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# Open Space Soil Assessment

## Sunset Meadows Subdivision

Weber County, UT

**Prepared for:**

Sierra Homes
470 North 2450 West
Tremonton, Utah 84337

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## List of Appendices

# 1.0 Introduction

Sierra Homes engaged Martin & Nicholson Environmental Consultants (M&N) to assess soil conditions in the designated agricultural open space of the Sunset Meadows subdivision. The goal of this assessment is to determine the location of various soil series in the subdivision, identify areas of prime agricultural land, and establish if soil series in the open space are suitable for agriculture (crops and pasture). This assessment included analysis of Natural Resource Conservation Service web-based soil data and laboratory analysis of soil samples collected in the open space. Assessment methodology, findings, discussion, and conclusions are presented in this document.

## 1.1 Study Area Description

The Sunset Meadows subdivision is located near Taylor, Utah in Weber County at approximately 4300 West between 1800 South and 2200 South (Township 6N, Range 2W, and Section 28) as illustrated in Figure 1, Appendix A. The subdivision is located in Weber County Zone A-1 (Agricultural). According to the Weber County Code, the purpose of the A-1 Zone is to designate farm areas, which are likely to undergo a more intensive urban development, to set up guidelines to continue agricultural pursuits, including the keeping of farm animals, and to direct orderly low-density residential development in a continuing rural environment. All agriculture operations shall be permitted at any time, including the operation of farm machinery and no agricultural use shall be subject to restriction because it interferes with other uses permitted in the zone.

The subdivision is 108 acres of which 56 contiguous acres in the northeast corner are designated as agricultural open space. Open space accounts for approximately 52 % of the subdivision and exceeds the 30 % requirement for Zone A-1. Sierra Homes intends to lease the western two thirds of agricultural open space for alfalfa production and the eastern third for pasture. Sierra Homes will deliver irrigation water to the southwest corner of the open space at which time the lessee will determine the most effective irrigation method, i.e., flood or sprinkler. Photographs of the open space area taken from five dominant soil series areas are found in Appendix B.

## 1.2 Weber County Open Space Regulations

The Weber County Code recommends that agricultural open space to be contiguous and that useful prime agricultural land shall first and foremost be used to satisfy open space requirements. Prime agricultural land is defined in the Weber County Code as areas of a lot or parcel best suited for large-scale crop production. These areas have soil types that have, or can have, highest nutrient content and best irrigation capabilities over other soil types on the

property and are of a sufficient size and configuration to offer marketable opportunities for crop-production.

This assessment specifically addresses compliance with items (c)(1) and (c)(3) (a-c) of Section 108-3-5 (Open Space Preservation Plan) taken directly from the Weber County Code.

*(c) Open space development standards and ownership regulations. All open space areas proposed to count toward the minimum open space area required by this chapter shall be clearly identified on the open space site plan. The following standards apply to their creation. Open space area in excess of the minimum required by this chapter are exempt from these standards.*

*(1) Minimum required open space area. A cluster subdivision requires a minimum percentage of its net developable acreage, as defined in section 101-1-7, to be preserved as open space, as described in Table 1 below:*

**Table 1. Open Space Requirements for Weber County Planning Zones**

| Zone | Required Open Space |
|---|---|
| **F-40 zone** | 90 % |
| **F-5 and F-10 zones** | 80 % |
| **AV-3, FV-3, and DRR-1 zones** | 60 % |
| **Zones not listed** | 30 % |

*(3) Agricultural open spaces to be contiguous and useful. In all agricultural zones, open space parcels shall be arranged to create future long-term agricultural opportunities in the following ways:*

- *a) By creating parcels of a sufficient size and configuration to support large-scale crop-producing operations. The area or areas of the subdivision that contains prime agricultural land, as defined by section 101-1-7, shall first and foremost be used to satisfy the open space requirements of this chapter. Only then may any portion of the prime agricultural land be used for other development purposes.*
- *b) Open space parcels shall be organized into one contiguous open space area. Contiguity may only be interrupted if preservation of long-term agricultural opportunities is best accomplished by allowing the interruption. The applicant bears the burden of proving this based on soil*

*sampling, irrigation capabilities, parcel boundary configuration, and industry best practices.*

c) *The exterior boundary of a contiguous open space area that is intended to satisfy the open space requirements of this chapter shall be configured so a 50-foot-wide farm implement can reach all parts of the area with three or more passes or turns. Generally, this requires the area to be at least 450 feet wide in any direction at any given point to be considered contiguous. This three-turn standard may be reduced by the planning commission for portions of the parcel affected by the following:*
    i. *The configuration of the existing exterior boundary of the proposed subdivision makes it impossible;*
    ii. *A street required by section 108-3-4 constrains the width of the parcel or bisects what would otherwise be one contiguous open space area if the street did not exist; or*
    iii. *Natural features, or permanent man-made improvements onsite that cannot be moved or realigned, cause an interruption to crop producing capabilities.*

# 2.0 Methodology

On April 8, 2020, staff from M&N visited the Sunset Meadows subdivision to collect samples of soil series found in the designated agricultural open space. As shown in Figure 2, Appendix A, and according to the USDA Natural Resource Conservation Service (NRCS), the following six soils are found in the agricultural open space:

1. Ac – Airport Silt Loam
2. KaA – Kidman Fine Sandy Loam
3. Le – Leland Silt Loam
4. LS – Leland-Saltair Complex
5. WaA – Warm Springs Fine Sandy Loam
6. WgA – Warm Springs Fine Sandy Loam, Saline, Sodic

Samples were collected for the following five soil series: Ac, KaA, Le, WaA, and WgA. The Leland-Saltair Complex (LS) was omitted from collection due to its minimal proportionate acreage relative to the total area of the proposed open space (See Table 2).

Prior to visiting the study area, staff of M&N generated global positioning system coordinates and waypoints for five sampling locations, one in each of the five soil series listed above. In order to obtain the most comprehensive analysis of each selected soil series, two additional samples were collected and recorded while in the field, totaling three samples per selected soil series, or 15 samples in total. Locations of collected soil samples are illustrated in Figure 2, Appendix A. M&N compiled each soil series sample using the following protocol:

1. Using a trench shovel, M&N removed surface litter and debris, dug a 12-inch deep hole, removed a thin slice of soil from one side of the hole, and placed it in a clean bucket.

2. Soil was thoroughly mixed in the bucket to attain a composite sample. Two cups of the mixed soil sample were collected and placed in a labeled, sterile gallon-sized resealable bag. Remaining contents in the bucket were replaced into the hole out of which they were collected, and the bucket cleaned.

3. Using the same protocol, a second and third sample of each soil series were collected and placed into their respective sample bags. In total M&N gathered five sample bags, which contained six cups of composite soil gathered from three individual locations per soil series.

4. M&N measured two cups of each composite soil sample and placed them into labeled, sterile quart-sized resealable bags and shipped them to Stukenholtz Laboratory, Inc. of Twin Falls, ID for analysis.

Diagnostic soil characteristics selected for analysis by Stukenholtz Laboratory, Inc. consisted of pH, cation-exchange capacity, excess Lime, Lime requirement, and organic matter, ammonium-nitrogen, nitrate-nitrogen, phosphorus, potassium, calcium, magnesium, sulfate-sulfur, iron, manganese, copper, boron, chloride, salts, and sodium composition. In addition to soil analysis Stukenholtz Laboratory, Inc. provides comments on soil characteristics and recommendations for mitigating conditions that are less favorable for agricultural production.

# 3.0 Findings

## 3.1 NRCS Soil Survey Results

The information in Table 2 was obtained using GIS-analysis and the NRCS Soil Survey. It consists of acreage calculations for each soil series in the subdivision and open space area, soil series descriptions, and general soil classifications reflective of potential agricultural production. Soil classifications are based on NRCS mapped soil series boundaries which may not be reflective of actual boundaries or conditions on the ground.

