

May
2016

Integrated Solid Waste Management Master Plan

Payson City Solid Waste Services



Payson City
439 W. Utah Ave.
Payson, Utah 84651
801-465-5200



**INTEGRATED SOLID WASTE MANAGEMENT
MASTER PLAN**

For
Payson City Solid Waste Services

Payson City
439 W. Utah Ave.
Payson, Utah 84651
801-465-5200

May 2016

ENGINEER'S CERTIFICATION AND DECLARATION

I, Chet A. Hovey, hereby certify that I am a Registered Professional Civil Engineer holding registration number 368556-2202 in the state of Utah. I declare that this Integrated Solid Waste Management Master Plan for Payson City Solid Waste Services was prepared under my direct supervision for Payson City, Utah.

Chet A. Hovey, P. E.

Utah Reg. 368556-2202

EXECUTIVE SUMMARY

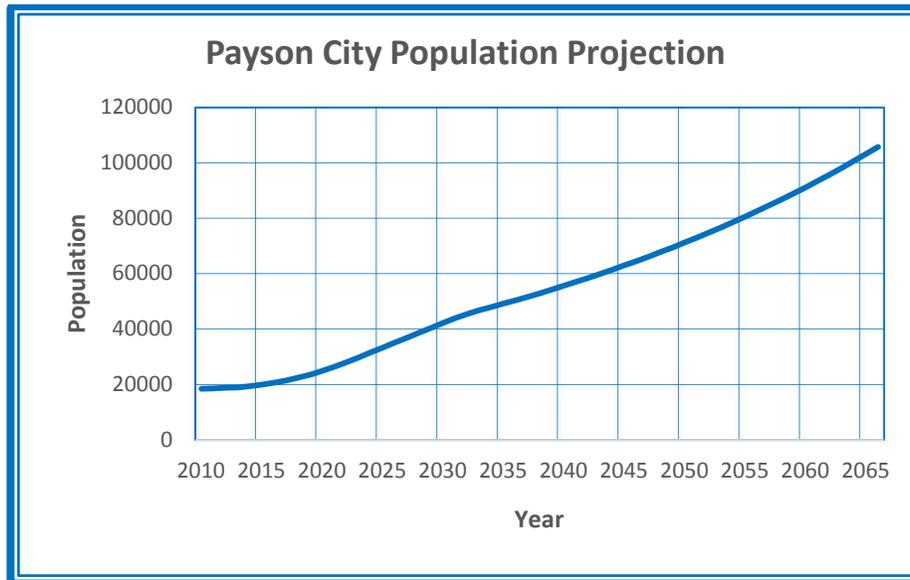
This Integrated Solid Waste (Master Plan) characterizes each component utilized by Payson City Solid Waste Services (Landfill Facility) in collecting, and disposing of the solid waste stream within its service area. The Master Plan will provide guidelines for the Landfill Facility to establish the nature, extent, and cost of improvements anticipated under a 20-year development window and a 50-year development window.

The service area contains Payson City and surrounding region which is located within the south central Utah County. Payson City is the major contributor to the Landfill Facility and incorporates about 8.7 square miles

The land use within Payson City is primarily a residential community with a small commercial base. Starting as a fort, Payson City has continued to grow with a land use pattern of mainly single family homes. With the recent additions of the Payson Business Park, designated commercial areas, and professional service areas, the economy of Payson City has expanded and diversified.

Population projections were obtained from Payson City to the year 2034. The population projection was extended from 2034 through 2066 using a 2.5% growth rate. Figure E.1 below shows a graphical representation of the population projections for Payson City.

Figure E.1



For Payson City, the rate of municipal solid waste generated per person, was estimated at 7.6 pounds per day and the construction and demolition debris is 6.2 pounds per day. This generation rates were determined using annual data provided by the Landfill Facility. The average household size is 3.6 persons per household.

To determine future infrastructure requirements, it is necessary to calculate the projected waste stream using the current generation rates and the population estimates under the 20-year and 50-year development windows.

The projected waste stream was calculated using the current generation rate and the population estimates as shown in the Table E-1.

E-1-Waste Generation Projection

Service Area	Development Window	Population Estimate	MSW Waste Generation (tons/yr)	C&D Waste Generation (tons/yr)
Payson City	Present 2016	20,631	28,624	23,236
	YR 2036	50,406	69,935	56,771
	YR 2066	105,730	146,693	119,080

Funding for solid waste management projects are primarily through fee for service and appropriations from entities within the area. Other funding options available for solid waste management projects including bonds and governmental agency loans and grants.

The Landfill Facility contracts directly to commercial generators to make disposal arrangements and waste is collected on an as needed basis. Residential accounts with curb side collection are collected once a week by the Landfill Facility to maintain public health and safety. Residential collections fees are unit based using a flat fee per container in an effort to reduce illegal dumping. Currently, customers are allowed additional containers for a reduced fee.

Sources of MSW, as characterized in this Master Plan, include both residential and commercial generators. The United States Environmental Protection Agency (EPA) estimates that between 55 to 65 percent of all MSW is residential. Due to lower recycling rates among residential waste, a high portion of residential waste is deposited in landfills. Based on EPA numbers from 2005 through 2012, waste generation has stabilized due to public awareness campaigns and source reduction. The Table E-2 is a summary of waste processed at the Landfill Facility.

E-2-Payson City Landfill Facility Distribution

Year	C&D Class IV (tons)	Mixed Waste (tons)	Sewer Sludge (tons)	Total (tons)
2011	20,380	22,644	939	43,963
2012	25,359	25,820	75	51,254
2013	23,339	26,933	405	50,677
2014	20,523	31,058	853	52,434
2015	17,690	26,158	992	44,840

The Table E-2 indicates that the amount of waste disposed of in the landfill fluctuates. However on average continues to increase with time as expected. Changes typically occur as a result in variations in the economy and population. Construction and demolition volumes are affected by large scale construction and demolition projects in the surrounding area. The mixed waste tonnages are affected by green waste, recycling and reuse programs.

The components of the waste management system were broken down to the general facility, collections, transfer station, recycling, and landfill. The capacity under present conditions, 20-year development window, and the 50-year development window was discussed for each component.

The following is a list of recommended studies and equipment with their priority of acquisition. This list will help to improve the operations of each component and should be implemented within each priority window.

General Facility (1 to 5 Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase. Suggested items in the overview analysis include:
 - General facility equipment
 - Scale House
 - Scales
 - Maintenance facility
 - Administration
 - Manpower

General Facility (5 to 10 Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase. Suggested items in the overview analysis include:
 - General facility equipment

Scale House
Scales
Maintenance facility
Administration
Manpower

General Facility (10 to 15 Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase.
Suggested items in the overview analysis include:
General facility equipment
Scale House
Scales
Maintenance facility
Administration
Manpower

General Facility (20-Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase.
Suggested items in the overview analysis include:
General facility equipment
Scale House
Scales
Maintenance facility
Administration
Manpower

General Facility (50-Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase.
Suggested items in the overview analysis include:
General facility equipment
Scale House
Scales
Maintenance facility
Administration
Manpower

Collections (1 to 5 Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase.
Suggested items in the overview analysis include:
Public versus Privatization
Collection Vehicles

Containers
Maintenance
Manpower

Collections (5 to 10 Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase.
Suggested items in the overview analysis include:
 - Public versus Privatization
 - Collection Vehicles
 - Containers
 - Maintenance
 - Manpower

Collections (10 to 15 Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase.
Suggested items in the overview analysis include:
 - Public versus Privatization
 - Collection Vehicles
 - Containers
 - Maintenance
 - Manpower

Collections (20-Year Priority)

- a. Beyond the current scope of work but, should be added in a future phase.
Suggested items in the overview analysis include:
 - Public versus Privatization
 - Collection Vehicles
 - Containers
 - Maintenance
 - Manpower

Collections (50-Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase.
Suggested items in the overview analysis include:
 - Public versus Privatization
 - Collection Vehicles
 - Containers
 - Maintenance
 - Manpower

Recycling (1 to 5 Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase.
Suggested items in the overview analysis include:
 - Public versus Privatization
 - Infrastructure Needs
 - Collection Vehicles
 - Containers
 - Maintenance
 - Manpower
 - Financial
 - Public Relations

Recycling (5 to 10 Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase.
Suggested items in the overview analysis include:
 - Public versus Privatization
 - Infrastructure Needs
 - Collection Vehicles
 - Containers
 - Maintenance
 - Manpower
 - Financial
 - Public Relations

Recycling (10 to 15 Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase.
Suggested items in the overview analysis include:
 - Public versus Privatization
 - Infrastructure Needs
 - Collection Vehicles
 - Containers
 - Maintenance
 - Manpower
 - Financial
 - Public Relations

Recycling (20-Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase.
Suggested items in the overview analysis include:
 - Public versus Privatization
 - Infrastructure Needs

Collection Vehicles
Containers
Maintenance
Manpower
Financial
Public Relations

Recycling (50-Year Priority)

- a. Beyond the current scope of work, but should be added in a future phase. Suggested items in the overview analysis include:
 - Public versus Privatization
 - Infrastructure Needs
 - Collection Vehicles
 - Containers
 - Maintenance
 - Manpower
 - Financial
 - Public Relations

Landfills (1 to 5 Year Priority)

- a. Complete remaining Phases of the Master Plan.
- a. Finalize future Class IV and Class V disposal options and locations.
- b. Initiate the permitting process for lateral expansion of both landfills.
- c. Evaluate benefits of different equipment to increase density to extend useful life of existing disposal facilities. Disposal densities of existing waste streams are considered minimal due to achievable compactive effort of the current landfill equipment.
- d. Evaluate manpower requirements based on incoming tonnage and operations of both landfills.

Landfills (5 to 10 Year Priority)

- a. Make preparations to close existing Class IV Landfill.
- b. Update Master Plan as needed.
- c. Develop an Integrated Solid Waste Management Feasibility Study (Study). The Study would investigate alternatives for collection and disposal of solid waste within the service area. The Study should include a no action, privately

owned collection, publicly owned collection, regional landfills, and waste to energy, material recycling center, and siting of new proper comparisons utilizing the latest technological advances. In addition, each alternative should consider siting criteria, political, opposition, and economic Impacts.

Landfills (10 to 15 Year Priority)

- a. Update Master Plan and Study as needed.
- b. Additional equipment and manpower will likely be required.
- c. Evaluate future Class V collections and disposal options.
- d. Evaluate future Class IV disposal options.

Landfills (20-Year Priority)

- a. Update Master Plan and Study as needed.
- b. Additional equipment and manpower will likely be required.
- c. Evaluate future Class V collections and disposal options.
- d. Evaluate future Class IV disposal options.

Landfills (50-Year Priority)

- a. Update Master Plan and Study as needed.
- b. Additional equipment and manpower will likely be required.
- c. Evaluate future Class V collections and disposal options.
- d. Evaluate future Class IV disposal options.

TABLE OF CONTENTS

	<u>Pg.</u>
EXECUTIVE SUMMARY	E-1 – E-8
CHAPTER 1 - INTRODUCTION	
1.1 PURPOSE AND SCOPE	1-1
1.2 BACKGROUND	1-1
CHAPTER 2 - DEMOGRAPHICS	
2.1 OVERVIEW	2-1
2.2 LAND USE	2-1
2.3 CLIMATE	2-1
2.4 GEOLOGY	2-3
2.5 ENVIRONMENT	2-3
2.6 POPULATION.....	2-7
2.7 ECONOMICS.....	2-7
2.8 HOUSING	2-8
2.9 PLANNING UNITS.....	2-8
2.10 GROWTH	2-8
2.11 FUNDING	2-9
2.11.1 Fee for Service	2-9
2.11.2 Bonds	2-9
2.11.3 Governmental Agency Loans.....	2-9
2.11.4 Governmental Agency Grants.....	2-9
CHAPTER 3 – INTERGRATED SOLID WASTE MANAGEMENT	
3.1 OVERVIEW	3-1
3.2 SOLID WASTE FACILITIES	3-5

TABLE OF CONTENTS (CONTINUATION)

	<u>Pg.</u>
CHAPTER 4 – CAPACITY EVALUATION	
4.1 OVERVIEW	4-1
4.2 GENERAL FACILITY	4-1
4.2.1 Present Capacity	4-1
4.2.2 20-Year Development Window	4-1
4.2.3 50-Year Development Window	4-1
4.3 COLLECTIONS.....	4-2
4.3.1 Present Capacity	4-2
4.3.2 20-Year Development Window	4-2
4.3.3 50-Year Development Window	4-2
4.4 RECYCLING AND DIVERSION.....	4-3
4.4.1 Present Capacity	4-3
4.4.2 20-Year Development Window	4-4
4.4.3 50-Year Development Window	4-4
4.5 LANDFILL FACILITIES	4-5
4.5.1 Present Capacity	4-7
4.5.2 20-Year Development Window	4-11
4.5.3 50-Year Development Window	4-11
CHAPTER 5 – RECOMMENDATIONS	
5.1 OVERVIEW	5-1
5.2 GENERAL FACILITY	5-1
5.3 COLLECTIONS.....	5-1
5.4 RECYCLING AND DIVERSION.....	5-2
5.5 LANDFILL FACILITIES	5-2
CHAPTER 6 – REFERENCES	
6.1 REFERENCES	6-1

