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Creating Community Greenbelts Through TDR Zoning

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CREATING COMMUNITY GREENBELTS THROUGH TDR ZONING

A TDR TRAINING MANUAL FOR LOCAL GOVERNMENTS AND COMMUNITIES IN THE INTERMOUNTAIN WEST

By

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ABSTRACT

Many cities and towns in the Intermountain West were founded on the ideals of clustered community development with surrounding greenbelts by Mormon settlers in the mid nineteenth century. Since the twentieth-century development of the automobile, increased mobility has enabled residential and commercial development to disrupt surrounding rural lands with scattered growth. Correctly applied, TDR (Transfer of Development Right) strategies could reverse negative sprawling development trends by channeling growth towards existing communities to simulate the abandoned pioneer town and country model. A community development transfer strategy can respect private property rights, and allow farmers to keep their land in agriculture while earning development income.

This report provides a description and methodology for understanding and applying TDR to current land development policies by focusing on Cache County, Utah, a chosen jurisdiction in the heart of the Intermountain West. A GIS case study further explores TDR community build-out potential by applying a greenbelt zoning model to Mendon, Utah, an 11,484-acre town and surrounding farm-belt area. The findings of this study show how the Mendon region (current population 1,436) could preserve over 9,000 acres of farmland and wildlife habitat surrounding the community while accommodating an additional 3,564 residents (a 46-year growth projection) on only 1,572 acres. Final recommendations include an inter-local governmental agreement between Cache County and local cities as a cooperative effort to direct development from county open spaces towards established community infrastructure.

Given the absence of state TDR enabling legislation in Utah, inter-jurisdictional development right transfers (from county jurisdiction into city boundaries) are not permitted. An inter-local agreement, however, would enable a city to target unincorporated receiving zones (or development zones) adjacent to existing incorporated boundaries. As a condition for city water and sewer services, a city could require that county development rights be transferred into receiving zones and developed according to city design standards. After receiving zones fill with development, a city could annex after 12 months of providing services without petition or protest from receiving zone residents. Inter-local TDR agreements are recommended by the Cache County-wide Planning and Development (CCPD) director as a means of achieving the TDR greenbelt growth patterns recommended in this research. (114 Pages)

