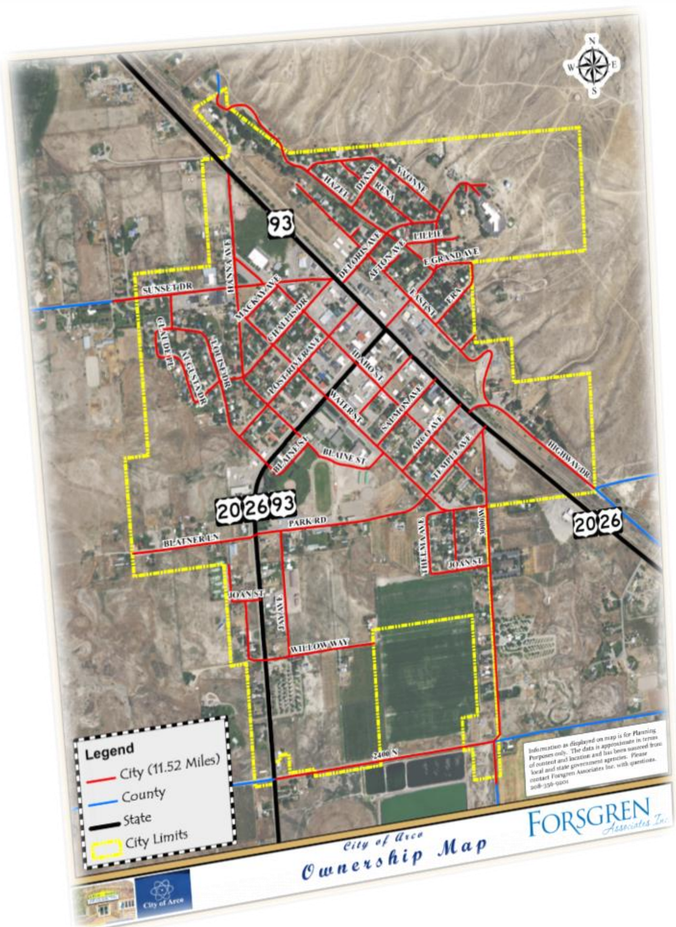
City of Arco

Transportation Planning Study Update 2018



Prepared For: City of Arco

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engineering stronger communities™

City of Arco

Transportation Planning Study

Update 2018

This plan is stamped and signed by

Aaron Swenson, P.E.

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CHAPTER 1: INTRODUCTION

Each transportation system is unique in its own way. This is why the planning process is not a simple matter of following a series of sequential steps. Successful management is reliant on effective planning and the ability to control costs. Proper planning can assure the integration of maintenance and future growth with limited funds. The need to coordinate goals and objectives goes beyond internal planning and reaches out to neighboring entities. The process of establishing a Transportation Planning Study sets the foundation that benefits many facets of city management and improves citizen satisfaction.

This document is an update to the City of Arco's Transportation Planning Study that was performed previously. This update will focus on updating the following:

- Pavement Management Plan (PMP)
- Sign Management Plan (SMP)
- Capital Improvement Plan (CIP)

CHAPTER 2: THE CITY OF ARCO

Arco is a community located in Butte County Idaho. The population was 995 on the 2010 census with an estimated population of 849 in 2016. According to the history on Wikipedia, the town was ooriginally known as Root Hog, the original town site was five miles south at the junction of two stagecoach lines (Blackfoot-Wood River and Blackfoot-Salmon). A suspension bridge that crossed the Big Lost River funneled traffic through the settlement. The town leaders applied to the U.S. Post Office for the town name of "Junction." The Postmaster General thought the name too common and suggested that the place be named Arco for Georg von Arco (1869–1940) of Germany who was visiting Washington, D.C. at the time. Georg von Arco was an inventor and a pioneer in the field of radio transmission and would become the lead engineer of Telefunken, a German company founded in 1903 that produced radio vacuum tubes. The town later moved four miles southeast when the stage station was moved to Webb Springs at Big Southern Butte. When the Oregon Short Line railroad arrived from Blackfoot in 1901 the stage lines became obsolete and the town of Arco moved northwest to its present site. Arco was the first community in the world ever to be lit by electricity generated solely by nuclear power. This occurred for about an hour on July 17, 1955, powered by Argonne National Laboratory's BORAX-III reactor at the nearby National Reactor Testing Station (NRTS), which eventually became the site of the Idaho National Energy Laboratory, a predecessor of the current Idaho National Laboratory

Today, the City of Arco encompasses 11.52 miles of roadway; the following Ownership map shows the City of Arco boundaries and roadways.

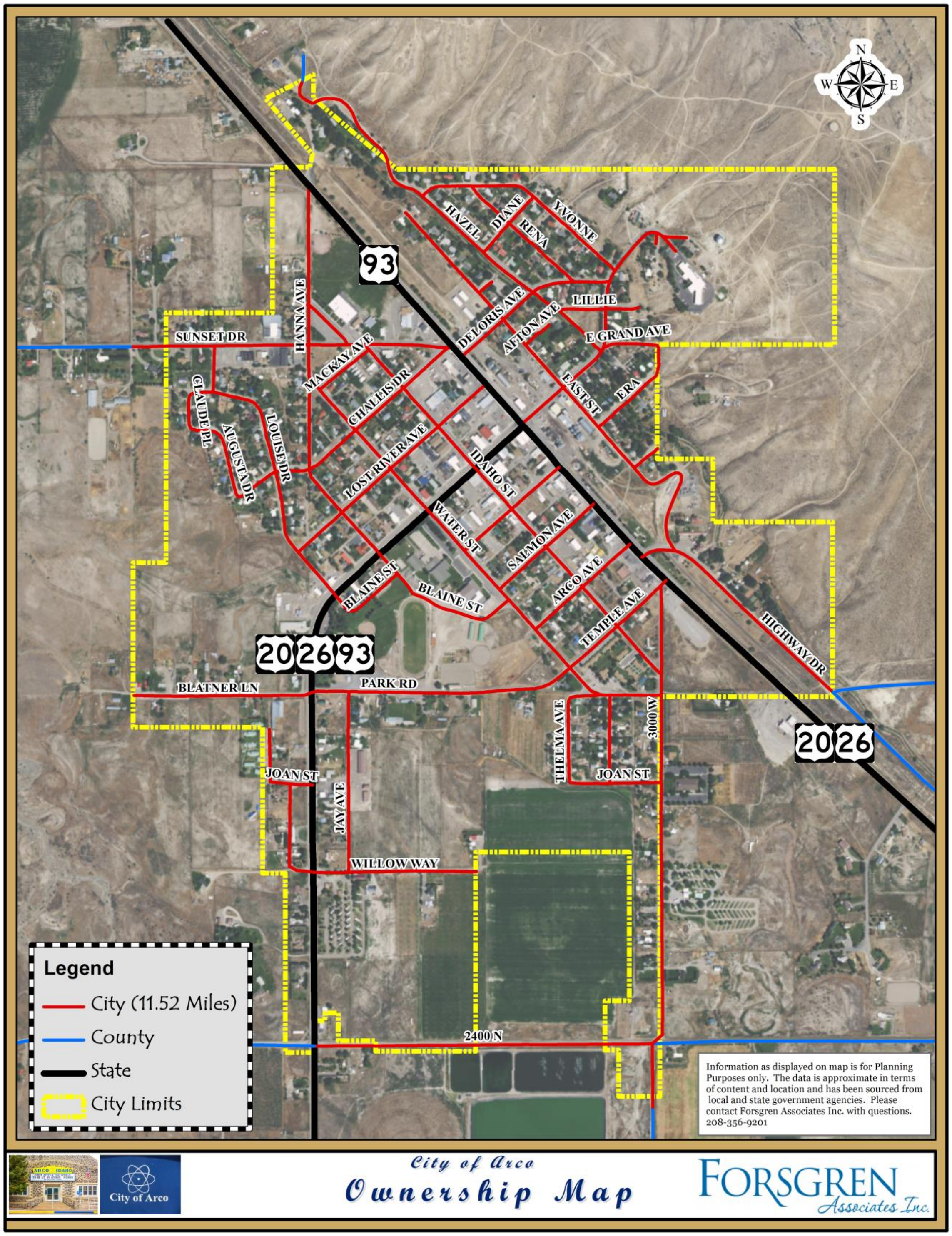

Figure 2-1: Roadway Ownership Map

CHAPTER 3: PAVEMENT MANAGEMENT PLAN

PAVEMENT MAINTENANCE GOAL:

"APPLY THE CORRECT ROAD TREATMENT AT THE IDEAL TIME THAT WILL INCREASE THE ROAD QUALITY IN THE MOST EFFICIENT AND EFFECTIVE WAYS POSSIBLE"

Creating a Maintenance/Pavement Management Plan, also known as a Pavement Management System (PMS), is one of the most important programs a City can implement. One of the City's largest investments is in the road infrastructure. The quality of preservation work performed on this road infrastructure directly determines the surface life, future maintenance cost, ride quality, and ultimately user costs. It is the responsibility of those who are involved to assure that the tax-payers are getting their money's worth.

Figure 3-1: Typical Road Life Cycle

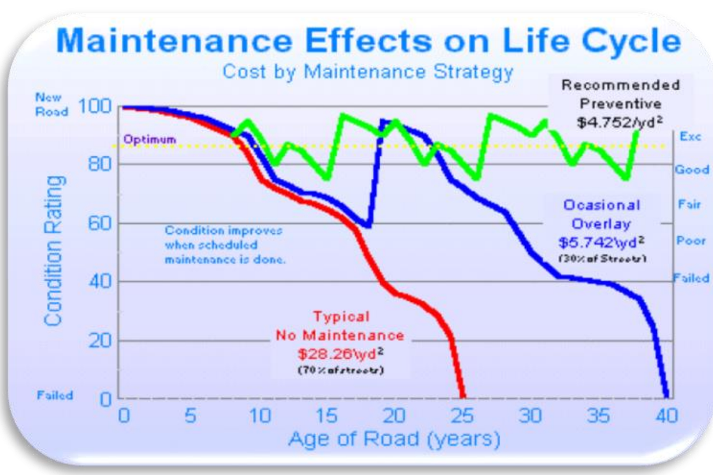

Figure 3-2: Maintenance Effects on Road Life Cycle

The life of a typical City street is shown in Figure 3-1. This figure shows how the condition of the road deteriorates with the age of the road. There are four critical zones where various maintenance methods should be implemented to preserve the life of the road and decrease the amount of money spent over the life of the road.

The main goal of a pavement maintenance program is to keep the roads from falling into the overlay and reconstruct zones. When a road falls into one of these zones, the cost required to repair these roads increases immensely. Through maintenance activities, the life of a road can be vastly increased. Figure 3-2 shows the effects that preventative maintenance, an occasional overlay or seal coat, and no maintenance will have on the life of a road.

By implementing a preventative maintenance system, it will cost approximately $4.75 per square yard for maintenance after the construction of the roadway over 25 years; where performing no maintenance will cost approximately $28.26 per square yard over the same period. Preventative maintenance techniques will save up to six to seven times the amount of money it would cost over the do nothing approach.

"Well prepared roads will require less money to maintain"

Existing Roadway Conditions

In September 2017, the roadway conditions were collected and entered into a GIS database. In this database, there are a number of roadway characteristics that were entered into the data dictionary; the following sections discuss the data that was collected.

General Road Information

The following is a list of the seven (7) data columns that are in the general road information category.

Table 3-1: Data Dictionary

Segment ID	Surface Type	Fatigue Cracking Rating
Road Name	Owner	Longitudinal Cracking Rating
From Street	Importance	Edge Cracking Rating
To Street	Road Function	Transverse Cracking Rating
Width	PCR	Patching
Length	PCI	Minor Repair
Area	Unpaved Rating	Major Repair

From the database, Figure 3-3 (Road Length Map) and Figure 3-4 (Road Width Map) were created. These two (2) maps start on the following page.

