LEYDEN ROCK METROPOLITAN DISTRICT
SPECIAL MEETING
Leyden Rock Clubhouse
17685 W. 83rd Drive, Arvada, Colorado
Wednesday, July 12, 2023 at 11:30 a.m..
https://leydenrocklife.com/

Brett Vernon, President	Term to May 2027
Scott J. Plummer, Secretary	Term to May 2027
Jeff Cunningham, Treasurer	Term to May 2025
Christian Ardita, Assistant Secretary	Term to May 2025
Tanis Batsel Stewart, Assistant Secretary	Term to May 2025

NOTICE OF SPECIAL MEETING AND AGENDA

1. Call to Order/Declaration of Quorum
2. Director Conflict of Interest Disclosures
3. Approval of Agenda
4. Public Comment – Members of the public may express their views to the Board on matters that affect the District on items not otherwise on the agenda. Comments will be limited to three (3) minutes per person.
5. Preservation Tree Care Presentation (**enclosure**)
6. District Management Matters
7. Director's Matters
8. Other Business
9. Adjourn

2023 Regular Meetings
January 17; February 21; March 21; April 18; May 16; June 20; July 18; August 15; September 19; October 17; November 21; and December 19 at 6:00 p.m. via teleconference.

1237.0008; 1324167

PRESERVATION
EST. 1997
TREE CARE
"For the ♥ of Trees"
303.761.1088
www.preservationtreecare.net

May 4th, 2023

Ms. Katie Call

Leyden Rock

Dear Ms. Katie Call,

It was a pleasure exploring the trees of Leyden Rock. Enclosed you will find Leyden Rock tree Evaluation that you have requested. Within this report, I have discussed the condition of the trees located within the thirty-one specified sections of Leyden Rock, and I provide a number of recommendations for next steps.

As a result of my observation and investigation, I have concluded that the trees in Leyden Rock have a variety of correctable issues, and they are of an age and capability of having long-term success. The main issues I will discuss here are: species selection, planting, mechanical injury, watering, nutrients, pests, and disease.

I strongly recommend addressing these issues systematically to improve the health of the trees within the community. Practices such as tree wrapping, appropriate watering, appropriate planting techniques, fertilization, and the use of a pneumatic tool such as an Air Spade© to mitigate soil compaction and address root and planting issues will greatly enhance the ability for trees at Leyden Rock to thrive.

Best Regards,

Jon
Jon Carleton
General Manager
Preservation Tree Care
ISA Certified Arborist® Rm- 7939A
ISA Tree Risk Assessment Qualified
TCIA Certified Treecare Safety Professional
O- 303.761.1088 |C- 720.624.6063

LEYDEN ROCK

Prepared for: Ms. Katie Call

MAY 4TH, 2023

Prepared By:
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General Manager
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Table of Contents

Jon Carleton
Preservation Tree Care
Tree Evaluation
Leyden Rock

Summary

Ms. Katie Call, the Operations Coordinator at Leyden Rock Metro District, reached out to our office in late September 2022 with a request to provide an evaluation of the trees at Leyden Rock. Ms. Call, at the request of the board of directors and stakeholders for Leyden Rock, requested a formal report from me detailing my evaluation of the trees as well as any recommendations I have for the care and management of these plants. I was contracted on March 16th, 2023, to provide this report.

My investigation revealed that there were many factors in place that would allow for successful long-term tree health. These factors included some quality species selection and mostly quality planting techniques. With these successes, I also discovered factors that will limit the long-term viability of the community's forest. These factors included a lack of species diversity, soil compaction and quality, water quality issues, irrigation problems, improper planting techniques, and some minor pest and disease issues. To better manage the trees at Leyden Rock, I recommended that Ms. Call hire an ISA Certified Arborist® to provide soil and root relief using a pneumatic air tool such as an AirSpade®, provide winter watering, winter anti-desiccant sprays, biannual fertilization, perform a water test, and future tree planting and care. Furthermore, I suggested having a qualified landscape professional adjust irrigation issues by adding additional zones and repairing broken lines and heads.

Introduction

Background and History

Leyden Rock Metropolitan District has been developed over the last ten years to now feature 1,500 acres of space with 1,800 homes. Of that acreage, sixty percent of it is dedicated to open space with over seventeen miles of trailed weaving throughout the community. The community continues to grow now, adding trees to its already nearly 2,000 tree inventory. The trees appear to have mostly been installed or naturally grown since the community's inception; meaning that all trees are between six months – approximately ten years in the ground. The trees are between one to twenty inches in diameter and four to thirty feet in height and spread. Ms. Call indicated that the community has a desire to ensure the long-term health and viability of their trees and to limit the amount of removal and replacement they need to perform in the future. There has been a perception of large losses in their forest in addition to the appearance of seemingly unhealthy trees.

Assignment

After my discussion with Ms. Call and board members in the spring of 2023, we agreed to the following directive:

1. Visit the site and examine the community managed trees and located in the 31 designated sections (Figures 1-9),
2. Provide an inventory of the trees including health, species, diameter, height and location,
3. Analyze the condition of the forest and provide feedback regarding to planting, irrigation, species selection, and care,
4. Summarize my findings in a report.

Limits of Assignment

I based my report on my findings from a visual inspection during various trips to the community in March and April 2023. I utilized a **probe rod** and a **diameter tape** to perform minor mechanical inspections and get accurate measurements respectively. I utilized information provided from Ms. Call regarding the history of the site and issues with the forest. I did not perform any **sounding** with a mallet from the ground as the majority of the trees did not exhibit signs of decay nor were they of substantial size. I also did not perform a **root crown inspection** or an **aerial inspection** of any of the trees. Furthermore, I did not complete any **diagnostic soil testing** within the scope of this assignment, though I was provided with previous reporting from 2021 from which I will include analysis.

Purpose and Use of the Report

The purpose of this report is to provide an accurate assessment of the current condition of the trees by reviewing aspects such as **structural integrity,** planting depth and quality of installation, analyzing irrigation and watering practices, and observing any pest or disease issues. Furthermore, I will provide an outline of how to provide care and manage the plant material moving forward. This report is intended to be used by Ms. Katie Call and the Leyden Rock Metro District to better manage and understand their forest. Upon submission, this report will become the property of Leyden Rock Metro District, and the use of this report will be at their discretion.

Observations

I visited the Leyden Rock Metro District at the request of Ms. Katie Call on five separate occasions between March 21st and April 11th to inspect the trees at Leyden Rock Metro District.