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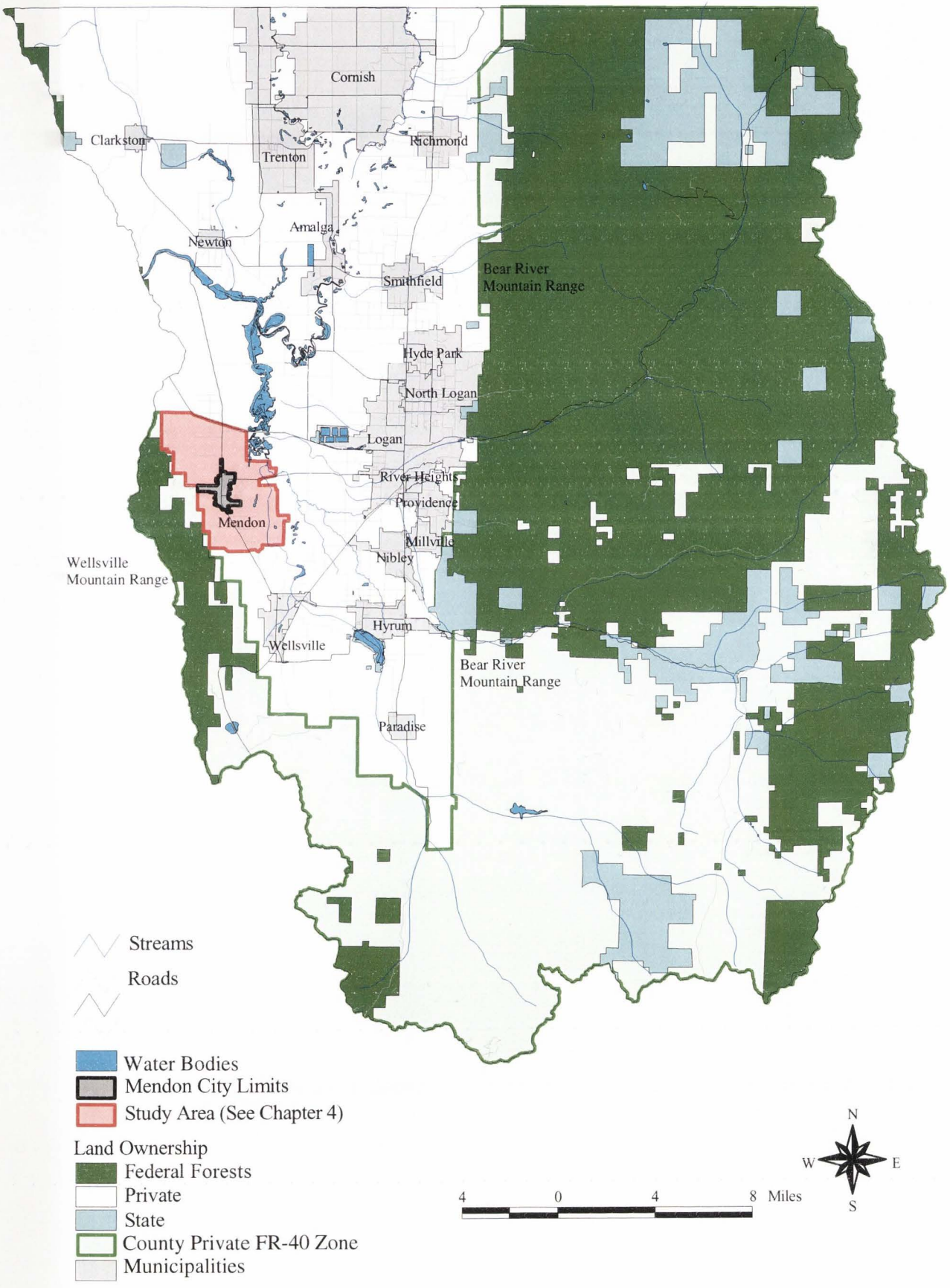
INTRODUCTION

This research prescribes a development transfer program custom suited to communities in Cache County, UT. This report is intended to assist local governments in preserving open farmland, central-valley wetlands and safe highway corridors, while respecting private property rights. Cache County's 2000 census population of 91,000 will soon arrive at 100,000, a demographic figure that heightens land development and speculation interests from local to national levels. Franchise businesses increasingly seek to profit from the county's economic progress, particularly in the county seat of Logan and its surrounding region along the east bench of the valley -- the Logan Urbanized Area. Figure 1 shows Cache County and incorporated communities located within the Cache Valley area. The Cache Valley area contains most of the county's development, and is defined by the Bear River Mountains to the east, and the Wellsville Mountains to the West. Without alternative growth strategies secured, traditional rural open spaces within the valley will continue to dissolve into American suburbs and experience the familiar problems of sprawl that plague cities and regions nationwide.

This thesis will provide a methodology to model the development potential of Cache County unincorporated lands based upon current land use policies, and the current economic supply and demand of land for residential development. These findings will then be used to create a Transfer of Development Right (TDR) growth strategy for local governments to better guide the county's growth potential into key development areas called receiving zones. Given TDR's relative obscurity in the state of Utah, and given the need for local governments to better understand this flexible planning tool, this study is also dedicated to describing and illustrating TDR and its potential for the region.

A strategically designed TDR program will create a local development right market, producing incentives for private county land owners to transfer county development rights closer to or within incorporated cities. Cities may then annex county parcels that have acquired additional development rights from other parcels in the surrounding farmland belt as an incorporation requirement and extend the public water system and other utilities. This type of annexation policy would create a land use pattern that consumes less land for development, reduces infrastructure costs and local taxes, and preserves local quality of life. **This research is intended to increase understanding of current county development**

Figure 1. Cache County, Utah



trends, and to encourage local governments to create economic incentives to promote development transfers towards their jurisdictional investments while saving surrounding open space.