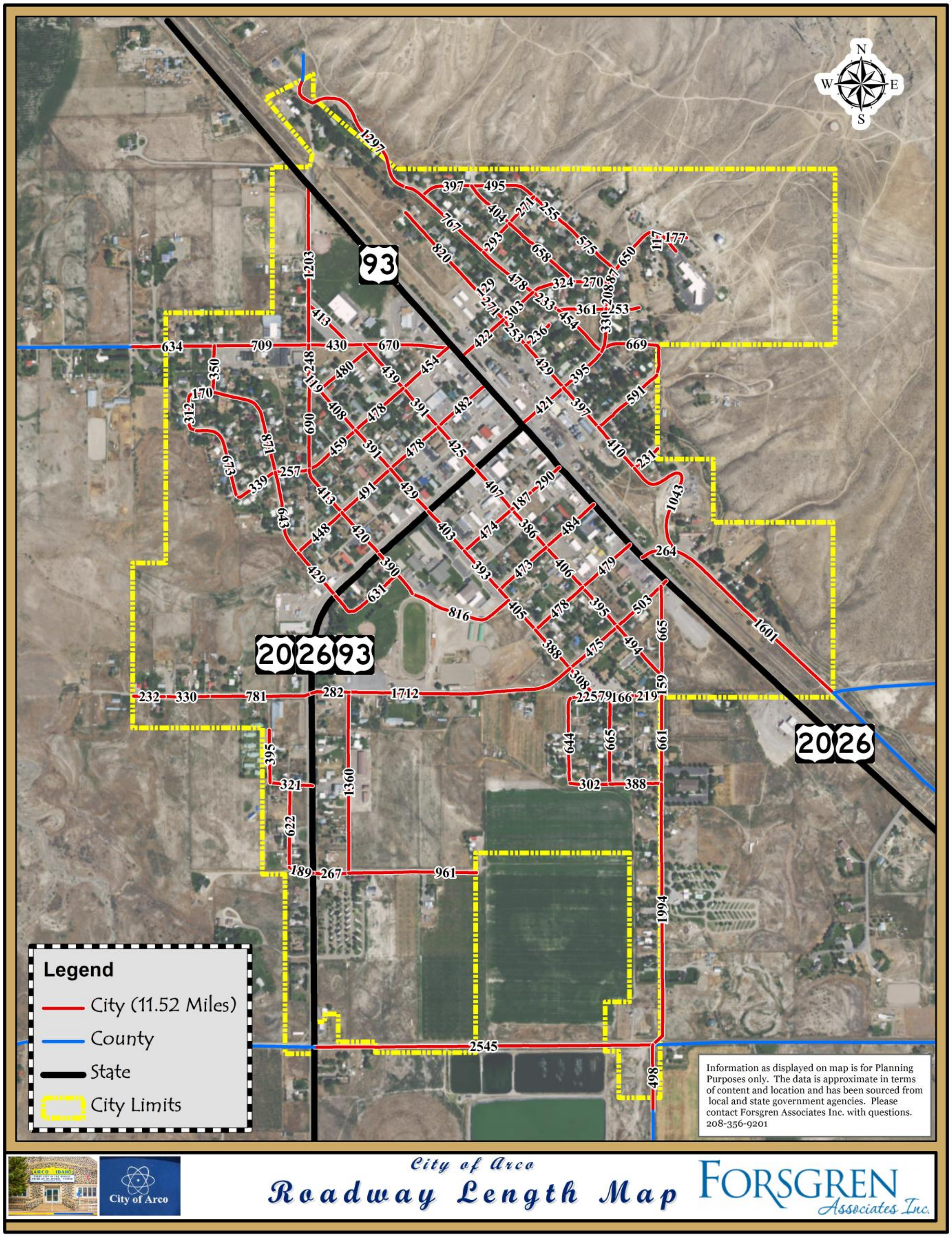

Figure 3-3: Roadway Length Map

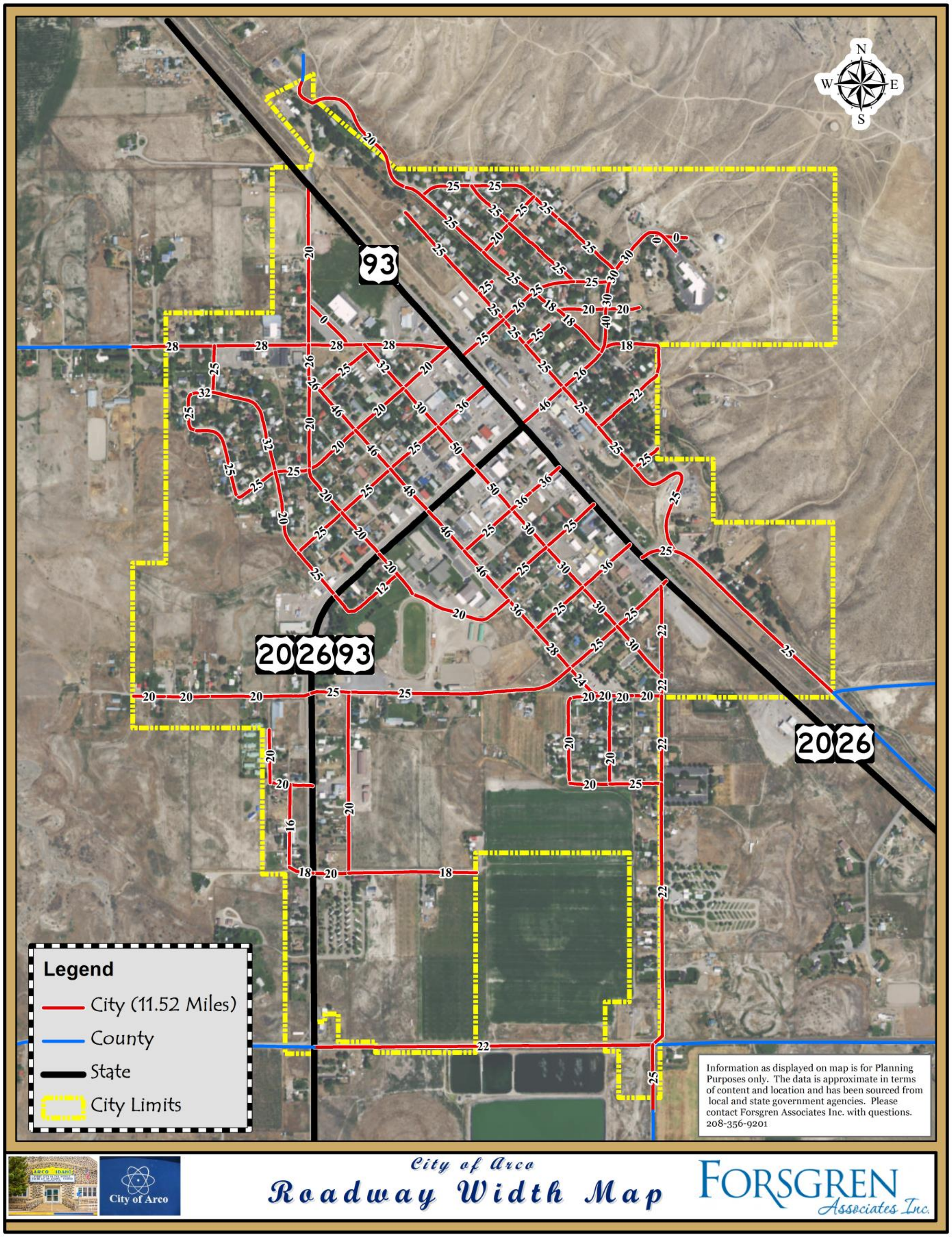

Figure 3-4: Roadway Width Map

ROAD SURFACE

For the road surface, a roadway segment was placed in either a paved or unpaved category. To provide a visual of the road surface types, Figure 3-5 (Road Surface Type Map) was created.

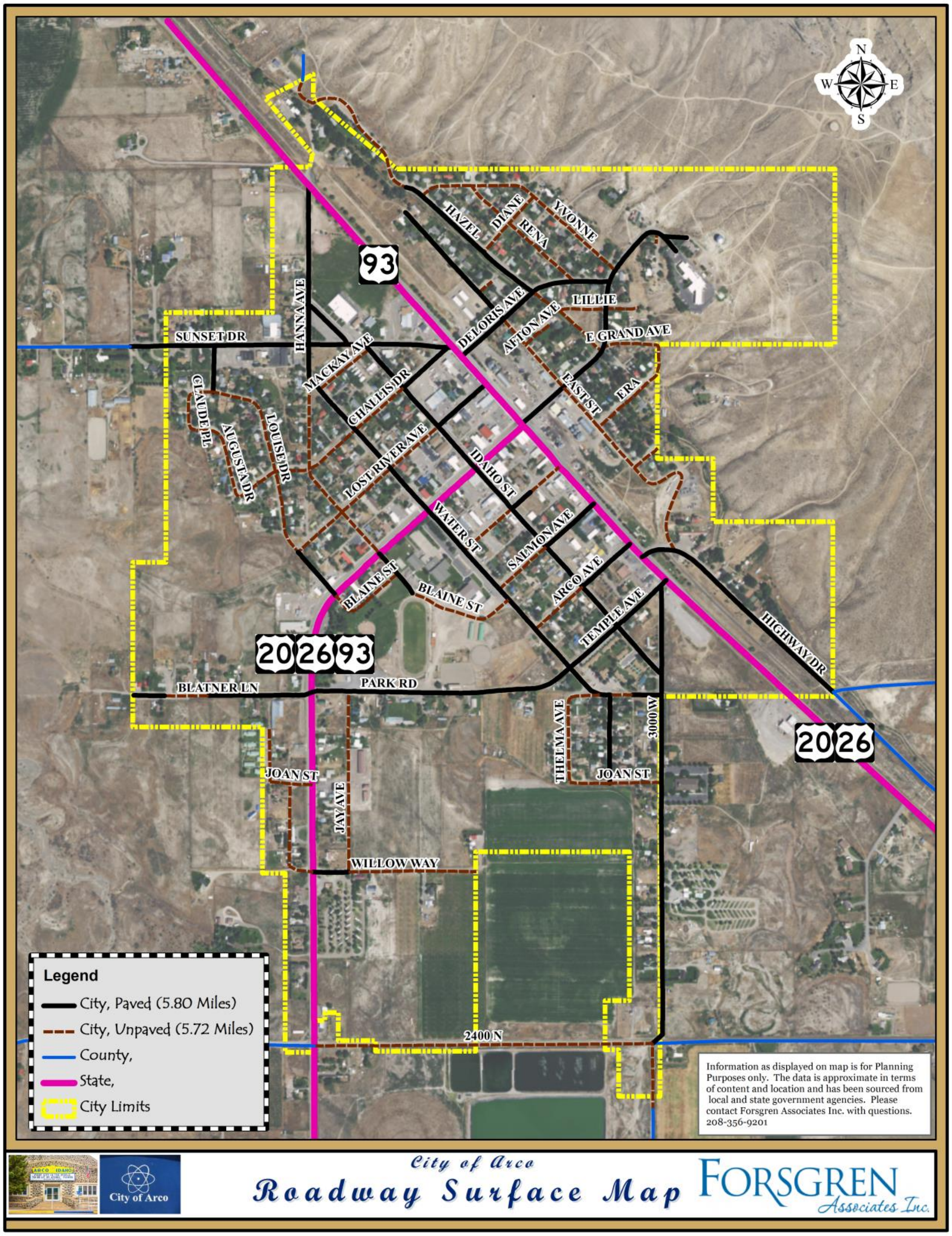

Figure 3-5: Roadway Surface Map

ROADWAY DISTRESSES

The following is a list of the roadway distresses and their rating range that were entered into the recommended column:

- Fatigue Cracking (1 through 9)
- Transverse Cracking (1 through 9)
- Longitudinal Cracking (1 through 9)
- Edge Cracking (1 through 9)
- Patching (1 through 9)

Additionally, in order to gain a better understanding of these distresses, the following sections briefly describe each distress

FATIGUE CRACKING

Fatigue cracking is a series of interconnection cracks caused by fatigue failure of asphalt concrete surface under repeated traffic loading. Cracking begins at the bottom of the asphalt surface (base) where tensile stress and strain are highest under a wheel load. The cracks propagate to the surface initially as a series of parallel longitudinal cracks. After repeated traffic loading, the cracks connect, forming many-sided, sharp-angled pieces that develop a pattern resembling chicken wire or the skin of an alligator. Figure 3-6 (Fatigue Cracking Map) was created to demonstrate the severity and extent of the fatigue cracking.

TRANSVERSE CRACKING

Transverse cracks are perpendicular to the pavement's centerline or laydown direction. These cracks occur mainly from shrinkage of the HMA surface due to low temperatures or asphalt binder hardening or from reflective cracks caused by cracks beneath the surface layer. Figure 3-7 (Fatigue Cracking Map) was created to demonstrate the severity and extent of the transverse cracking.

LONGITUDINAL CRACKING

Longitudinal cracks are cracks that form parallel to the pavement's centerline due to poorly constructed paving joints, shrinkage of the asphalt layer, daily temperature cycling, cracks in an underlying layer that reflect up through the pavement, and/or longitudinal segregation caused by the improper operation of the paver. Figure 3-8 (Longitudinal Cracking Map) was created to demonstrate the severity and extent of the longitudinal cracking.

EDGE CRACKING

Edge cracks are cracks that form on the edge of pavement due to a lack of lateral support, settlement of underlying material, shrinking of drying out soil, weak base or subgrade layer, poor drainage, frost heave, and/or heavy traffic or vegetation along the edge. Figure 3-9 (Edge Cracking Map) was created to demonstrate the severity and extent of the Edge cracking.

PATCHING

A patch is defined as the area of pavement that has been replaced with new material to repair the existing pavement. A patch is considered a defect no matter how well it performs. Figure 3-10 (Patching Map) was created to demonstrate the severity and extent of the patching.