Leyden Rock Metro District is a community of 1,800 homes located in Northwest Arvada. It has its own separate water district and is founded on the old coal mining town of Leyden. According to our contract, Leyden Rock Metro District is considered a “quasi-municipality.” I used nine site maps provided by Ms. Call to understand the boundaries of the community (see Figures 1 - 9). I observed and inventoried only trees that were community managed, meaning no trees located on homeowner private property are included in this report. I have summarized my observations below:

1. I observed 1,979 total individual landscaped and maintained trees made up of 20 different species. I did not include obvious **volunteer trees** growing in **riparian areas** or other non-managed vegetation**.**
2. The most common **gymnosperms,** or evergreen trees, include the piñon pine (*Pinus edulis*) and the Austrian pine (*Pinus nigra*). These two species combine to make up 37% of the canopy at Leyden Rock.
3. The most common **angiosperms,** or deciduous trees, include the hybrid cottonwood (*P. x euramericana*) and the English Columnar oak (*Quercus robur 'Fastigiata'*). These trees make up 9% of the canopy at Leyden Rock.
4. Of the 1,979 trees, 1,543 or 78% of the trees are in good to excellent condition (Figure 10).
5. Piñon pines are also the most successful trees on-site with greater than 97% of these trees currently in good to excellent condition (Figure 11).

6. The white pine (*Pinus strobus*) is the gymnosperm struggling the most on-site with 98% of these trees being in the fair to very poor condition.
7. The hackberry (*Celtis occidentalis*) is the angiosperm struggling the most on-site with 86% of these trees being in the fair to very poor condition.
8. The most common **abiotic** plant health issues on-site are species selection, **soil compaction**, drought or water stress often due to winter desiccation, and poor planting practices.
9. The most common **biotic** issues on-site are **aphids**, **rough bulletgall wasp** (*Disholcaspis quercusmamma*), and the potential for **ips engraver beetle**.

Discussion

Discussion of Site and Abiotic Issues

Species Diversity:

Having a diverse landscaped forest is crucial to maintaining a healthy canopy. When single species dominate a forest's population, the effects of a pest or disease can be devastating to the overall forest as these issues would affect and possibly kill a large portion of the forest in a community. Leyden Rock boasts a canopy that is made up of over 50% pinon pine, Austrian pine, and Rocky Mountain juniper. While these species have been largely very successful on this site, if a pest or disease outbreak occurs, the community could be forced to deal with a massive loss of canopy.

Soil Compaction:

Soil compaction occurs when pressure is placed on the soil causing a reduction in available oxygen to the root zone as those pockets of air are compacted and eliminated. Compaction can occur when equipment is driven over or parked on the root zone, or even from heavy foot traffic over the root zone. Given that the root zones for many of the landscaped trees here are impacted by either a path or a road, there is good evidence that the soil is compacted in these areas. Compacted soils make it difficult for roots to penetrate, thus limiting root growth. If root growth is limited, then **anchorage** will also be limited – leading to less stable trees as the canopy expands and the forces applied to the roots are increased by weight and wind. Given the trees are generally planted in groups, anchorage likely will only be an issue for isolated and exposed trees (photo 8).

Water Quality:

Water quality, specifically as it pertains to the water's **pH** may be an issue here. Denver Water has recently increased the pH of the water it provides to average 8.8, up from 7.8 previously (2022, *Adjusting the pH in Drinking Water*). Thus, the water is now ten times more **alkaline** than it was a few years ago. This shift in pH seems to particularly negatively impact the Colorado blue spruce, as it prefers a more neutral to slightly alkaline pH – 6.8-7.2 (Fechner, 2022). Anecdotally, it appears that the white pine may be adversely affected by the higher pH water (photo 10).

My research was not able to reveal the specific source of water for Leyden Rock Metro District, so if the water sourced here is also susceptible to this pH raise is unknown. However, a supplemental water test can determine the pH of the water on-site.

Irrigation Issues:

Additionally, while the majority of the trees on-site appeared to have irrigation set up to them at some point, some irrigation appeared to be in poor repair (Photo 9), missing altogether, or on improper scheduling (Photo 7). Proper watering is the first step in proper tree care, and in Colorado with our low annual precipitation, that involves proper irrigation set up. The lack of proper watering and water retention is evidenced by the browning of needles on many of the evergreen trees, a symptom known as **winter desiccation** (Photo 1 and 4).

Planting Installation Issues:

While many of the trees on site appeared to be planted at the correct depth and had nice berms set up to help with water retention, there was some evidence of some poor planting practices. One such practice is planting too deep, or inappropriate planting depth (photo 2). Poor planting depth is often indicative of other poor planting practices such as leaving twine and cages intact upon installation. Twine and cages can cause trees to become **root bound**. These trees may also develop **girdling roots** that can eventually result in poor canopy development or even tree death. Additionally, several trees had tree straps used in the planting process to stabilize the tree left on too long. These tree straps become embedded in the tree, often girdling stems or trunks (Photo 3 and photo 6).

Soil Issues:

As previously mentioned, I did not take any new soil samples during my assessment. However, a previous soil assessment was provided by Taddekin Tree Company in 2021. As we did not complete the service in house, I cannot speak about the methods or procedure for pulling these samples.

Based on the results of this sampling, the **organic material** is low, the pH is high, nitrates were low, and the soil composition is sandy loam, clay loam, and sandy clay loam (Taddekin Report, 2021). These results are evident from a surface level given the color, texture, and moisture level (photo 7). As noted in the report, these results generally indicate a need to increase water intervals but a reduction of amount of water to allow for proper drainage and biannual fertilizations to assist with building soil health over time.

Discussion of Biotic Issues

Overall, given the propensity of trees in good or excellent condition here, my current concern for biotic issues is low.

Aphids:

I observed aphids to be the most common and prevalent pest issue on-site. Due to the timing of my assessment in the early spring, my observations involved previous damage or species susceptibility as this pest was not currently active during my assessment. While large populations of this sucking pest can

cause foliage dieback and therefore adverse health effects for the trees on which they feed, most of the damage is minor and there is little need for chemical intervention.

Rough Bulletgall Wasp:

Some of the bur oaks on-site exhibited signs of Rough Bulletgall Wasp (*Disholcaspis quercusmamma*) (Photo 5). These insects produce a woody, generally rounded gall on bur oaks. **Sooty molds** may grow on the gall as they age. The stubby-bodied brown wasps are only present in the late October/early November timeframe when they emerge from the gall and oviposit in the dormant buds. The insect only causes minor injury to the plant as heavy infestations can stunt the growth of twigs. The honeydew residue left by the wasps may also attract nuisance insects like other wasps or bees. There are no insecticidal controls for this insect, but there are several species of parasitic wasps that act as natural enemies (*Rough bulletgall WASP - Colorado State University* 2022).

Potential Issue - Ips engraver beetle:

Another biotic issue that I would have concern to become an issue in the future would be infestations of bark beetles, specifically the **ips engraver beetle** (*Ips hunteri*). These pests rarely attack healthy trees; they occur most often in trees that are already stressed by drought, poor site conditions, mechanical damage, or newly transplanted trees (Cranshaw & Leatherman, 2013). As there are many recently planted spruce and pines as well as some water problems on-site, the ips beetle is a pest to be wary of in the future.

