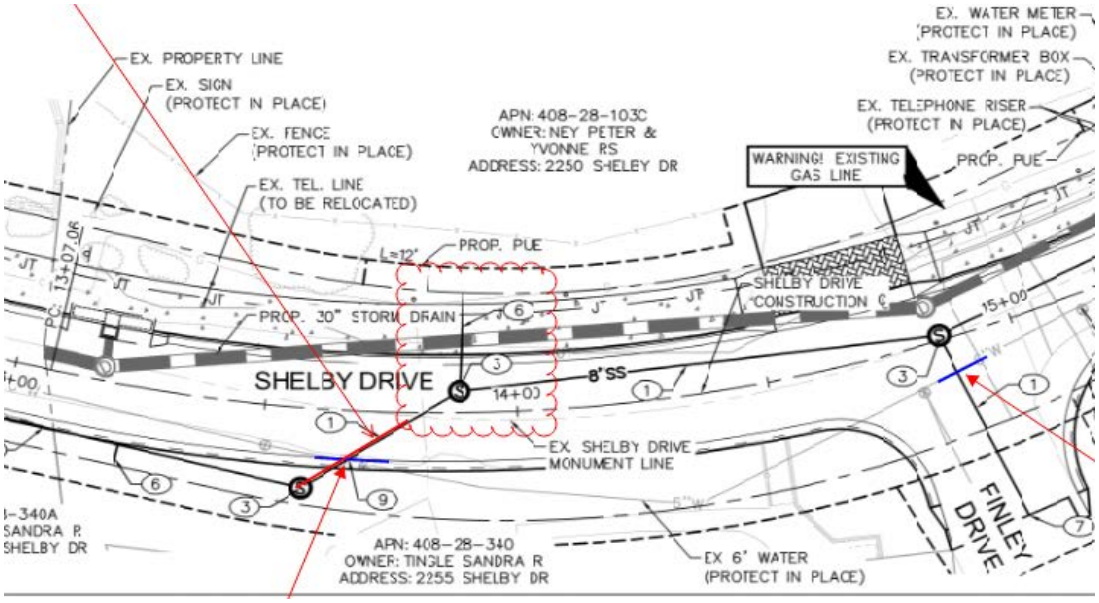
The Project is a proposed multi-family development to be composed of 1 three-story building with 30 Housing Units, leasing office, common area and a gym. The site will contain 42 parking spaces, with an access drive connecting to the south on Shelby Drive.

200 SEWER SYSTEM

The Site is currently vacant and there is an existing 8" PVC sewer main in Shelby Drive as park of the City of Sedona collection facilities system. As-built drawings from the recent *Shelby Drive Roadway Improvement Project (8/24/2022)* shows an existing 6" sewer service line extended to the site (See ***Figure 2***). The exact depth of this service invert is unknown and will need to be verified prior to construction.

Based on discussions with the City of Sedona, the downstream sewer main and wastewater treatment plant has sufficient capacity to support the Project's sewer proposed flows at this time and a Will Serve Letter for the project has been obtained.

Figure 2 – Excerpt from As-builts of Sewer Service Stub



300 SEWER ANALYSIS

300.1 Jurisdictional Design Criteria

No new sewer mains will be installed with this project, instead an existing service will be connected to. Design of the service will be in accordance with According to the International Plumbing Code (2018 IPC), cleanouts are located at any direction change greater than 45° or at the end of the line. All buildings are required to have a two-way cleanout at the building per IPC. Intermediate cleanouts will be placed every 100 feet or less.

300.2 Proposed Wastewater Flows

The Project will include 24 1-bedroom units and 6 3-bedroom units. It was conservatively estimated that the 1-bedroom units will have 2 persons per a dwelling unit and the 3- bedroom units will have 4 persons per a unit. Per Arizona Administrative Code Title 18 Chapter 9 Tabel 1. Unit Design Flows, the Sewage Design Flow is 80 Gallons per a day per a Person. A peaking factor of 3.62 was selected per R18-9-E301 for a population of 100.