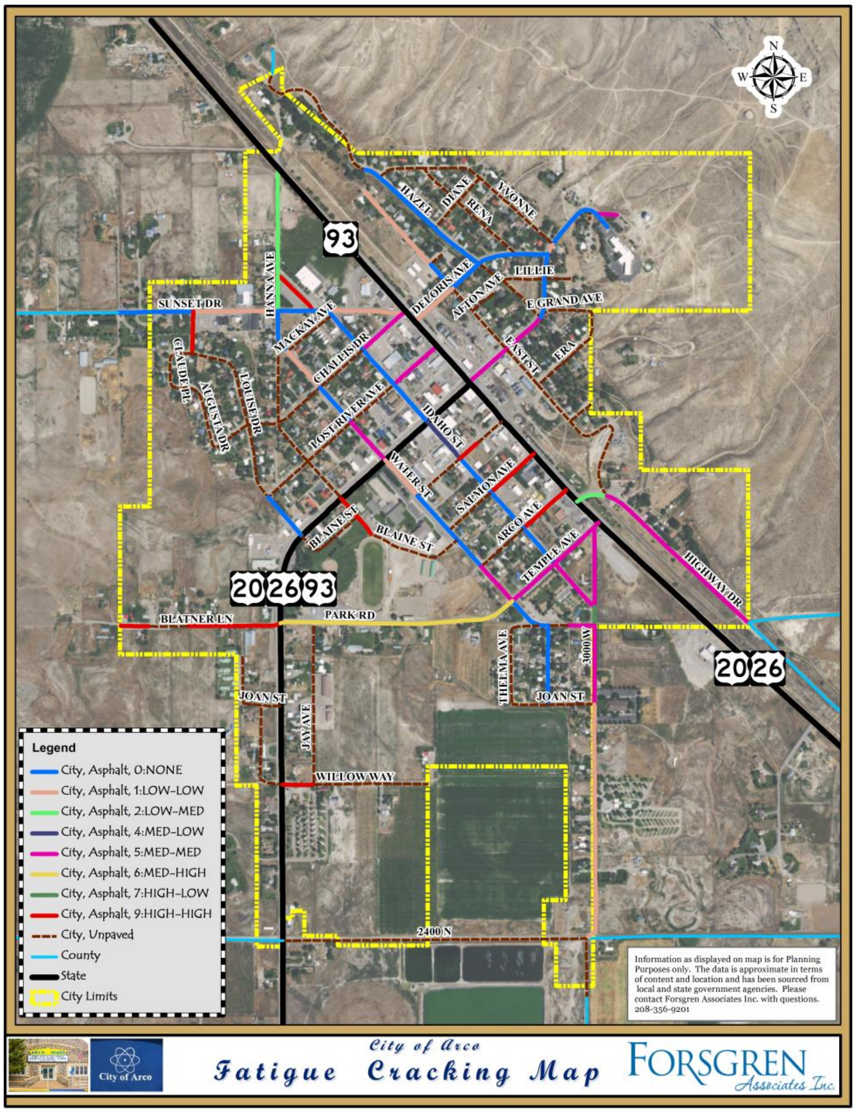

Figure 3-6: Fatigue Cracking Map

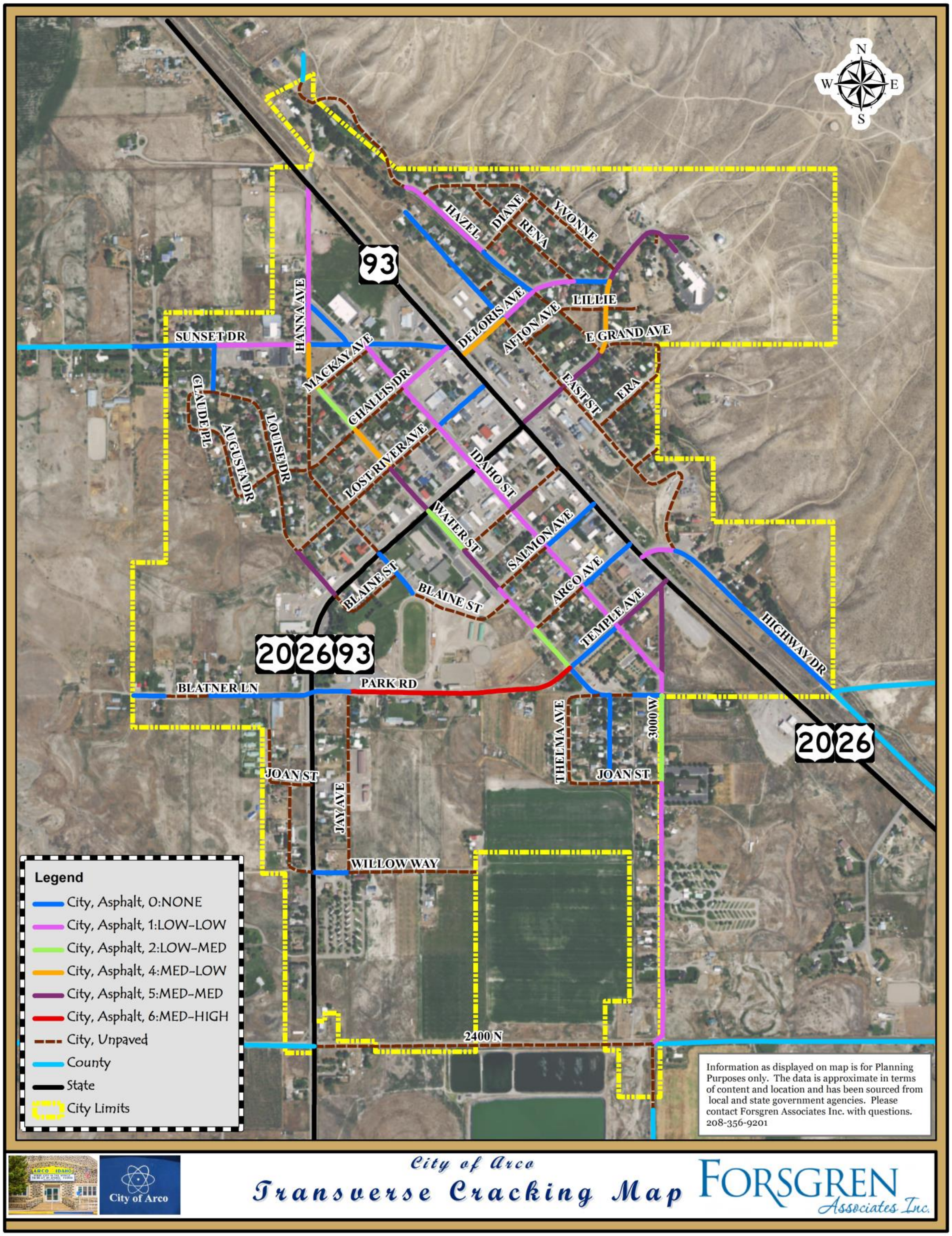

Figure 3-7: Transverse Cracking Map

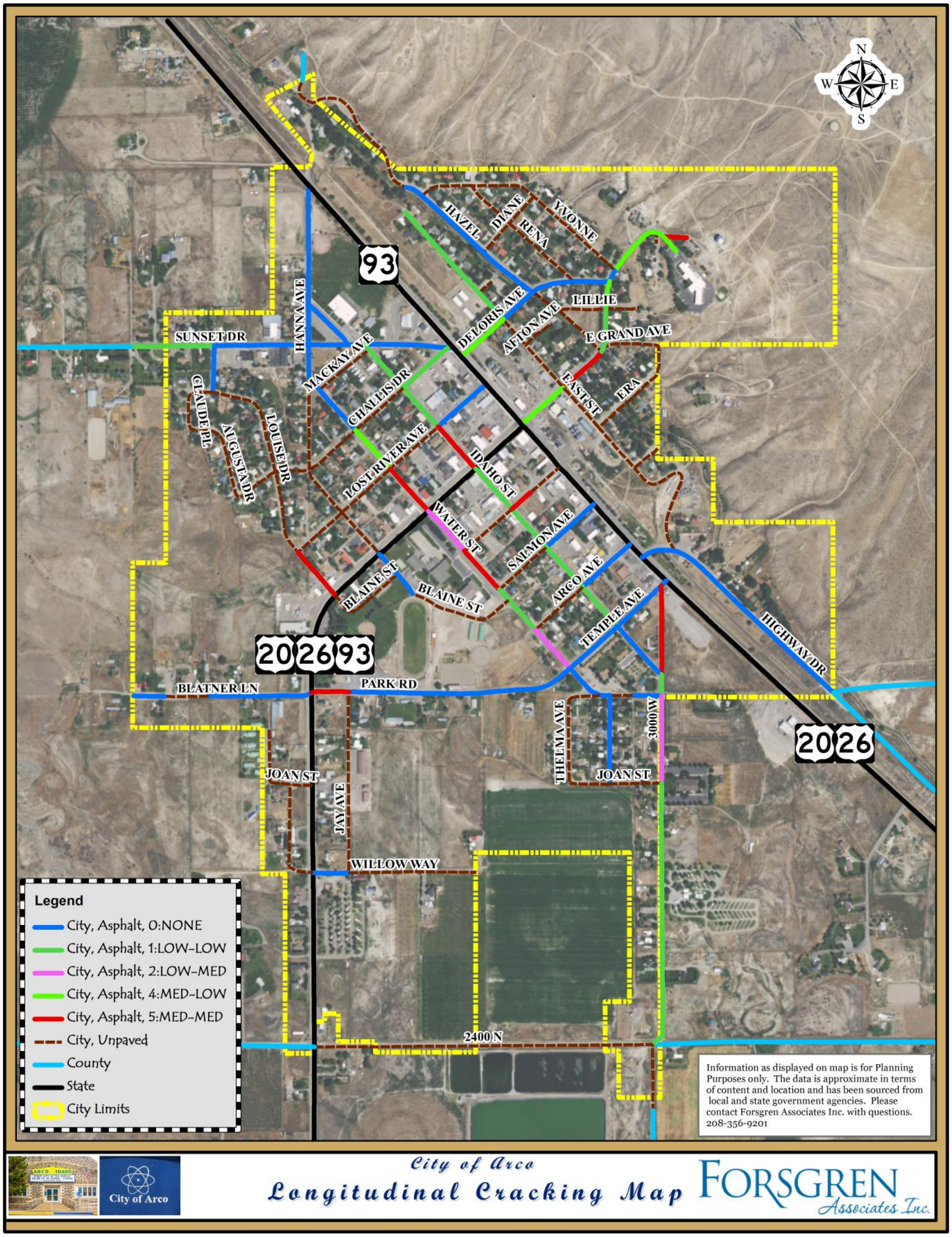

Figure 3-8: Longitudinal Cracking Map

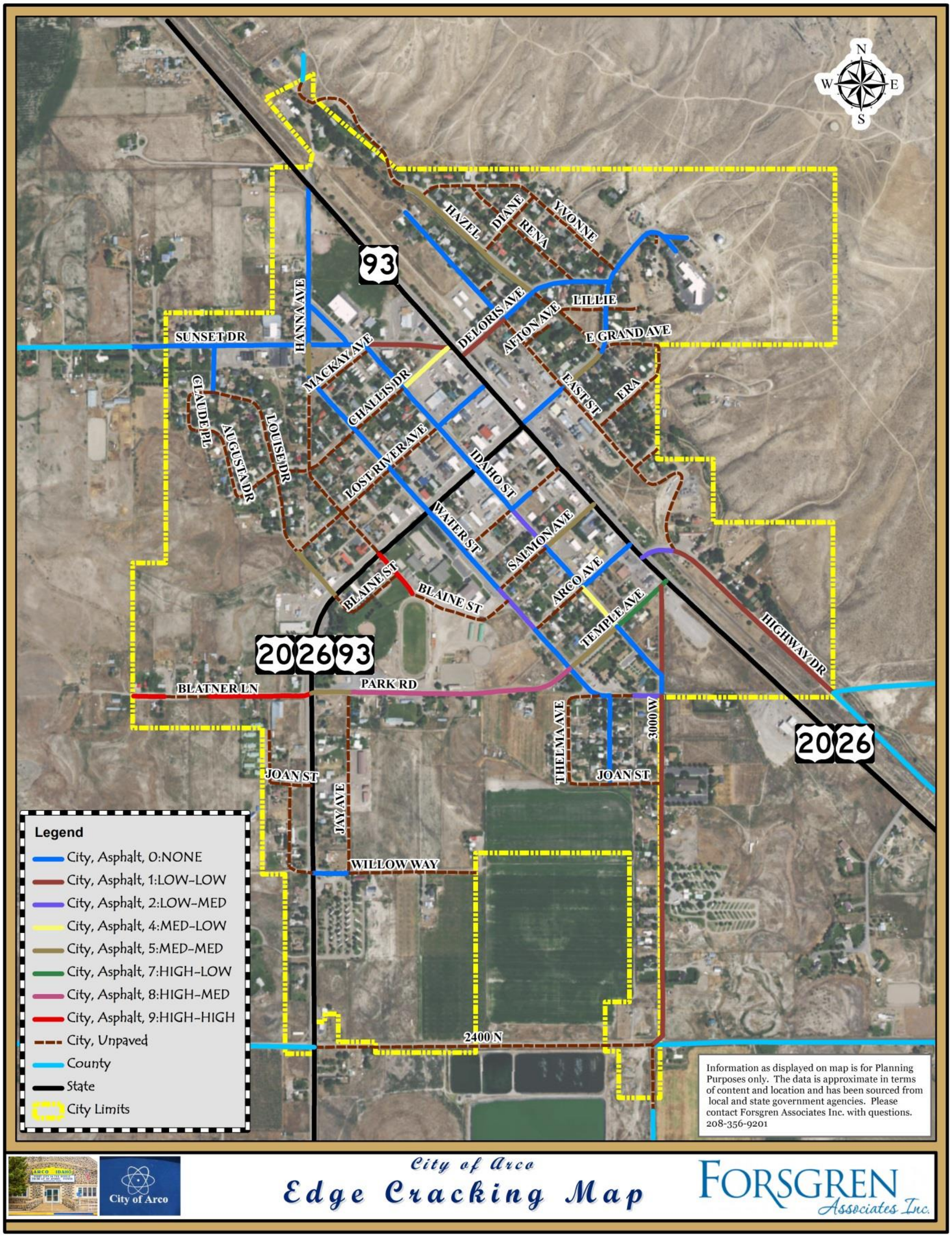

Figure 3-9: Edge Cracking Map

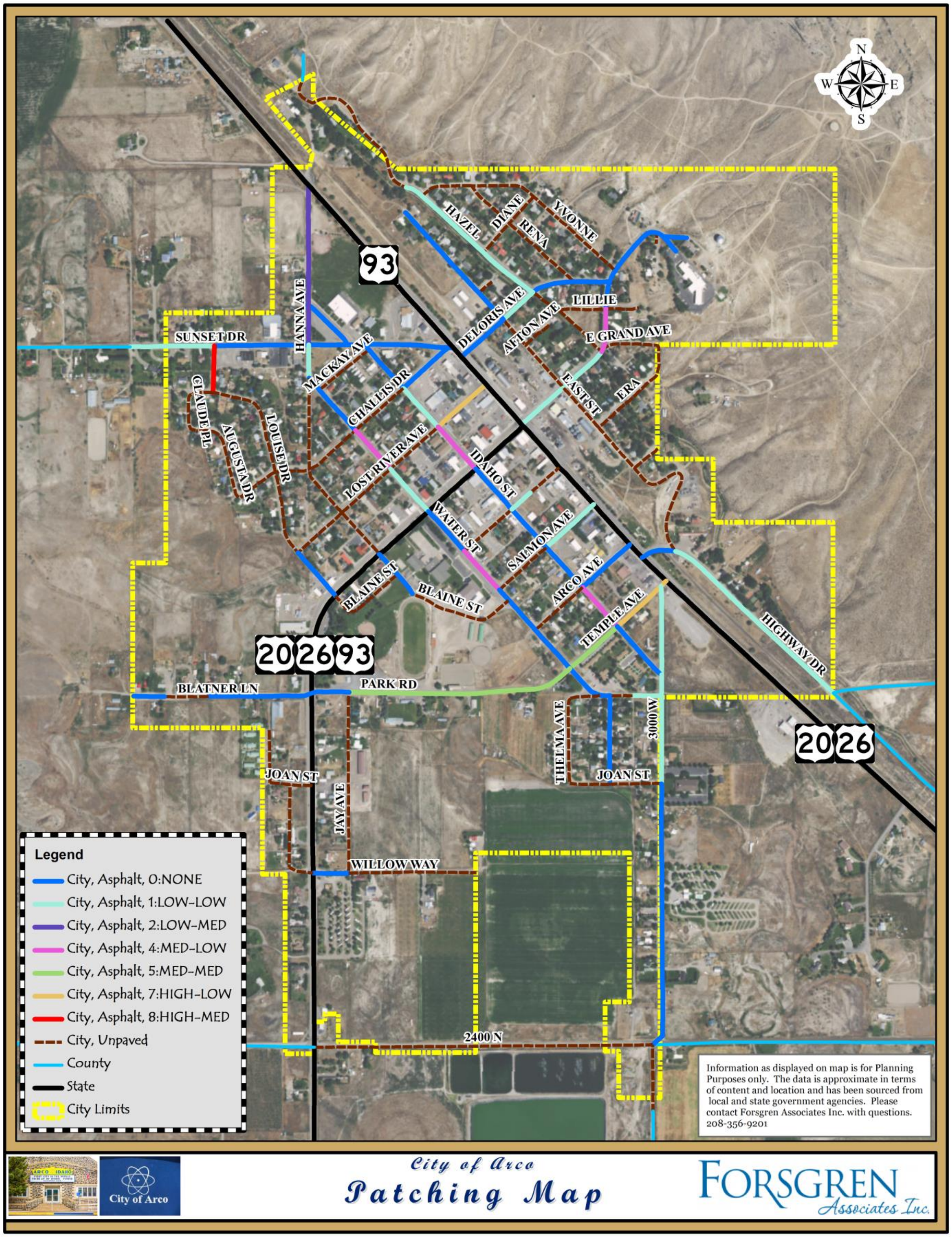

Figure 3-10: Patching Map

Pavement Condition Rating (PCR)