Cache County also can promote development transfers by subsidizing water development, road improvements, and sewer systems in areas better suited for growth. A TDR incentive program for local governments would essentially funnel growth away from sensitive landscapes such as prime farmland, wetlands, critical viewsheds, critical transportation corridors, etc., and guide it towards more suitable areas for development while respecting of existing private property rights.

Cache County's current development climate and resulting growth pattern stems from market forces and the constraints of development policies from local and state governments. Contributing factors to the county's development market include a population increase of 2.5 percent annually, a growing economy with emerging high tech industries, the continued growth of Utah State University, and the resulting housing market demands throughout the valley. Logan, with a population of 43,695, offers employment, shopping and a state university to Cache County citizens as well as neighboring counties such as Box Elder County and Rich County, UT, and Franklin County, ID.

Current development constraints in Cache County include a state restriction on new water right appropriations (see Chapter 3, "State of Utah Water Regulations for Cache County"), a-state required minimum lot size for septic and well permits on a new building lot, and the county's latest subdivision requirements for residential housing. The state also has set water quality standards guiding the installation of individual and public drinking water systems. The county's subdivision ordinance allows a minimum lot size of 1/2 acre, although state septic and water quality regulations require a larger lot area to protect ground water from contamination. The combined requirements of these policies and their resulting financial constraints on development profits will be modeled in this study to determine current land development potential and value in the county.

With this information, Cache County communities may offer a competitive development right density to unincorporated property owners as a set number of development rights per parcel. This concept (further explored in Chapter 3), anticipates the value of development rights by modeling costs and profits of county development, modeling development restrictions, and examining development risks. Through this economic analysis, communities may better calculate the development value or the number of development

rights marketable from county parcels. Municipalities should then require that adjacent development proposals acquire additional development rights from a target green-belt area before annexation is considered. Awarding annexation to developers that acquire sufficient development rights from target greenbelt owners creates an incentive to conserve open space, and treats all property owners surrounding the community with equal development opportunity. This provisional annexation strategy would ensure that community development simultaneously preserves local open space, minimizes community taxes and impact fees, and promotes a healthy growth pattern.

CHAPTER 1: PUBLIC VALUE OF LOCAL OPEN SPACE

Cache County residents may take for granted the multiple public benefits of agricultural and natural open space. Rural open space offers much more than aesthetic and psychological benefits to the community and regional populous. The following lifestyle benefits are possible for a community's future if farmland is conserved:

1. Quality of Life: Conserved views of agriculture increase town livability by providing a quality setting for each community resident. Homes with visibility or access to open space typically enjoy property value enhancement. Wildlife such as pheasants, doves, squirrels and porcupines also enhance the appeal of rural open space. Wetland and marsh areas are also frequently adjacent to agricultural lands and host a variety of waterfowl and mammal species including the great blue heron, sand hill crane, red wing black bird, pelicans, beaver, and muskrat. Wild creatures make homes in grass embankments along agricultural fences and ditches, river and wetland corridors, forested slopes, fallow land, and forest grazing areas.

2. Reduction of Automobile Congestion: The advantages of preserved farmland apply to the functions of community transportation and safety as well. Traffic safety and efficiency improves when conserved

Figure 2. Commercial development fronting U.S. Highway 89-91, between Logan and Smithfield.

farmland reduces the number of driveways and sidewalks along highway connector routes. Land fronting highway 89-91 between Logan and Smithfield was once a significant agricultural belt that enabled efficient travel between the two cities. After a few decades of commercial development seeking frontage along the highway easement, the road has lost its effectiveness as a regional connector route. The cities of Logan, North Logan, Hyde Park and Smithfield have competed to annex this land for commercial development, creating multiple parking lot connections, driveway connections and a growing number of stoplights (see Figures 2 & 3). These interruptions intensify traffic congestion, dangerously confusing the road's function between highway and a suburban-commercial collector road.