Conclusion

Despite some of the concerns outlined in my discussion, the forest at Leyden Rock Metro District is in good health and condition. While there are some biotic and abiotic concerns, most issues are manageable and limited to specific species. By adjusting species selection and watering practices, many of the site issues will be able to be corrected moving forward. The majority of the trees in the community are in good to excellent health, and, based off of my observations, they can be set up well to thrive into maturity. Following my outlined recommendations will help the Leyden Rock forest grow and thrive.

Recommendations

Based on my observations, investigation, and subsequent conclusions, I am able to offer the following recommendations for Leyden Rock Metro District (In order of Importance):

1. Hire a company employing ISA Certified Arborists® to:
    a. Perform regular winter watering of the community trees with added nutrients and **water penetrates** during times when the irrigation system is not running.
    b. Perform **anti-desiccant** sprays twice a year between November and March.
    c. Perform biannual fertilizations of the community trees.
    d. Perform a water test of the irrigation water to understand the pH and makeup of the water being applied to the plants on-site.
    e. Utilize an **Air Spade©** or similar tool to mitigate the soil compaction under trees exhibiting signs of stress, poor planting, or root issues. This can be done by **radial trenching** within the root zone or a comparable technique. The air tool limits root damage while still allowing for adequate excavation. The areas spaded should be back filled with a combination of native soil and **amended topsoil**.
    f. Implement an annual inspection of the trees to monitor their health and identify any novel issues before they become too problematic to address.
    g. Remove and replace the 149 trees in the poor to very poor category of health rating. Replace trees with species appropriate for the site and soil conditions. Remove white pines and hackberries from the planting list. Increase species diversity to mitigate the risk of pest and disease outbreaks compromising large portions of the forest.
    h. Install tree wrap on all deciduous trees 5 years and younger between November – March each year.
2. Ms. Katie Call and the Board can do the following to further assist in the management of their community trees:
    a. Apply an organic mulch within the **drip zone** of all the trees, being careful not to allow the mulch to come within one foot of the trunk of each tree. Mulch helps with moisture retention, becomes a natural fertilizer as it decomposes, and helps fine root growth development. Establishing mulch rings around each tree or group of trees will also mitigate the mechanical damage that can occur during other landscape operations such as mowing or string trimming. Many tree services will dump mulch for no cost.
    b. Hire a professional irrigation service or landscape professional to audit the irrigation system. Ensure that the irrigation is in working order for all trees, and the program allows for adequate water to each tree. This system will need to be monitored and adjusted regularly during the growing seasons to ensure that trees are getting the appropriate amount of watering based on site specific soil conditions.

Glossary of Terms

Abiotic	physical rather than biological; not derived from living organisms.
Aerial Inspection	An inspection of a trees canopy from aloft. Usually either in an aerial lift or from climbing the tree.
Air Spade©	Brand name of a pneumonic device designed to remove soil with compressed air and limit damage to roots.
Alkaline	having the properties of an alkali, or containing alkali; having a pH greater than 7.
Amended Topsoil	Any material added to a soil to improve its physical properties, such as water retention, permeability, water infiltration, drainage, aeration and structure.
Anchorage	The action of securing something to a base or the state of being secured.
Angiosperm	a plant that has flowers and produces seeds enclosed within a carpel. The angiosperms are a large group and include herbaceous plants, shrubs, grasses, and most trees.
Anti-desiccant	a product that acts as a protective coating on the leaf or needle of a plant to reduce water loss during periods of stress, drought, or high wind.
Aphid	a minute bug that feeds by sucking sap from plants. It reproduces rapidly, often producing live young without mating, and may live in large colonies that cause extensive damage to crops.
Biotic	relating to or resulting from living things, especially in their ecological relations.
Diagnostic soil testing	Testing through the taking of soil samples or plugs to determine the plant available concentrations of plant nutrients.
Drip Zone	The area directly located under the outer circumference of the tree branches
Girdling roots	a root that grows in a circular or spiral pattern around the trunk or at or below the soil line, gradually strangling the trunk.
Gymnosperm	A plant that has seeds unprotected by an ovary or fruit. Gymnosperms include the conifers, cycads, and ginkgo.
Ips engraver beetles	a common group of bark beetles that infest spruce and pine trees.
Leaders	Main branches of a tree
pH	a figure expressing the acidity or alkalinity of a solution on a logarithmic scale on which 7 is neutral, lower values are more acid and higher values more alkaline. The pH is equal to −log10 c, where c is the hydrogen ion concentration in moles per liter.

Phloem	the vascular tissue in plants that conducts sugars and other metabolic products downward from the leaves.
Probe Rod	A rod usually made of steel or other hard metal that is used to measure depth
Radial Trenching	Means of aerating the soil around a tree by removing and replacing soil in trenches made in a spoke-like pattern in the root zone to improve conditions for root growth.
Riparian areas	the interface between land and a river or stream
Rootbound	having roots formed into a dense, tangled mass that allows little or no space for further growth.
Root Crown Inspection	An inspection of the area where the min roots join the plant stem, usually at or near ground level; root collar
Root Zone	Area within the soil profile where roots exist; typically the root zone of the tree extends beyond the drip zone.
Rough Bulletgall Wasp	a stubby-bodied, dark brown wasp with a round abdomen that produce a woody, rounded gall on bur oaks.
Soil Compaction	Compression of the soil, often as a result of vehicle or pedestrian traffic, that breaks down the soil aggregates and reduces soil volume and total pore space, especially the macropores.
Sooty mold	a black velvety mold that grows on the surfaces of leaves and stems affected by honeydew.
Sounding	Utilizing a rubber mallet to lightly strike the trunk of a tree, listening for differences in pitch that may indicate decay.
Structural Integrity	The strength or viability of the structure of a tree.
Terminal Growth	The end point of a branch or stem.
Tree Wrap	a paper wrapping material used to insulate young deciduous trees during the winter months.
Vascular System	The system of a tree made up of Xylem and phloem that link all parts of the plant, transporting water, minerals and manufactured food around while also forming part of the structural support for plants.
Volunteer trees	Trees that grew naturally in the landscape and were not intentionally planted
Water Penetrates	Additives that allow for water to better penetrate or absorb into soil.
Winter Desiccation	a common type of winter injury that occurs when the amount of water lost by the foliage exceeds the amount picked up by the roots.

Xylem the vascular tissue in plants that conducts water and dissolved nutrients upward from the root and also helps to form the woody element in the stem.