The PCR is a rating given to the roadway as its overall condition. The PCR is based off of the Pavement Condition Index (PCI) which is a numerical rating for the condition of a road segment within the road network, where 0 is the worst condition and 100 is the best. By using the PCI and PCR, the recommended maintenance that is associated with a roadway segment can be determined. To provide a visual of the PCR, Figure 3-11 (Pavement Condition Rating Map) was created.

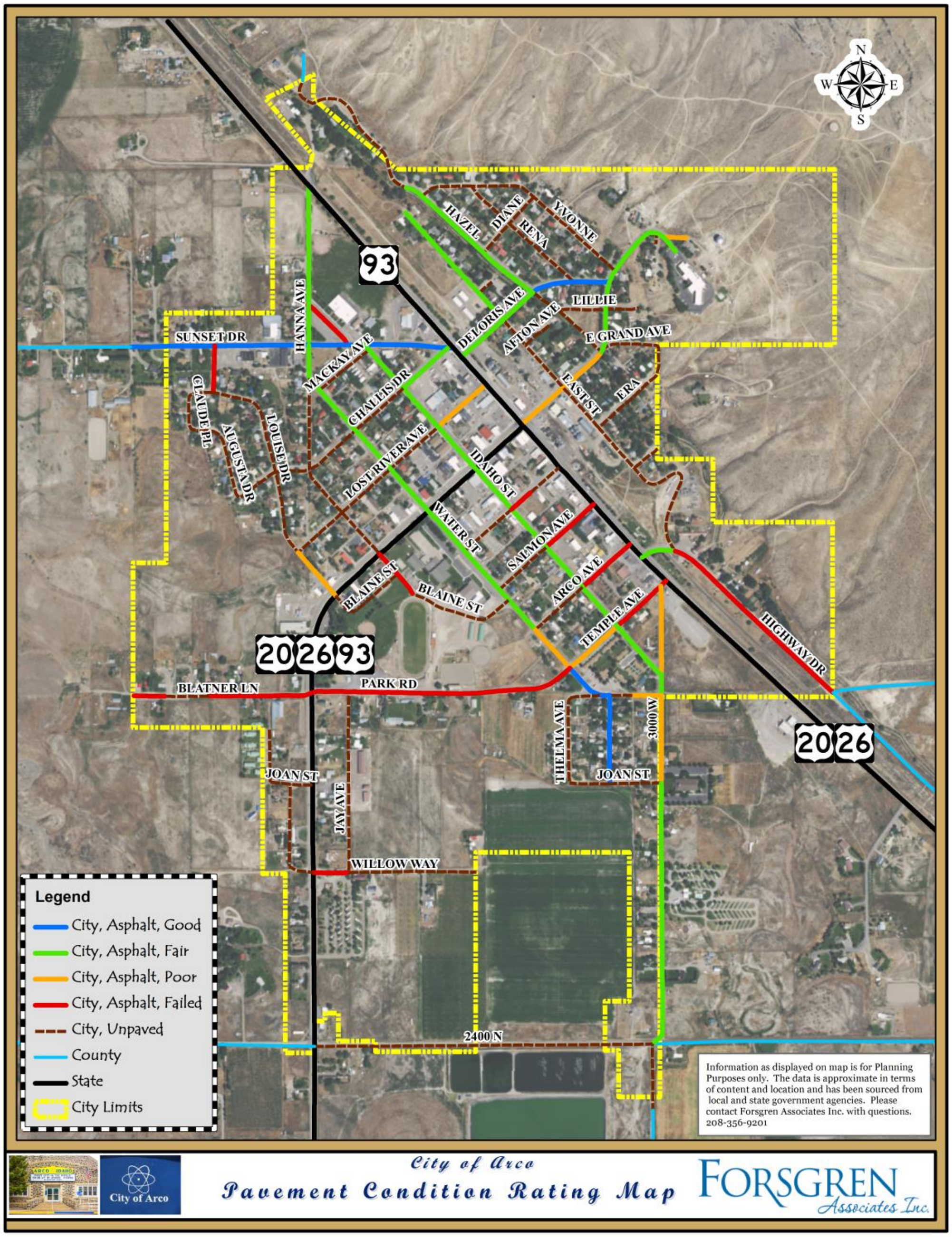

Figure 3-11: PCR Map

Recommended Minor Repair Methods

Ideally, before a major repair to a roadway segment is preformed, it is recommend that a minor repair be performed first. For the roads in Arco, the recommended minor repairs are: no minor maintenance, crack seal, and fatigue cracking patching. To provide a visual of the recommended minor repair methods for each segment, Figure 3-12 (Minor Repair Map) was created; on the following page.

Recommended Major Repair Methods

Preferably after a minor repair has been performed, a major repair may be done. For the roads in Arco, the recommended major repairs are: chip/slurry seal, an asphalt overlay, and a total reconstruct. To provide a visual of the recommended minor repair methods for each segment, Figure 3-13 (Major Repair Map) was created; on the following page.

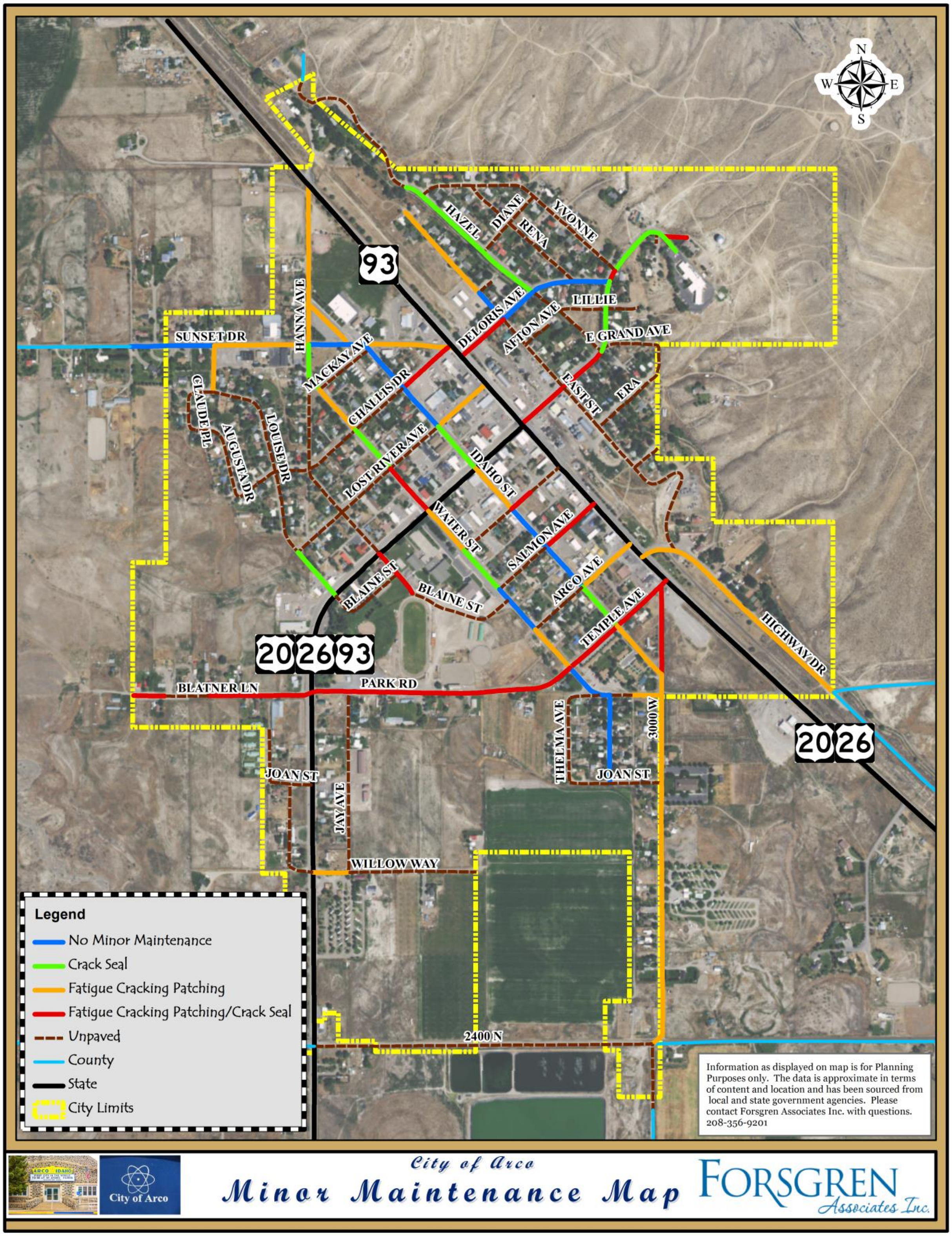

Figure 3-12: Minor Repair Recommendation Map

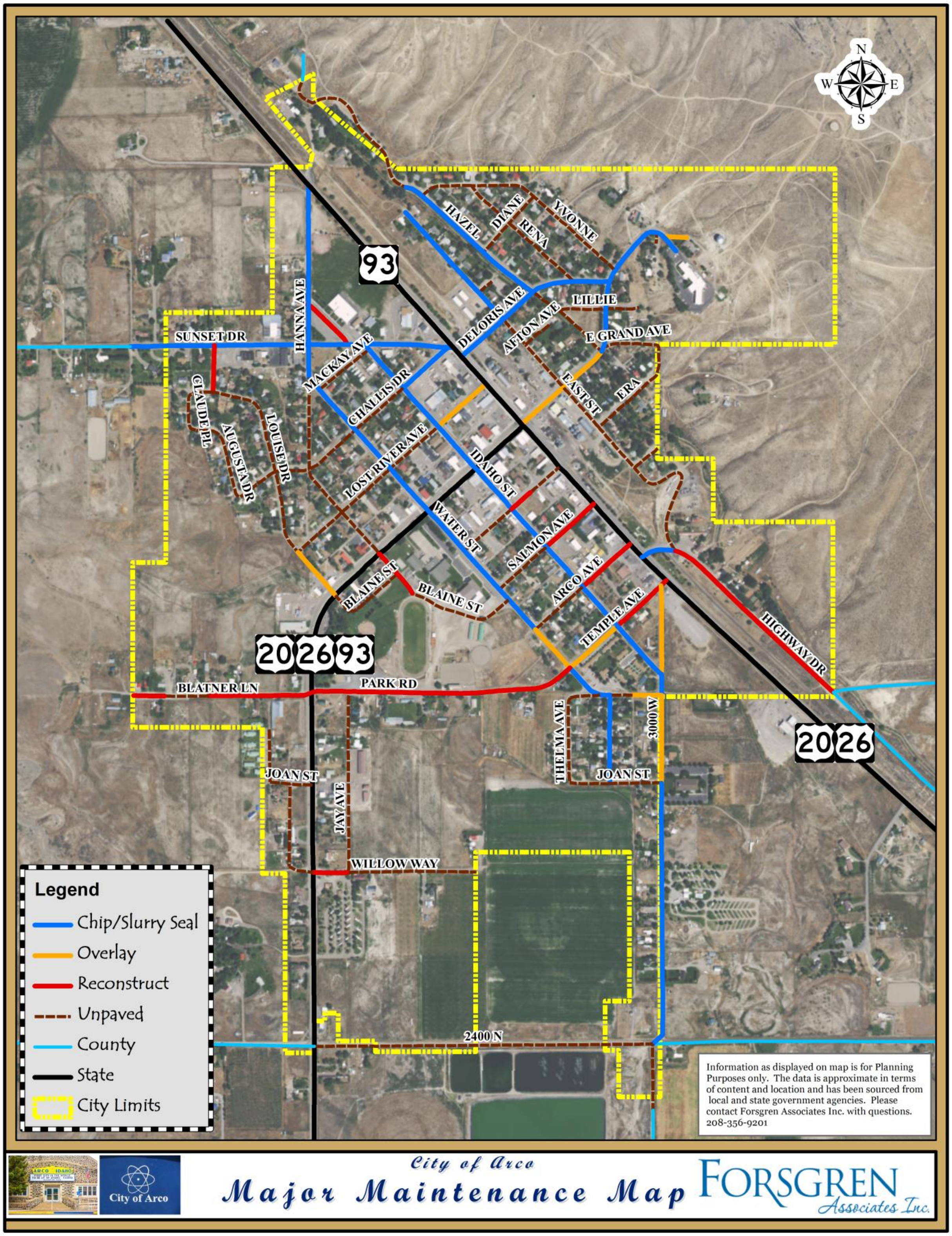

Figure 3-13: Major Repair Recommendation Map

UNPAVED ROADWAY

Even though unpaved roadways are not a part of the PMP, a condition rating was performed on these roads. The roads were rated good, fair, poor, and failed; there were no poor or failed unpaved roads found. Figure 3-14 shows the result of this analysis.