Tables 1 and 2 compare the accident rate between the Wellsville - Logan highway segment of Highway 89 / 91to the Logan – Smithfield segment of the highway where significantly more commercial development has occurred. The increased points of vehicle access of the north Logan segment contributed to an accident rate 2.8 times higher in 1999 than the Wellsville – Logan south segment (4.11 / 1.47 = 2.8).

Table 1. Segment of Wellsville to Logan South: Mileposts 19.55 to 25.16

	1997	1998	1999
Number of Accidents	51	55	40
Accident Rate	1.88	2.02	1.47

Accident Rate = [(# of Accidents) x (1,000,000)] / [(# of years) x (365 days) x (Average Daily Traffic) x (Segment Length)]

Table 2. Segment of Logan North to Smithfield: Mileposts 28.5 to 32.32

	1997	1998	1999
Number of Accidents	118	119	146
Accident Rate	3.32	3.35	4.11

Accident Rate = [(# of Accidents) x (1,000,000)] / [(# of years) x (365 days) x (Average Daily Traffic) x (Segment Length)]

Source of Tables 1 & 2: (Lee, 2001)

Gradually, as home and business driveways plug into Cache Valley highways and necessitate slower driving speeds to minimize automobile accidents, commuting time is increased. Many businesses rely on Salt Lake City's international airport, which currently requires a commute time of less than an hour and a half from Logan. The Cache Valley Initiative, a new coalition of business interests and planners, is expressing great concern that highway 89-91 from Logan to Wellsville may become congested with roadside businesses just as the Smithfield Logan Corridor has experienced over the past three decades. Businesses that rely on airport transportation concur that competitive growth along this traffic corridor will increase commuting time to and from the Salt Lake airport, potentially requiring them to relocate their

businesses closer to Salt Lake City. Through creative planning and design, commercial nodes may be built and connected to county highways by coordinated collector roads and expanded turning lanes. Commercial nodes separated by open farmland corridors would preserve clear visibility of a surrounding expanse of green space, while reducing traffic congestion and accidents.

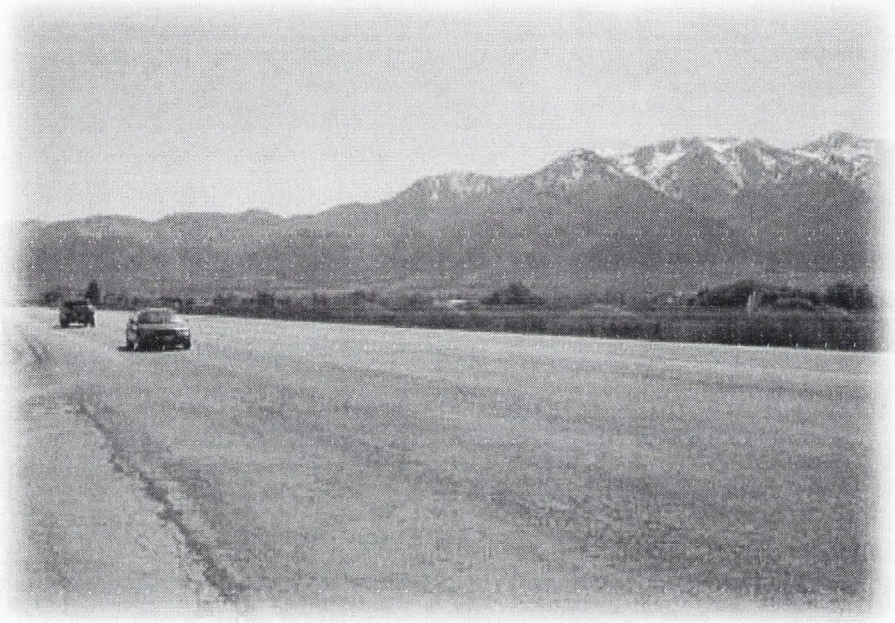


Figure 3. Farmland fronting U.S. Highway 89-91, between Logan and Wellsville.