**Table 2. Soil Series and Total Acreage in Sunset Meadows Subdivision and Agricultural Open Space**

| Soil Unit Symbol & Name | Acreage in Total Sunset Meadows Subdivision | % of Total Sunset Meadows Subdivision | Acreage in Designated Open Space | % of Designated Open Space |
|---|---|---|---|---|
| **Ac - Airport Silt Loam; 0 to 2 % slopes** | 9.85 | 9.13% | 9.85 | 17.57% |

| Soil Unit Symbol & Name | Acreage in Total Sunset Meadows Subdivision | % of Total Sunset Meadows Subdivision | Acreage in Designated Open Space | % of Designated Open Space |
|---|---|---|---|---|
| **KaA - Kidman Fine Sandy Loam; 0 to 1 % slopes** | 21.14 | 19.59% | 8.39 | 14.97% |
| **Lb - Lakeshore Fine Sandy Loam; 0 to 1 % slopes** | 6.47 | 6.00% | - | - |
| **Le - Leland Silt Loam; 0 to 1 % slopes** | 24.43 | 22.63% | 22.52 | 40.18% |
| **LS - Leland-Saltair complex; 0 to 1 % slopes** | 1.05 | 0.97% | 1.05 | 1.87% |
| **Sy - Syracuse Loamy Fine Sand** | 1.18 | 1.09% | - | - |
| **WaA - Warm Springs Fine Sandy Loam; 0 to 1 % slopes** | 21.60 | 20.02% | 6.35 | 11.33% |
| **WgA - Warm Springs Fine Sandy Loam, Saline, Sodic; 0 to 1 % slopes** | 22.20 | 20.57% | 7.89 | 14.08% |
| **Total** | **107.92** | **100.00%** | **56.05** | **100.00%** |

## 3.2 Soil Series Descriptions

**Airport Silt Loam (Ac)** – The Airport series consists of very deep soils formed in lacustrine deposits derived from limestone, sandstone, shale and quartzite. This soil is somewhat poorly drained with slow permeability and medium surface runoff. Airport soils are used mainly for pastureland, with drained, reclaimed sites used for irrigated cropland (NRCS, 2005a).

**Kidman Fine Sandy Loam (KaA)** – The Kidman series is a very deep composite soil formed in alluvium or lacustrine deposits of quartzite, sandstone, granite, limestone, and gneiss parent material. Kidman soils are moderately well to well drained with moderately rapid permeability and very low to high surface runoff depending on saline concentration. These soils are

primarily used for irrigated cropland, most commonly alfalfa, sugar beets, tomatoes, asparagus, corn, and irrigated pasture (NRCS, 2005b).

**Lakeshore Fine Sandy Loam (Lb)** – The very deep, poorly drained Lakeshore series soil is comprised of lacustrine deposits derived from mixed-rock. Negligible surface runoff and slow permeability make this soil susceptible to occasional ponding events. Primary uses of Lakeshore fine sandy loam include grazing rangeland and wildlife habitat, naturally harboring 10% or less vegetative cover (NRCS, 2006a).

**Leland Silt Loam (Le)** – The Leland series consists of very deep, somewhat poorly drained soils that formed in lacustrine deposits originating from sandstone, limestone, quartzite, and shale. These slowly permeating soils produce medium surface runoff and are used mainly as rangeland. Reclaimed Leland areas produce irrigated alfalfa, pasture, small grains, and sugar beets (NRCS, 2005c).

**Leland-Saltair Complex (LS)** – This complex contains approximately 65% fine-loamy Leland silt loam and 35% fine-silty Saltair silt loam. The Saltair series is moderately to strongly alkaline, containing 2% to 8% salts to a depth of 60 inches. The addition of the saline Saltair reduces permeability and drainability and increases surface runoff relative to the Leland series (above). Therefore, this poorly drained complex soil series has slow to very slow permeability and very high surface runoff. Practical uses for the Leland-Saltair Silt Loam Complex are grazing rangeland and pastureland (NRCS, 2007).

**Syracuse Loamy Fine Sand (Sy)** – The Syracuse series is a very deep composite soil formed in alluvium and lacustrine deposits of quartzite, limestone, and gneiss. This soil produces low to very low surface runoff with poor drainability and moderate to moderately rapid permeability. Efficient use of Syracuse soils includes irrigated cropland, urban development, and rangeland. In the case of reclamation and artificial drainage, irrigated cultivation of alfalfa, corn, tomatoes, sugar beets, and small grains become viable (NRCS, 2006b).

**Warm Springs Fine Sandy Loam (WaA)** – The Warm Spring series consists of very deep, somewhat poorly drained soils derived from mixed-rock lacustrine deposits. This moderately to slowly permeating fine-loamy soil of low or medium surface runoff is best used as pastureland and, when irrigated and drained, for cultivated crops such as alfalfa, improved pasture, small grains, sugar beets, and tomatoes (NRCS, 2005d).

**Warm Springs Fine Sandy Loam, Saline, Sodic (WgA)** – Similar to the Warm Springs Fine Sandy Loam (WaA), this soil consists of lacustrine deposits derived of mixed-rock. Due to high concentrations of both salts and sodium in this soil series, drainage, runoff, and permeation

characteristics are slightly amplified in the WgA series relative to that of the WaA series (above), with poor drainage, slowly to very slowly permeating, and medium to high surface runoff qualities (NRCS, 2005d). Increased salt (saline) composition adversely effects the ability and rate of plant roots to absorb water, and high concentrations of sodium (sodic) causes degradation and densification of soil structure, decreasing soil drainage quality and impeding plant root growth (NDSU, 2004). Most efficient use of Saline and Sodic Warm Springs Fine Sandy Loam lands include grazing rangeland and pasture. If irrigated and drained, production of cultivated crops such as alfalfa, improved pasture, and small grains become viable.

Table 3 presents four general soil classifications reflective of potential agricultural production for all soil series in the subdivision consisting of farmland classification, irrigated capability class, yield of irrigated crops (alfalfa), and yield of irrigated crops (pasture/AUMs). Figures 3 through 6 illustrating these classifications are found in Appendix A. Soil classifications are based on NRCS mapped soil series boundaries which may not be reflective of actual boundaries or conditions on the ground.

**Table 3. Soil Series Classifications**

| Soil Unit Symbol & Name | Farmland Classification | Irrigated Capability Class[1] | Yields of Irrigated Crops – Alfalfa (tons/acre) | Yields of Irrigated Crops – (Pasture / AUMs) |
|---|---|---|---|---|
| **Ac - Airport Silt Loam; 0 to 2 % slopes** | Not Prime Farmland | III | 3.5 | 6.65 |
| **KaA - Kidman Fine Sandy Loam; 0 to 1 % slopes** | Prime Farmland, if Irrigated | I | 6.0 | Not Available |
| **Lb Lakeshore fine sandy loam; 0 to 1 % slopes** | Not Prime Farmland | Not Available | Not Available | Not Available |
| **Le - Leland Silt Loam; 0 to 1 % slopes** | Not Prime Farmland | Not Available | Not Available | Not Available |
| **LS - Leland-Saltair complex; 0 to 1 % slopes** | Not Prime Farmland | Not Available | Not Available | Not Available |

| | | | | |
|---|---|---|---|---|
| **Sy - Syracuse loamy fine sand, moderately saline, sodic; 0 to 2 % slopes** | Not Prime Farmland | III | 4.0 | 8.55 |
| **WaA - Warm Springs Fine Sandy Loam; 0 to 1 % slopes** | Prime Farmland, if Irrigated & Drained | II | 5.0 | 10.45 |
| **WgA - Warm Springs Fine Sandy Loam, Saline, Sodic; 0 to 1 % slopes** | Not Prime Farmland | IV | 4.0 | 8.55 |

**1 Irrigation Capability Class –** Capability classes, designated by values I through VIII, show general suitability of soils for most field crop varieties. The numbers indicate progressively greater limitations and narrower choices for practical use, where Class I soils have few limitations and a wide variety of practical use and Class VIII soils have severe limitations that restrict the depth of their use (NRCS, 2020).

## 3.3 Soil Analysis Results

The results of the soil analysis conducted by Stukenholtz Laboratory, Inc. for each soil series are found in Appendix C. The results provide specific measurements of various agriculture-related parameters such as texture, pH, salts, phosphorus, and nitrate. The analysis indicates when these parameters are very low to very high for alfalfa and/or pasture grass crop production. Based on these results Stukenholtz Laboratory, Inc. provides nutrient application recommendations and management comments that include ways to mitigate adverse conditions. All but the Warm Springs Fine Sandy Loam (WaA) series have management comments. These range from reducing soluble salts and excess boron through drainage and deep irrigation to applying elemental sulfur or gypsum to reduce effects of sodium to monitoring for nitrate. Soil texture and management comments for each soil series are provided in Table 3.