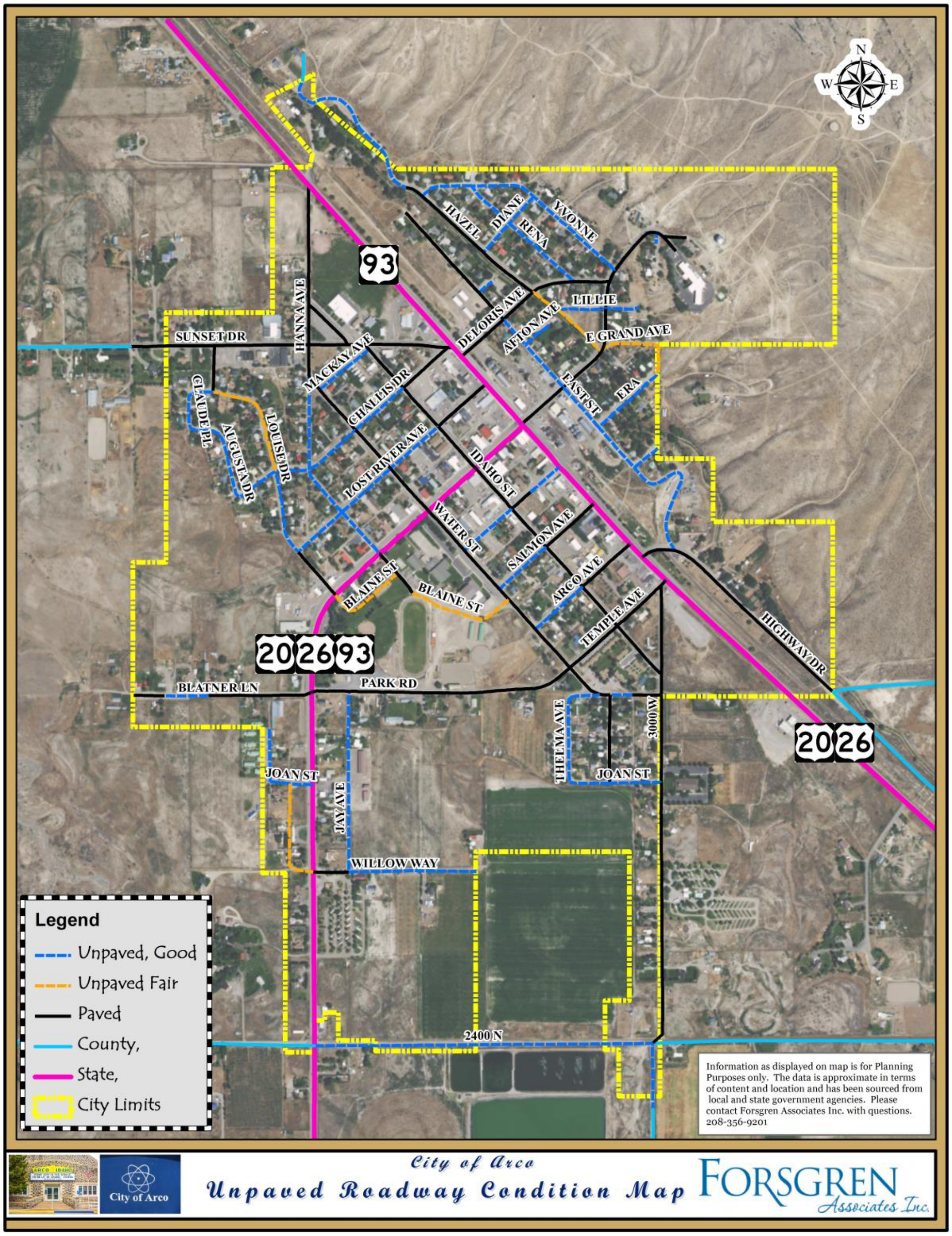

Figure 3-14: Unpaved Roadway Condition Map

CHAPTER 4: SIGN MANAGEMENT PLAN

According to the Manual of Uniform Traffic Control Devices (MUTCD), traffic control devices are very critical for a safe and efficient transportation of people and goods. The use of traffic control devices help to reduce crashes and congestion along with improving the efficiency of the transportation system. In the City of Arco , the main traffic control device is road signs. This section will examine both the posts and signs in the City of Arco 's road sign network.

POST INVENTORY AND CONDITION

A post is a long piece of material, usually wood or metal, set upright into the ground to serve as a marker or support for traffic signs.

POST DATA COLLECTION

The post characteristics were inventoried and analyzed with the signs. The data that was entered into are:

- Location ID
- Post material (wood, metal, other)
- Support condition (Excellent, Fair, Good, and Poor)
- The number of signs on the post
- Does the post need straightened

POST DATA COLLECTION RESULTS

Currently there are 200 posts maintained by the City that support 348 signs. Of these 200 posts, 195 are not failed and five (5) are failed. To visually demonstrate the location and the type of each post; Figure 4-1 (Post Location/Type Map) on the following page was created. Figure 4-2 was generated to show the locations of the 195 not failed posts and the five (5) failed posts.

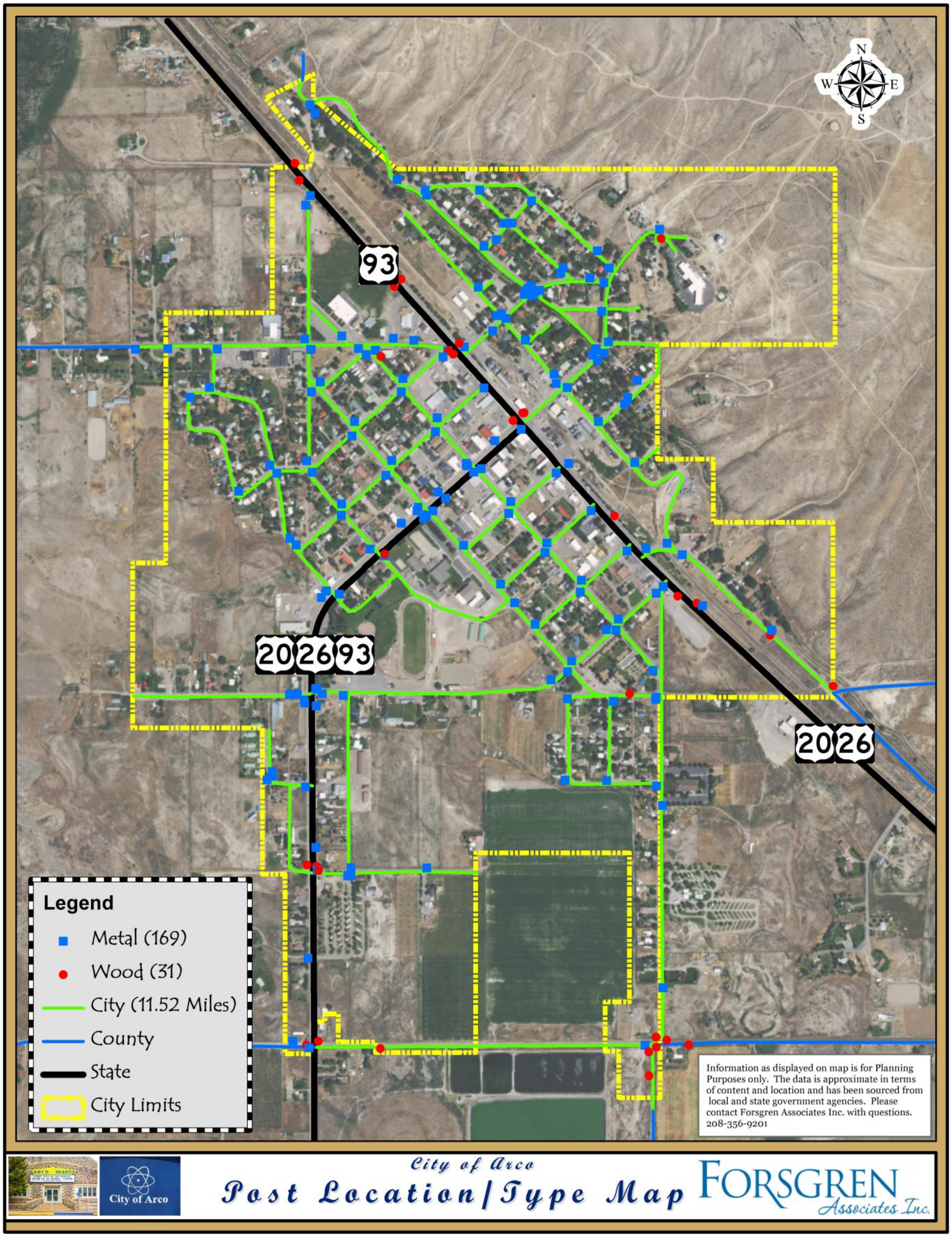

Figure 4-1: Post Location and Type Map

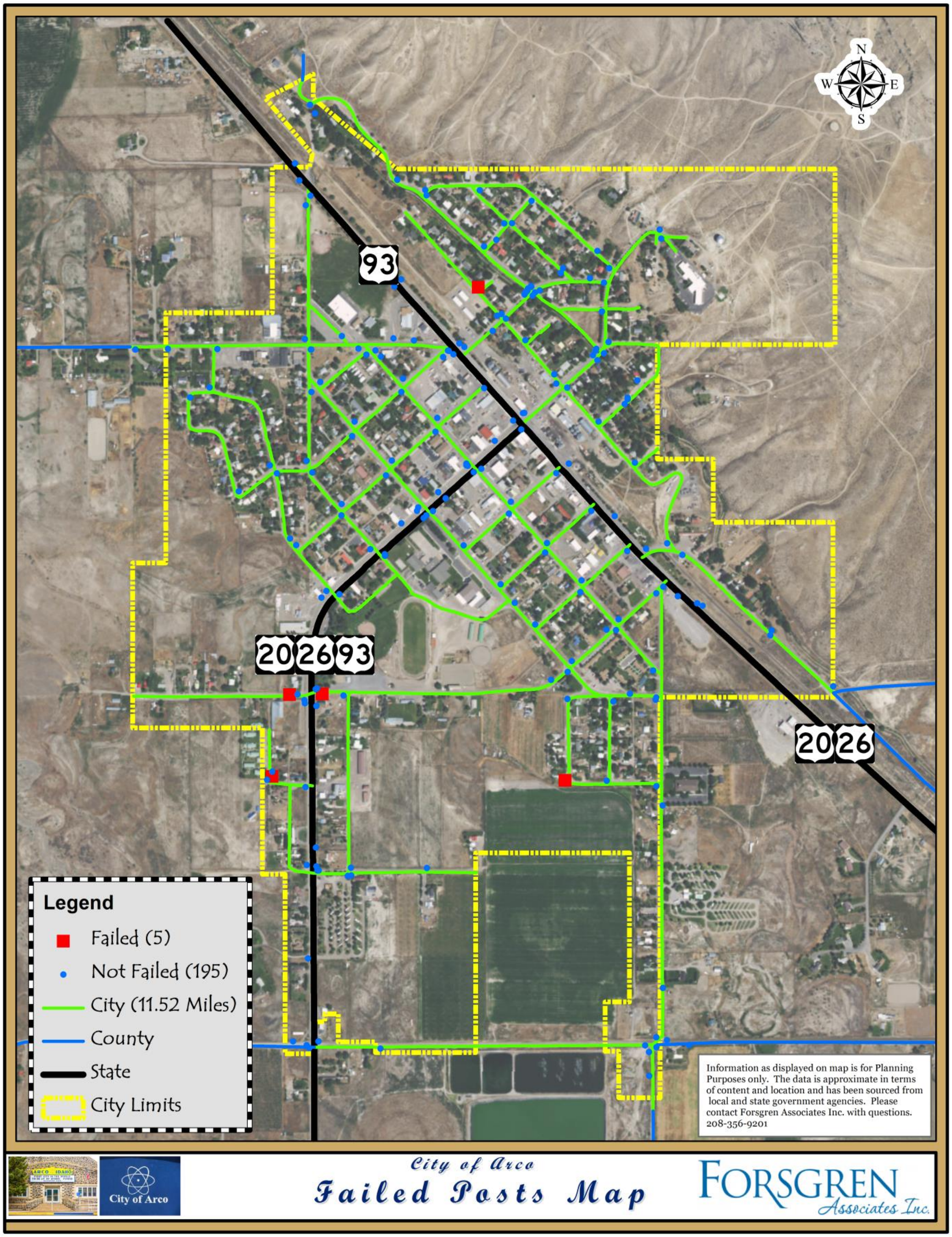

Figure 4-2: Failed Posts Map

SIGN INVENTORY AND CONDITION

A sign is defined as "an official device that gives a specific message, either by words or symbols, to the public."

SIGN DATA COLLECTION

The sign characteristics were inventoried and analyzed. The data that was entered into databse are:

- Location ID (this correlates with the post ID)
- MUTCD Code
- MUTCD Description
- MUTCD Type
- Mount Height
- Visibility
- Sign Condition Rating

SIGN TYPES

In the sign database, all the signs receive a MUTCD code. Each code represents a sign within a sign category; the main sign categories are Regulatory, Warning, and Information Signs.