<u>LIST OF FIGURES</u>	<u>Pg.</u>
CHAPTER 1 - INTRODUCTION	
1.1 Vicinity Map	1-2
CHAPTER 2 - DEMOGRAPHICS	
2.1 Zoning Map	2-2
2.2 Average Annual Precipitation Map	2-4
2.3 Free Water Surface Evaporation Map	2-5
2.4 Geology Map.....	2-6
2.5 Payson City Population Projection	2-7
CHAPTER 3 – INTERGRATED SOLID WASTE MANAGEMENT	
3.1 Waste Generation in the United States	3-1
3.2 United States Waste Generation Rates	3-2
3.3 2012 MSW Materials Breakdown by Weight	3-3
3.4 2012 MSW Product Categories Breakdown by Weight	3-4
CHAPTER 4 – CAPACITY EVALUATION	
4.1 Projected Construction and Demolition Waste Stream.....	4-6
4.2 Projected Municipal Solid Waste Stream	4-7
4.3 Site Plan	4-8
4.4 MSW Cell.....	4-9
4.5 C&D Cell.....	4-10
CHAPTER 5 - RECOMMENDATIONS	
N/A	
CHAPTER 6 - REFERENCES	
N/A	

<u>TABLES</u>	<u>Pg.</u>
CHAPTER 1 - INTRODUCTION	
N/A	
CHAPTER 2 - DEMOGRAPHICS	
2.1 Climate Data	2-1
2.2 Projected Waste Generation	2-8
CHAPTER 3 – INTERGRATED SOLID WASTE MANAGEMENT	
3.1 Payson City Landfill Distribution.....	3-4
CHAPTER 4 – CAPACITY EVALUATION	
4.1 Projected Construction and Demolition Waste Stream.....	4-5
4.2 Projected Municipal Solid Waste Stream	4-6
CHAPTER 5 - RECOMMENDATIONS	
N/A	
CHAPTER 6 - REFERENCES	
N/A	

CHAPTER 1 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this Integrated Solid Waste Master Plan (Master Plan) is to characterize each component utilized by Payson City Solid Waste Services for collecting, and disposing of their solid waste stream. This Master Plan will be developed in a phased approach. Advanced Environmental Engineering was contracted to develop the first phase which will serve as a foundation for the Master Plan as it is expanded, refined, and updated in future phases.

The objectives of this Master Plan are:

- To serve as a single reference for information related to Integrated Solid Waste Management for Payson City Solid Waste Services.
- To establish nature, extent and cost of improvements under present conditions.
- To establish nature, extent and cost of improvements for the 20-year development window.
- To establish nature, extent, and cost of improvements for the 50-year development window.

The procedures used to accomplish these objectives were:

- Identify population estimates and growth projects for the service area which currently is Payson City.
- Determine past and present waste volumes.
- Estimate waste characterization.
- Calculate landfill disposal capacity and life expectancy.
- Identify borrow and future disposal areas.
- Outline manpower requirements based on waste stream volume.
- List equipment requirements based on waste stream volume.
- Buffer zone and land acquisition.

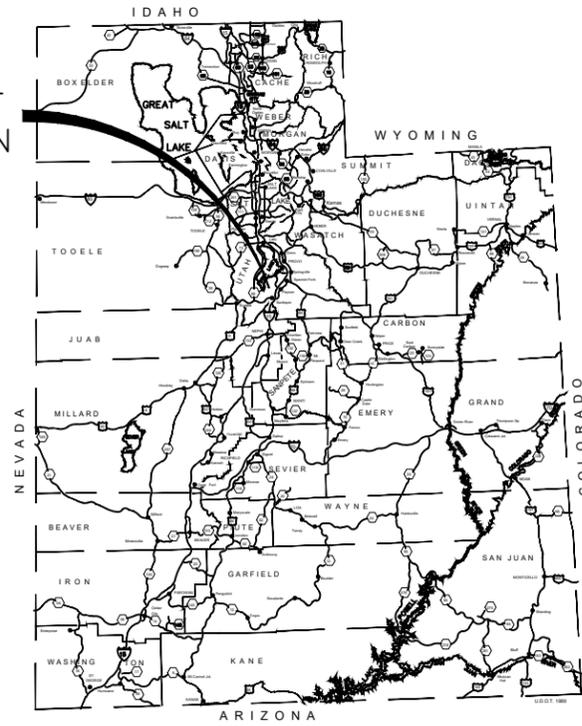
This Master Plan is designed to be a dynamic plan that should be updated regularly for use with physical and financial planning.

1.2 BACKGROUND

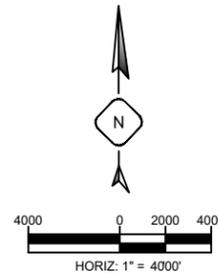
Payson City, an incorporated municipality in the State of Utah, is located in Utah County. It is nestled against the foothills of the Wasatch Mountains as shown in Figure 1.1. Its current population estimate is 20,600 and has an area of over 8.6



PROJECT LOCATION

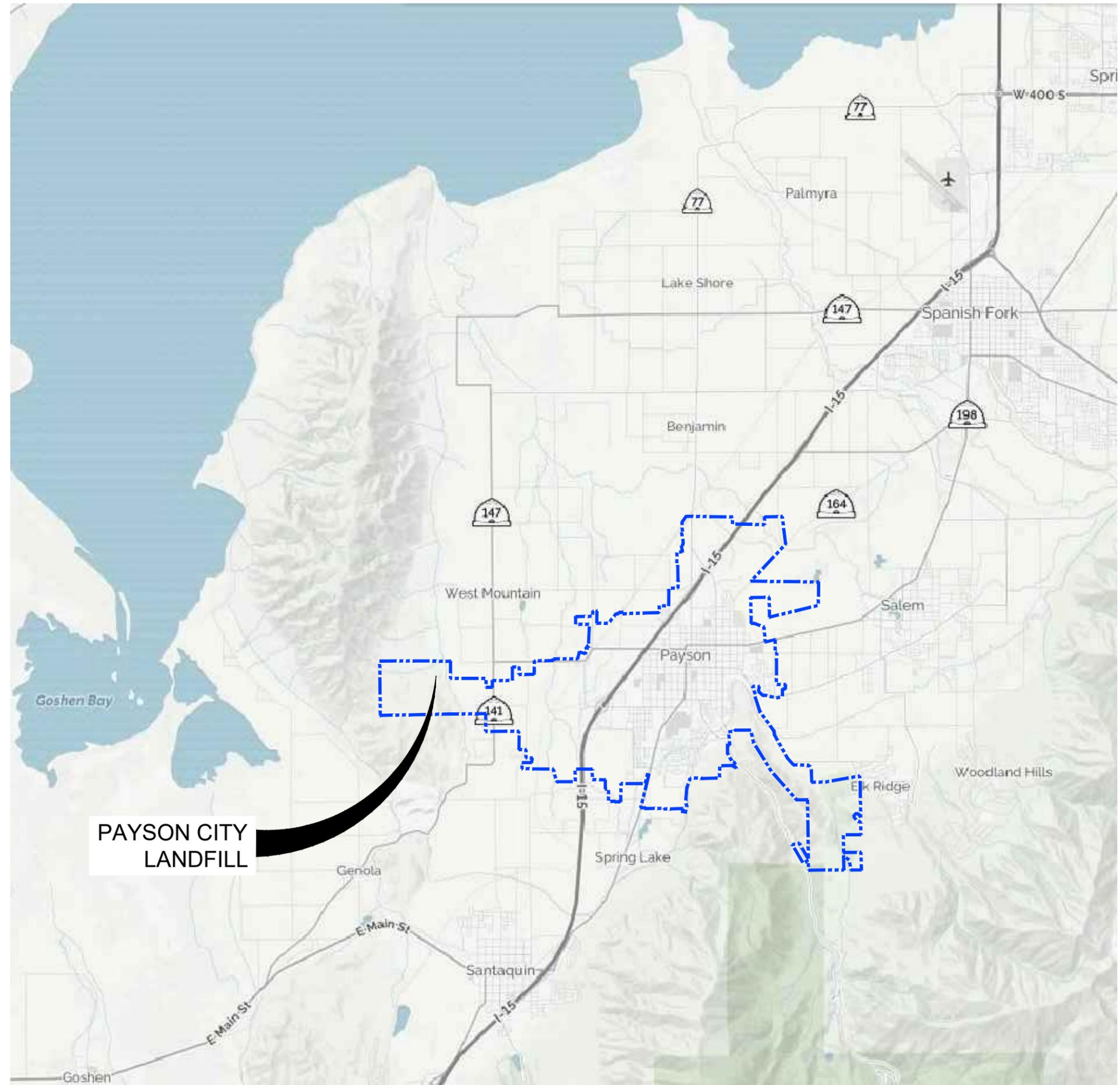


LOCATION MAP



LEGEND:

----- CITY BOUNDARY



PAYSON CITY LANDFILL

REVISION	
DATE	
NO.	

DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1 INCH

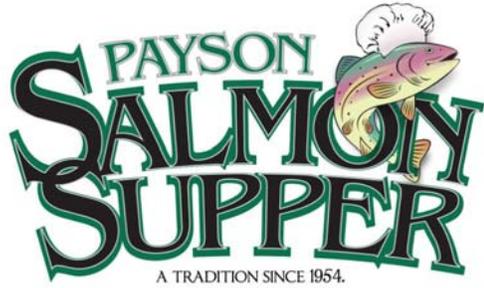
VICINITY MAP
 PAYSON CITY SOLID WASTE SERVICES
 INTEGRATED SOLID WASTE MASTER PLAN
 PAYSON, UT



DESIGN:	CH
DRAWN:	JC
CHECKED:	CH
DATE:	05/27/2016

square miles. Payson City was first settled in 1850, by Church of Jesus Christ of Latter Day Saints, and originally named Fort Peteetneet, meaning, "little waters," after the Ute Indian Chief Peteetneet. In January of 1853, Payson City was incorporated and the name was change to honor its founder, James Pace. A monument stands to Chief Peteetneet at the first school in Payson, which is used for the Peteetneet Museum and Cultural Arts Center.

Payson City also has a rich Scottish heritage and enjoys multiple festivals and community gatherings per year. These festivals and gatherings include the Onion Days Celebration (started in 1929), Salmon Supper (started in 1953), Scottish Heritage Festival (started in 1984), and band concerts. Monuments that dot Payson City include the Payson City Historical Markers, Peteetneet Museum, and Historic Main Street.



Solid waste generated within Payson City consist mostly of residential waste with a limited amount of commercial waste. Payson City Solid Waste Services provides curbside collection services for the residence and customized collection services for the commercial accounts. All waste collected is transported to the Payson City Landfill (Landfill Facility) for final disposal. The Landfill Facility accepts construction and demolition debris from Payson City residents along with Utah County residents.

CHAPTER 2 DEMOGRAPHICS

2.1 OVERVIEW

Payson City currently requires all residents to participate in their residential solid waste collection program. The collection program includes the removal and disposal services of residential and commercial solid waste. Each resident is provided an approved garbage container which is serviced by Payson City Solid Waste Services or its designated agent weekly. All residential waste collected within Payson City is transported to the Payson City Landfill (Landfill Facility) or a Payson City Solid Waste Services approved facility. Commercial accounts have options for garbage container size and disposal frequency. Green waste is also accepted and processed at the compost facility located at the Landfill Facility. The compost facility produces screened soil, wood compost, and topsoil which is sold at the Landfill Facility. Paper recycling is collected at Park View School in Payson City and all other recyclables are directed to South Utah Valley Solid Waste District transfer station in Springville. The Landfill Facility is located in Payson City at the western end of Utah Avenue and has a physical address of 6665 W 10400 S.

At the time of this Master Plan, no other approved disposal facilities were available.

2.2 LAND USE

The land use within Payson City is primarily a residential community with a small commercial base. Starting as a fort, Payson City has continued to grow with a land use pattern of mainly single family homes. With the recent addition of the Payson Business Park, designated commercial areas, and professional service areas, the economy of Payson City has expanded and diversified. Figure 2.1 is a copy of the current zoning map.

2.3 CLIMATE

The climate within Payson City can be defined as arid with low precipitation rates, high temperatures, and high evaporation rates. Table 2.1 below lists average climate data for Payson City.