**Table 3 – Soil Analysis Results**

| Soil Unit Symbol & Name | Acreage (%) in Proposed Open Space | Crop | Comments |
|---|---|---|---|
| **Ac - Airport Silt Loam; 0 to 2 % slopes** | 9.85 (17.57%) | Alfalfa / Grass | Soil texture – Silt Loam. Soluble salts may reduce yield and quality. Establish good drainage and deep irrigate to remove excess soluble salts. Deep irrigated to leach away excess Boron. Apply elemental sulfur or gypsum to reduce harmful effects of high sodium. |

| Soil Unit Symbol & Name | Acreage (%) in Proposed Open Space | Crop | Comments |
|---|---|---|---|
| **KaA - Kidman Fine Sandy Loam; 0 to 1 % slopes** | 8.39 (14.97%) | Alfalfa | Soil texture – Sandy Loam. Apply elemental sulfur or gypsum to reduce harmful effects of high sodium. |
| **Le - Leland Silt Loam; 0 to 1 % slopes** | 22.52 (40.18%) | Alfalfa / Grass | Soil texture – Sandy Loam. Deep irrigated to leach away excess Boron. Apply elemental sulfur or gypsum to reduce harmful effects of high sodium. Monitor crop with plant tissue tests and add N as needed. |
| **WaA - Warm Springs Fine Sandy Loam; 0 to 1 % slopes** | 6.35 (11.33%) | Alfalfa | Soil texture – Sandy Loam. No Comments |
| **WgA - Warm Springs Fine Sandy Loam, Saline, Sodic; 0 to 1 % slopes** | 7.89 (14.08%) | Alfalfa / Grass | Soil texture – Sandy Loam. Soluble salts may reduce yield and quality. Establish good drainage and deep irrigate to remove excess soluble salts. Deep irrigated to leach away excess Boron. Apply elemental sulfur or gypsum to reduce harmful effects of high sodium. Apply elemental sulfur or acid forming fertilizers for excessively calcareous soils. Monitor crop with plant tissue tests and add N as needed. |
| **Total** | **56.05 (100.00%)** | | |

# 4.0 Discussion

The NRCS soils data provide information on the eight soil series in the Sunset Meadows subdivision, six of which are found in the designated agricultural open space. The dominant soil series across the entire subdivision are Kidman Fine Sandy Loam (KaA), Leland silt loam (Le), Warm Springs fine sandy loam (WaA), and Warm Springs fine sandy loam saline sodic (WgA), which account for 82.81 % of all soils. The dominant soil series in the designated open space are Airport (Ac), Kidman fine sandy loam (KaA), Leland silt loam (Le), and Warm Springs fine sandy loam saline sodic (WgA). These four soil types account for 86.80 % of all soils in the designated open space.

According to the NRCS official soil descriptions most soil series can be used for agricultural production, most commonly alfalfa, sugar beets and irrigated pasture. Some soil series such as Airport (Ac) and Leland silt loams (Le), and Warm Springs fine sandy loam saline sodic (WgA)

are improved by reclamation, irrigation, or drainage. Lakeshore fine sandy loam and (Lb) Leland-Saltair Complex (LS) soil series are generally limited to grazing rangeland and pastureland.

Kidman Fine Sandy Loam (KaA) and Warm Springs fine sandy loam (WaA) are considered prime farmland, the latter if irrigated and drained. However, soil samples in the Kidman soil series indicate high levels of sodium. Five of the eight soil series have available data to show general suitability for most field crops if irrigated. Of these five, Warm Springs fine sandy loam saline sodic (WgA) has the most restrictions. The estimated yield of alfalfa ranges from 3.5 to 6 tons / acre in the Airport (Ac) and Kidman Fine Sandy Loam (KaA) soil series, respectively. The estimated yield of irrigated crops for pasture measured in animal unit months (AUMs) ranges from 6.65 to 10.45 in the Airport (Ac) and Warm Springs fine sandy loam (WaA) soil series, respectively.

Based on NRCS data and soil sample analysis, all soils in the designated open space are suitable for crop production and pastureland with the exception of the Leland-Saltair Complex (1.87 % of open space), which is only suitable for grazing rangeland or pastureland. Approximately 26 % of the open space is considered prime farmland or prime farmland, if irrigated and drained, as per the NRCS. The results of the soil analysis recommend specific improvements to certain soil series to mitigate the effects of naturally occurring conditions such as high soluble salts, sodium, and boron.

This mosaic of soil series, limitations, and management recommendations extends throughout the entire Sunset Meadows subdivision. Areas proposed for residential development include some soil series considered prime farmland if drained and irrigated and some prime farmland with potentially high sodium levels. Residential development locations also include soil series that require improvements, nutrient application, and/or management to mitigate existing conditions as well as those areas limited to grazing rangeland and pastureland.

# 5.0 Conclusion

This assessment specifically addressed compliance of the Sunset Meadows subdivision property with items (c)(1) and (c)(3) (a-c) of Section 108-3-5 (Open Space Preservation Plan) of the Weber County Code. Compliance with these code sections is addressed in the following two sections.

## 5.1 Section 108-3-5 (c)(1)

Assuming that all acreage is developable, Sunset Meadows contains 56 acres of designated open space within the 108-acre subdivision. Open space accounts for approximately 52% of the total area of the subdivision. This exceeds the 30% required for subdivisions in Zone A-1.

## 5.2 Section 108-3-5 (c)(3)

(a) In an attempt to support large-scale crop-producing operations, the designated agricultural open space contains 14.74 acres of prime agricultural land associated with the Kidman Fine Sandy Loam (KaA) and Warm Springs fine sandy loam (WaA) soil series. Prime agricultural land within the open space does not equal 30% of the total subdivision acreage or 32.4 acres. There are approximately 28 acres of Kidman Fine Sandy Loam (KaA) and Warm Springs fine sandy loam (WaA), which are designated as prime agricultural land, in the subdivision but outside the designated open space. According to this section of the Weber County Code, prime agricultural land should first be used to satisfy the open space requirements.

NRCS data indicates that the other soil series in the open space are suitable for crop production and pastureland. Also based on the soil analysis, recommended improvements to these soil series and Kidman Fine Sandy Loam (KaA) exist, which can mitigate the effects of naturally occurring conditions such as high soluble salts, sodium, and boron. Improvements to approximately 18 acres of the Leland silt loam (Le) soil could increase agricultural production within the open space.

(b) The designated agricultural open space is configured into a single, contiguous parcel fronted by 1800 South and adjacent to other agricultural land. It is located on the northeast corner of the subdivision so that it does not intrude into the center of the Sunset Meadows subdivision or create separation between Sunset Meadows and surrounding subdivisions. The results of the soil analysis suggest that soils within the open space have the potential to support agricultural opportunities. However, in some cases improvements such as nutrient application, drainage, and/or other management actions are required to improve soil conditions.

(c) The designated agricultural open space is at least 450 feet wide in any direction at any given point to accommodate a 50-foot wide farm implement.

# 6.0 References

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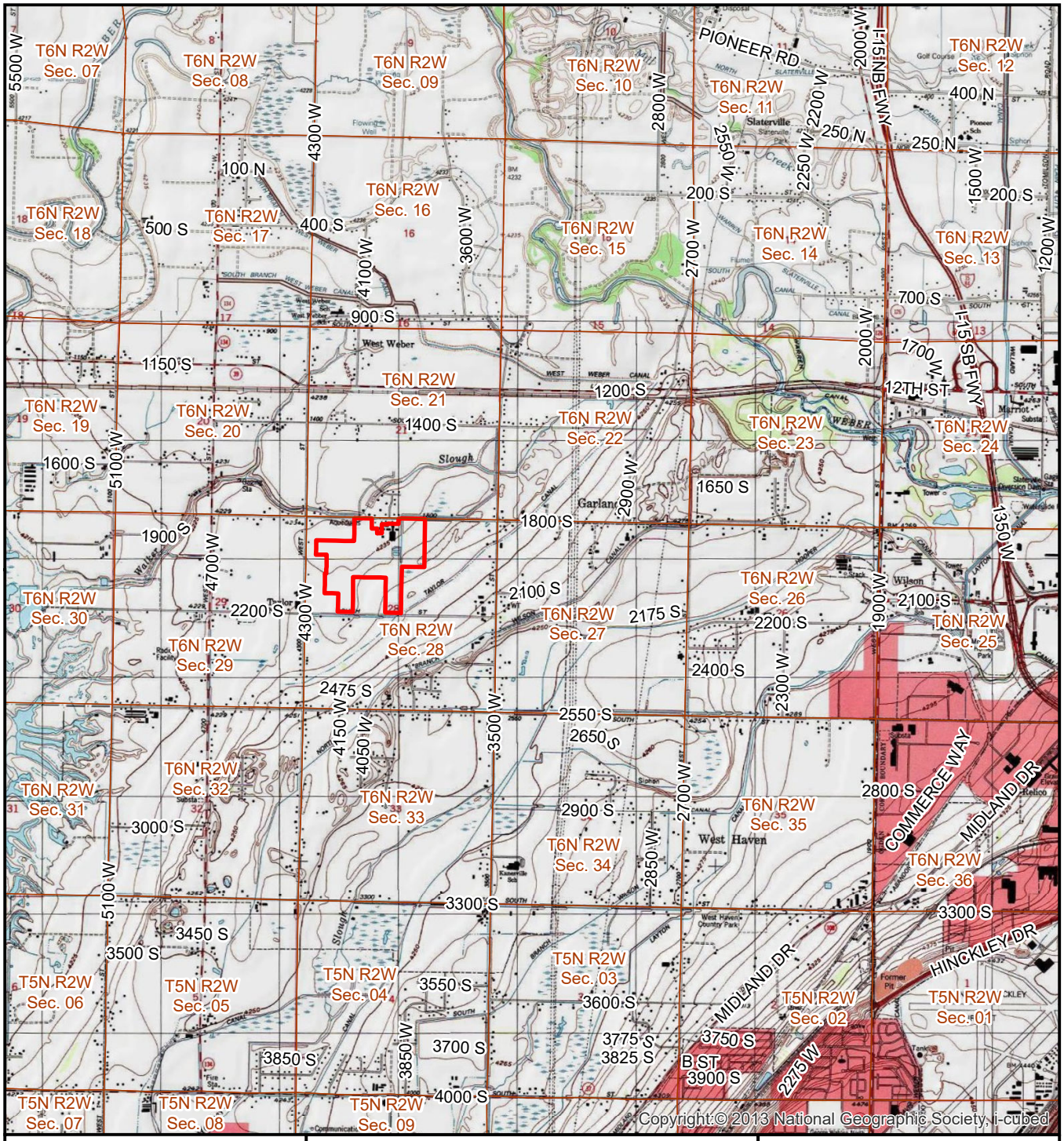
# Appendix A – Maps