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Appendix A: Figures, Photos, and Documents

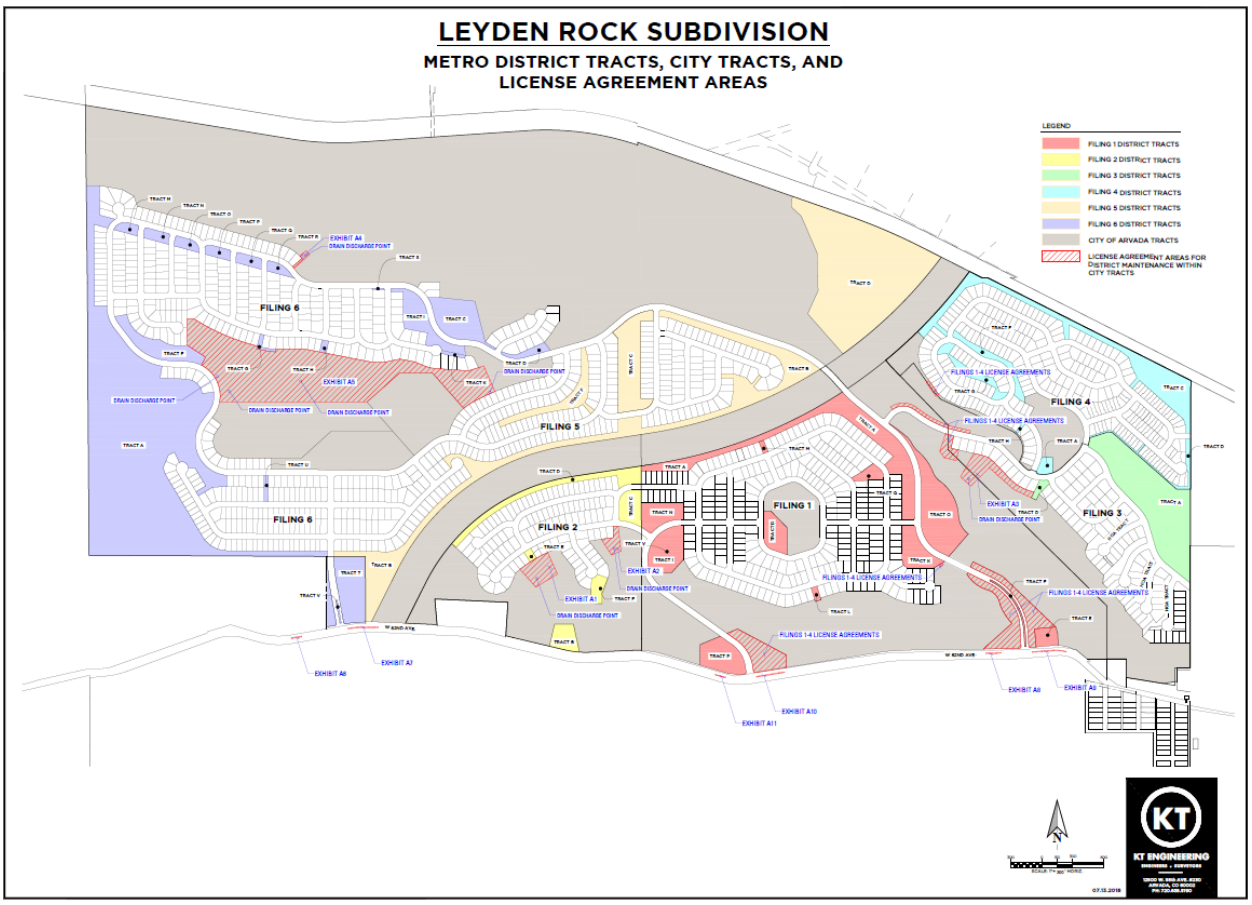

Figure 1: Leyden Rock Tract Map

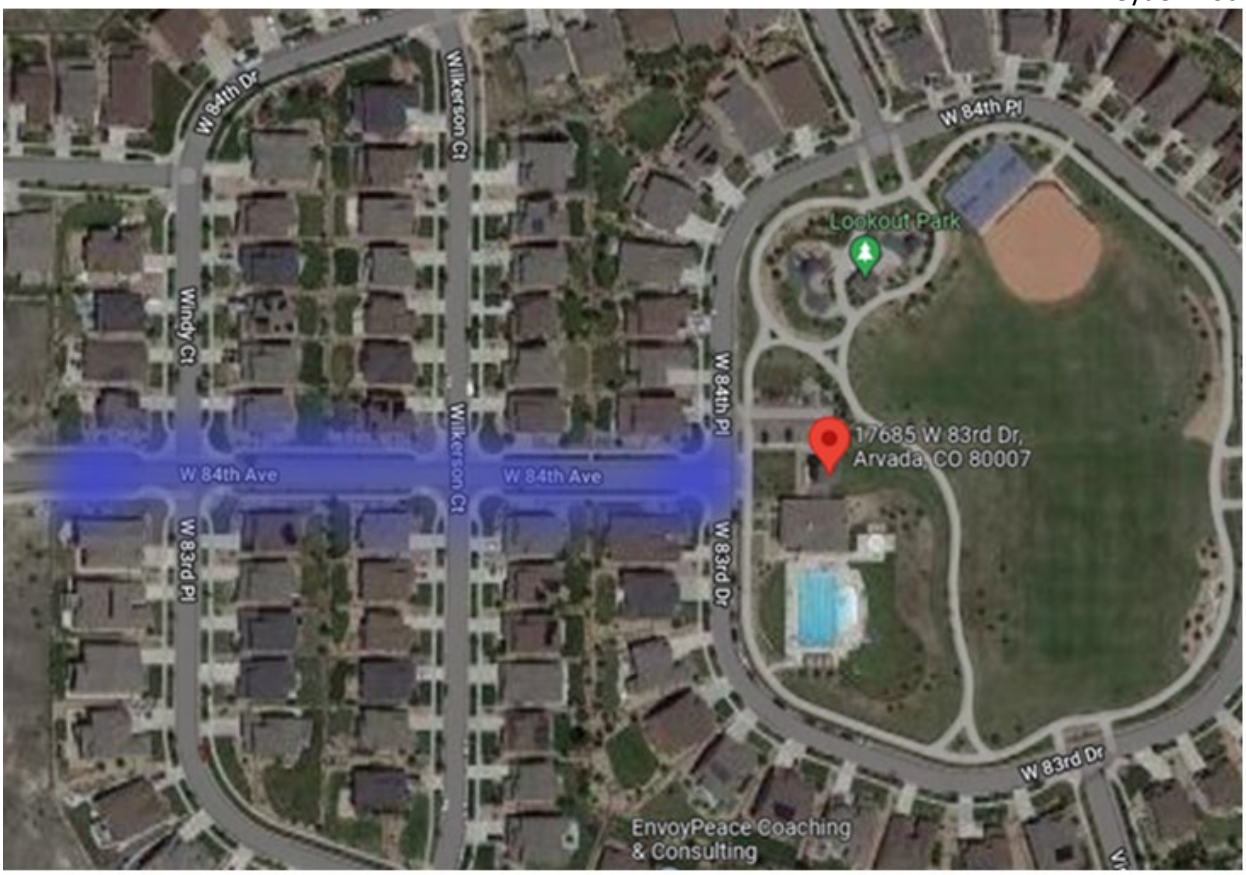

Figure 2: Additional Area to Survey

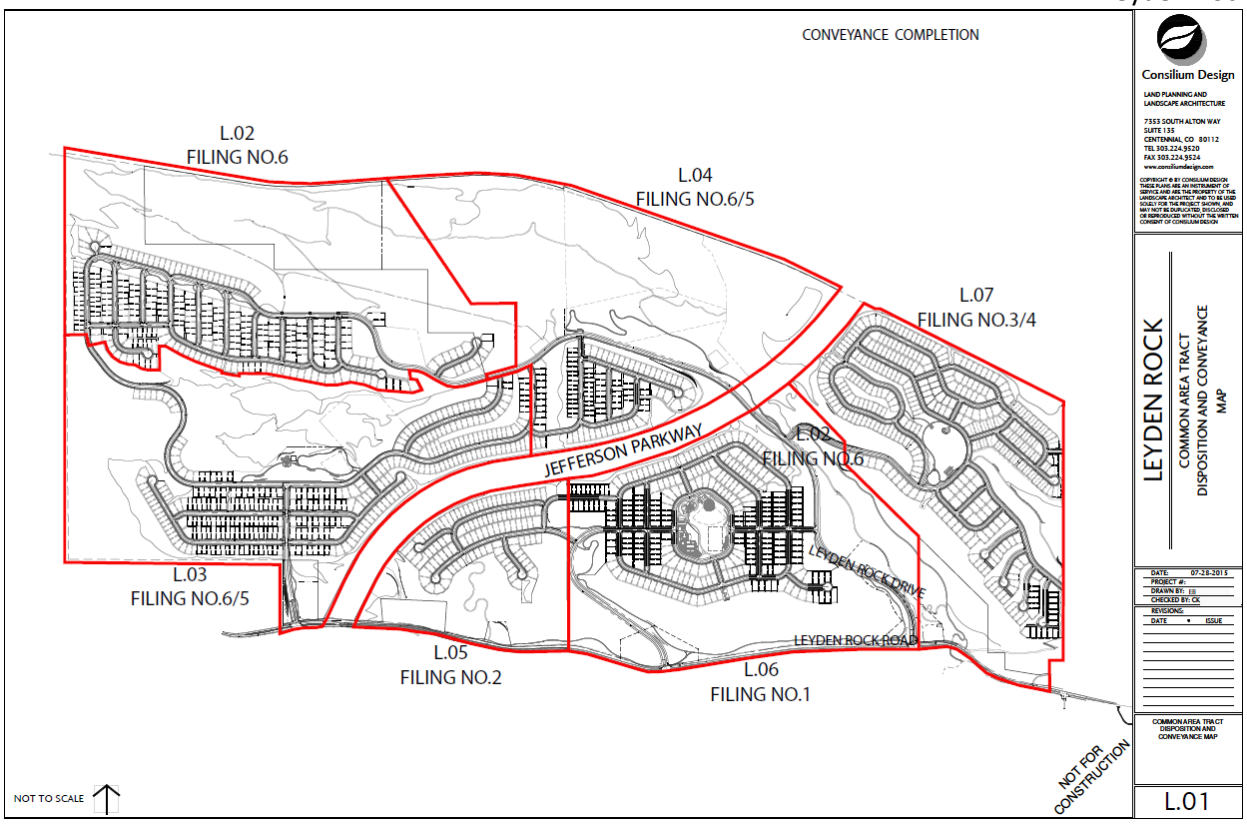

Figure 3: Filing Overview

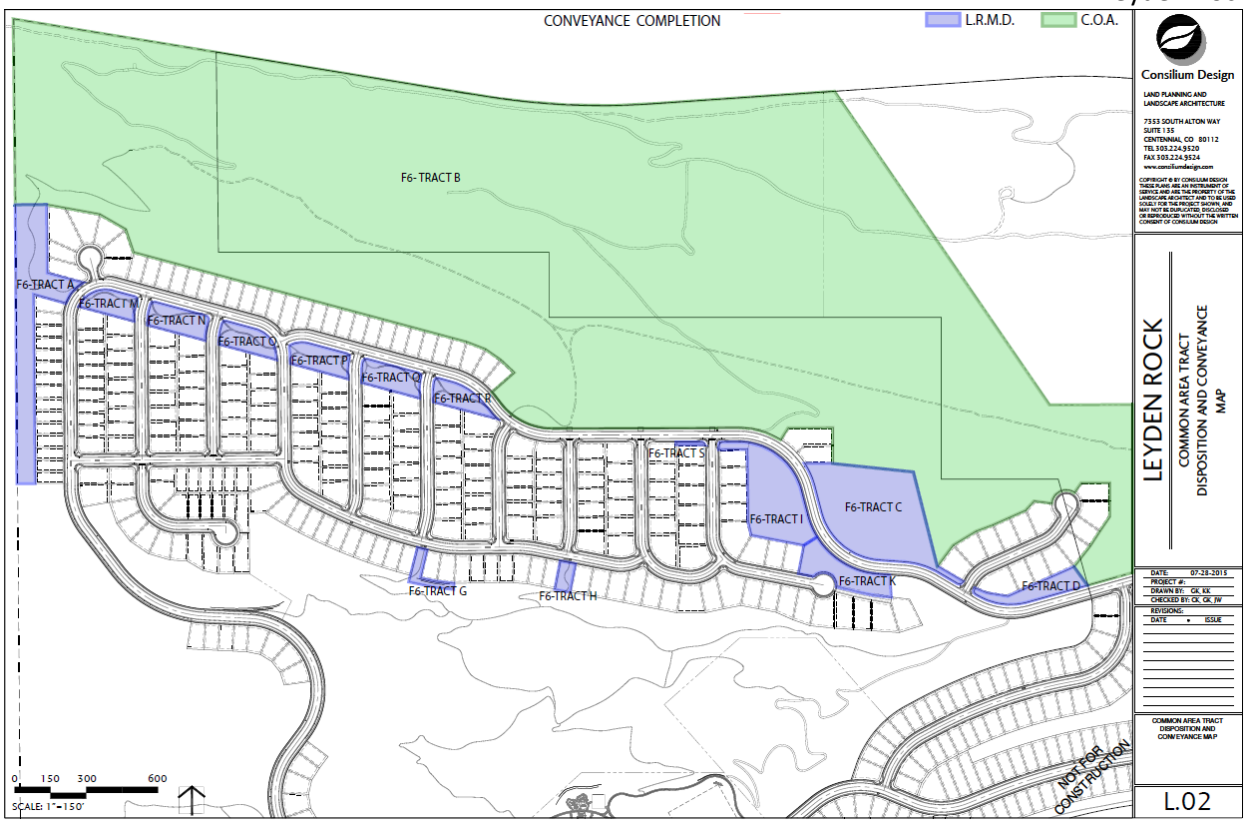

Figure 4: Tract map #1

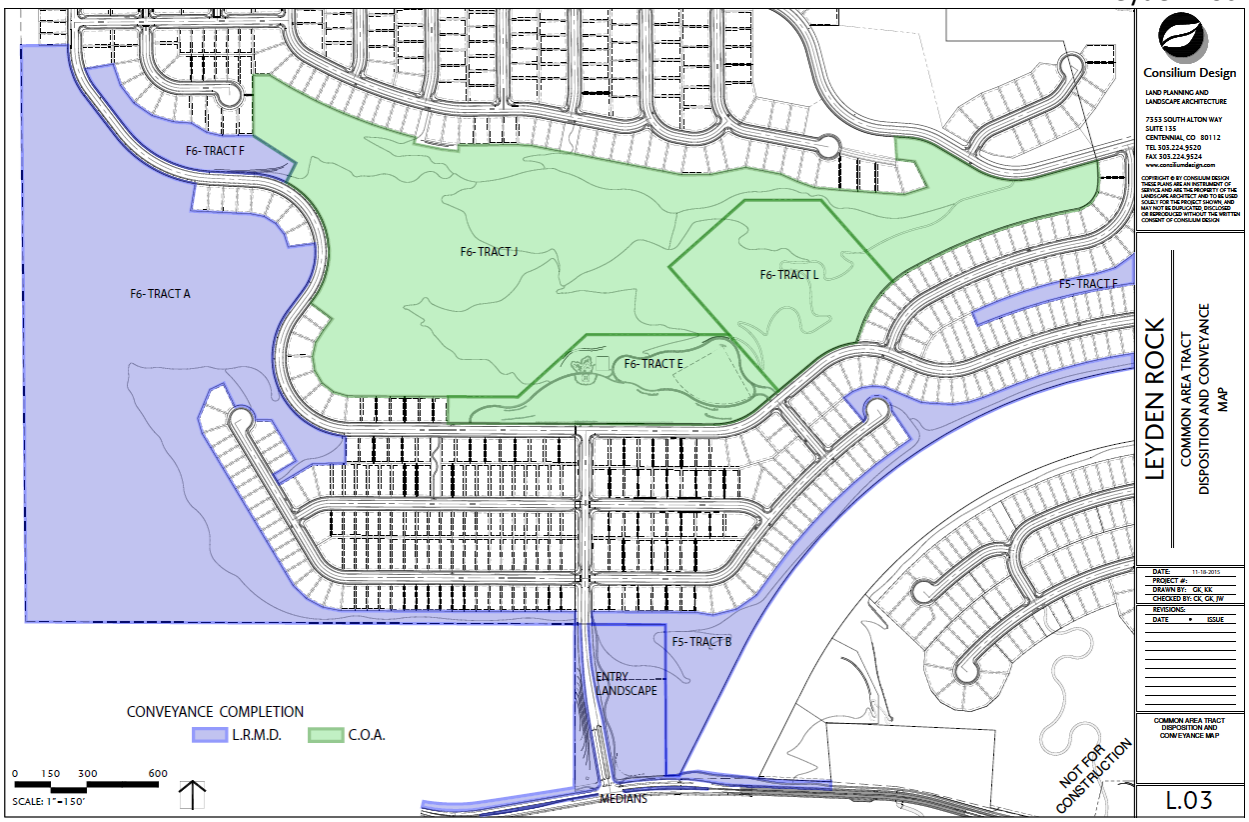

Figure 5: Tract map #2

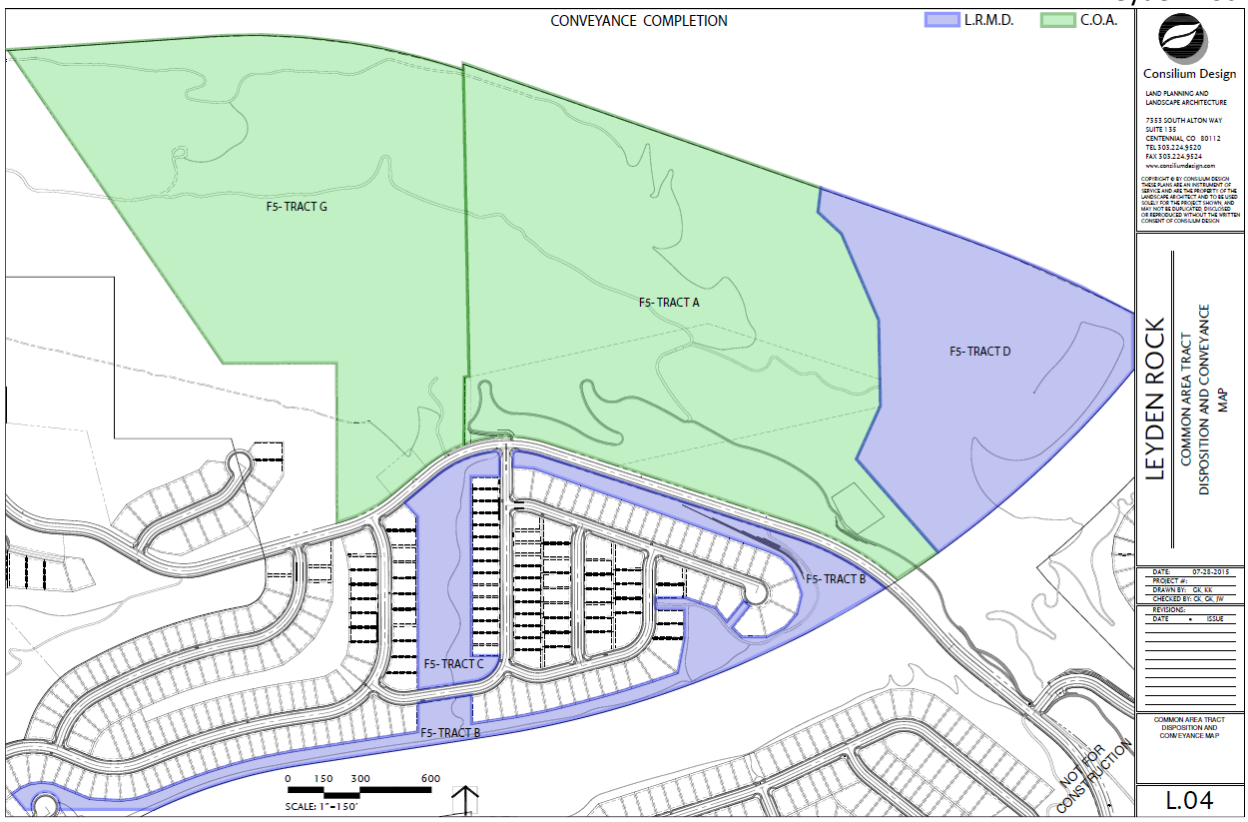

Figure 6: Tract map #3

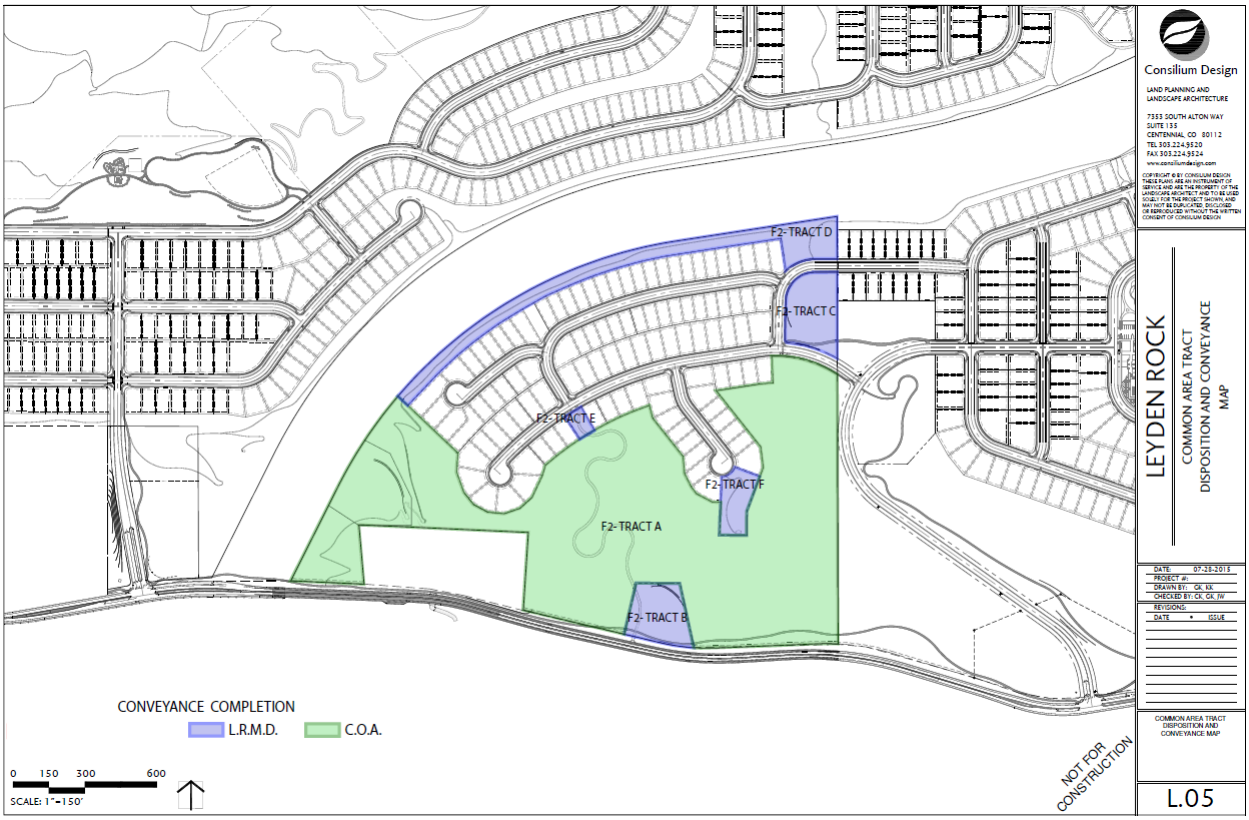

Figure 7: Tract map #4