3. Fire Protection: Community farmland functions as a public health and safety buffer by preventing forest fires from engulfing human development. Forest fire hazards took center stage in the American West during the summer of 2000, when many communities and homeowners were forced to abandon their homes to escape uncontrolled blazes. On statewide news channels in Utah, Governor Leavitt urged the state to explore methods of reducing fire tragedies and acknowledged that many of the fire-prone areas are neighborhoods built next to native forest vegetation. Communities with a surrounding agricultural greenbelt enjoy protection from possible forest and scrub vegetation fires. Development that occurs adjacent to native vegetation areas in the west risks damage from wildfire, particularly during dry, rainless seasons.

4. Flood Protection: Farmland also provides flood control and ground water recharge, and can improve local ground water quality by absorbing spring runoff and rainwater. Although many farms

throughout the United States contribute non-point source pollutants and sediments to local surface water, responsible application of fertilizers and protection of riparian vegetation can drastically improve water quality (Olsen, 1999). Despite the farming industry's need for improvement, water contamination from surface runoff is a greater problem in commercial and urbanized areas with extensive pavement coverage. The combined impervious area of roofs, roads, drives, sidewalks, curbs, and gutters increases water runoff by 10% - 20% in low density single family developments, and more than 90% in commercial developments (cited in Olsen, 1999, p. 64). Preserved open space at lower community elevations can serve as an absorption field to filter pollutants and sediment loads before surface runoff reaches open streams and rivers.

5. Reduced Infrastructure – Reduced Taxes: Communities in Cache County should preserve a surrounding greenbelt of farmland while encouraging growth towards existing development to minimize public service taxes and fees. Community farmland generates more in local taxes than it demands in local services, producing a net gain in community tax revenues. A 1994 USU community services study of Cache County estimated that agricultural tax revenues account for 5.2 percent of total county tax revenues. The expenditure–to-revenue ratio for agricultural or open lands was 0.27, suggesting that incorporated farmland receives 27 cents in services for each dollar of tax contribution. In contrast, average community expenditure-to-revenue ratios for residential development was determined to be 1.24, revealing that residences received $1.24 in services for each $1 contributed to taxes. The commercial expenditure-to-revenue ratio was 0.43, or 43 cents of services gained for each dollar spent as taxes (Snyder & Fergeson, 1994).

The study further suggests that agricultural operations in Cache County increasingly subsidize residential development as urban sprawl consumes farmland, "requiring that more funds be transferred between agriculture and commercial enterprises to residential areas." This is especially the case for a community or area such as Cache County that is "in the process of becoming urbanized," where commercial tax revenues are less available to subsidize residential development (Snyder & Fergeson, 1994).

To minimize the increasing costs of services, particularly in Logan's bedroom communities without a commercial tax base, an efficient growth strategy is crucial. A New Jersey fiscal impact study

conducted in 1992 recommended an efficient community growth strategy that would save the state $1.3 billion in service expenditures over a 20-year period. The state's plan prescribed a growth strategy that consumed 78,000 acres of farmland for future development rather than 108,000 acres without the plan (cited in Daniels & Bowers, 1997). Preservation of New Jersey's recommended 30,000 acres equates to savings of over $43,000 per acre.

To achieve an efficient growth pattern, community leaders should avoid linear annexations that reach towards speculated commercial hubs in search of tax revenues. The stream of residential housing that typically follows utility lines will likely consume any generated retail tax revenues. In 1991, Augusta County, Virginia discovered that industrial development revenues failed to cover deficits created from the accompanying residential development. Daniels and Bowers conclude in this example that "the lesson for citizens is to insist that economic development officials and politicians check their assumptions about what is good for the local economy (p. 16)."

A community that accomplishes an efficient growth pattern is better equipped to deal with natural disasters as well. In the possible event of a major flood or earthquake, the administering of emergency relief, town clean up, and repair of minimal utilities would occur in a much more timely and cost efficient manner.