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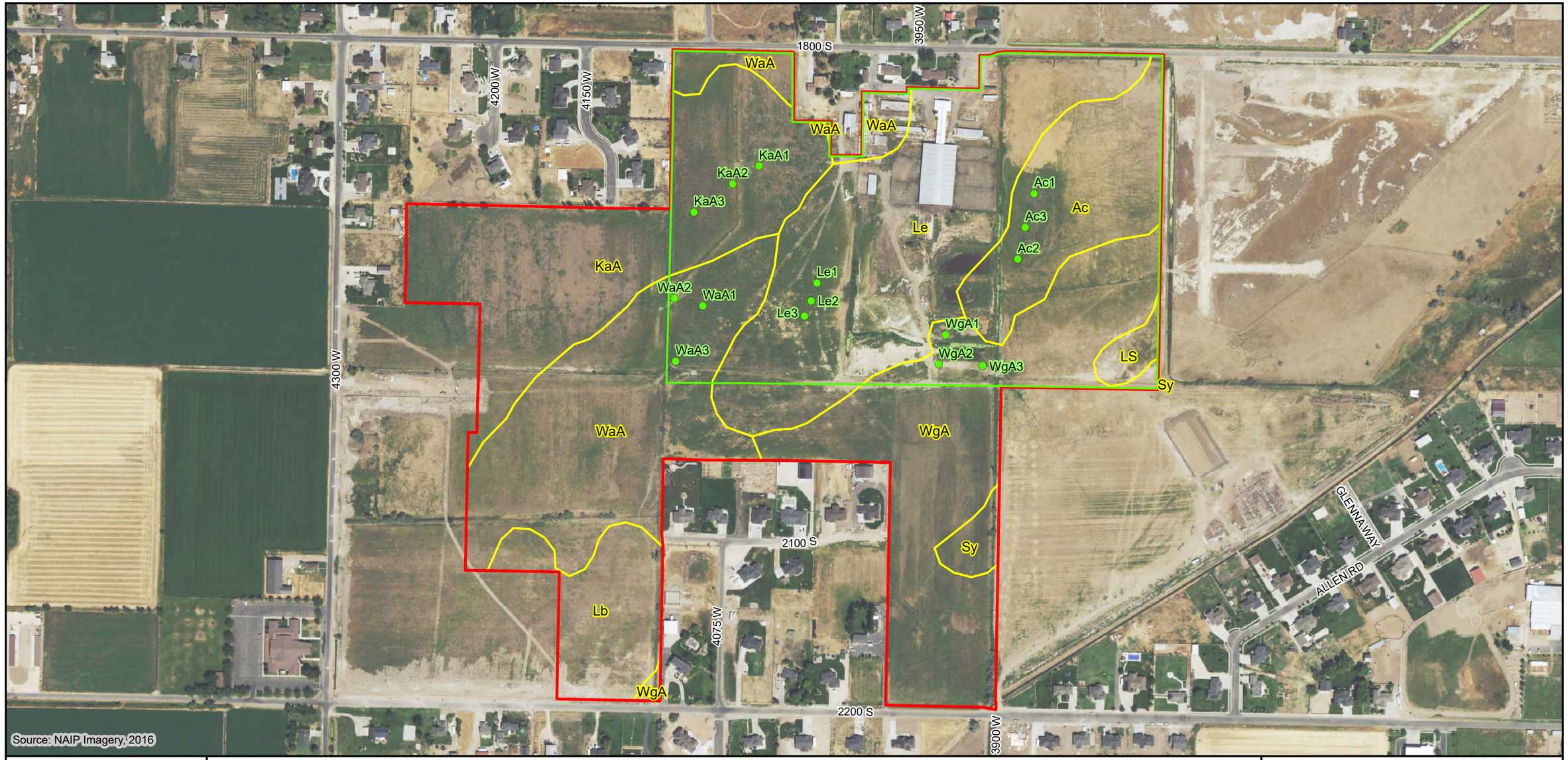


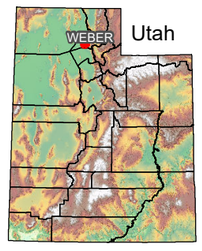


- Soil Sample
- Project Area
- Open Space
- Soils Map Unit

| Label | Map Unit Name |
|---|---|
| Ac | Airport silt loam, 0 to 2 percent slopes |
| KaA | Kidman fine sandy loam, 0 to 1 percent slopes |
| Le | Leland silt loam, 0 to 1 percent slopes |
| LS | Leland-Saltair complex, 0 to 1 percent slopes |
| Sy | Syracuse loamy fine sand, moderately saline, sodic, 0 to 2 percent slopes |
| WaA | Warm Springs fine sandy loam, 0 to 1 percent slopes |
| WgA | Warm Springs fine sandy loam, saline, sodic, 0 to 1 percent slopes |

N

Feet
0 400 800

**Sunset Meadows**

Figure 2

Soil Series and sample locations

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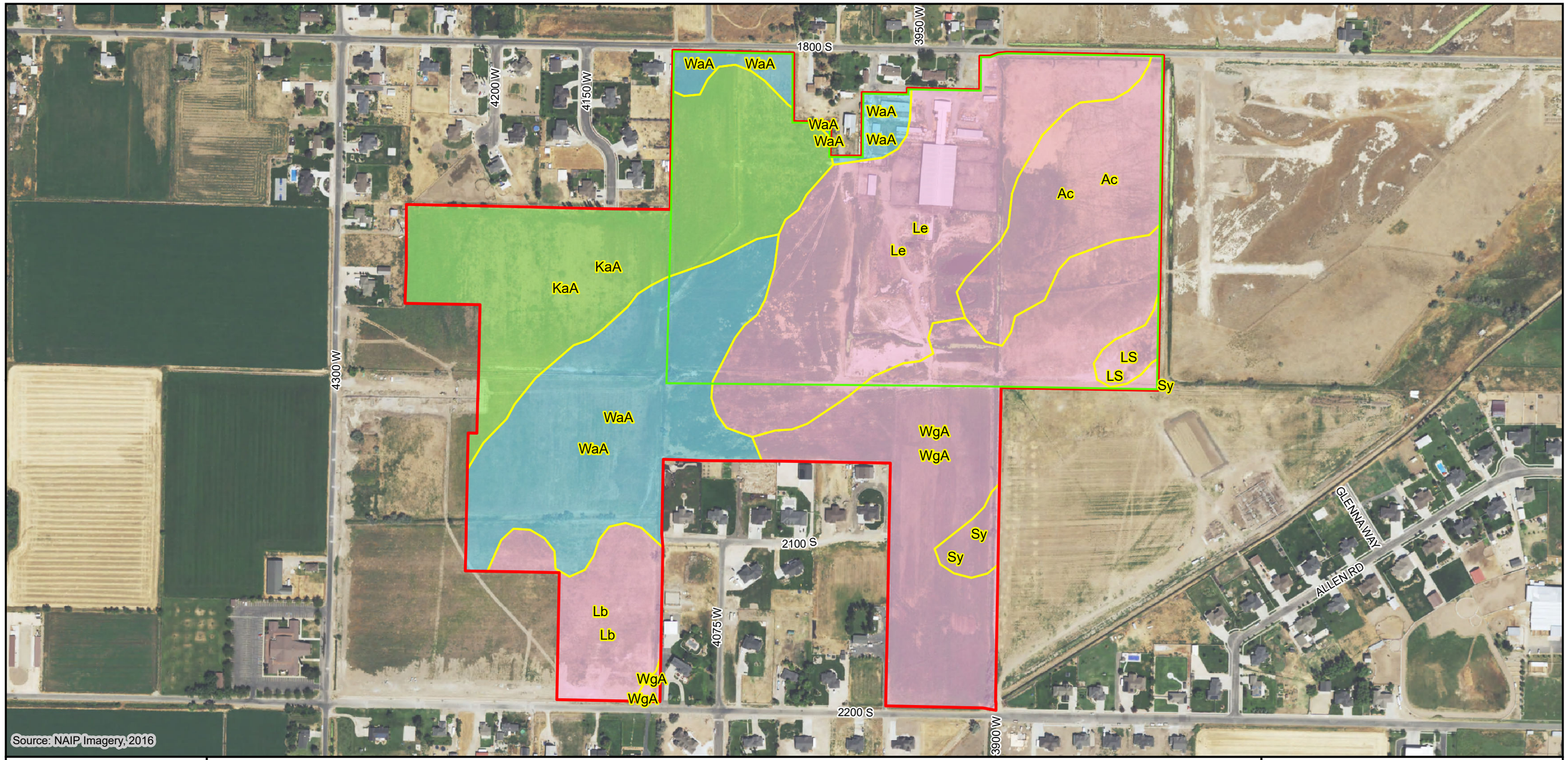