REGULATORY SIGNS

Traffic signs are intended to instruct road users on what they must or should do. Examples of regulatory signs are: stop, yield, speed limit, wrong way, and one way signs. The regulatory signs in Arco are stop, yield, and speed limit signs. In order to show the location and type of each regulatory sign, two (2) figures were created; Figure 4-3 was generated to show the stop and yield signs and Figure 4-4 was created to show the speed limit signs.

WARNING SIGNS

Warning signs are traffic signs that indicate a hazard on the road ahead. Examples of warning signs are: railroad crossing, right turn, left turn, curve, stop ahead, intersection ahead, pedestrian, and bicycle signs. In order to show the location and type of each warning sign, Figure 4-5 was generated.

Guide and Informational Signs

Traffic signs do what the names of the category emphasize; they guide and give information to the motorist or pedestrian. Examples of guide and informational signs are: destination, street name, bicycle parking, automobile parking, and bike route signs. In order to show the location and type of each Guide and Informational sign, Figure 4-6 was generated.

Sign Data Collection Results

Currently there are 348 signs in the City of Arco. In total, there are 310 not failed signs, 35 failed signs, and three (3) missing signs.

Sign Improvements, Maintenance, and Recommendations

One of the best ways to increase safety in a City is by having a good sign network. According to the Transportation Research Board, sign maintenance programs provide five times the improved safety cost/benefit ratio than other safety programs. By implementing a sign improvement program, a City can reduce liability while creating a safer flow of traffic.

From the data collection effort, we learn that there are signs in failed condition that need replaced, there are posts that need straightened, signs that are mounted too low, and some signs that are obstructed by vegetation. To demonstrate the locations of these signs and posts that need improved, two (2) figures were created; Figure 4-7 Sign Maintenance Map 1 shows the failed signs and posts that need improved and Figure 4-8 Sign Maintenance Map 2 shows the signs that need raised and need vegetation cleared.

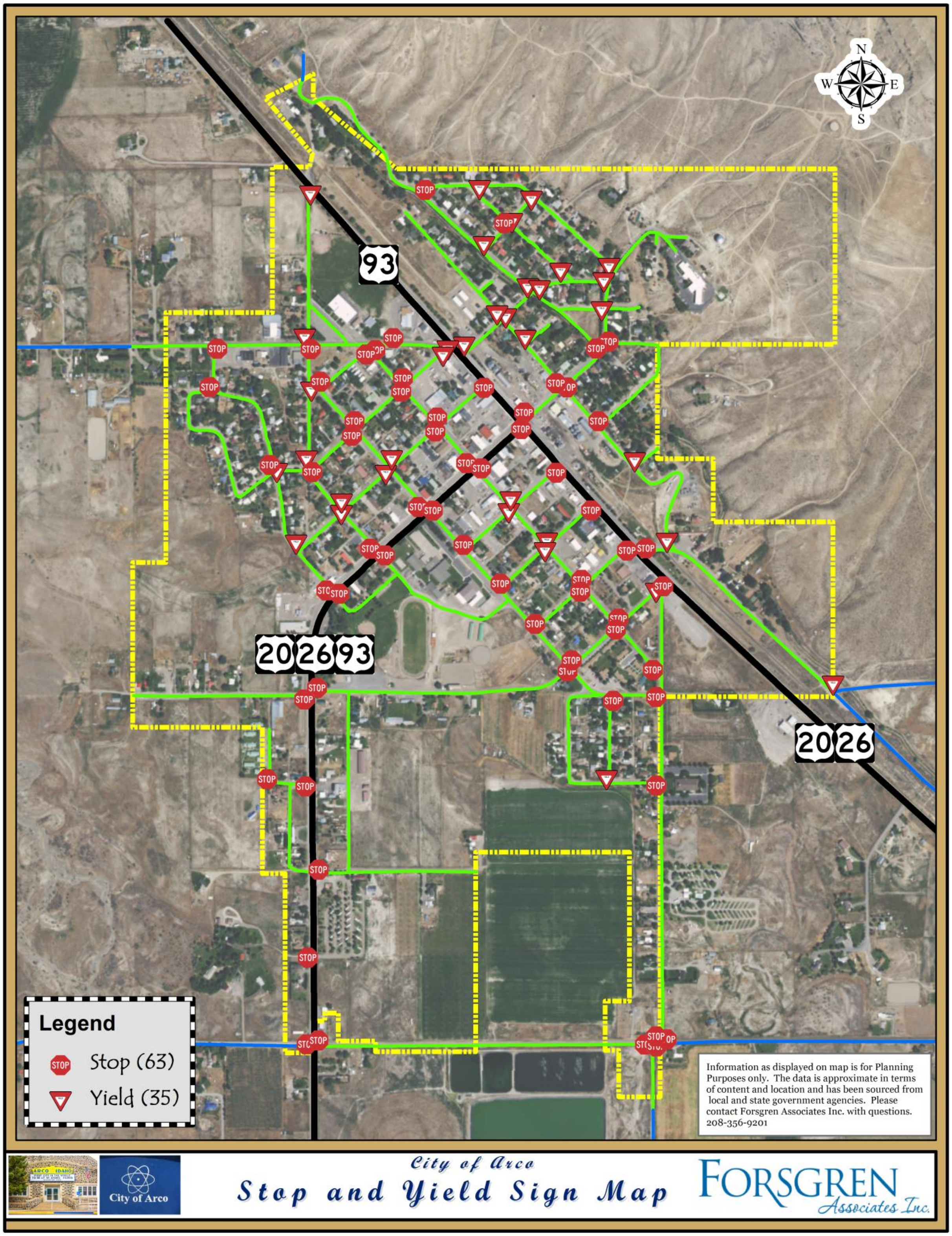

Figure 4-3: Regulatory Sign Map 1 (Stop and Yield Signs)

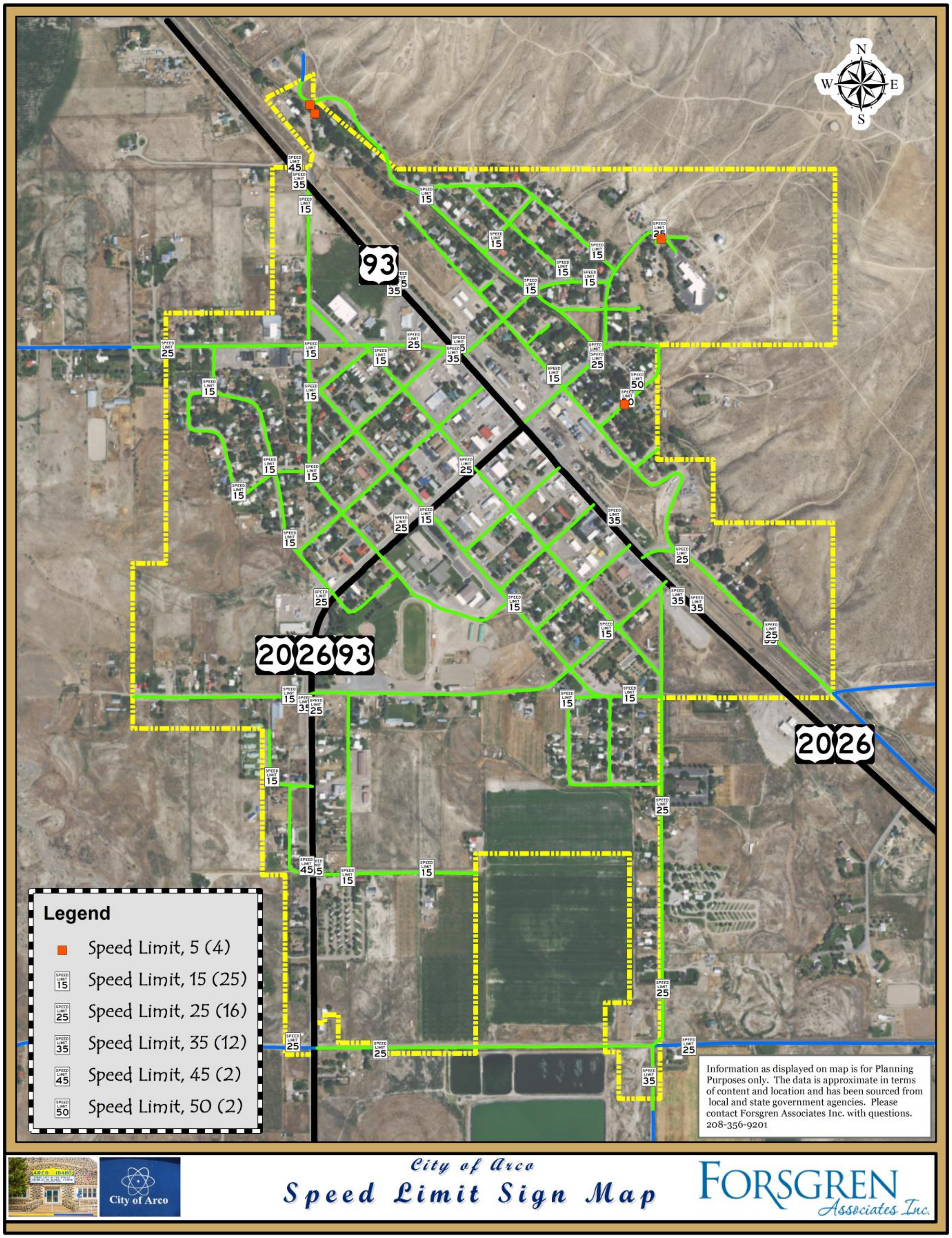

Figure 4-4: Regulatory Sign Map 2 (Speed Limit Signs)