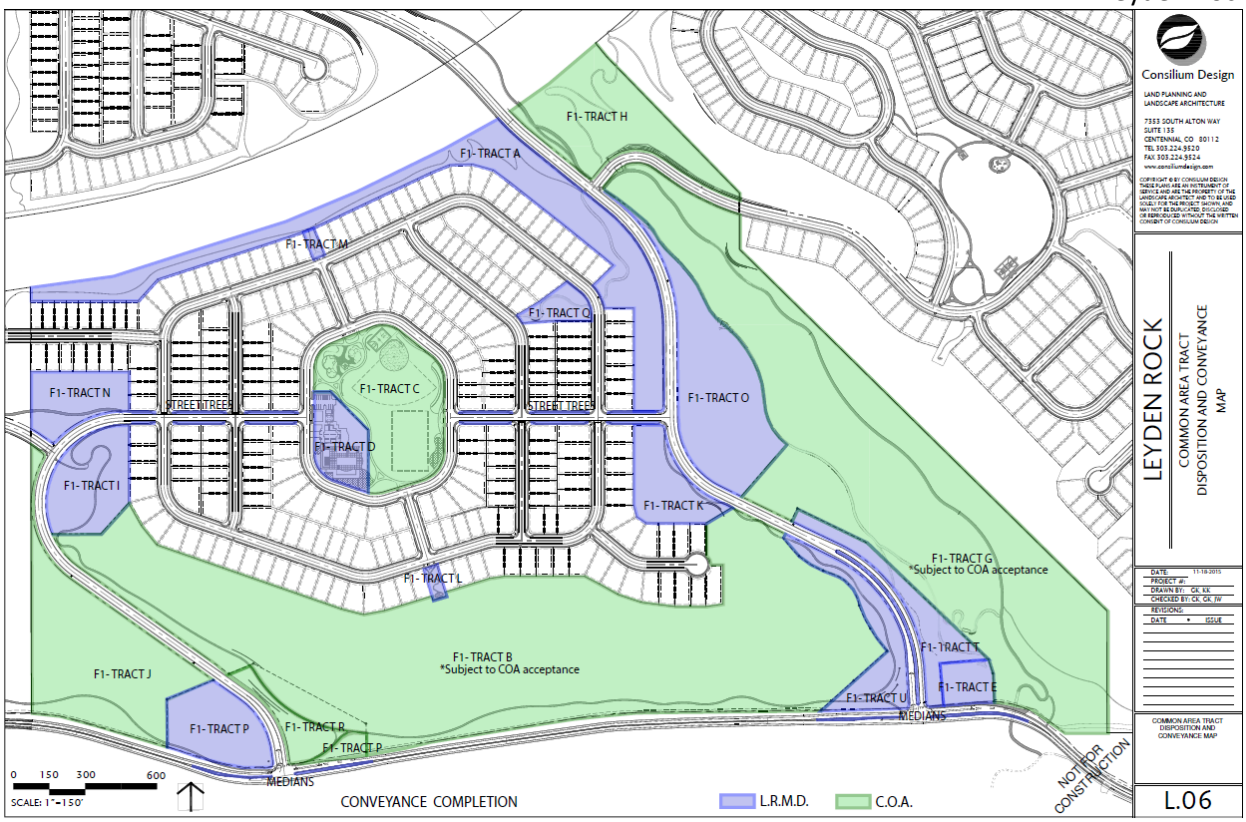

Figure 8: Tract map #5

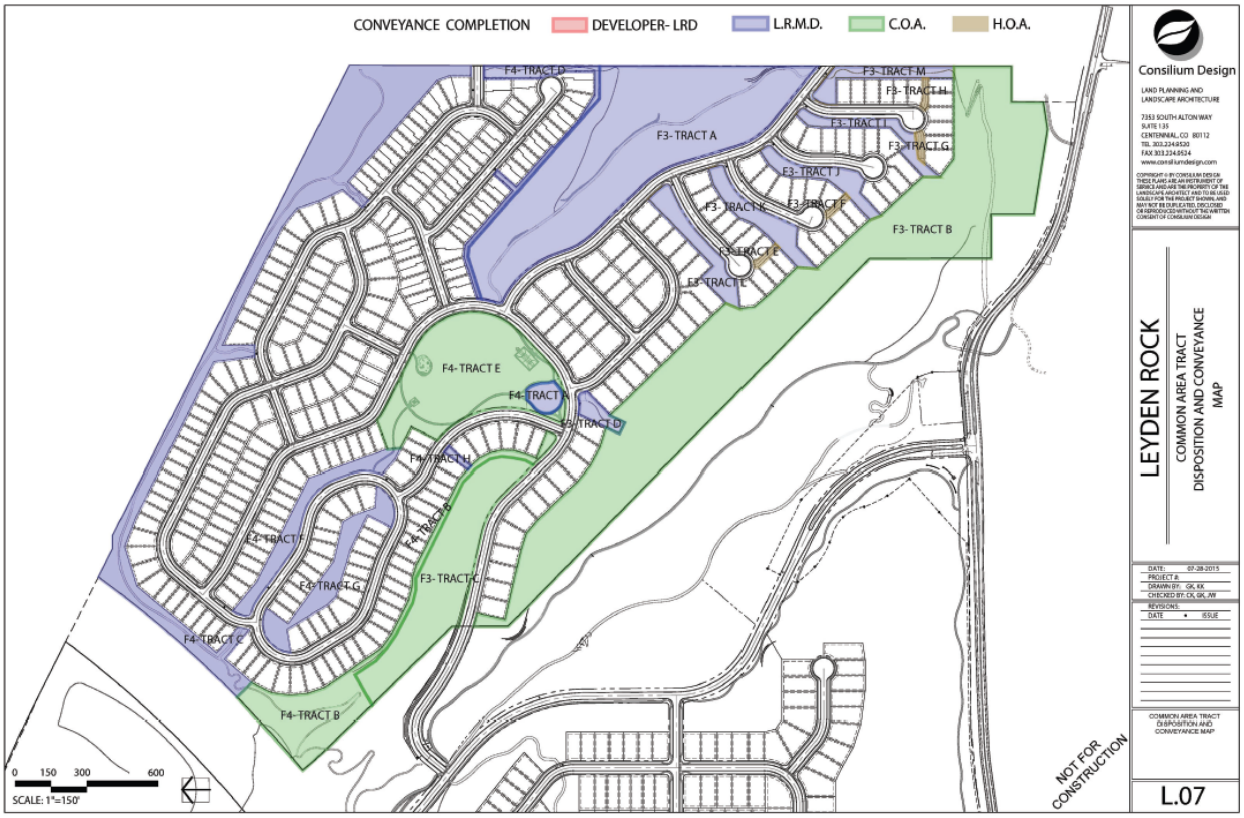

Figure 9: Tract map #6

Genus	Species	Common Name	Excellent	Good	Fair	Poor	Very Poor	Total	% of Total
Pinus	*edulis*	Pinon pine	261	107	3	3	4	378	19%
Pinus	*Negra*	Austrian Pine	152	193	13	0	5	363	18%
Juniperus	*scopulorum*	Rocky Mountain Juniper	62	160	53	6	0	281	14%
Pinus	*ponderosa*	Ponderosa pine	136	43	0	1	2	182	9%
Picea	*pungens*	Colorado blue spruce	20	58	69	3	31	181	9%
Pinus	*strobus*	White pine	0	2	55	57	26	140	7%
P. x	*euramericana*	Hybrid Cottonwood	14	77	8	1	0	100	5%