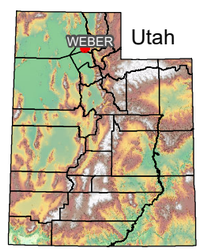


Project Area
Open Space
Soils Map Unit

**Farmland Classification**

Not prime farmland
Prime farmland if irrigated
Prime farmland if irrigated and drained

| Label | Map Unit Name |
|---|---|
| Ac | Airport silt loam, 0 to 2 percent slopes |
| KaA | Kidman fine sandy loam, 0 to 1 percent slopes |
| Le | Leland silt loam, 0 to 1 percent slopes |
| LS | Leland-Saltair complex, 0 to 1 percent slopes |
| Sy | Syracuse loamy fine sand, moderately saline, sodic, 0 to 2 percent slopes |
| WaA | Warm Springs fine sandy loam, 0 to 1 percent slopes |
| WgA | Warm Springs fine sandy loam, saline, sodic, 0 to 1 percent slopes |

N

Feet
0 400 800

**Sunset Meadows**

Figure 3

Farmland Classification

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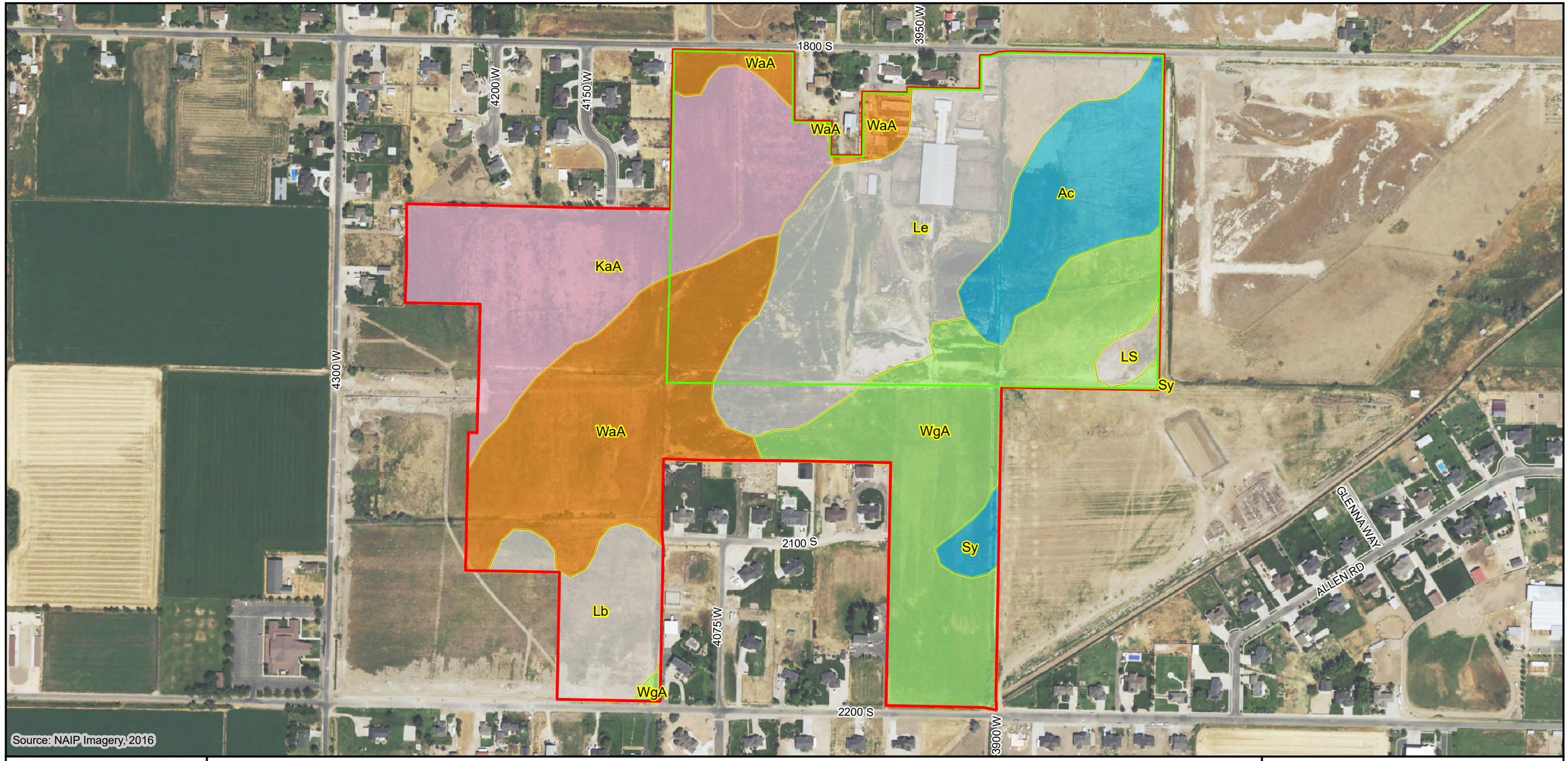
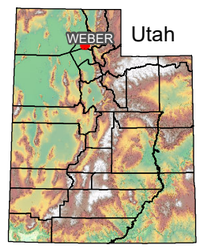



Project Area

Open Space

Soils Map Unit

**Irrigated Capability Class**

{DCD, >}

Capability Class - I

Capability Class - II

Capability Class - III

Capability Class - IV

Not rated or not available

| Label | Map Unit Name |
|---|---|
| Ac | Airport silt loam, 0 to 2 percent slopes |
| KaA | Kidman fine sandy loam, 0 to 1 percent slopes |
| Le | Leland silt loam, 0 to 1 percent slopes |
| LS | Leland-Saltair complex, 0 to 1 percent slopes |
| Sy | Syracuse loamy fine sand, moderately saline, sodic, 0 to 2 percent slopes |
| WaA | Warm Springs fine sandy loam, 0 to 1 percent slopes |
| WgA | Warm Springs fine sandy loam, saline, sodic, 0 to 1 percent slopes |