Calculate Population: 24 1-bedroom x 2 persons + 6 3-bedrrom x 4 persons = 72 persons

Average Day Demand : 80 Gallons per person per day x 72 persons = **5,760 gallons per day (or 4 gpm)**

Dry Weather Peak Daily Flow: 5,760 gallons per day x 3.62 PF = **20,851 gallons per day (or 14.5 gpm)**

300.3 Sewer Calculations

Flow capacity per Manning's formula for uniform pipe flow:

$$Q = \frac{1.49}{n} * A * R^{\frac{2}{3}} * S^{\frac{1}{2}}$$

Where:

Q = Pipe capacity (cfs)
n = Manning's roughness coefficient (0.013 for PVC)
A = Cross sectional area (ft2)
R = Hydraulic radius (ft.)
S = Minimum slope (ft/ft)

The flowing full (d/D=1) capacity for the 6" sewer service line stubbed to the site with a minimum slope of 0.77%: Q=220 gpm (Check > 14.5 gpm good) and a velocity of 2.50 ft/sec (Check > 2.5 ft/sec good)

400 CONCLUSION

As demonstrated, the proposed sewer service for the multi-family development of Villas on Shelby will be designed in accordance with local City and County codes and have the capacity to service the Site. The project demand is less than the 6" sewer line capacity and an acceptable velocity is achieved with a minimum slope of 0.77% although the service will be constructed at steeper slope. The City of Sedona has determined that the downstream collection system and treatment facility has capacity for the Project currently.

Appendix A
Will Serve Letter

Mail:
102 Roadrunner Dr.
Sedona, AZ 86336
Site:
7500 W. SR 89A
Sedona, AZ 86336
(928) 204-2234
sedonaaz.gov
FAX (928) 204-7137

Wastewater Department

March 7, 2023

Bonnie Harbage
HS Development Partners
5777 S. Rural Rd, Suite 4
Tempe, AZ 85283

SUBJECT: WILL SERVE SEWER – 2250 Shelby Drive
APN 408-28-103C

This letter is in response to your request regarding sewer service availability for the property referenced above.

This parcel has sewer availability, due to sewer being available adjacent to the point of access to the property, as defined in City Code section 13.15. Currently, the property is being billed the sewer standby fee.

Assuming adequate capacity is available at the time of development approval, sewer will be served by the city of Sedona. If you have any questions or concerns, please contact me at (928) 203-5069.

Sincerely,

Roxanne Holland, PE
Director of Wastewater

RH:ms
cc: J. Andy Dickey, Assistant City Manager/City Engineer (e-copy)
Sandra Phillips, Assistant Director of Public Works (e-copy)
Hanako Ueda, Assistant Engineer (e-copy)
Sal Valenzuela, Chief Public Works Inspector (e-copy)
Denise Breland, Accountant I (e-copy)
Marsha Beckwith, Accounting Tech II, (e-copy)
Streets file: Shelby Drive

Mail:
102 Roadrunner Dr.
Sedona, AZ 86336
Site:
7500 W. SR 89A
Sedona, AZ 86336
(928) 204-2234
sedonaaz.gov
FAX (928) 204-7137

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Sal Valenzuela, Chief Public Works Inspector (e-copy)
Denise Breland, Accountant I (e-copy)
Marsha Beckwith, Accounting Tech II, (e-copy)
Streets file: Shelby Drive

ARIZONA WATER COMPANY

3805 N. BLACK CANYON HIGHWAY, PHOENIX, AZ 85015-5351 • P.O. BOX 29006, PHOENIX, AZ 85038-9006
PHONE: (602) 240-6860 • FAX: (602) 240-6874 • TOLL FREE: (800) 533-6023 • www.azwater.com

March 16, 2023

Bonnie Harbage
HS Development Partners, LLC
30 S. Oak Street
London, OH 43140

Re: Domestic Water Service to APN 408-28-103C

Dear Ms. Harbage:

Arizona Water Company (the "Company") certifies that the above-described property is located within its Sedona Certificate of Convenience and Necessity in Sedona, Arizona, and that it will provide water service to the property in accordance with the Company's tariffs and the Arizona Corporation Commission's rules and regulations. It will be the responsibility of the developer to provide the funds to install the necessary water facilities, and the Company assumes no liability to install those facilities if the funds are not advanced by the developer.

The design of the water distribution system must comply with the Company's standard specifications that are on file at the Yavapai County Development Services. Both preliminary and final water system designs must be approved by the Company.

It will also be the responsibility of the developer to comply with all of the requirements of regulatory agencies having jurisdiction over Arizona subdivisions and of Arizona statutes applicable to subdivided or unsubdivided land, including, but not limited to, requirements relating to a Certificate of Assured Water Supply, as set forth in the Arizona Groundwater Management Act, A.R.S. §45-576.