6. Local Food Production: Conserving agricultural open space provides future options to diversify local crop production, a practice that may someday prove to be more profitable than mono-cultural production, or even necessary. Currently in Utah, the majority of our food products are imported from out of state (Einfeldt, 2000). If I-80, I-70, and I-15 were damaged in earthquakes, could local crops be produced to fill our grocery store shelves? Rising fuel prices may increase food transportation costs and create a stronger market for local ag products. The most optimistic global estimates project a 60-year oil reserve to supply our current energy consumption rates (Olsen & Olsen, 1999, 37). Olsen & Olsen assert that U.S. natural gas reserves will not last much longer than oil, particularly if population growth and rising oil prices increase the current rate of natural gas consumption. The American food system, which includes production, transportation, processing, and marketing accounts for 17% of total U.S. energy consumption or the equivalent of about 425 gallons of oil per capita per year (p. 38). National and international food processing conglomerates increasingly control food prices by dictating crop products, locations, and pricing

through large-scale production contracts. In national and international agribusiness, a small number of food processing giants, agricultural seed companies and farm machinery companies control large percentages of sales within their branch of the industry (Lyson, Geisler, & Schlough, 1999, p. 185). As smaller independent farms disappear, larger processing conglomerates may increasingly control food prices, creating community dependency on transported products from other regions. Despite these trend shifts, Americans currently enjoy paying less of their income for quality food than any other country in the world, or about 10 percent of our annual salary compared to Japan at 19 percent, and India at 53 percent (cited in UDAF, 2001). If rising food costs push this percentage upwards, a stronger market will exist for local farmers, reducing much of the current pressure to convert farmland to development.

Agriculture: A Threatened Industry

Many farmers subdivide their land or sell it to developers as low food prices continue to lag behind inflation and exploding housing markets. Farmland is purchased by land speculators who seek subsidies from Utah's Greenbelt tax cut program until the housing market ripens the property for development. Utah loses 20,000 acres of private agricultural land annually, or 350 acres of farmland each week. The Utah Department of Agriculture and Food suggests that "the effects of this loss are quiet for now. But if the trend continues, we might have trouble meeting our food demands by the year 2045 (cited in UDAF, 2001)."

A disturbing trend in Utah and the entire nation is the competition between land development and agriculture for quality ground. Daniels and Bowers suggest that "because prime farmland is level, gently sloping and is well drained, it is also the cheapest land to develop for houses, offices, and factories (1997, 8)." The most productive agricultural lands in Utah are direct competition with current land development patterns of communities, which also compete for limited water rights. Utah ranks number 2 in the nation for new housing units, with an average growth increase of 22.1 percent in the 90s, just behind the nation's fastest growing state, Nevada, at 49 percent - and just of ahead of Idaho, ranked at number 3. In these intensive growth areas threatened by development, 80 percent of Utah's fruit is grown, 70 percent of the state's vegetables are harvested, 30 percent of meats and grains are produced, and 50 percent of dairy products are produced (cited in UDAF, 2001).

Utah's land development momentum easily out-competes agricultural landscapes. Development profits eclipse stagnant farm product prices, and farmers face increased nuisance complaints from new suburban neighbors unfamiliar with the smells, sounds, and dust, pesticide, and herbicide realities of rural agriculture. In seeking a balance between ag-preservation and growth accommodation, some good farmland must be sacrificed near marketable growth areas. Despite the visible conflicts between agriculture and residential development, a local agricultural industry can be preserved through proper planning and design. As planning expert Tom Daniels suggests, "Communities that can protect a viable amount of farmland and support the farm operators will reap economic, fiscal, environmental, and aesthetic benefits for years to come (Daniels & Bowers, 1997, 5)." Although agriculture accounts for only 1.5 percent of the U.S. workforce and less than 1 percent of Gross Domestic Product, its effect on the national economy is much larger because of its market links to a variety of related industries. This multiplier effect circulates through machinery, food processing, fertilizer production, seed, feed, labor, and financial services to produce agricultural commodities (cited in UDAF, 2001).