Table 2.1 – Climate Data

Region	Average Annual Precipitation (in/yr)	Mean Temperature (°F)	Free Water Surface Evaporation (in/yr)
Payson City	15.7	51.9	40-45



PAYSON CITY ZONING MAP

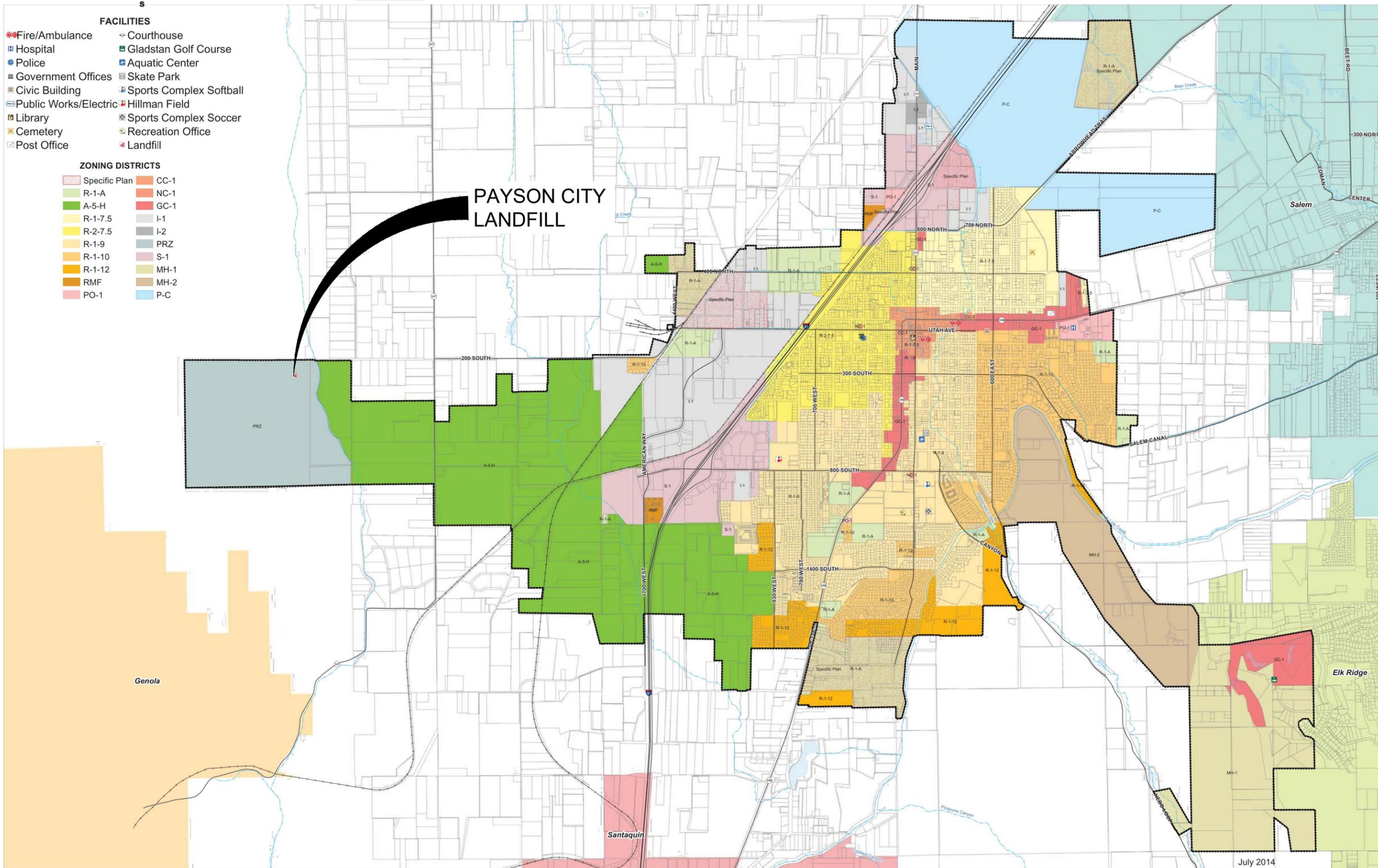
0 1/4 1/2 1 Mile

- FACILITIES**
- Fire/Ambulance
 - Hospital
 - Police
 - Government Offices
 - Civic Building
 - Public Works/Electric
 - Library
 - Cemetery
 - Post Office
 - Courthouse
 - Gladstan Golf Course
 - Aquatic Center
 - Skate Park
 - Sports Complex Softball
 - Hillman Field
 - Sports Complex Soccer
 - Recreation Office
 - Landfill

ZONING DISTRICTS

- Specific Plan
- R-1-A
- A-5-H
- R-1-7.5
- R-2-7.5
- R-1-9
- R-1-10
- R-1-12
- RMF
- PO-1
- CC-1
- NC-1
- GC-1
- I-1
- I-2
- PRZ
- S-1
- MH-1
- MH-2
- P-C

PAYSON CITY LANDFILL



REVISION	
DATE	
NO.	

DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1 INCH



ZONING MAP
 PAYSON CITY SOLID WASTE SERVICES
 INTEGRATED SOLID WASTE MASTER PLAN
 PAYSON, UT



DESIGN:	CH
DRAWN:	JC
CHECKED:	CH
DATE:	05/27/2016

July 2014
2.1
2.2

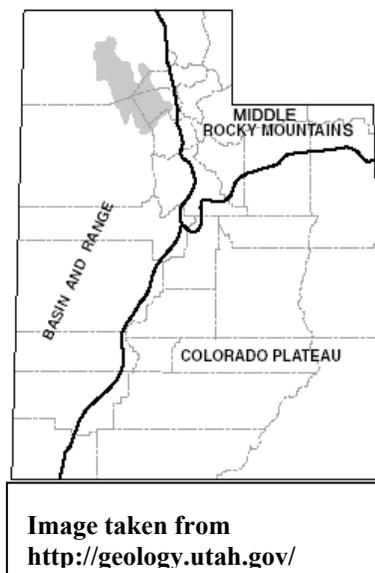
See Figure 2.2 for the average annual precipitation and Figure 2.3 for free water surface evaporation.

2.4 GEOLOGY

Payson City is located on the eastern edge of the Basin and Physiographic Province Range located in the northwest part of the State of Utah. This basin and range is noted for its physiography and geologic structure characterized by intervening structural basins formed during faulting and north-south trending tilted mountain ranges with steep mountain fronts with flatter valley floors. See Figure 2.3 regional geology.

The Landfill Facility is situated mainly on the following formations:

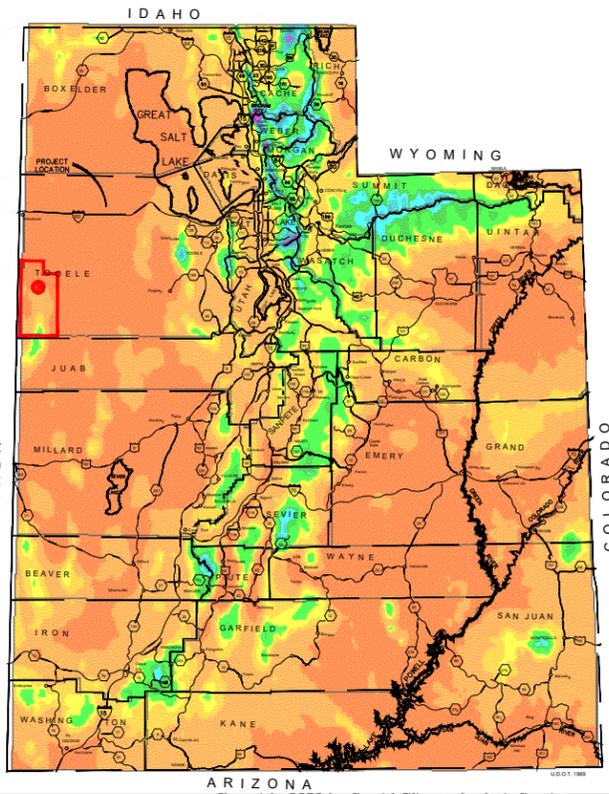
- Pleistocene-age Alpine Formation
- Pleistocene-age Provo Formation
- Outcrops of Cretaceous-age North Horn Formation
- Outcrops of Pennsylvanian-age Oquirrh Formation



The Landfill Facility is situated at the Provo level of Lake Bonneville as evidenced by local deposits. Underlying limestone and sandstone layered bedrock was encountered approximately 150 feet below ground surface. The nearest mapped fault to the Landfill Facility is an east-west trending normal fault located approximately 4,600 feet south. The area of the Landfill Facility is designated as having a very low liquefaction potential and there is no evidence of subsidence. The main groundwater in the region is within the interbedded lenticular deposits of gravel, sand, silt, and clay as would be characterized by unconsolidated basin-fill deposits. Groundwater occurs in both confined and unconfined conditions as water moves from porous mountainous recharge areas to clay lenses in the valley floors. The Landfill Facility has a very flat groundwater gradient east-northeast. The water would be classified as pristine.

2.5 ENVIRONMENT

Most of the native vegetation in the region has been cleared for development or agriculture. Historically the native vegetation was extremely hardy to survive within the arid climate. The average elevation of Payson City is about 4700 feet and the Landfill Facility ranges in elevation between 4760 to 4940 feet. The region's environment and veiwshed are directly impacted by the Wasatch Mountain range. The mountain slopes and valley floor vegetative habitat for Utah are; Juniper, Scrub Oak, Sagebrush, and Cheatgrass.



Average Annual Precipitation

Utah

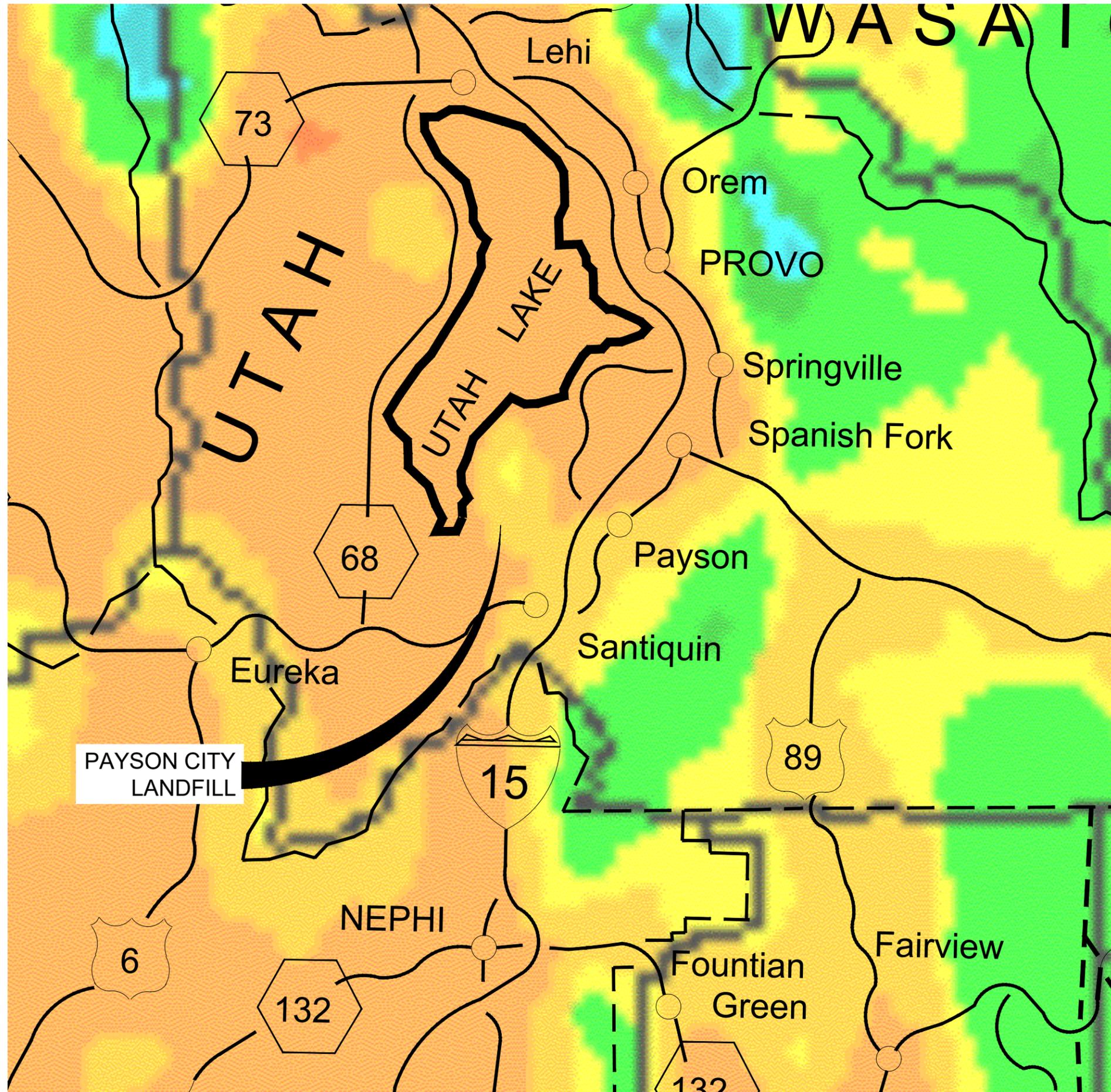


For information on the PRISM modeling system, visit the SCAS web site at <http://www.ocs.orst.edu/prism>

The latest PRISM digital data sets created by the SCAS can be obtained from the Climate Source at <http://www.climate-source.com>

This is a map of annual precipitation averaged over the period 1961-1990. Station observations were collected from the NOAA Cooperative and USDA-NRCS Snotel networks, plus other state and local networks. The PRISM modeling system was used to create the gridded estimates from which this map was made. The size of each grid pixel is approximately 4x4 km. Support was provided by the NRCS Water and Climate Center.