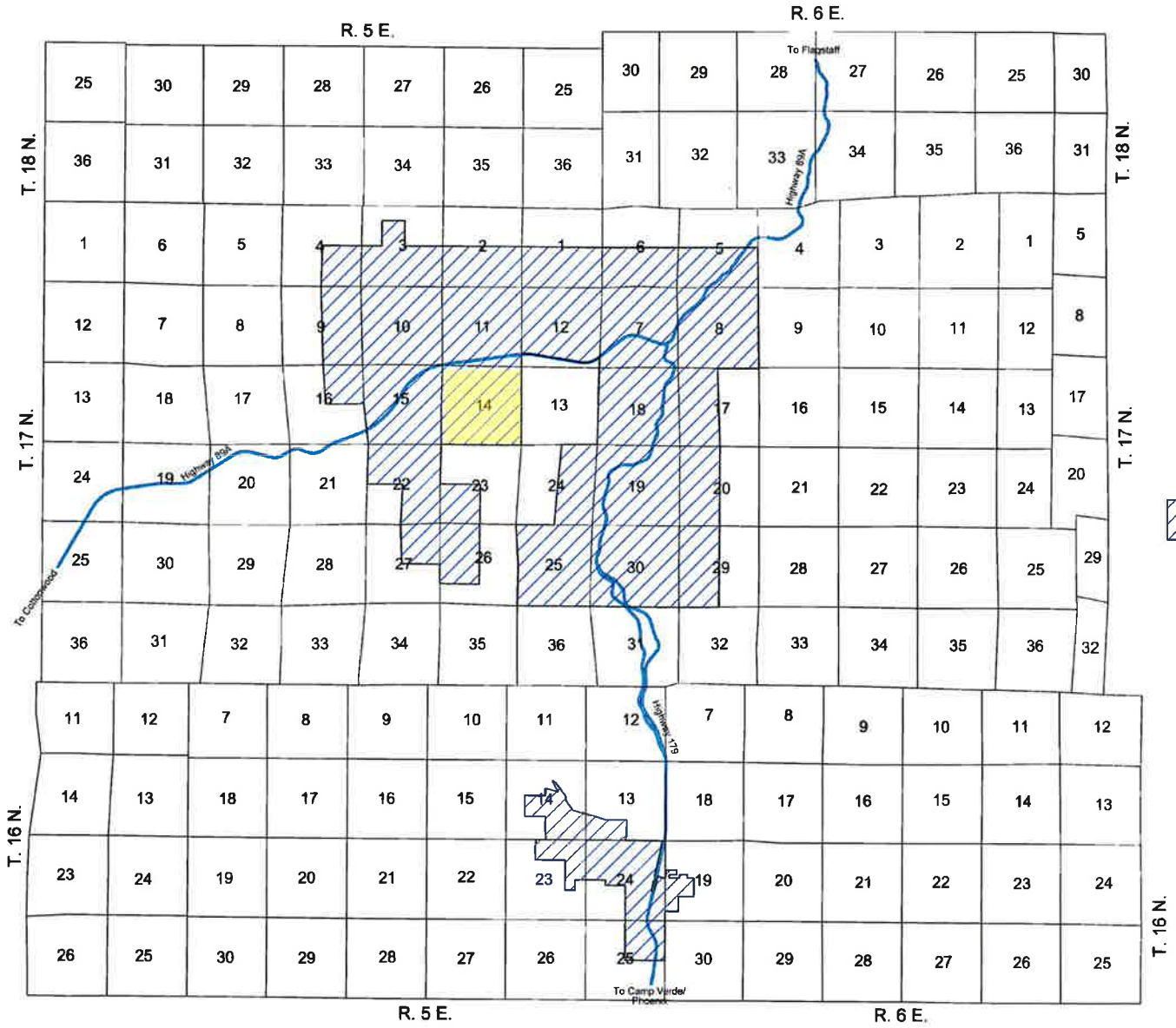
Please notify the Company if you will be proceeding with development of the property so the Company can prepare the necessary Agreement.