N

Feet

0 400 800

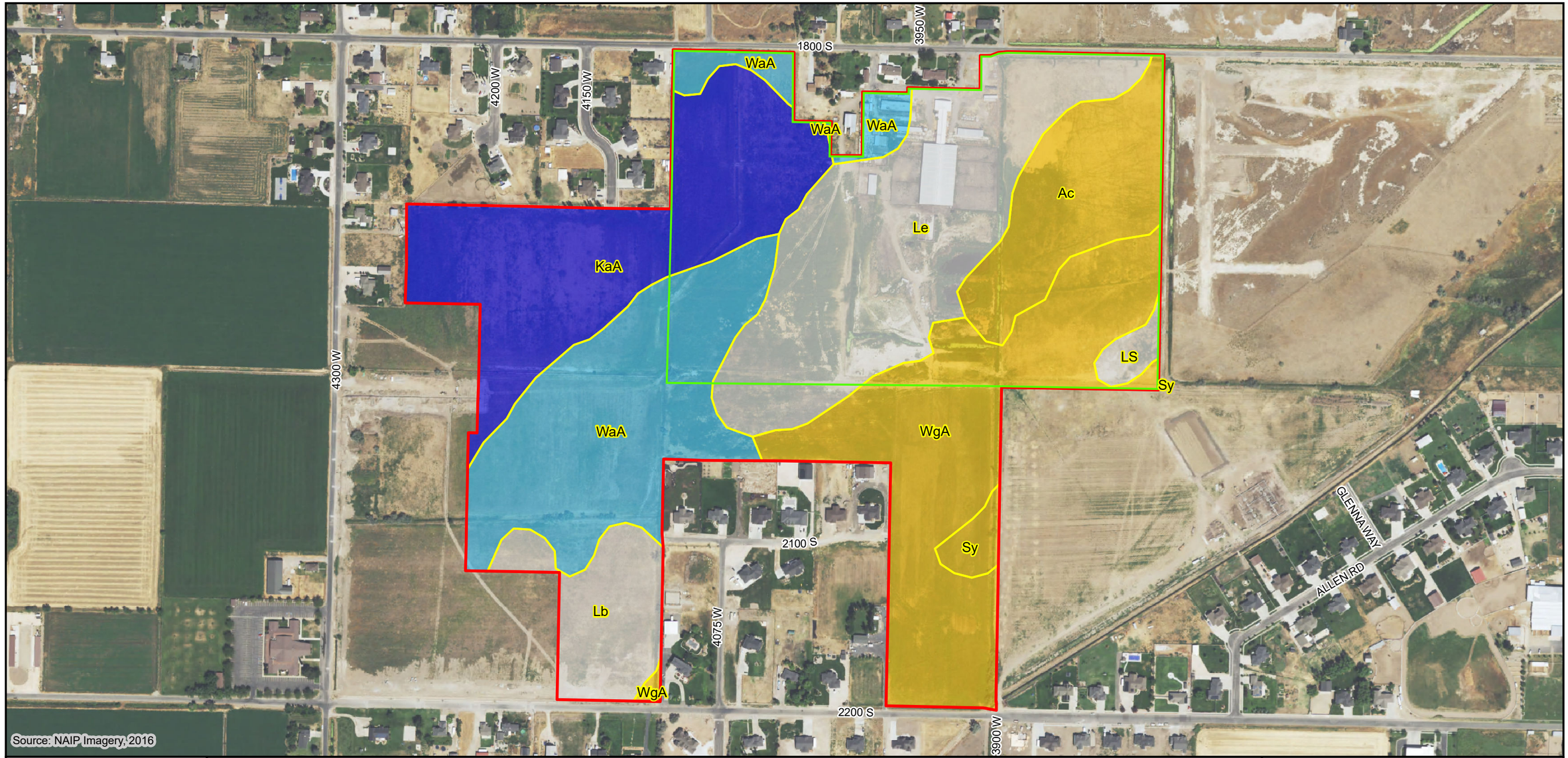
**Sunset Meadows**

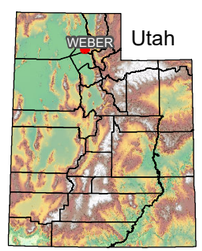
Figure 4

Irrigated Capability Class

MARTIN & NICHOLSON
ENVIRONMENTAL CONSULTANTS

4/10/2020 C:\GIS_Projects\M_N\M_N_1076_Sunset_Meadows\irrigated_capability.mxd




Project Area

Open Space

Soils Map Unit

**Yields of Irrigated Crops (Map Unit) Alfalfa Hay:**

(Alfalfa hay/Tons), {NAN, >}

- <= 3
- > 3 AND <= 4
- > 4 AND <= 4.5
- > 4.5 AND <= 5
- > 5 AND <= 6
- Not rated or not available

| Label | Map Unit Name |
|---|---|
| Ac | Airport silt loam, 0 to 2 percent slopes |
| KaA | Kidman fine sandy loam, 0 to 1 percent slopes |
| Le | Leland silt loam, 0 to 1 percent slopes |
| LS | Leland-Saltair complex, 0 to 1 percent slopes |
| Sy | Syracuse loamy fine sand, moderately saline, sodic, 0 to 2 percent slopes |
| WaA | Warm Springs fine sandy loam, 0 to 1 percent slopes |
| WgA | Warm Springs fine sandy loam, saline, sodic, 0 to 1 percent slopes |

N

Feet

0 400 800

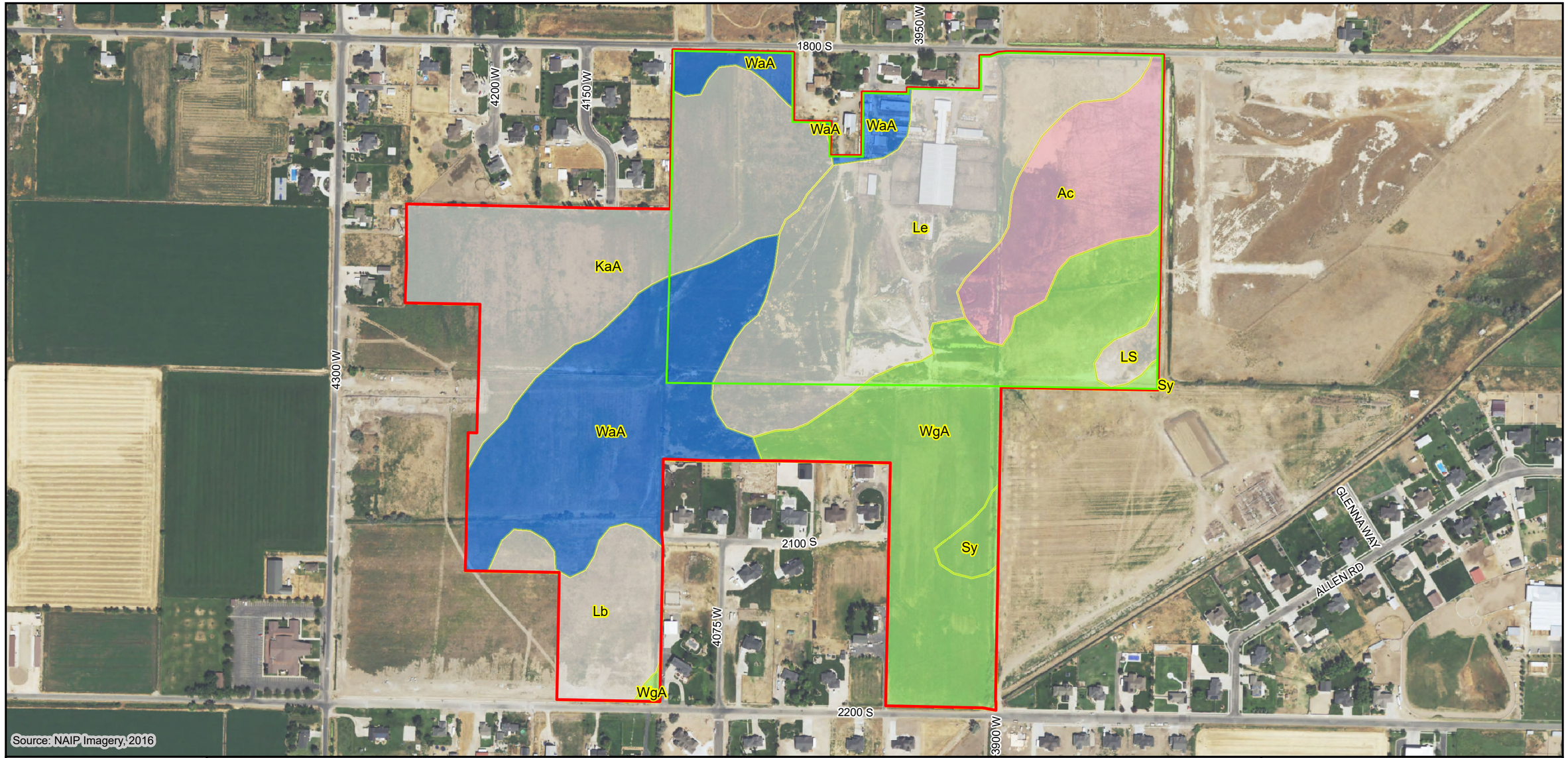
**Sunset Meadows**

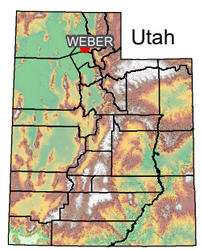
Figure 5

Yields of Irrigated Crops, Alfalfa Hay

MARTIN & NICHOLSON ENVIRONMENTAL CONSULTANTS

4/10/2020 C:\GIS_Projects\M_N\M_N_1076_Sunset_Meadows\yields_alfalfa.mxd




Project Area

Open Space

Soils Map Unit

**Yields of Irrigated Crops (Component) Pasture: (Pasture/AUM), {WA, >, null = 0}**

- Not rated or not available
- > 5.4 AND <= 7.2
- > 7.2 AND <= 9
- > 9 AND <= 10.45

| Label | Map Unit Name |
|---|---|
| Ac | Airport silt loam, 0 to 2 percent slopes |
| KaA | Kidman fine sandy loam, 0 to 1 percent slopes |
| Le | Leland silt loam, 0 to 1 percent slopes |
| LS | Leland-Saltair complex, 0 to 1 percent slopes |
| Sy | Syracuse loamy fine sand, moderately saline, sodic, 0 to 2 percent slopes |
| WaA | Warm Springs fine sandy loam, 0 to 1 percent slopes |
| WgA | Warm Springs fine sandy loam, saline, sodic, 0 to 1 percent slopes |

N

Feet
0 400 800

**Sunset Meadows**

Figure 6

Yields of Irrigated Crops, Pasture/AUMs

MARTIN & NICHOLSON ENVIRONMENTAL CONSULTANTS

4/10/2020 C:\GIS_Projects\M_N\M_N_1076_Sunset_Meadows\yields_pasture.mxd

# Appendix B – Photographs

Photograph B-1. Airport (Ac) soil series area looking south.