Copyright 2000 by Spatial Climate Analysis Service, Oregon State University



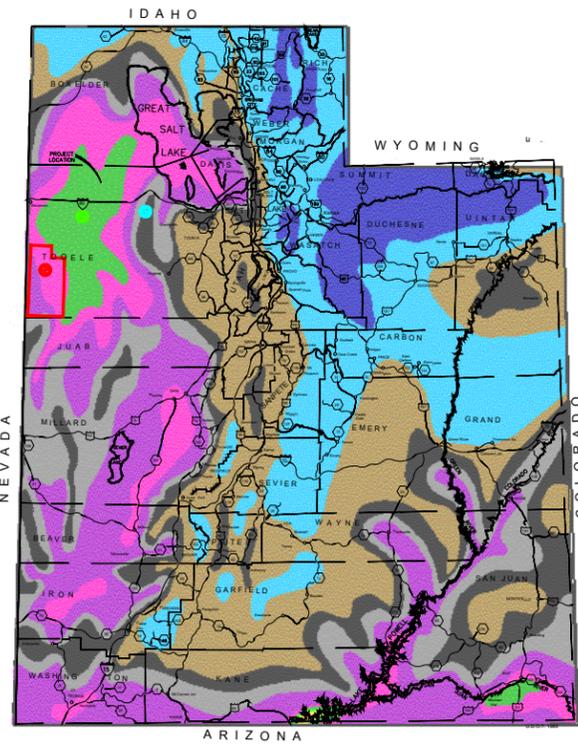
NO.	DATE	REVISION

DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1 INCH

AVERAGE ANNUAL PRECIPITATION MAP
 PAYSON CITY SOLID WASTE SERVICES
 INTEGRATED SOLID WASTE MASTER PLAN
 PAYSON, UT

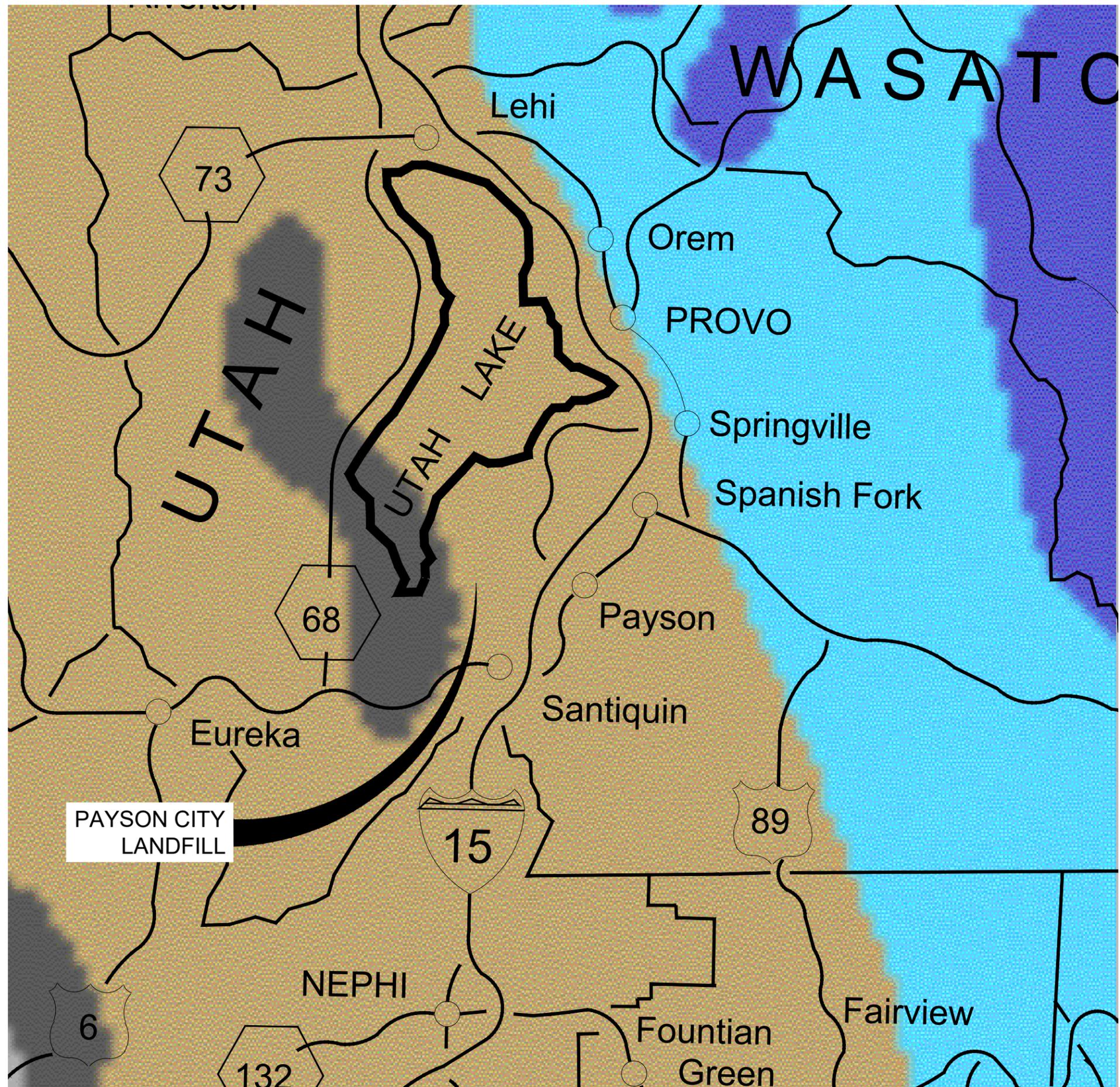
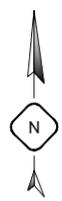
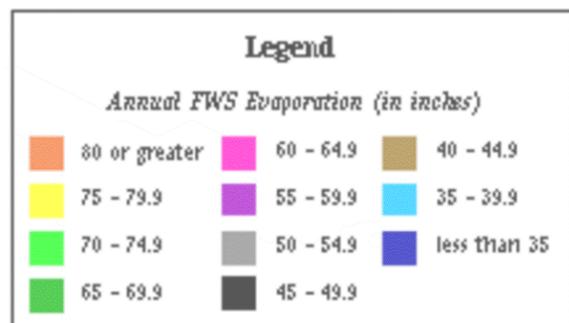


DESIGN:	CH
DRAWN:	JC
CHECKED:	CH
DATE:	09/27/2016



LOCATION MAP

**Free Water Surface Evaporation
(Shallow Lake)
Annual**



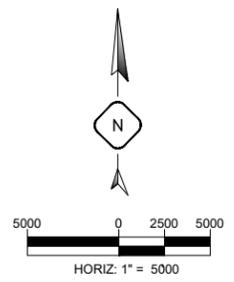
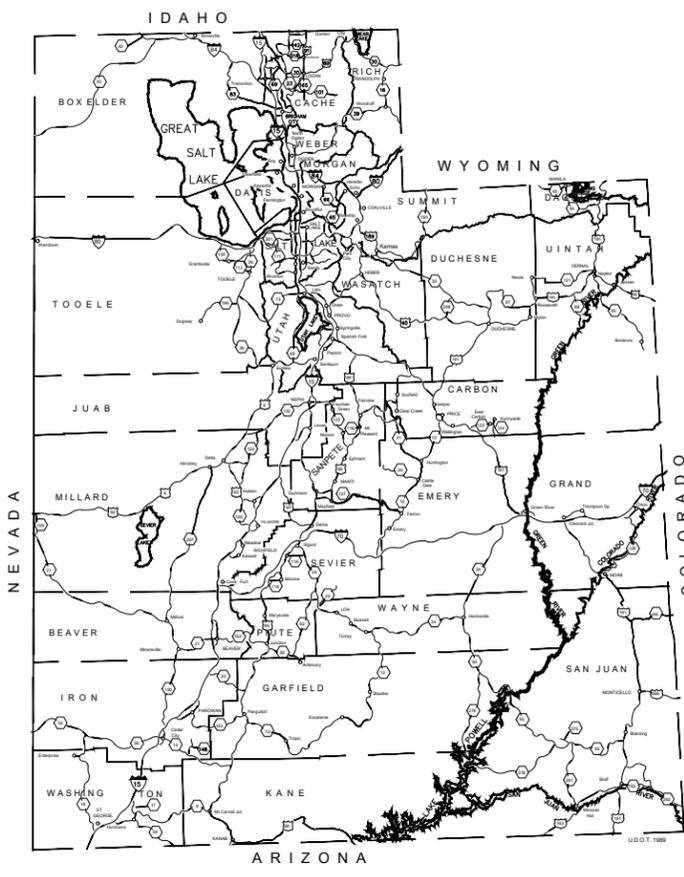
NO.	DATE	REVISION

DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1 INCH

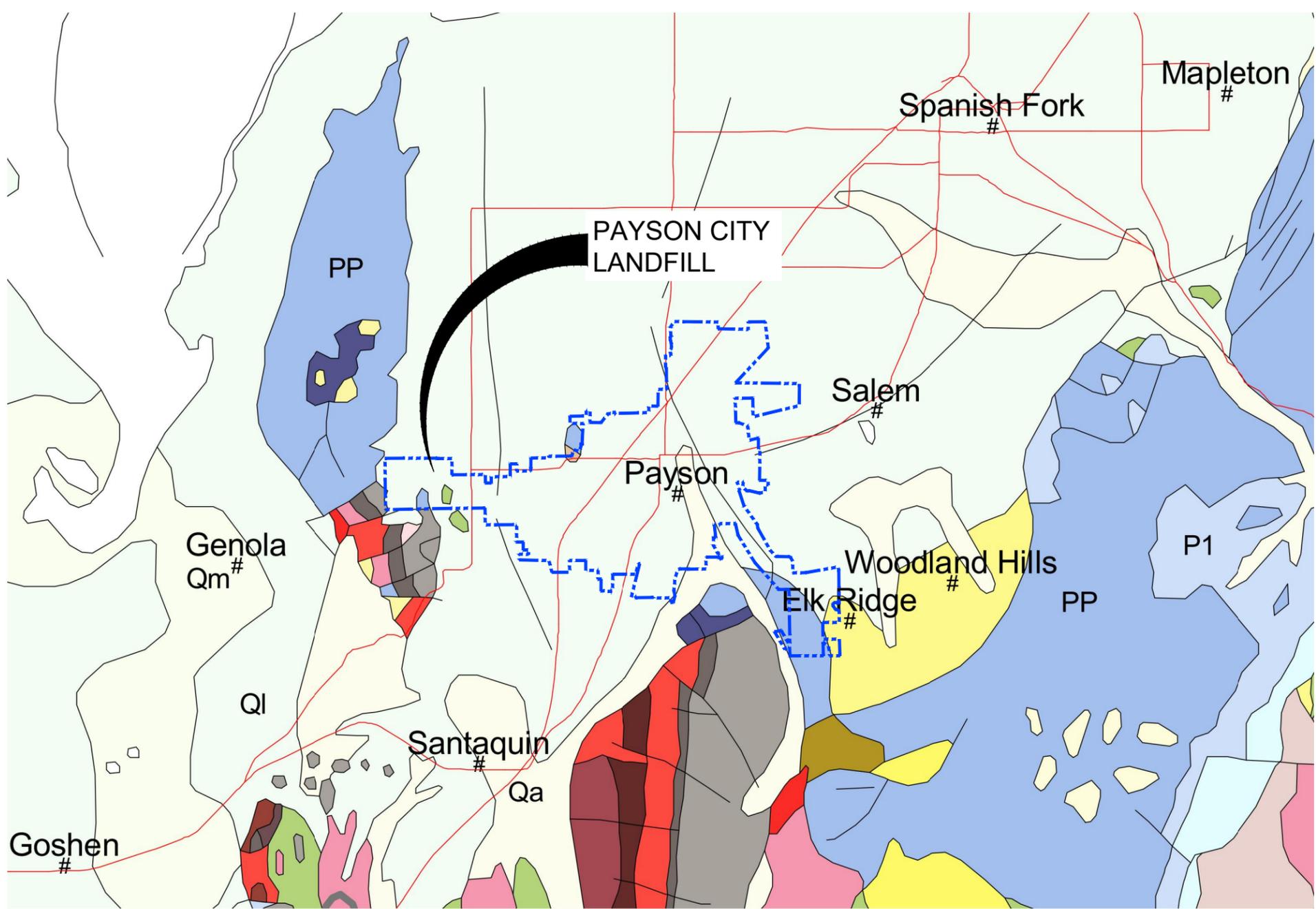
FREE WATER SURFACE EVAPORATION MAP
 PAYSON CITY SOLID WASTE SERVICES
 INTEGRATED SOLID WASTE MASTER PLAN
 PAYSON, UT



DESIGN:	CH
DRAWN:	PC
CHECKED:	CH
DATE:	05/27/2016



LEGEND:
 - - - - - CITY BOUNDARY



Surficial deposits and igneous rocks in all parts of Utah are shown by the symbols to the right. Other map units are identified by symbols shown in the columns below. Refer to small index map to locate the area represented by each column.