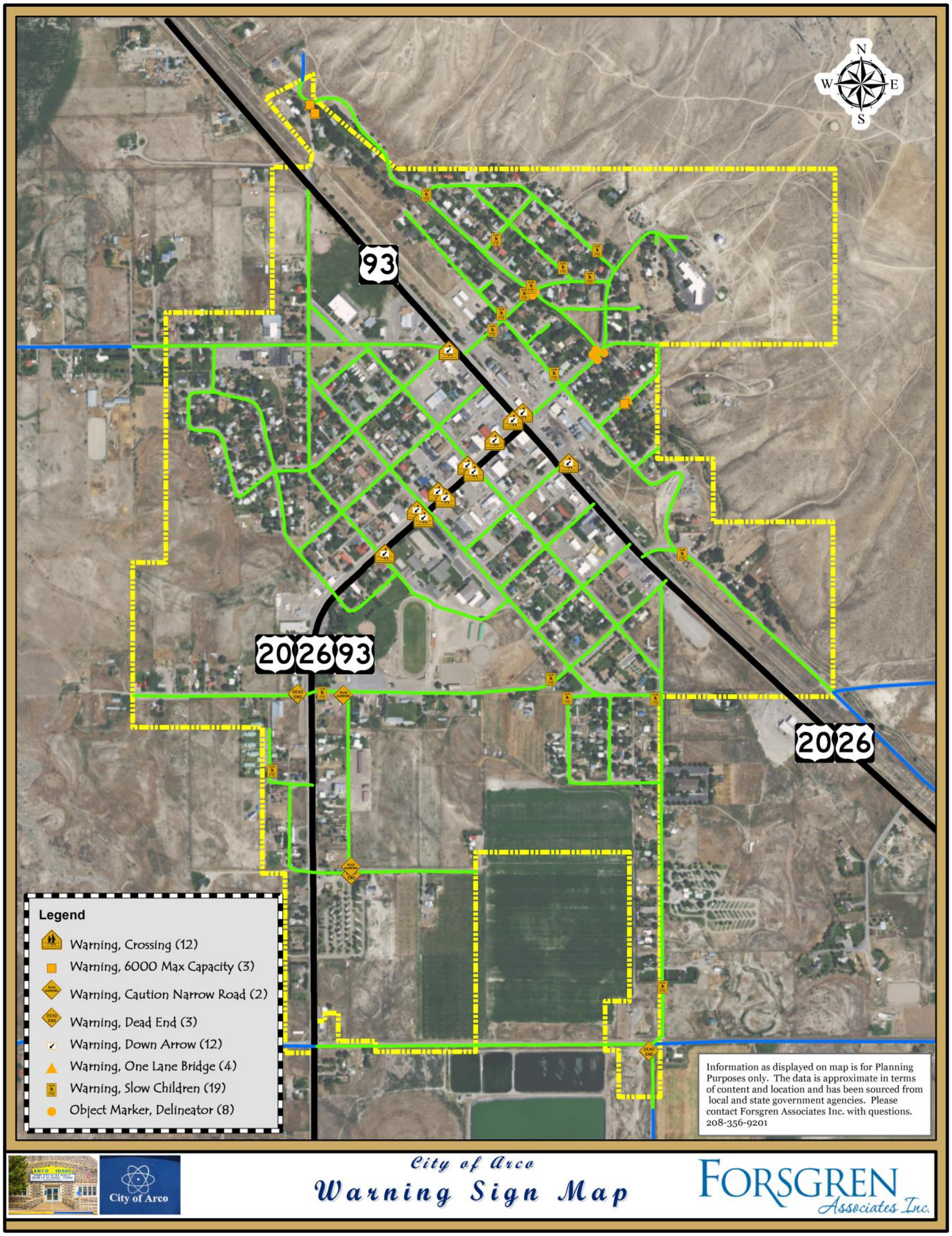

Figure 4-5: Warning Sign Map

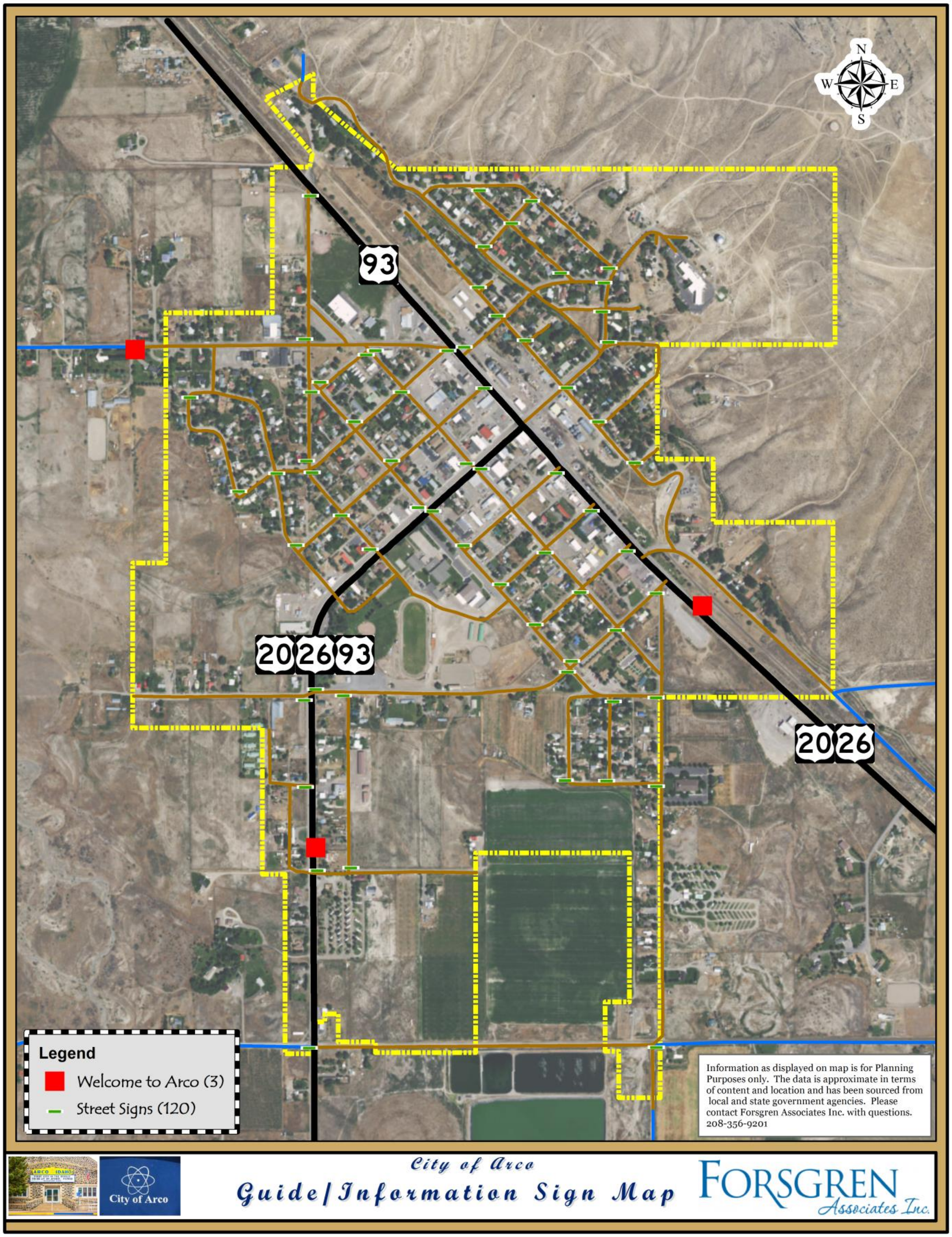

Figure 4-6: Guide and Informational Sign Map

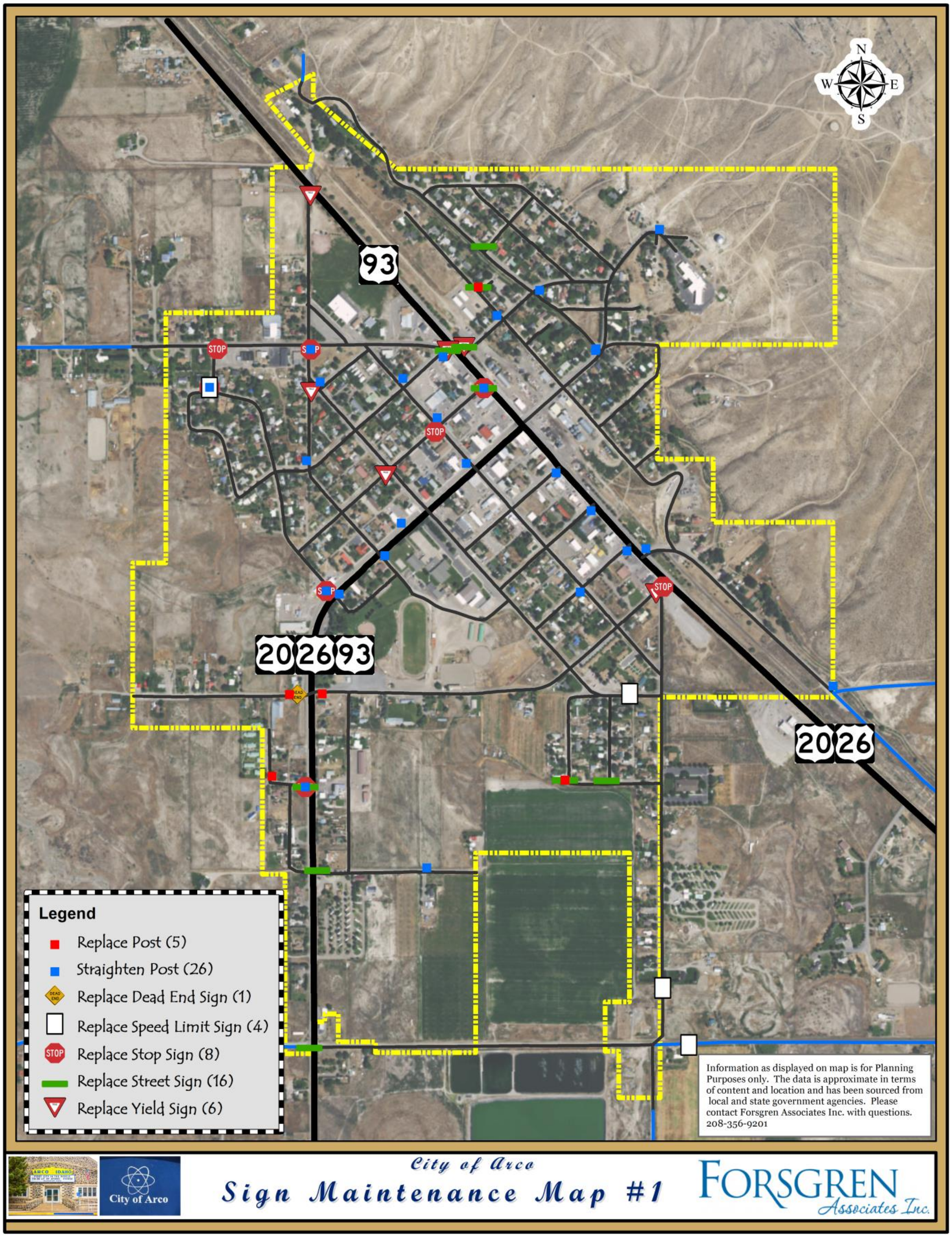

Figure 4-7: Sign Maintenance Map 1

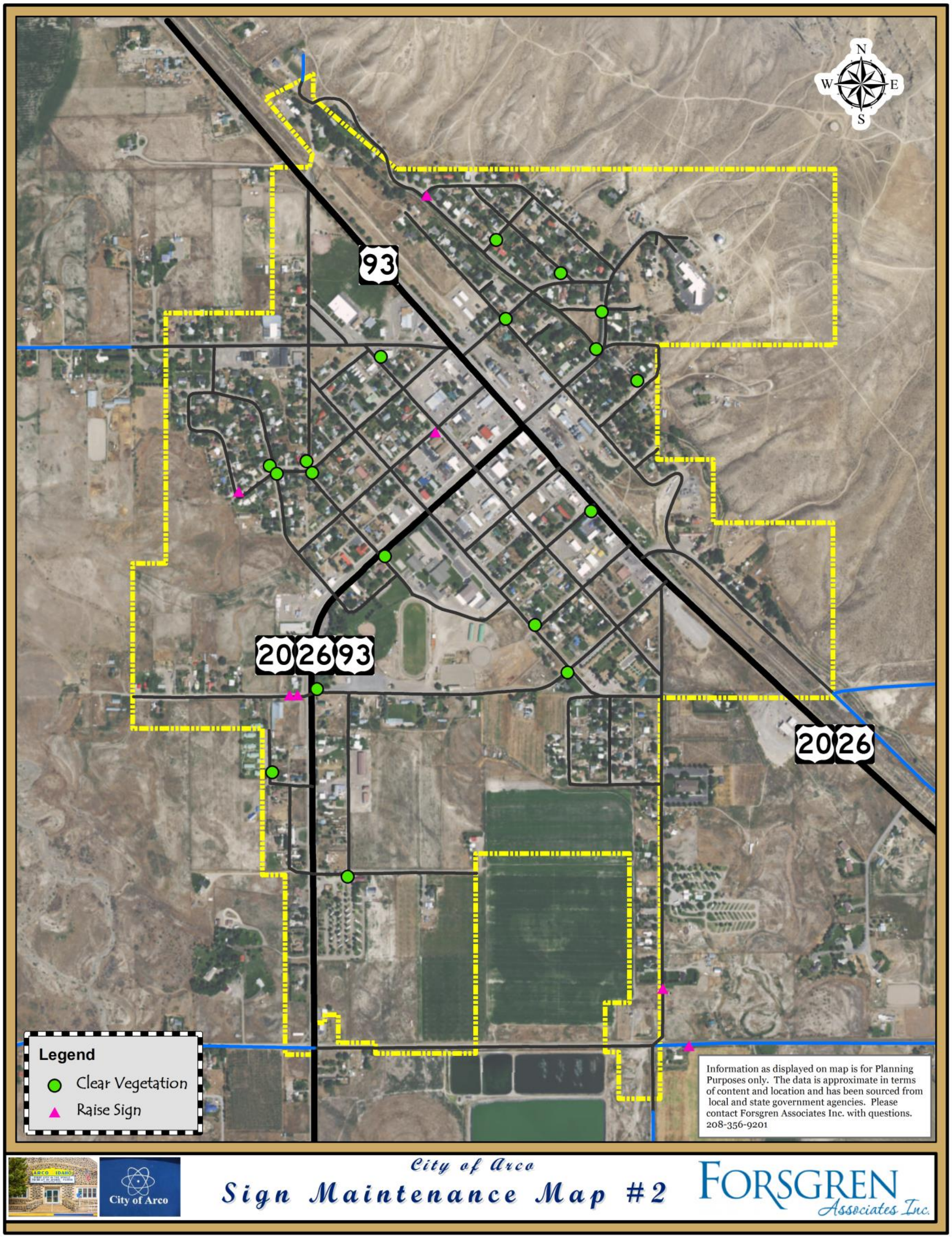

Figure 4-8: Sign Maintenance Map 2

Chapter 5: Capital Improvement Plan (CIP)

The goal of the CIP is to:

"Provide a safe, convenient, aesthetic and economically functional transportation system for the City and region, which includes pedestrians, bicycles, automobiles, trucks, agricultural vehicles, and other modes of transportation for the safe and efficient movement of people, goods and services"

Road Improvement Projects

The overall assessment of the roadways indicates that there are a number of roadways improvements. The City has outlined a number of construction projects. The projects are:

Project #1: Chip Seal and Repair Existing Asphalt Roads

There are eight (8) chip seal projects that were identified by the City as priority roads. It is assumed that the cost of a chip seal is $0.30 per square foot or $2.70 per square yard. The following sections identify the approximate length, width, area, and Engineers Opinion of Probable Cost (EOPC) for each of the chip seal projects.

Project 1A: S Idaho St

Length ≈ 2,100 feet

Width: Range from 30 to 50 feet

Area ≈ 70,775 square feet

EOPC ≈ $21,500

Project 1B: N Idaho Street

Length ≈ 1,250 feet

Width: Range from 30 to 50 feet

Area ≈ 47,000 square feet

EOPC ≈ $14,500

Project 1C: Water Street

Length ≈ 3,700 feet

Width: Range from 20 to 48 feet

Area ≈ 139,250 square feet

EOPC ≈ $42,000

Project 1D: Sunset Dr.

Length ≈ 2,500 feet

Width: 28 Feet

Area ≈ 68,500 square feet

EOPC ≈ $21,000

Project 1E: W. Grand St. to Hospital

Length ≈ 2,100 feet

Width: Range from 26 to 46 feet

Area ≈ 71,250 square feet

EOPC ≈ $21,500

Project 1F: E Delores to Hwy 93

Length ≈ 1,350 feet

Width: 25 feet

Area ≈ 33,250 square feet

EOPC ≈ $10,000

Project 1G: S Thelma St.

Length ≈ 875 feet

Width: 20 feet

Area ≈ 17,500 square feet

EOPC ≈ $5,250

Project 1H: E Joan St.

Length ≈ 700 feet

Width: Range from 20 to 25 feet

Area ≈ 15,750 square feet

EOPC ≈ $4,750

A map showing the locations and EOPC of each chip seal project is provided on the following page.