Very truly yours,

Andrew J. Haas

Andrew J. Haas, PE
Vice President - Engineering
developmentservices@azwater.com

sla



Area Covered By Present CCN

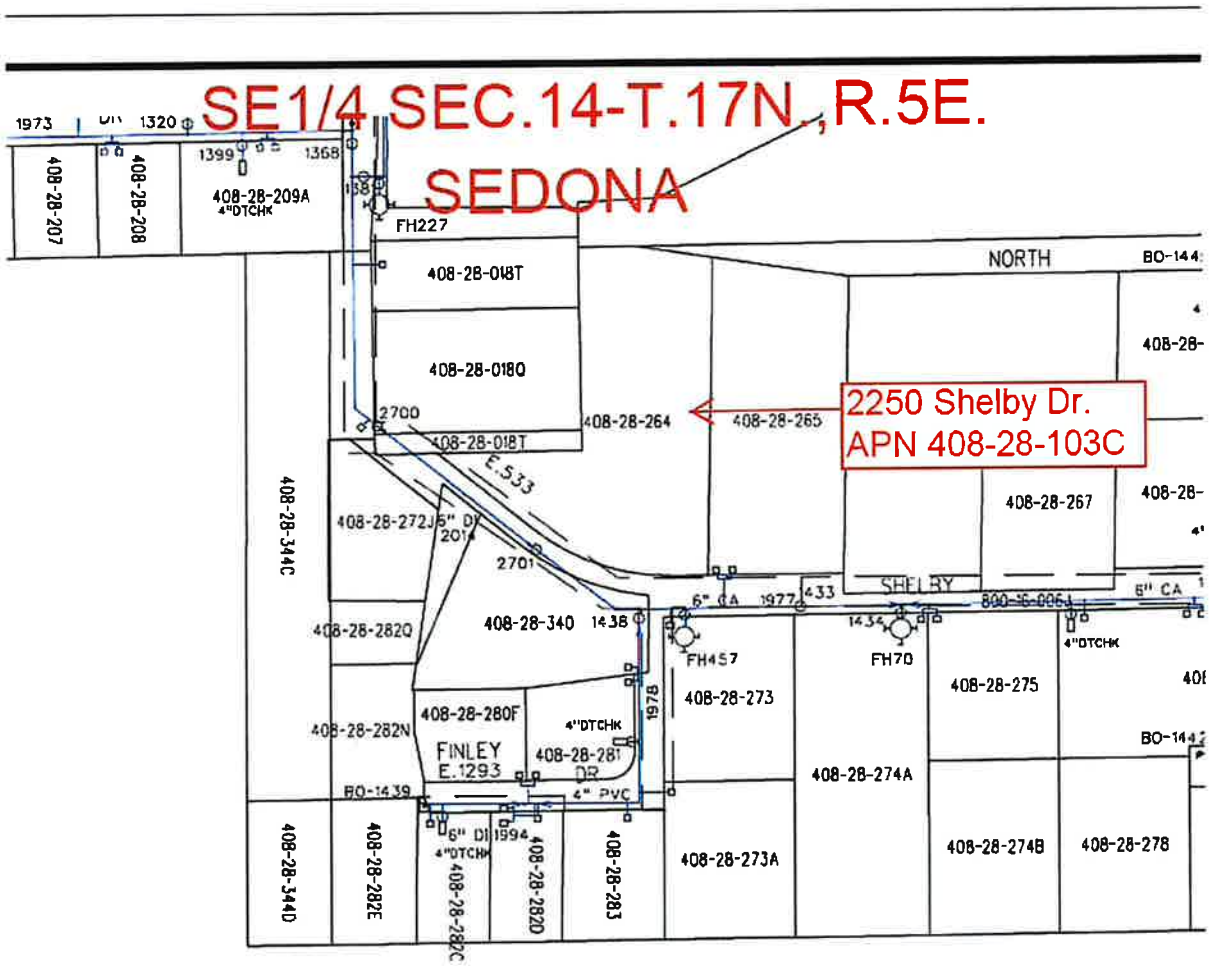
No.	Decision Date	Revision	By	Date
28				
27				
26				
25				
24				
23	11/05	Decision No. 68309 (VOC)	CS	1/06
22	4/04	Decision No. 66992	CS	4/04
21	7/99	Decision No. 61849 (VOC)	CS	4/00
20	3/98	Decision No. 60717 (VOC)	GRS	5/99
19	7/97	Decision No. 60265	GRS	5/99
18	1/95	Decision No. 59398 (VOC)	GRS	12/95
17	8/88	Decision No. 56108 (Trmtr/VOC)	GRS	1/89
16	9/86	Decision No. 55163 (DEL-VOC)	GRS	1/88
15	9/83	Decision No. 53757 (Trmtr VOC)	GRS	10/83
14	1/74	Decision No. 43913	RWH	1/74
13	8/73	Decision No. 43593 (+VOC)	MS	8/73
12	10/69	Decision No. 40253 (Trmtr)	CB	12/17
11	2/67	Decision No. 38825	RB	11/68
10	10/66	Decision No. 38577 (Trmtr)	RB	11/68
9	1/66	Decision No. 38009	RB	11/68
8	12/65	Decision No. 38226 (Trmtr)	RB	11/68
7	12/64	Decision No. 35087 (Trmtr)	RB	11/68
6	9/63	Decision No. 34756 (VOC)	RB	11/68
5	6/63	Decision No. 34510 (Trmtr)	RB	11/68
4	5/63	Decision No. 34532	RB	11/68
3	4/63	Decision No. 34162 (Trmtr)	RB	11/68
2	9/62	Decision No. 34382 (Trmtr)	RB	11/68
1	8/60	Decision No. 32356 (VOC)		11/68