SURFICIAL DEPOSITS

- | | | | |
|-----|-------------------------|-----|--------------------------|
| Qa | Alluvium and colluvium | Ql | Lake Bonneville deposits |
| Qao | Older alluvial deposits | Qm | Marshes |
| Qe | Eolian deposits | Qs | Mud and salt flats |
| Qg | Glacial deposits | Qls | Landslides |

Radiometric ages (millions of years)
 0
 QUATERNARY
 2 my
 PLIOCENE
 5 my
 MIOCENE
 24 my
 OLIGOCENE
 38 my

IGNEOUS ROCKS

- | | | | | | |
|-----|-----------|-----|-------------------------------------|-----|------------------------------------|
| Qb | Basalts | Qr | Rhyolites | Tt | Tertiary intrusive rocks |
| Tpb | Basalts | Tpr | Rhyolites | Tj | Jurassic intrusive rocks |
| Tmb | Basalts | Tmr | Rhyolites | Pci | Precambrian intrusive rocks |
| Tma | Andesites | Tmv | Miocene volcanic rocks, undivided | Tvu | Tertiary volcanic rocks, undivided |
| | | Tov | Oligocene volcanic rocks, undivided | | |

REVISION	
DATE	
NO.	
DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1 INCH	
0 1/2 1	

GEOLOGY MAP
 PAYSON CITY SOLID WASTE SERVICES
 INTEGRATED SOLID WASTE MASTER PLAN
 PAYSON, UT



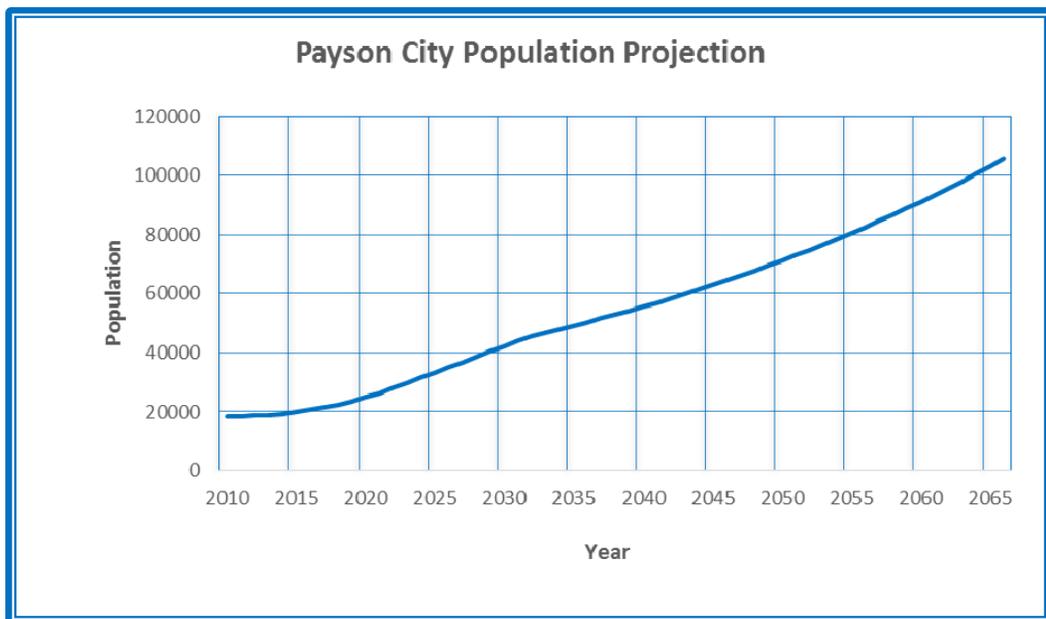
DESIGN:	CH
DRAWN:	PC
CHECKED:	CH
DATE:	05/27/2016

Wildlife in the region includes Deer, Elk, Moose, Blue Grouse, Raptors, Turkey, Coyote, Bobcat, Greensnakes, and Chuckars.

2.6 POPULATION

Population projections were obtained from Payson City to the year 2034. The population projection was extended from 2034 through 2066 using a 2.5% growth rate. Figure 2.5 below shows a graphical representation of the population projections for Payson City.

Figure 2.5



Typically, a period of 20 years is used to determine future infrastructure needs although planning efforts can extend as much as 50 years. Thus, the population projection was extended accordingly.

2.7 ECONOMICS

The estimated median household income in Payson City for 2013 was \$59,226 and the State of Utah was \$59,770. The difference in socio-economic groups often will impact the solid waste generation rates and the type of waste generated. Wealthier populations tend to generate more product packing materials per capita than less affluent populations. Rural populations often generate larger green waste streams than high density populations. All of these factors can affect the generation rates.

2.8 HOUSING

In 2010, an estimated 5,263 housing units were identified within Payson City.

2.9 PLANNING UNITS

For master planning efforts, the planning unit can either be interpreted by weight or volume for the materials that enter the waste stream and is calculated prior to recycling, composting or final disposal. In this Master Plan, the planning unit will be defined by weight. According to the EPA 2012 Fact Sheet, the average American generates about 4.38 pounds of municipal solid waste each day and of that about 66 percent or 2.9 pounds of the total waste generated within the United States was landfilled.

For Payson City, the rate of municipal solid waste generated per person, was estimated at 7.6 pounds per day. This generation rate was determined using annual data provided by the Landfill Facility. The average household size is 3.6 persons per household. In comparing this to the national average, the estimated generation rate of the service area is high. This can be explained due to the green waste component, type of collection services, and socio-economics.

The rate of construction and demolition debris is heavily dependent on growth within the service area and large construction projections. The five year average generation rate per person for construction and demolition debris is 6.2 pounds per day using the population of Payson City. This rate is higher than national averages and could be misleading. Some residents of Utah County and other municipalities regularly bring construction and demolition debris for disposal. The population generating this waste is unaccounted for and would be difficult to estimate.

2.10 GROWTH

To determine future infrastructure requirements, it is necessary to calculate the projected waste stream using the current generation rate and the population estimates under the 20-year and 50-year development windows.

Table 2.2 – Waste Generation Projection

Service Area	Development Window	Population Estimate	MSW Waste Generation (tons/yr)	C&D Waste Generation (tons/yr)
Payson City	Present 2016	20,631	28,624	23,236
	YR 2036	50,406	69,935	56,771
	YR 2066	105,730	146,693	119,080

2.11 FUNDING

The following is a summary of available funding options for solid waste management projects.

2.11.1 Fee for Service

The Landfill Facility utilizes a fee for service contract for its customers. Monies collected for service and appropriations from Payson City are the preferred funding option.

2.11.2 Bonds

Payson City has the bonding capacity to fund construction of solid waste facilities and facility improvements. Bonding options include Non-voted General Obligation Bonds, Voted General Obligation Bonds, System Revenue Bonds, Sales and Gasoline Tax Revenue Bonds, Certificates of Participation, General Improvement Districts, and Redevelopment Area Bonds.

2.11.3 Governmental Agency Loans

Payson City has the option to benefit from low interest loans secured from the Federal Government administered through agencies such as US Department of Agriculture Rural Utilities Service (USDA).

2.11.4 Governmental Agency Grants

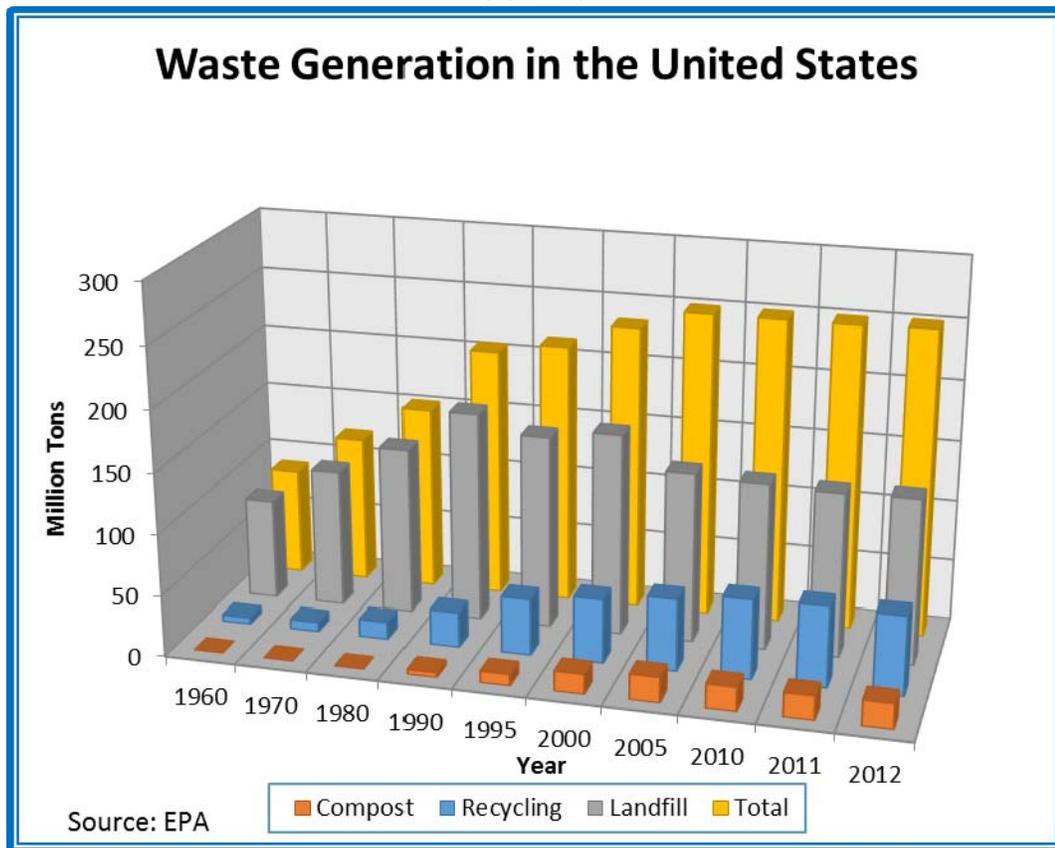
State and Federal grant programs are available for application by Payson City.

CHAPTER 3 INTEGRATED SOLID WASTE MANAGEMENT

3.1 OVERVIEW

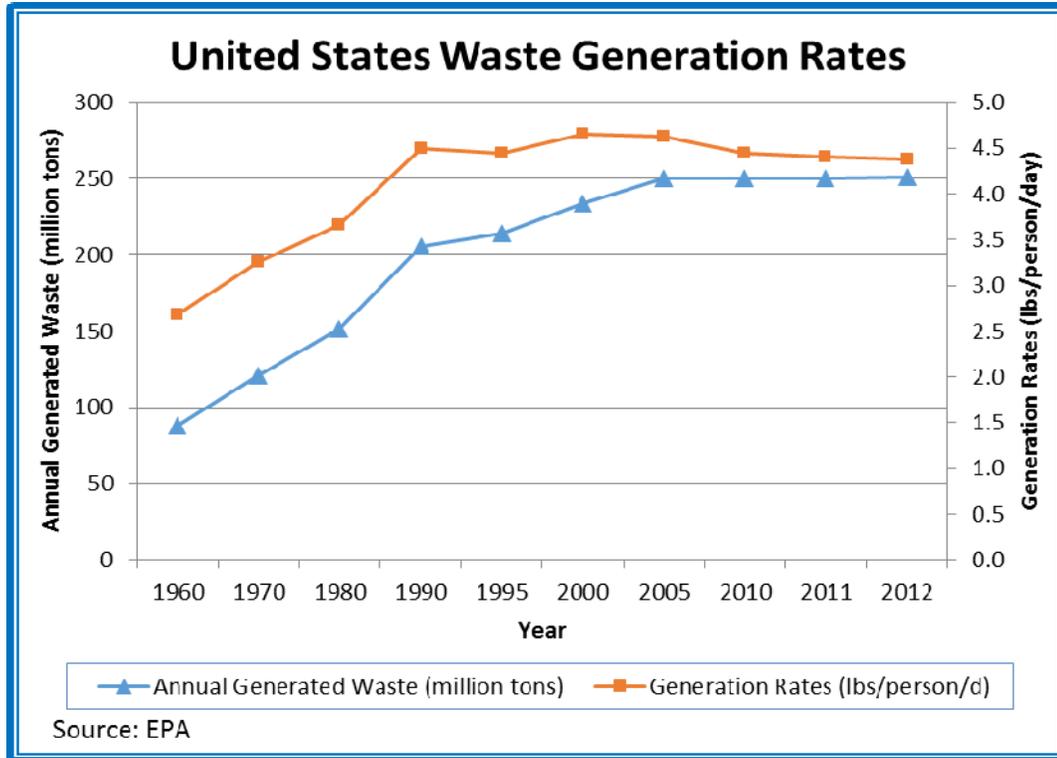
“Integrated solid waste management is a balanced, comprehensive approach to solid waste management incorporating waste reduction, recycling, composting, waste-to-energy incineration, and safe landfilling.” (SWANA)
Figure 3.1 below shows the waste generation rates in the United States from 1960 through 2008.