Quercus	*Robar 'Fastigiata'*	English Columnar oak	46	17	9	3	1	76	4%
Celtis	*occidentalis*	hackberry	0	8	48	1	2	59	3%
Malus	*sylvestris*	crabapple	2	30	15	0	0	47	2%
Quercus	*bicolor*	Swamp white oak	7	30	0	0	0	37	2%
Quercus	*macrocarpa*	Bur Oak	4	16	5	0	0	25	1%
Crataegus	*monogyna*	Hawthorn	0	25	0	0	0	25	1%
Gleditsia	*triacanthos*	honeylocust	2	11	9	3	0	25	1%
Amelanchier	*arborea*	Serviceberry	0	21	0	0	0	21	1%
Tilia	*americana*	Linden	2	11	0	0	0	13	1%
Acer	*Freemanii*	Autumn Blaze maple	0	11	0	0	0	11	1%
Acer	*ginnala*	Ginnala maple	6	3	0	0	0	9	0%
Pinus	*heldreichiis*	Bosnian Pine	0	4	0	0	0	4	0%
Fraxinus	*Americana*	Autumn Purple Ash	0	2	0	0	0	2	0%
Totals			714	829	287	78	71	1979	
% of Total Trees			36%	42%	15%	4%	4%		

Figure 10: Inventory Spreadsheet

Each tree is scored to relate it to its condition class. Score is added values of 6 categories each rated on a scale of 1-3 or 1-5 with 3 or 5 being the highest (best) rating. The categories are:

A. Trunk condition
B. Growth Rate
C. Structure
D. Insects and Disease
E. Crown Development
F. Life Expectancy

Condition Class follow the aggregate score of each category. See map and map legend for each tree's rating.

Excellent (Green): 23-26
Good (Blue): 19-22
Fair (Yellow): 14-18
Poor (Pink): 10-13
Very Poor (Red): 6-9

Figure 11: Tree Health Rating Scale

Photo 1: evidence of desiccation

Photo 2: Planting depth issue

(3) piñon pines, 3-4", 8', green

Photo 3: tree straps left in tree

Photo 4: additional desiccation evidence

Photo 5: bullet gall in bur oak

Photo 6: Further girdling evidence

Photo 7: Drought and possible planting issues

Photo 8: uprooted juniper to re-stake

Photo 9: Evidence of irrigation in disrepair

Photo 10: most white pines are dead or declining here