ARIZONA WATER COMPANY

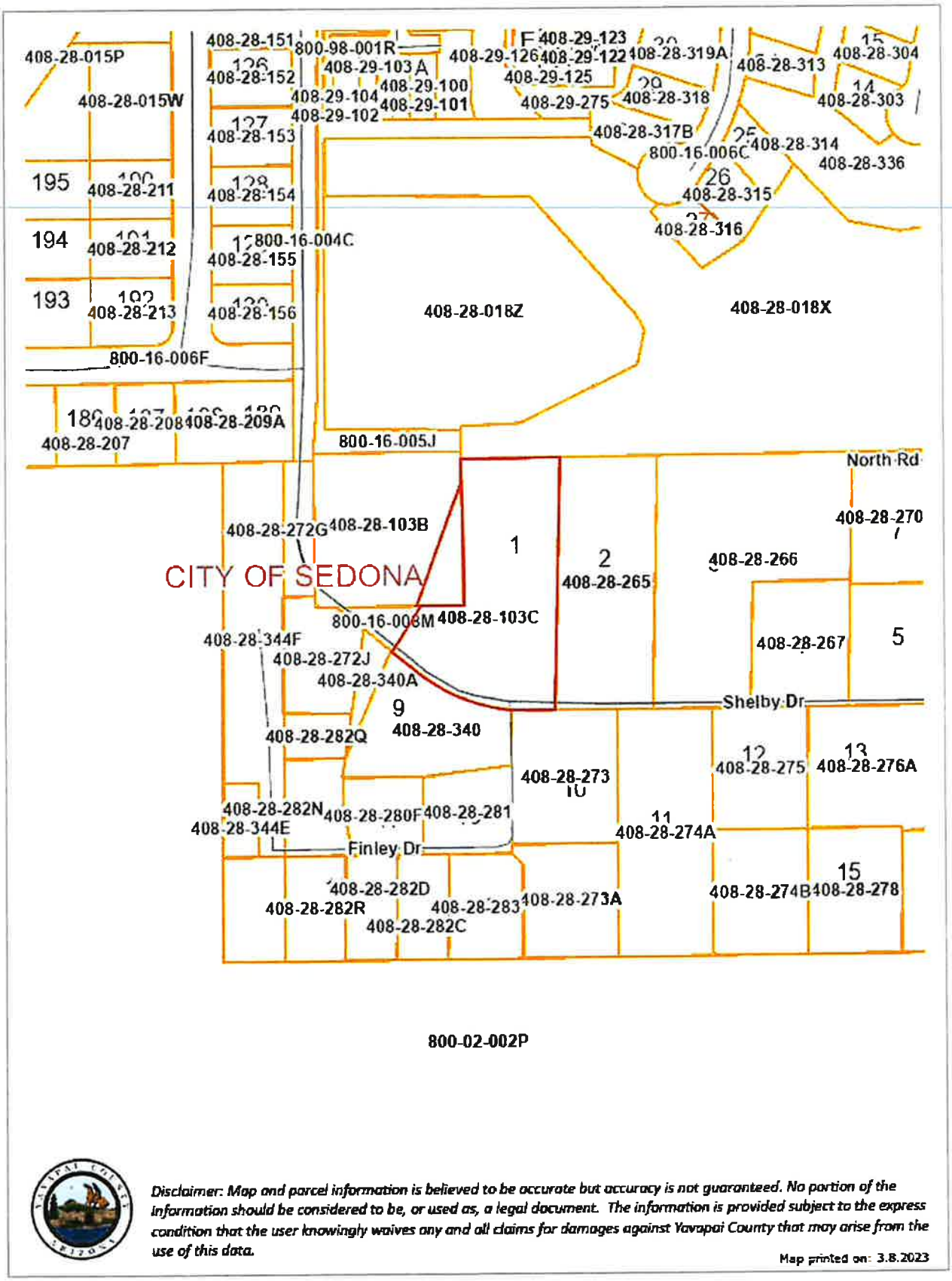
AREA COVERED BY PRESENT C.C.N.
AT
SEDONA

DATE: August 1960 | SCALE: 1" = 1 Mile

Sedona, Arizona – APN 408-28-103C



Map Disclaimer: This map is for general reference only. It does not replace a land survey and Arizona Water Company does not guarantee its thematic or spatial accuracy.



Disclaimer: Map and parcel information is believed to be accurate but accuracy is not guaranteed. No portion of the information should be considered to be, or used as, a legal document. The information is provided subject to the express condition that the user knowingly waives any and all claims for damages against Yavapai County that may arise from the use of this data.

Map printed on: 3.8.2023

Cc: Casey Goff <cgoff@azwater.com>; Shawna Arnold <sarnold@azwater.com>
Subject: WILL SERVE LETTER REQUEST RE: Request RE: Water Access - 2250 Shelby Drive

Casey, will serve letter request for this property, can you send over maps for this and Shawna will prepare the letter.

From: bharbage@hsdevpartners.com <bharbage@hsdevpartners.com>
Sent: Tuesday, March 7, 2023 6:55 AM
To: Amy Cunningham <acunningham@azwater.com>
Subject: Water Access - 2250 Shelby Drive

Good morning Amy,

I am working on a project located at:

2250 Shelby Drive
Sedona, AZ 86336

And need to get service availability letter for water, I am not sure if water for this site is serviced by Arizona Water Company or Oak Creek Water Company; can you confirm that you service this site and if so, how can I request a service letter for this site?

Thank you,

HS DEVELOPMENT PARTNERS

Bonnie Harbage
Partner
bharbage@hsdevpartners.com
614-610-4628 | 937-607-9755
HS Development Partners

Gloria Sesmas | Arizona Water Company
Development Services Supervisor
3805 N. Black Canyon Hwy.| Phoenix, AZ 85015

D: 602.240.6860 ext. 1136| **developmentservices@azwater.com**
Visit us at www.azwater.com

From: bharbage@hsdevpartners.com <bharbage@hsdevpartners.com>
Sent: Wednesday, March 8, 2023 11:03 AM
To: Gloria Sesmas <gsesmas@azwater.com>