FIGURE 3.1



The sharp increase in waste generated from 1960 to 2005 can be attributed to population increases, product packaging, and economic growth. The stabilization of waste generation between years the 2005 and 2012, as shown in Figure 3.1 and 3.2, is attributed to public awareness campaigns and source reduction. Source reduction means to avoid the generation of waste at the source. Efforts have been made to educate designers, manufactures, and the general public on ways to reduce or divert wastes. The goal or benefit of waste reduction is to save operating and disposal costs and also help conserve natural resources. Figure 3.2 below is a comparison of MSW generation rate and the total waste generated.

FIGURE 3.2

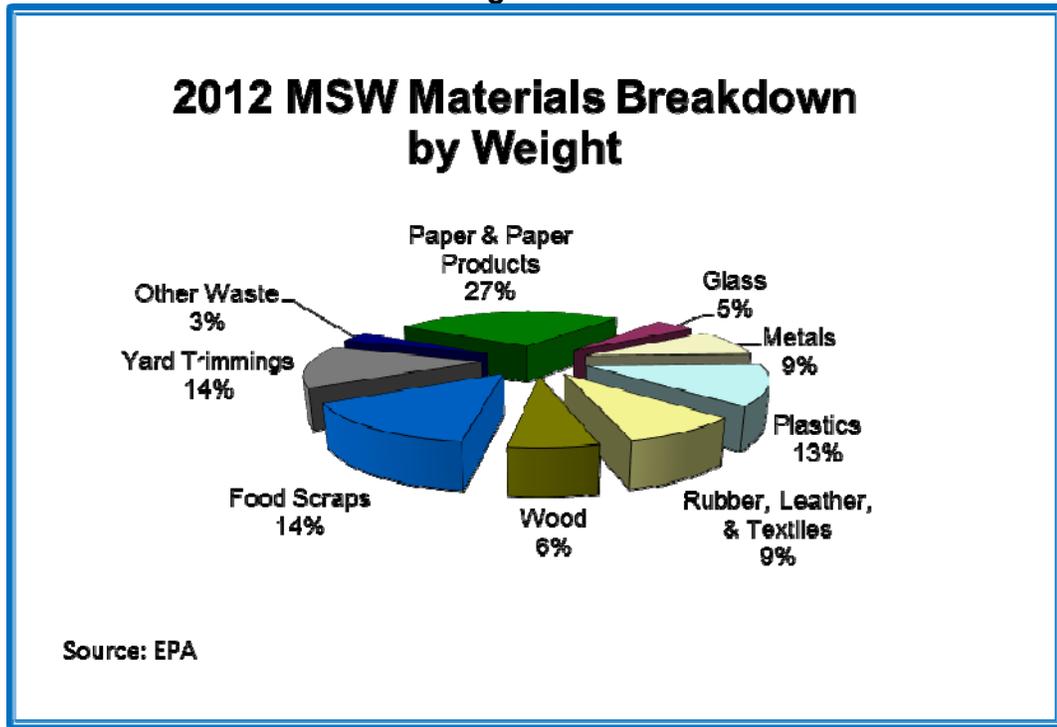


The figure indicates that the generation rate has stabilized and started to slowly decline. This decrease in generation rate has offset the population growth resulting in stabilized annual waste volume.

Two methods are commonly used to define the composition of MSW. The first is by material and the other is by product category. Each method will be discussed below.

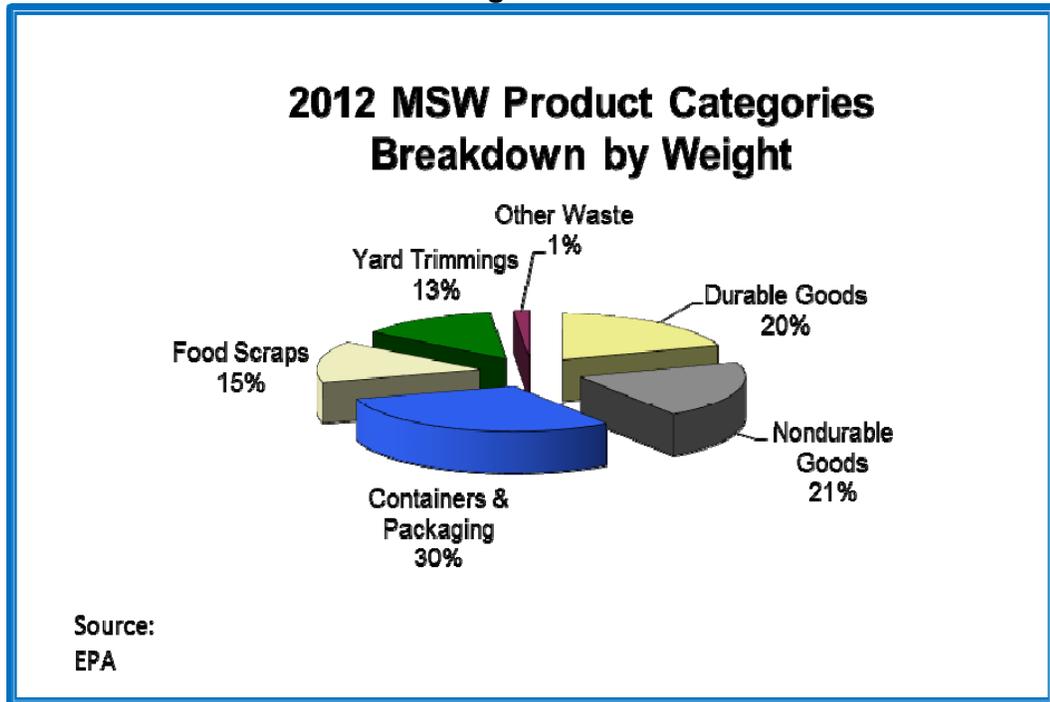
A typical breakdown, by weight, of MSW materials is shown in Figure 3.3 below. The highest rate of recovery among the material categories are yard trimmings, paper and paper products, and metal products. In 2012, the national average for recovering paper was 50.5%.

Figure 3.3



A typical breakdown, by weight, of product categories is shown in Figure 3.4 below. Containers and packaging comprise the largest portions of waste generation with nondurable goods right behind. The 2012 national average for recovery of containers and packaging was 76 percent.

Figure 3.4



Sources of MSW, as characterized in this Master Plan, include both residential and commercial generators. The United States Environmental Protection Agency (EPA) estimates that between 55 to 65 percent of all MSW is residential. Due to lower recycling rates among residential waste, a high portions of residential waste is deposited in landfills. Table 3.1 below is summary of waste processed at the Landfill Facility.

Table 3.1 – Payson City Landfill Distribution

Year	C&D Class IV (tons)	Mixed Waste (tons)	Sewer Sludge (tons)	Total (tons)
2011	20,380	22,644	939	43,963
2012	25,359	25,820	75	51,254
2013	23,339	26,933	405	50,677
2014	20,523	31,058	853	52,434
2015	17,690	26,158	992	44,840

Table 3.1 indicates that the amount of waste disposed of in the landfill fluctuates but on average continues to increase with time as expected as the economics change and population continues to grow. Construction and demolition tonnages are effected by large scale construction and demolition projects in the surrounding area. The Mixed Waste tonnages are effected by green waste, recycling and reuse programs.

3.2 SOLID WASTE FACILITIES

All municipal solid waste is disposed of in properly permitted landfills operated and owned by Payson City Solid Waste Services. Payson City Solid Waste Services operate a class IV and a class V landfill cell approximately 2.5 miles to the west of Payson City. Payson City Solid Waste Services provides solid waste collection services for the residence and businesses within Payson City. All of these waste streams are delivered and disposed of at the Landfill Facility. The Landfill Facility is a permitted facility which has a footprint of 170 acres.

CHAPTER 4 CAPACITY EVALUATION

4.1 OVERVIEW

The capacity evaluations provided for each component of Payson City Solid Waste Services are based on population projects and the growth distributions from Chapter 2 – Waste Generation Projection. Historical waste generation data was used to analyze the capacity for the present condition (2016), 20-year development window (2036), and the 50-year development window (2066).

4.2 GENERAL FACILITY

The general facility covers the equipment used by the facility, manpower, scale house, scale, and any maintenance facilities.

4.2.1 Present Capacity

This element is beyond the current Scope of Work. Suggested items in the overview analysis include:

- General facility equipment
- Scale House
- Scales
- Maintenance facility
- Administration
- Manpower

4.2.2 20-Year Development Window

This element is beyond the current Scope of Work. Suggested items in the overview analysis include:

- General facility equipment
- Scale House
- Scales
- Maintenance facility
- Administration
- Manpower

4.2.3 50-Year Development Window

This element is beyond the current Scope of Work. Suggested items in the overview analysis include:

- General facility equipment
- Scale House
- Scales
- Maintenance facility

Administration
Manpower

4.3 COLLECTIONS

As previously stated, Payson City Solid Waste Services provide collection services to the residents and businesses of Payson City. Payson City Solid Waste Services will ensure sufficient equipment and supply of residential cans and business containers as demand continues to increase. The residential cans and business containers are specifically selected to allow for a fully automated collection system which utilizes specialized collection vehicles.

4.3.1 Present Capacity

This element is beyond the current Scope of Work. Suggested items to be included in the collections analysis:

- Public versus Privatization
- Collection Vehicles
- Containers
- Maintenance
- Manpower

4.3.2 20-Year Development Window

This element is beyond the current Scope of Work. Suggested items to be included in the collections analysis:

- Public versus Privatization
- Collection Vehicles
- Containers
- Maintenance
- Manpower

4.3.3 50-Year Development Window

This element is beyond the current Scope of Work. Suggested items to be included in the collections analysis:

- Public versus Privatization
- Collection Vehicles
- Containers
- Maintenance
- Manpower

4.4 RECYCLING AND DIVERSION

4.4.1 Present Capacity

Capacity evaluations for recycling and diversion is beyond the current scope of work. However, Payson City residents can recycle materials at the following five drop-off sites:

Provo Recycling Department

251 W 800 N

North Park in Provo, UT

General Government Offices

Western Metals Recycling LLC

685 S Freedom Blvd

Franklin South in Provo, UT

Wholesale Scrap Materials, Wholesale Recycling Depots

Western Metals Recycling LLC

1776 Colorado Ave

Provo, UT

Wholesale Recycling Depots, Wholesale Scrap Materials

Recycling Coalition Of Utah

363 W 550 N

Springville, UT

Wholesale Recycling Depots

South Utah Valley Solid Waste District

2450 W 400 S P.O. Box 507

Springville, UT

Waste Disposal, Wholesale Recycling Depots

Suggested items for considerations include:

- Public versus Privatization
- Infrastructure Needs
- Equipment
- Collection Vehicles
- Containers
- Maintenance
- Manpower
- Financial
- Public Relations

4.4.2 20-Year Development Window

As the waste stream continues to increase, the available disposal space will continue to increase in value. Payson City is very aware of the importance of waste diversion throughout the community. As the population increases, the green waste production will also increase requiring additional infrastructure and manpower to operate the compost/mulch facility. Under the 20-year development window, the Landfill will continue to expand. The relocation of the compost/mulch facility should consider future landfill expansion, traffic flow, and processing needs. Capacity evaluations for recycling and diversion is beyond the current scope of work. Suggested items for considerations include:

- Public versus Privatization
- Infrastructure Needs
- Equipment
- Collection Vehicles
- Containers
- Maintenance
- Manpower
- Financial
- Public Relations

4.4.3 50-Year Development Window

As the landfill expands, the compost/mulch facility will need to be relocated which is beyond the current scope of work. Suggested items for considerations include:

- Public versus Privatization
- Infrastructure Needs
- Equipment
- Collection Vehicles
- Containers
- Maintenance
- Manpower
- Financial