Photograph B-2. Kidman (KaA) soil series area looking north.

Photograph B-3. Leland (Le) soil series area looking north.

Photograph B-4. Warm Springs (WaA) soil series area looking south

Photograph B-5. Warm Springs (WgA) soil series area looking west

# Appendix C – Soil Data

# STUKENHOLTZ LABORATORY, INC.

2924 Addison Avenue East, P.O. Box 353 Twin Falls, ID 83301

2132 208-734-3050 Fax: 208-734-3919 www.stukenholtz.com

ALLEN, SAM
3322 EAST CUMMINS RD
SALT LAKE CITY, UT 84109

Tel: 530-414-0569
Report No: 31275
Date Received: 4/12/2020
Date Reported: 4/13/2020

| SOIL TEST DATA | Sample 1 | | Sample 2 |
|---|---|---|---|
| pH | **9.2** | VH | |
| Salts, mmhos/cm | **5.1** | VH | |
| Chlorides, ppm | **104** | H | |
| Sodium, meq/100g | **4.10** | VH | |
| CEC, meq/100g | **20.4** | H | |
| Excess Lime, % | **4.7** | H | |
| Organic Matter, % | **3.74** | H | |
| Organic N, lb/Acre | **120** | H | |
| Ammonium - N, ppm | **2.1** | VL | |
| Nitrate - N, ppm | **38** | H | |
| Phosphorus, ppm | **241** | VH | |
| Potassium, ppm | **1468** | VH | |
| Calcium, meq/100g | **7.3** | M | |
| Magnesium, meq/100g | **4.3** | VH | |
| Sulfate - S, ppm | **76** | VH | |
| Zinc, ppm | **9.4** | VH | |
| Iron, ppm | **15.8** | H | |
| Manganese, ppm | **12.6** | VH | |
| Copper, ppm | **5.5** | VH | |
| Boron, ppm | **3.20** | VH | |

| | Sample 1 | Sample 2 |
|---|---|---|
| **Grower** | **ALLEN, SAM** | |
| **Sample Identity** | **AIRPORT SLT LM** | |
| **Crop** | **ALF/GRASS** | |
| **Yield Goal** | **6.33 T** | |
| **Acres** | **10.4** | |
| **Prev Crop T/Acre** | **NONE GIVEN** | |
| **Manure T/Acre** | | |
| **Prev Applied Nut** | | |

**RECOMMENDATIONS, lbs Nutrients or Units per Acre**

| | |
|---|---|
| Nitrogen | **35** |
| $P_2O_5$ – Phosphate | **0** |
| $K_2O$ - Potash | **0** |
| Calcium | **75** |
| Magnesium | **0** |
| Sulfate - Sulfur | **0** |
| Zinc | **0** |
| Iron | **0** |
| Manganese | **0** |
| Copper | **0** |
| Boron | **0** |
| Elemental Sulfur | **700** |
| Gypsum | **4000** |
| Lime | **0** |

**Base Saturation, %**

| | | | |
|---|---|---|---|
| Potassium | (Ideal 3 - 6) | **23.1** | H |
| Calcium | (Ideal 65 - 80) | **35.8** | L |
| Magnesium | (Ideal 15 - 25) | **21.1** | M |
| Sodium | (Ideal < 3) | **20.1** | H |

**Relation of CEC to Soil Texture**

| | |
|---|---|
| 0-5 Sand | 18-24 Silt Loam |
| 5-12 Loamy Sand | 24-36 Clay Loam |
| 12-18 Sandy Loam | 36+ Clay |

**Comments**

Crop / Yield 1 Soluble salts may reduce yield and quality.
Crop / Yield 1 Establish good drainage and deep irrigate to remove excess soluble salts.
Crop / Yield 1 Boron level is possibly toxic. Deep irrigate to leach away excess Boron.
Crop / Yield 1 Sodium is too high. Elemental Sulfur or Gypsum will reduce the harmful effects.

# STUKENHOLTZ LABORATORY, INC.

2924 Addison Avenue East, P.O. Box 353 Twin Falls, ID 83301

2132 208-734-3050 Fax: 208-734-3919 www.stukenholtz.com

ALLEN, SAM
3322 EAST CUMMINS RD
SALT LAKE CITY, UT 84109

Tel: 530-414-0569
Report No: 31276
Date Received: 4/12/2020
Date Reported: 4/13/2020

| SOIL TEST DATA | Sample 1 | | Sample 2 |
|---|---|---|---|
| pH | **8.2** | H | |
| Salts, mmhos/cm | **1.2** | L | |
| Chlorides, ppm | **9** | VL | |
| Sodium, meq/100g | **0.60** | L | |
| CEC, meq/100g | **15.9** | M | |
| Excess Lime, % | **2.4** | M | |
| Organic Matter, % | **3.16** | H | |
| Organic N, lb/Acre | **120** | H | |
| Ammonium - N, ppm | **4.4** | VL | |
| Nitrate - N, ppm | **5** | VL | |
| Phosphorus, ppm | **184** | VH | |
| Potassium, ppm | **753** | VH | |
| Calcium, meq/100g | **8.9** | M | |
| Magnesium, meq/100g | **4.0** | H | |
| Sulfate - S, ppm | **13** | M | |
| Zinc, ppm | **8.3** | VH | |
| Iron, ppm | **14.3** | H | |
| Manganese, ppm | **8.1** | H | |
| Copper, ppm | **3.1** | VH | |
| Boron, ppm | **2.21** | H | |

| | Sample 1 | Sample 2 |
|---|---|---|
| **Grower** | **ALLEN, SAM** | |
| **Sample Identity** | **KIDMAN FINE SND** | |
| **Crop** | **ALFALFA** | |
| **Yield Goal** | **6 T** | |
| **Acres** | **8.4** | |
| **Prev Crop T/Acre** | **NONE GIVEN** | |
| **Manure T/Acre** | | |
| **Prev Applied Nut** | | |

**RECOMMENDATIONS, lbs Nutrients or Units per Acre**

| | |
|---|---|
| Nitrogen | **80** |
| $P_2O_5$ – Phosphate | **0** |
| $K_2O$ - Potash | **0** |
| Calcium | **0** |
| Magnesium | **0** |
| Sulfate - Sulfur | **40** |
| Zinc | **0** |
| Iron | **0** |
| Manganese | **0** |
| Copper | **0** |
| Boron | **0** |
| Elemental Sulfur | **200** |
| Gypsum | **1000** |
| Lime | **0** |

**Base Saturation, %**

| | | | |
|---|---|---|---|
| Potassium | (Ideal 3 - 6) | **15.2** | H |
| Calcium | (Ideal 65 - 80) | **56.0** | L |
| Magnesium | (Ideal 15 - 25) | **25.2** | H |
| Sodium | (Ideal < 3) | **3.8** | H |

**Relation of CEC to Soil Texture**

| | |
|---|---|
| 0-5 Sand | 18-24 Silt Loam |
| 5-12 Loamy Sand | 24-36 Clay Loam |
| 12-18 Sandy Loam | 36+ Clay |

**Comments**

Crop / Yield 1 Sodium is too high. Elemental Sulfur or Gypsum will reduce the harmful effects.

# STUKENHOLTZ LABORATORY, INC.

2924 Addison Avenue East, P.O. Box 353 Twin Falls, ID 83301

2132 208-734-3050 Fax: 208-734-3919 www.stukenholtz.com

ALLEN, SAM
3322 EAST CUMMINS RD
SALT LAKE CITY, UT 84109

Tel: 530-414-0569
Report No: 31277
Date Received: 4/12/2020
Date Reported: 4/13/2020

| SOIL TEST DATA | Sample 1 | | Sample 2 |
|---|---|---|---|
| pH | **9.1** | VH | |
| Salts, mmhos/cm | **2.2** | H | |
| Chlorides, ppm | **9** | VL | |
| Sodium, meq/100g | **1.20** | M | |
| CEC, meq/100g | **17.8** | M | |
| Excess Lime, % | **3.7** | M | |
| Organic Matter, % | **2.75** | H | |
| Organic N, lb/Acre | **110** | H | |
| Ammonium - N, ppm | **2.7** | VL | |
| Nitrate - N, ppm | **17** | M | |
| Phosphorus, ppm | **222** | VH | |
| Potassium, ppm | **1366** | VH | |
| Calcium, meq/100g | **8.5** | M | |
| Magnesium, meq/100g | **3.7** | H | |
| Sulfate - S, ppm | **13** | M | |
| Zinc, ppm | **6.3** | VH | |
| Iron, ppm | **6.0** | M | |
| Manganese, ppm | **7.7** | H | |
| Copper, ppm | **2.6** | H | |
| Boron, ppm | **3.21** | VH | |

| | Sample 1 | Sample 2 |
|---|---|---|
| **Grower** | **ALLEN, SAM** | |
| **Sample Identity** | **LELAND SILT LM** | |
| **Crop** | **ALF/GRASS** | |
| **Yield Goal** | **6 T** | |
| **Acres** | **22.9** | |
| **Prev Crop T/Acre** | **NONE GIVEN** | |
| **Manure T/Acre** | | |
| **Prev Applied Nut** | | |