Cc: Casey Goff <cgoff@azwater.com>
Subject: RE: Request RE: Water Access - 2250 Shelby Drive

I just need a letter indicating that this is in the service area and accessible to water we don't need a cost estimate at this time.

Thank you,
Bonnie

From: Gloria Sesmas <gsesmas@azwater.com>
Sent: Wednesday, March 8, 2023 1:01 PM
To: 'bharbage@hsdevpartners.com' <bharbage@hsdevpartners.com>
Cc: Casey Goff <cgoff@azwater.com>
Subject: Request RE: Water Access - 2250 Shelby Drive

Bonnie, are you requesting a letter just confirming the property is in our service area, or do you need a preliminary cost estimate for water facilities to the property?

Please confirm so we can better assist you.

P.O. Box 308
Cottonwood, AZ 86326

3/1/2023

Bonnie Harbage
HS Development Partners

Re: 2250 Shelby Dr Sedona, AZ 86336

Dear Bonnie,

The above referenced project is located in Arizona Public Service Company's electric service area. The Company extends its lines in accordance with the "Conditions Governing Extensions of Electric Distribution Lines and Services," Schedule 3, and the "Terms and Conditions for the Sale of Electric Service," Schedule 1, on file with the Arizona Corporation Commission at the time we begin installation of the electric facilities.

Application for the Company's electric service often involves construction of new facilities for various distances and costs depending upon customer's location, load size and load characteristics. With such variations, it is necessary to establish conditions under which Arizona Public Service will extend its facilities.

The enclosed Schedule 3 policy governs the extension of overhead and underground electric facilities to customers whose requirements are deemed by Arizona Public Service to be usual and reasonable in nature.

Please give me a call at 928-274-9659 so that we may set up an appointment to discuss the details necessary for your project.

Sincerely,

Matthew Herrera
Customer Project Representative
Verde Service Planning – Arizona Public Service