Public Relations

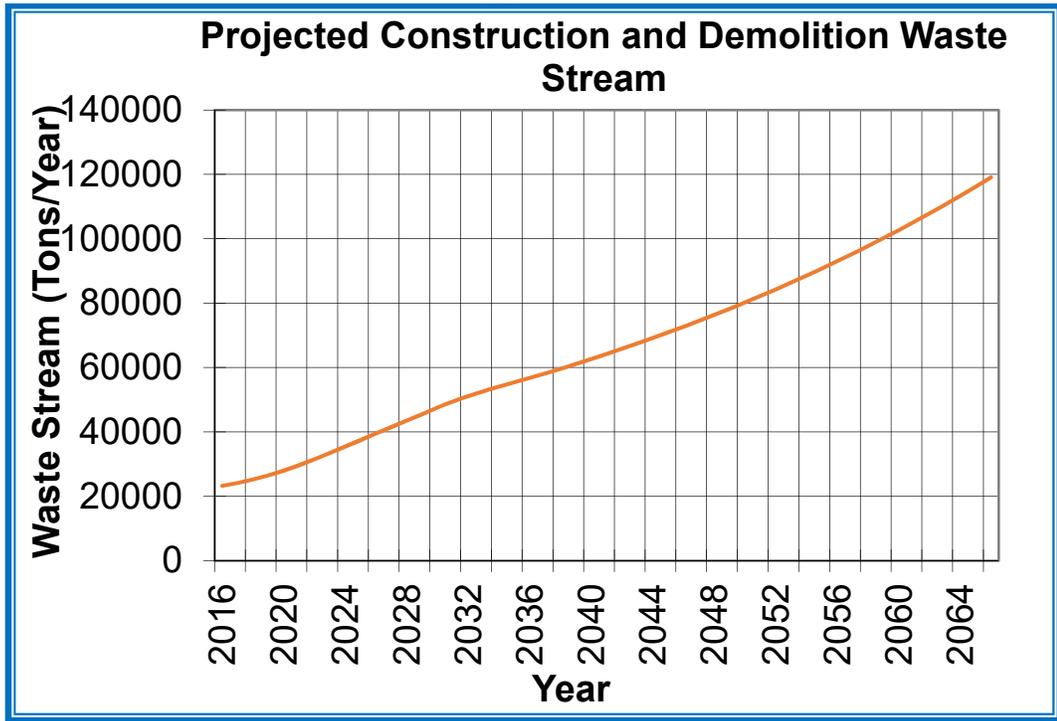
4.5 LANDFILL FACILITIES

Payson City Solid Waste Services operate a class IV, class V landfill, and compost facility approximately 2.5 miles west of Payson City. The service area for Landfill Facility includes all of Payson City and also provides services for some residence of Utah County and surrounding municipalities. Municipal solid waste is collected from residences by Payson City. Residents of Payson City who bring their waste to the Landfill Facility are not charged a disposal fee. Industrial and commercial wastes are collected privately and also delivered to the landfill for a disposal fee. A disposal fee is charged for disposal of construction and demolition debris. However, each household of Payson City receives a punch card for three free dumps.

The landfills were permitted in 2004 and has a footprint of 170 acres. The property is bounded on the east by the Strawberry Highline Canal, on the west by Bureau of Land Management property, and on the north and south by private land owners.

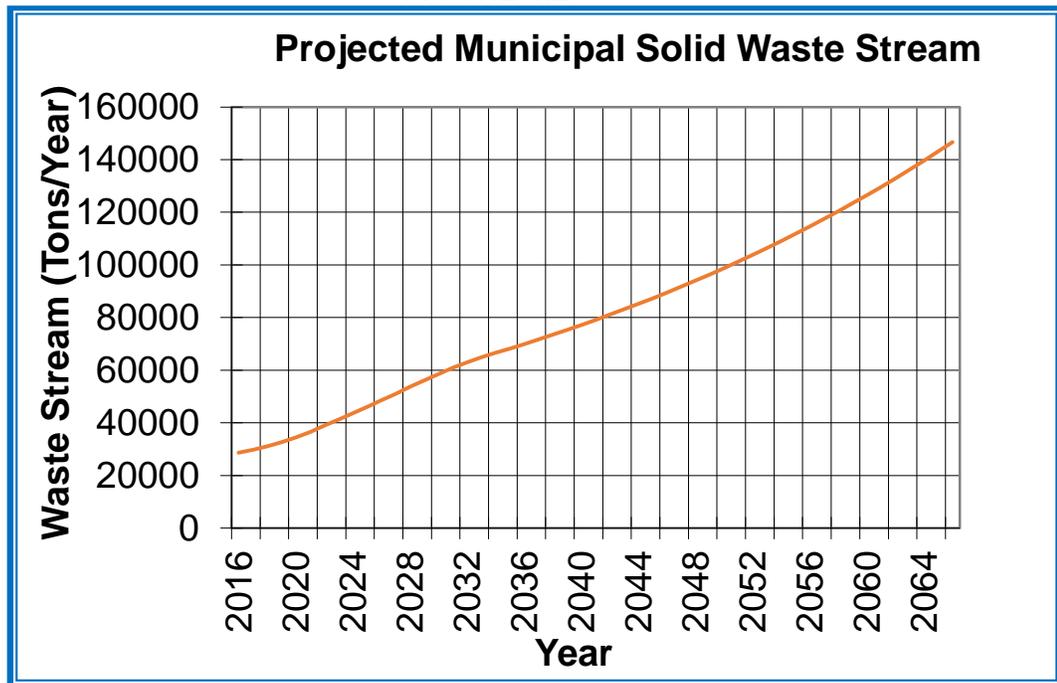
Construction and demolition debris brought to the Landfill Facility are disposed of in the Class IV Landfill. The existing Class IV Landfill is about 20 acres in size and is currently being built up to final grade. The projected construction and demolition debris waste stream per year is shown below in Figure 4.1.

FIGURE 4.1



Municipal solid waste generated within the service area is also disposed at the Landfill Facility within the Class V Landfill. The Class V Landfill disposal site is 30 acres and is currently being built up to final grade. The projected municipal solid waste stream per year is shown below in Figure 4.2.

FIGURE 4.2



4.5.1 Present Capacity

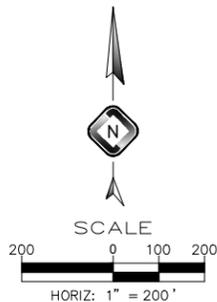
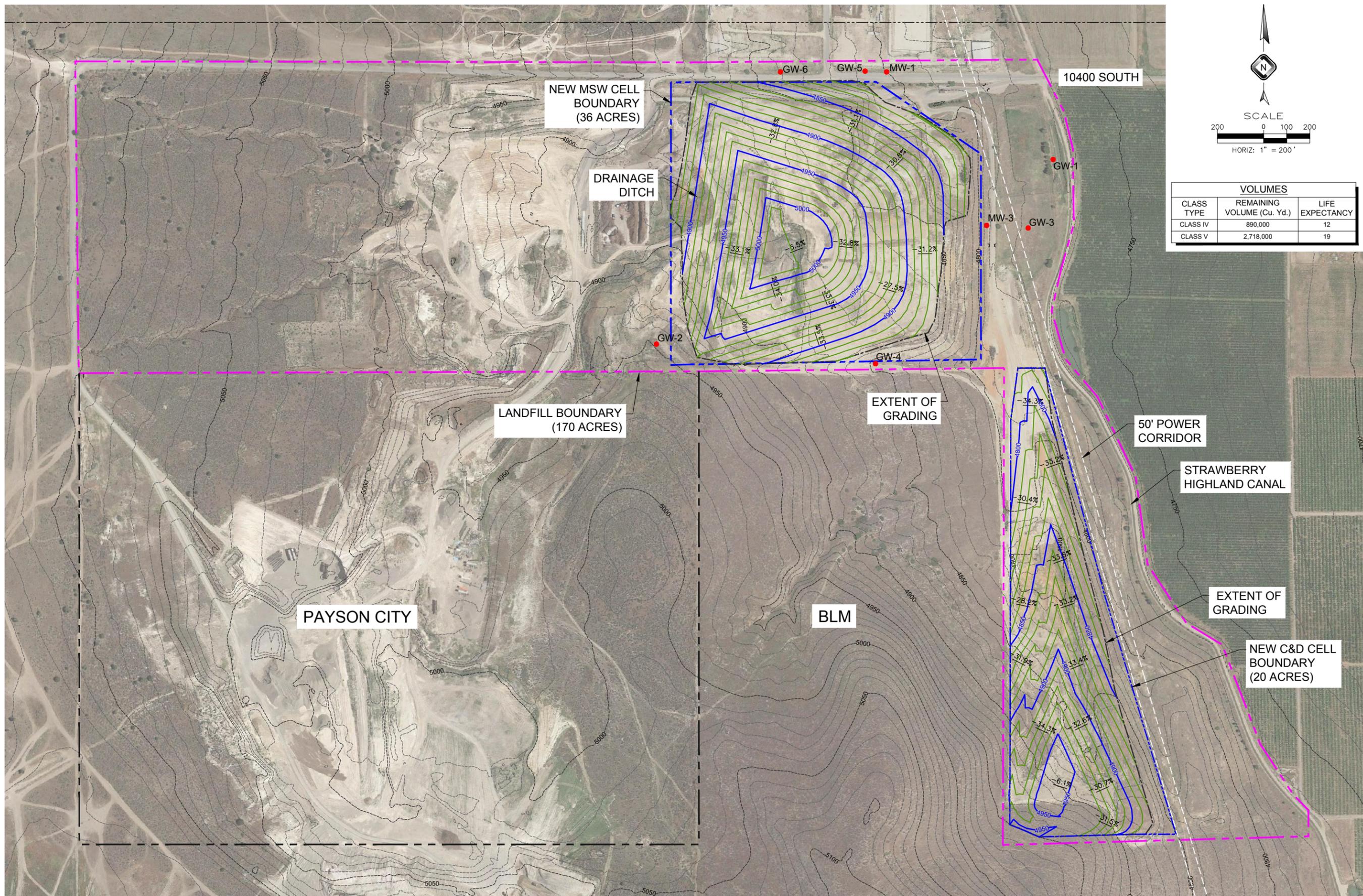
The full utilization scenario of the current footprint is shown in Figures 4.3 through 4.5. These figures identify finished slopes, access roads, and site drainage.

Every effort has been made to utilize conservative assumptions and parameters in calculating the life expectancies of these landfills. The assumptions and parameters used are listed below.

Based on the estimated volume requirements, the Class IV Landfill would be designed to meet the solid waste management requirements for a period of twelve years. The following assumptions were used in the analysis:

- A total of 20 usable acres for Class IV disposal.
- Topographical information provided is reflective of site conditions.
- Side slope shall not exceed 3 Horizontal to 1 Vertical.

By: Justin Calder, Jun 03, 2016 10:39am
 P:\15050-Payson City\15051-Solid Waste Master Plan\Drawings\Sheets\Solid Waste Master Plan_Access Road 2016-05-17.dwg



VOLUMES		
CLASS TYPE	REMAINING VOLUME (Cu. Yd.)	LIFE EXPECTANCY
CLASS IV	890,000	12
CLASS V	2,718,000	19

DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1 INCH

NO.	DATE	REVISION

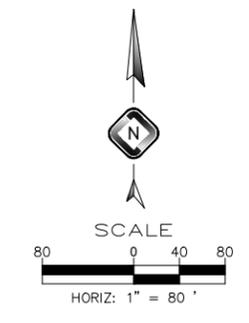
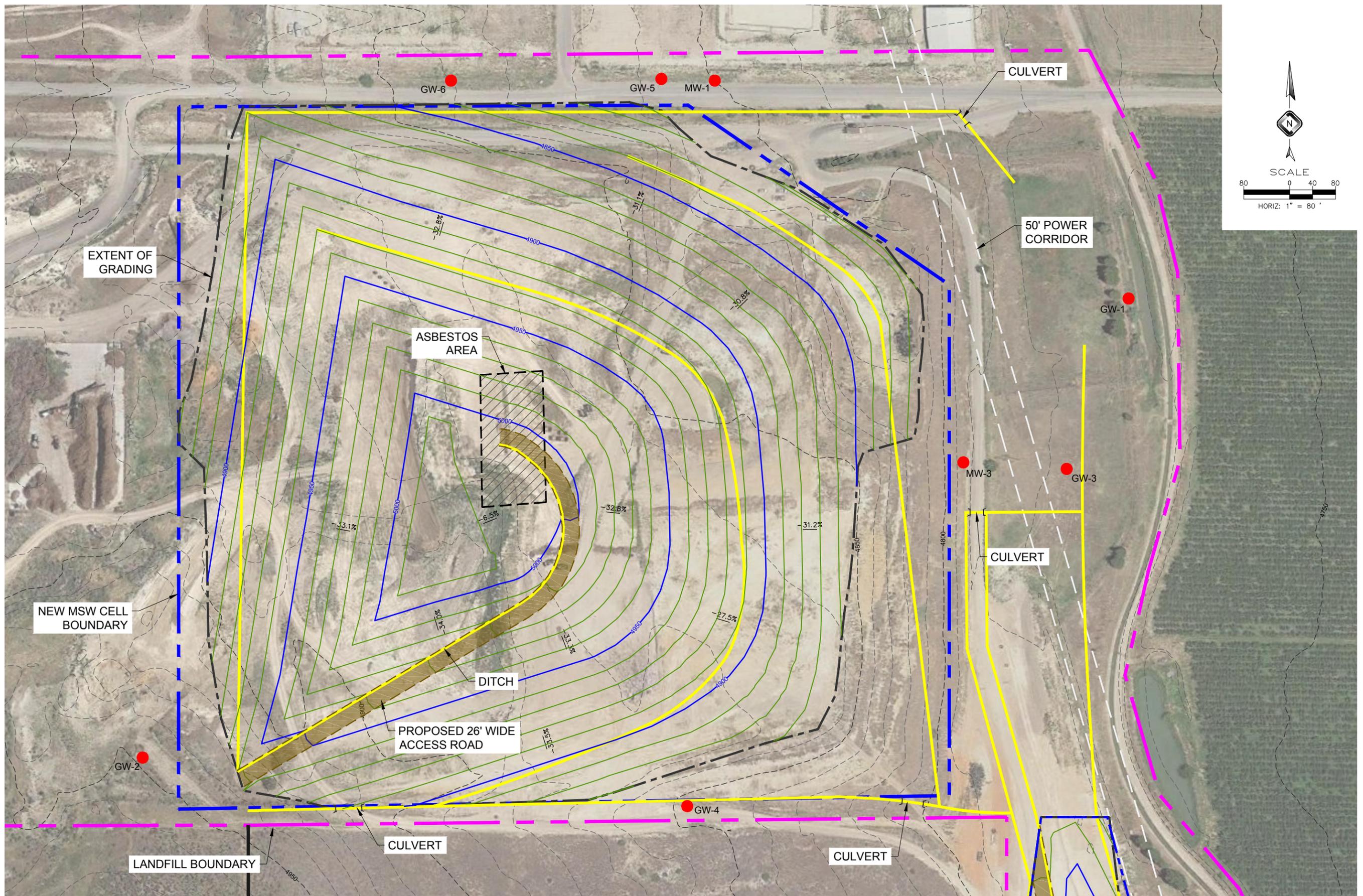
SITE PLAN
 PAYSON CITY SOLID WASTE SERVICES
 INTEGRATED SOLID WASTE MASTER PLAN
 PAYSON, UT