**RECOMMENDATIONS, lbs Nutrients or Units per Acre**

| | |
|---|---|
| Nitrogen | **140** |
| $P_2O_5$ – Phosphate | **0** |
| $K_2O$ - Potash | **0** |
| Calcium | **0** |
| Magnesium | **0** |
| Sulfate - Sulfur | **40** |
| Zinc | **0** |
| Iron | **0** |
| Manganese | **0** |
| Copper | **0** |
| Boron | **0** |
| Elemental Sulfur | **400** |
| Gypsum | **2000** |
| Lime | **0** |

**Base Saturation, %**

| | | | |
|---|---|---|---|
| Potassium | (Ideal 3 - 6) | **24.6** | H |
| Calcium | (Ideal 65 - 80) | **47.8** | L |
| Magnesium | (Ideal 15 - 25) | **20.8** | M |
| Sodium | (Ideal < 3) | **6.7** | H |

**Relation of CEC to Soil Texture**

| | |
|---|---|
| 0-5 Sand | 18-24 Silt Loam |
| 5-12 Loamy Sand | 24-36 Clay Loam |
| 12-18 Sandy Loam | 36+ Clay |

**Comments**

Crop / Yield 1 Nitrogen recommendations have been modified to account for gravity irrigation.
Crop / Yield 1 Boron level is possibly toxic. Deep irrigate to leach away excess Boron.
Crop / Yield 1 Sodium is too high. Elemental Sulfur or Gypsum will reduce the harmful effects.
Crop / Yield 1 Split application of N is advised. Monitor crop with plant tissue tests and add N as needed.

# STUKENHOLTZ LABORATORY, INC.

2924 Addison Avenue East, P.O. Box 353 Twin Falls, ID 83301

2132 208-734-3050 Fax: 208-734-3919 www.stukenholtz.com

ALLEN, SAM
3322 EAST CUMMINS RD
SALT LAKE CITY, UT 84109

Tel: 530-414-0569
Report No: 31278
Date Received: 4/12/2020
Date Reported: 4/13/2020

| SOIL TEST DATA | Sample 1 | | Sample 2 |
|---|---|---|---|
| pH | **8.2** | H | |
| Salts, mmhos/cm | **1.2** | L | |
| Chlorides, ppm | **12** | L | |
| Sodium, meq/100g | **0.40** | VL | |
| CEC, meq/100g | **16.0** | M | |
| Excess Lime, % | **2.5** | M | |
| Organic Matter, % | **3.04** | H | |
| Organic N, lb/Acre | **120** | H | |
| Ammonium - N, ppm | **3.0** | VL | |
| Nitrate - N, ppm | **4** | VL | |
| Phosphorus, ppm | **180** | VH | |
| Potassium, ppm | **832** | VH | |
| Calcium, meq/100g | **9.0** | M | |
| Magnesium, meq/100g | **3.9** | H | |
| Sulfate - S, ppm | **13** | M | |
| Zinc, ppm | **8.5** | VH | |
| Iron, ppm | **8.0** | M | |
| Manganese, ppm | **7.5** | H | |
| Copper, ppm | **2.9** | H | |
| Boron, ppm | **2.29** | H | |

| | Sample 1 | Sample 2 |
|---|---|---|
| **Grower** | **ALLEN, SAM** | |
| **Sample Identity** | **WRM SPRG** | |
| **Crop** | **ALFALFA** | |
| **Yield Goal** | **4.75 T** | |
| **Acres** | **9.1** | |
| **Prev Crop T/Acre** | **NONE GIVEN** | |
| **Manure T/Acre** | | |
| **Prev Applied Nut** | | |

**RECOMMENDATIONS, lbs Nutrients or Units per Acre**

| | |
|---|---|
| Nitrogen | **80** |
| $P_2O_5$ – Phosphate | **0** |
| $K_2O$ - Potash | **0** |
| Calcium | **0** |
| Magnesium | **0** |
| Sulfate - Sulfur | **20** |
| Zinc | **0** |
| Iron | **0** |
| Manganese | **0** |
| Copper | **0** |
| Boron | **0** |
| Elemental Sulfur | **200** |
| Gypsum | **1000** |
| Lime | **0** |

**Base Saturation, %**

| | | | |
|---|---|---|---|
| Potassium | (Ideal 3 - 6) | **16.7** | H |
| Calcium | (Ideal 65 - 80) | **56.2** | L |
| Magnesium | (Ideal 15 - 25) | **24.4** | M |
| Sodium | (Ideal < 3) | **2.5** | M |

**Relation of CEC to Soil Texture**

| | |
|---|---|
| 0-5 Sand | 18-24 Silt Loam |
| 5-12 Loamy Sand | 24-36 Clay Loam |
| 12-18 Sandy Loam | 36+ Clay |

# STUKENHOLTZ LABORATORY, INC.

2924 Addison Avenue East, P.O. Box 353 Twin Falls, ID 83301

2132 208-734-3050 Fax: 208-734-3919 www.stukenholtz.com

ALLEN, SAM
3322 EAST CUMMINS RD
SALT LAKE CITY, UT 84109

Tel: 530-414-0569
Report No: 31279
Date Received: 4/12/2020
Date Reported: 4/13/2020

| SOIL TEST DATA | Sample 1 | | Sample 2 |
|---|---|---|---|
| pH | **9.9** | VH | |
| Salts, mmhos/cm | **5.4** | VH | |
| Chlorides, ppm | **171** | VH | |
| Sodium, meq/100g | **4.90** | VH | |
| CEC, meq/100g | **17.0** | M | |
| Excess Lime, % | **7.2** | H | |
| Organic Matter, % | **1.23** | M | |
| Organic N, lb/Acre | **50** | M | |
| Ammonium - N, ppm | **2.0** | VL | |
| Nitrate - N, ppm | **9** | L | |
| Phosphorus, ppm | **55** | VH | |
| Potassium, ppm | **1362** | VH | |
| Calcium, meq/100g | **5.7** | L | |
| Magnesium, meq/100g | **2.0** | L | |
| Sulfate - S, ppm | **80** | VH | |
| Zinc, ppm | **1.7** | M | |
| Iron, ppm | **11.2** | H | |
| Manganese, ppm | **7.1** | H | |
| Copper, ppm | **1.6** | H | |
| Boron, ppm | **3.26** | VH | |

| | Sample 1 | Sample 2 |
|---|---|---|
| **Grower** | **ALLEN, SAM** | |
| **Sample Identity** | **WGA WM SPR** | |
| **Crop** | **ALF/GRASS** | |
| **Yield Goal** | **8.5 T** | |
| **Acres** | **7.2** | |
| **Prev Crop T/Acre** | **NONE GIVEN** | |
| **Manure T/Acre** | | |
| **Prev Applied Nut** | | |

**RECOMMENDATIONS, lbs Nutrients or Units per Acre**

| | |
|---|---|
| Nitrogen | **255** |
| $P_2O_5$ – Phosphate | **0** |
| $K_2O$ - Potash | **0** |
| Calcium | **75** |
| Magnesium | **10** |
| Sulfate - Sulfur | **0** |
| Zinc | **5** |
| Iron | **0** |
| Manganese | **0** |
| Copper | **0** |
| Boron | **0** |
| Elemental Sulfur | **800** |
| Gypsum | **4500** |
| Lime | **0** |

**Base Saturation, %**

| | | | |
|---|---|---|---|
| Potassium | (Ideal 3 - 6) | **25.7** | H |
| Calcium | (Ideal 65 - 80) | **33.5** | L |
| Magnesium | (Ideal 15 - 25) | **11.8** | L |
| Sodium | (Ideal < 3) | **28.8** | H |

**Relation of CEC to Soil Texture**

| | |
|---|---|
| 0-5 Sand | 18-24 Silt Loam |
| 5-12 Loamy Sand | 24-36 Clay Loam |
| 12-18 Sandy Loam | 36+ Clay |

**Comments**

Crop / Yield 1 Soluble salts may reduce yield and quality.
Crop / Yield 1 Establish good drainage and deep irrigate to remove excess soluble salts.
Crop / Yield 1 Boron level is possibly toxic. Deep irrigate to leach away excess Boron.
Crop / Yield 1 Excessively Calcareous soils respond to 100-200 lbs/ac of Elemental Sulfur or Acid forming fertilizers.
Crop / Yield 1 Sodium is too high. Elemental Sulfur or Gypsum will reduce the harmful effects.
Crop / Yield 1 Split application of N is advised. Monitor crop with plant tissue tests and add N as needed.
Crop / Yield 1 Examples of acid forming fertilizers are: 21-0-0/Thio-Sul/Nitro-Sul and Disintegrating Sulfurs.