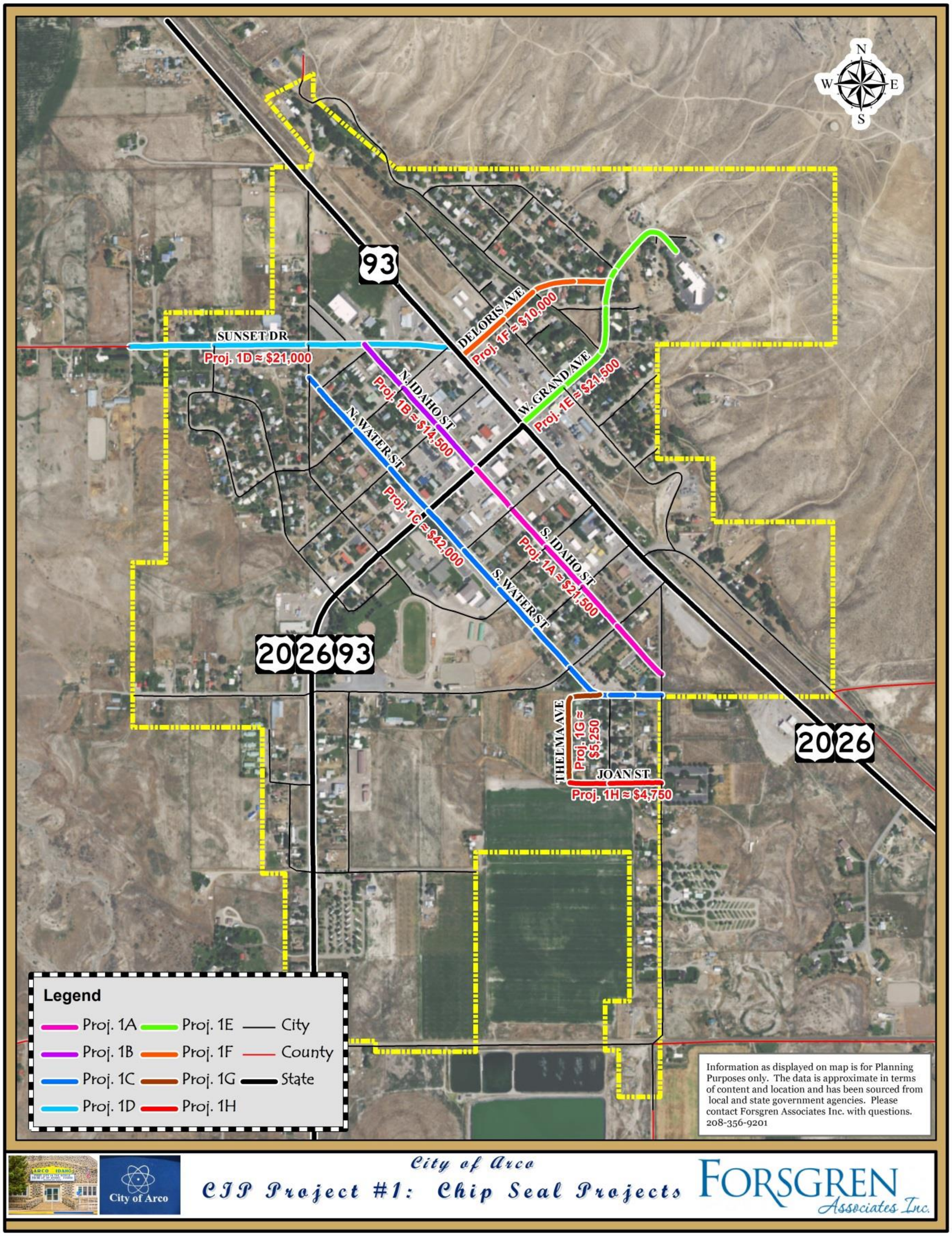

Figure 5-1: CIP Project #1: Chip Seal Projects

Project #2: Upgrade roads from HWY 93 to N Idaho Street

Project 2A: Era Ave

Length ≈ 475 feet

Width: 36 feet

Area ≈ 17,200 square feet

EOPC ≈ $55,000

Project 2B: Salmon Ave

Length ≈ 485 feet

Width: 25 feet

Area ≈ 12,100 square feet

EOPC ≈ $40,000

Project 2C: Arco Ave

Length ≈ 480 feet

Width: 36 feet

Area ≈ 17,300 square feet

EOPC ≈ $55,000

Project 2D: Temple Ave

Length ≈ 500 feet

Width: 25 feet

Area ≈ 12,750 square feet

EOPC ≈ $40,000

Project 2E: Off of West Grand 1 block

Project 2E-1: Blaine St

Length ≈ 1,200 feet

Width: 20 feet

Area ≈ 24,250 square feet

EOPC ≈ $75,000

Project 2E-2: Hanna Ave

Length ≈ 420 feet

Width: 20 feet

Area ≈ 8,400 square feet

EOPC ≈ $26,000

A map showing the locations and EOPC of each road upgrade project is provided on the following page.

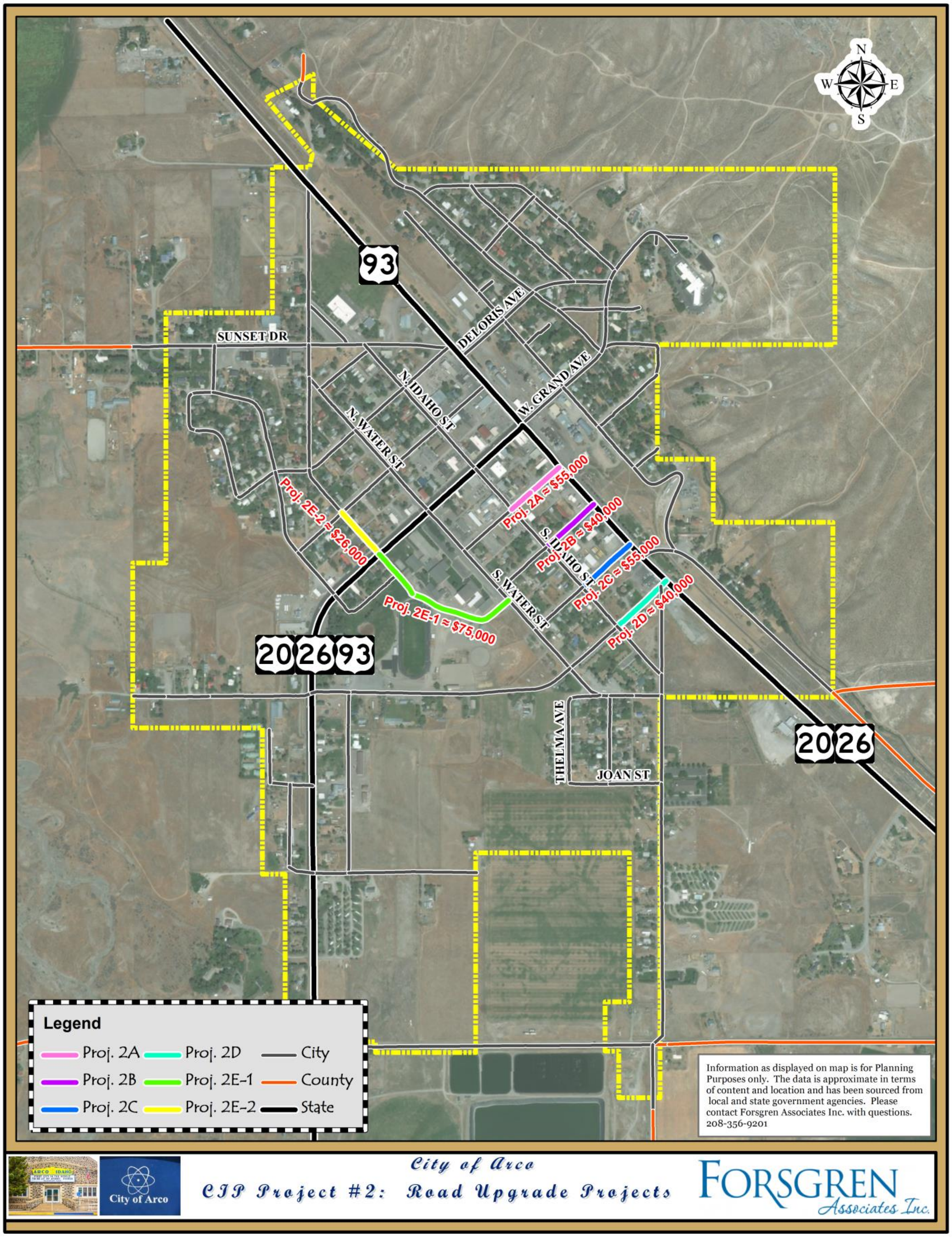

Figure 5-2: CIP Project #2: Road Upgrade Projects

PROJECT #3: DUST CONTROL AND GRADE (ADD ¾" AS NECESSARY) ALL GRAVEL ROADS

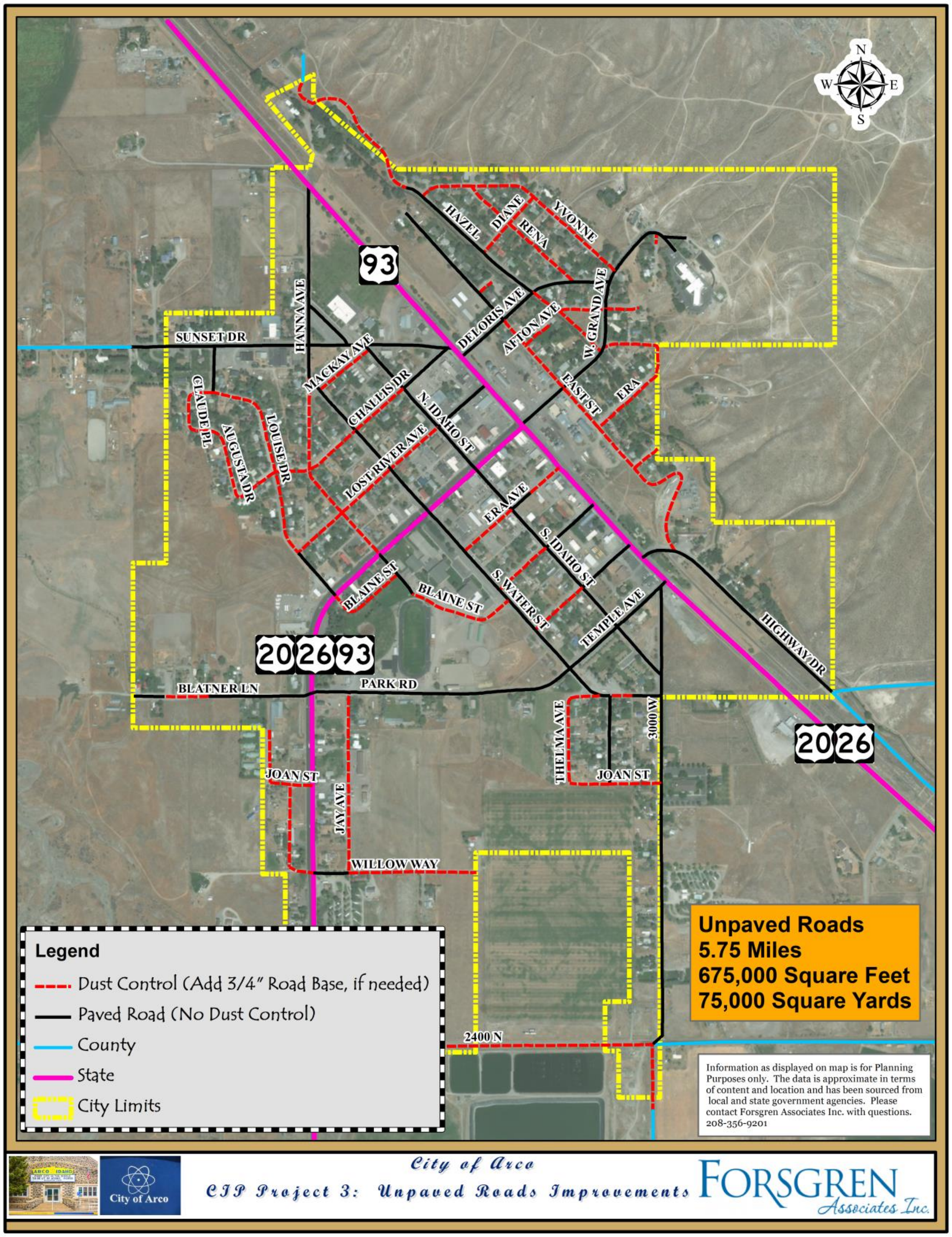

Figure 5-3: CIP Project #3: Unpaved Roads Improvement Project

FUNDING

With the limited budget that the City of Arco has for transportation improvement projects, outside funding is a necessity. The following section is a brief overview of funding. For additional information about funding, reference "The Manual on Local Highway Jurisdiction Funding Manual" on LHTAC's webpage at www.lhtac.org.

HIGHWAY USER REVENUES

Improved road mileage is defined as: "A road with any surface that is graded and drained." 45% of the Highway User Revenue (HUR) distribution is directly linked to the amount of improved road mileage identified by ITD. Through maintaining current GIS mapping and the associated database of the transportation network, the City will maximize the revenues from HUR distribution.

LOCAL HIGHWAY JURISDICTIONS FUNDING PROGRAMS

Currently the State of Idaho has some funding programs that the City of Arco can utilize in their endeavors to improve their road network. The following paragraphs identify the programs that can support the City of Arco maintenance and construction needs.

LOCAL RURAL HIGHWAY INVESTMENT PROGRAM (LRHIP)

This program is for a Local Highway Jurisdiction, a City under 5,000 in population, and a County or Highway City.

- ✓ **Construction Project:** This project includes any type of road or bridge project to improve the condition, safety or service life of the road and bridge from maintenance to reconstruction. This type of project is limited to $100,000.

- ✓ **Transportation Planning Study:** This project includes a roadway network analysis, proposed solutions to existing problems, a capital improvement plan, and a maintenance or asset management program. This project is limited to $50,000.

- ✓ **Sign Upgrades:** This project includes sign replacement projects to bring warning and regulatory signs, sign posts, and pavement markings up to MUTCD standards. This type of project is limited to $30,000.

LOCAL HIGHWAY SAFETY IMPROVEMENT PROGRAM (LHSIP)

This program is a federally funded program aimed at eliminating fatal and serious injury crashes on the roadway system; reference www.lhtac.org for more information.

FEDERAL-AID INCENTIVE PROGRAM

Rural cities (under 5,000 in population), highway, cities, and counties can apply for this program if the jurisdiction maintains a major collector roadway.

SURFACE TRANSPORTATION PROGRAM (STP)

Local Rural funds are allocated for projects in rural areas, and in cities with populations below 5,000. They may be used for new construction, reconstruction or rehabilitation of roadways functionally classified with FHWA as rural major collectors or higher with a small percentage allowed for minor collectors. These funds may also be used for enhancement, bridge, or safety activities. The local match requirement is 7.34 percent.

BRIDGES

Funds are for the replacement or rehabilitation of bridges. The bridge must be at least 20 feet long and have a qualifying "sufficiency rating," generally 50 or lower. The local or state match requirement is 7.34 percent.