ADVANCED ENVIRONMENTAL ENGINEERING
 1975 N. MAIN, SUITE #5, LAYTON, UTAH 84041
 PHONE: 801.773.3185 FAX: 801.773.3166

DESIGN:	CH
DRAWN:	JC
CHECKED:	CH
DATE:	05/27/2016

NOTE:
 TOPOGRAPHICAL INFORMATION PROVIDED BY PAYSON CITY.

By: Justin Calder, Jun 03, 2016 10:39am
 P:\15050-Payson City\15051-Solid Waste Master Plan\Drawings\Sheet\Solid Waste Master Plan_Access Road_2016-05-17.dwg



NOTE:
 TOPOGRAPHICAL INFORMATION PROVIDED BY PAYSON CITY.

NO.	DATE	REVISION

DRAWING IS NOT TO SCALE IF BAR
 DOES NOT MEASURE 1 INCH

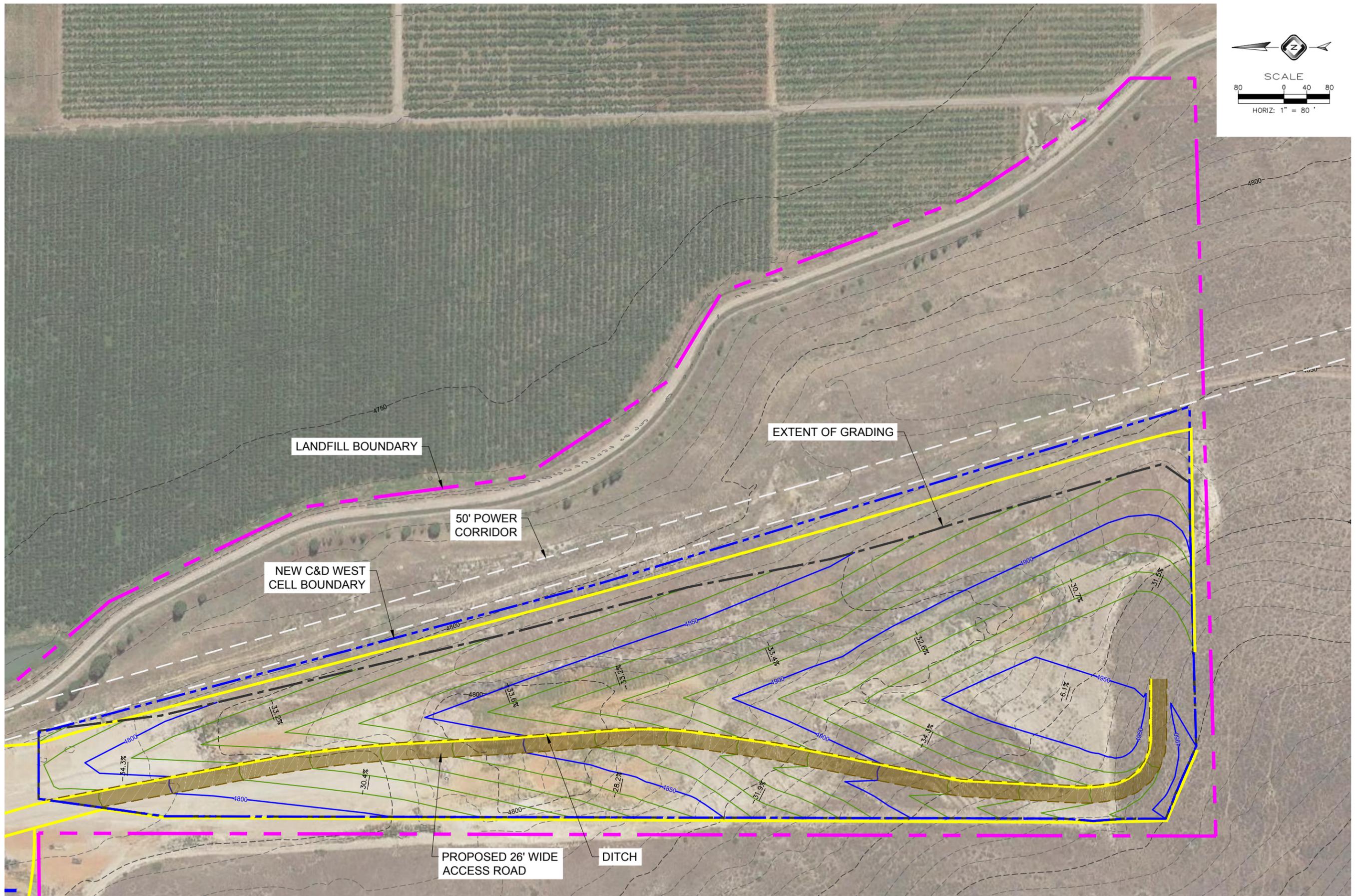
MSW CELL

PAYSON CITY SOLID WASTE SERVICES
 INTEGRATED SOLID WASTE MASTER PLAN
 PAYSON, UT



DESIGN:	CH
DRAWN:	JC
CHECKED:	CH
DATE:	05/27/2016

By: Justin Calder, Jun 03, 2016 10:40am
 P:\15050-Payson City\15051-Solid Waste Master Plan\Drawings\Sheet\Solid Waste Master Plan_Access Road_2016-05-17.dwg



NOTE:
 TOPOGRAPHICAL INFORMATION PROVIDED BY PAYSON CITY.

NO.	DATE	REVISION

DRAWING IS NOT TO SCALE IF BAR
 DOES NOT MEASURE 1 INCH

C&D CELL
 PAYSON CITY SOLID WASTE SERVICES
 INTEGRATED SOLID WASTE MASTER PLAN
 PAYSON, UT

ADVANCED ENVIRONMENTAL ENGINEERING
 1975 N. MAIN, SUITE #5, LAYTON, UTAH 84041
 PHONE: 801.773.3165 FAX: 801.773.3166

DESIGN:	CH
DRAWN:	JC
CHECKED:	CH
DATE:	05/27/2016

- Minimum slope of 2% to prevent ponding.
- The unit weight of the municipal solid wastes is 1200 lb/yd³.
- A 15% reduction of volume to account for intermediate and daily cover.

Based on the estimated volume requirements, the Class V Landfill would be designed to meet the solid waste management requirements for a period of nineteen years. The following assumptions were used in the analysis:

- A total of 36 usable acres for Class V disposal.
- Topographical information provided is reflective of site conditions.
- Side slope shall not exceed 3 Horizontal to 1 Vertical.
- Minimum slope of 2% to prevent ponding.
- The unit weight of the municipal solid wastes is 900 lb/yd³.
- A 20% reduction of volume to account for intermediate and daily cover.

Under a full utilization scenario, Payson City currently has twelve years of capacity in the Class IV Landfill and nineteen years capacity in the Class V Landfill. Capacity of both landfills could dramatically be affected by increasing density.

4.5.2 20-Year Development Window

Based on the 20-Year projects, Payson City will need to have expanded both their Class IV and Class V Landfills.

4.5.3 50-Year Development Window

Based on the 50-Year projects, Payson City will need to have expanded both their Class IV and Class V Landfills. A full utilization scenario for the entire Landfill Facility is beyond the current scope of work.

CHAPTER 5 RECOMMENDATIONS

5.1 OVERVIEW

The recommendations provided for each component of the Payson City's integrated solid waste management are based on population the capacity evaluations from Chapter 4 – Capacity Evaluation. Historical waste generation data was used to analyze the capacity for the present condition, the 20-year development window, and the 50-year development window.

5.2 GENERAL FACILITY

The following is a list of recommended studies and equipment with their priority of acquisition. This list will help to improve the operations of the general facility and should be implemented within each priority window.

Current Priority

- a. Beyond the current scope of work.

20-Year Priority

- a. Beyond the current scope of work.

50-Year Priority

- a. Beyond the current scope of work.

5.3 COLLECTIONS

The following is a list of recommended studies and equipment with their priority of acquisition. This list will help to improve the collections system and should be implemented within each priority window.

Current Priority

- a. Beyond the current scope of work.

20-Year Priority

- a. Beyond the current scope of work.

50-Year Priority

- a. Beyond the current scope of work.

5.4 RECYCLING AND DIVERSION

The following is a list of recommended studies and equipment with their priority of acquisition. This list will help to improve the operations of the recycling centers and diversion methods should be implemented within each priority window.

Current Priority

- a. Beyond the current scope of work.

20-Year Priority

- a. Beyond the current scope of work.

50-Year Priority

- a. Beyond the current scope of work.

5.5 LANDFILL FACILITIES

The following is a list of recommended studies and equipment with their priority of acquisition. This list will help to improve the operations of the landfill facilities and should be implemented within each priority window.

Current Priority (1 to 5 Year)

- a. Complete remaining Phases of the Master Plan.
- b. Finalize future Class IV and Class V disposal options and locations.
- c. Initiate the permitting process for lateral expansion of both landfills.
- d. Evaluate benefits of different equipment to increase density to extend useful life of existing disposal facilities. Disposal densities of existing waste streams are considered minimal due to achievable compactive effort of the current landfill equipment.
- d. Evaluate manpower requirements based on incoming tonnage and operations of both landfills.

Current Priority (5 to 10 Year)

- a. Make preparations to close existing Class IV Landfill.

- b. Update Master Plan as needed.
- c. Develop an Integrated Solid Waste Management Feasibility Study (Study). The Study would investigate alternatives for collection and disposal of solid waste within Payson City. The Study should include a no action, privately owned collection, publicly owned collection, regional landfills, and waste to energy, material recycling center, and siting of a new landfill. Each alternative should be thoroughly investigated to allow for proper comparisons utilizing the latest technological advances. In addition, each alternative should consider siting criteria, political, opposition, and economic Impacts.

Current Priority (10 to 15 Year)

- a. Update Master Plan and Study as needed.
- b. Implement future Class IV disposal options.
- c. Prepare to close existing Class V landfill cell.
- d. Evaluate and prepare to implement future Class V collections and disposal options.
- e. Additional equipment and manpower will likely be required.

20-Year Priority

- a. Update Master Plan and Study as needed.
- b. Additional equipment and manpower will likely be required.
- c. Evaluate future Class V collections and disposal options.
- d. Evaluate future Class IV disposal options.

50-Year Priority

- a. Update Master Plan and Study as needed.
- b. Additional equipment and manpower will likely be required.
- c. Evaluate future Class V collections and disposal options.
- d. Evaluate future Class IV disposal options.

CHAPTER 6 REFERENCES

6.1 REFERENCES

Payson City, January 2004 Payson City Class V Landfill – Solid Waste Permit Payson City, Utah.

Payson City, January 2003 Payson City Class V Landfill – Solid Waste Permit Application Payson City, Utah

Payson City, viewed April 2016 < <http://www.paysonutah.org/>>

Solid Waste Association of North America, Managing Construction & Demolition Debris Mananagement Silver Spring, Maryland

Solid Waste Association of North America, Managing MSW Recycling Systems Training Manual Silver Spring, Maryland

Solid Waste Association of North America, Manager of Landfill Operations Training and Certification Course Silver Spring, Maryland

Solid Waste Association of North America, Principles of Managing Integrated Municipal Solid Waste Management Systems Course Silver Spring, Maryland

Solid Waste Association of North America, Training Sanitary Landfill Operating Personnel Silver Spring, Maryland

Wikipedia, viewed April 2016 <https://en.wikipedia.org/wiki/Payson,_Utah>