As agriculture commodity prices remain low, some farmers may need to sell out of farming altogether, but should seek to sell their ground to other farmers with a manageable debt-to-income ratio. Stable farmers can afford to operate more ground for higher profit yields by maximizing use of expensive equipment investments. Unfortunately, farmers expanding their business cannot compete directly with developers when purchasing new acreage. Yet through a Transfer of Development Right program, farmers may acquire land at agricultural rates and continue farming after development rights have been transferred to other properties. A TDR program can further ensure the success of agriculture by guiding growth away from farming districts. This policy assures that growth occurs without creating too much pressure on local farms or causing owners to give up, sell, and move elsewhere. To communities that wish to strategize the preservation of a functioning agricultural landscape, Daniels and Bowers recommend that a minimum of 1,000 continuous acres is necessary for a farming area to successfully operate (1997).

Unnecessary Land Consumption

In rural communities, quality of life suffers as new development consumes more land than is necessary to support human settlement patterns. For example, leapfrog development for example - - the

practice of developing land isolated from any existing community fabric -- leaves fragmented open space between the existing community and the new development. This practice quickly places farmland or natural areas in the path of new subdivisions, and promotes inefficient and costly utility expansion. The results of this bad practice are islands of open space trapped by development on multiple sides, and interrupted corridors or large districts of open space.

Fragmented agriculture patches with surrounding development discourage farmers who must contend with increased traffic, crop vandalism, mobilization expenses, and nuisance complaints. Natural wildlife areas function better as continuous corridors or large contiguous landscapes as well. Small fragments of natural areas surrounded by development are much less attractive to animals, and are especially limiting if connectivity is lost to other habitat areas. Undersized open space islands are much more prone to invasive weeds from surrounding human activity and present a fire hazard in semi-arid climates when weeds and native grasses dry up in the late summer months. Open space islands require more maintenance, irrigation, and financial investment to keep the land desirable as a community green space amenity.

Agricultural and natural habitat open spaces on the other hand can be compatible land uses and can co-function as an interconnected system. Ranches and farms provide additional food and habitat for 75 percent of America's wildlife species (cited in UDAF, 2001). Strategic community planning can take advantage of relationships between farmland and natural landscapes to maximize benefits for both humans and wildlife. For example, a river corridor with riparian plant growth can effectively serve as a sound and visual buffer between community development and an agriculture district. This type of buffer can minimize the transfer of dust and noise from a farm to a residential neighborhood, or can prevent residential clutter such as children's bicycles from littering farm fields and damaging expensive farming equipment. Riparian areas in Cache County are typically less fire-prone than the region's open bench lands, maple forests, and juniper-sage forests, and provide vegetated connectivity for wildlife from the mountain forests to valley marsh areas. Wildlife species likewise benefit from ag-land that separates the impacts of human development from critical wildlife habitat areas. The valley marshes, for example, host a wide variety of water fowl, including sensitive species such as the great blue heron, a large bird that nests just a few miles east of Mendon. The nesting habits of the great blue heron require minimal disturbance

from humans, given their instinctive behavior of relocating when frequently disturbed by humans or predators. Ranch lands east of Mendon provide the necessary separation between the heron's chosen habitat and concentrated human development within the city limits. Wildlife habitat surrounding a community serves as an incredible amenity for local residents, supporting consumptive activities such as fishing and hunting, and nonconsumptive activities such as walking, hiking, biking, canoeing, bird watching, etc.

This recreational aspect of habitat preservation can serve as an economic boost to a community. A 1981 economic study of the Long Point Marsh in Ontario, Canada, revealed that 17,000 people visited the wetlands during the year to participate in consumptive and nonconsumptive activities. It was estimated that these visitors spent $120,000 in the local community on transportation, food, lodging, etc (Nordstrom, 1988, p. 2). Brigham City, located in Box Elder County just 35 miles from Logan, enjoys significant tourism dollars from visitors to the State Bear River Refuge, located 10 miles southeast of the city's restaurants, shops, and hotels (p. 6). The refuge attracts over 30,000 visitors to the Brigham City area from all 50 states and from foreign countries.

The cities of Hyde Park and North Logan in Cache County were once surrounded by green belts of agriculture and natural areas. Today, the visible evidence of land conversion to housing and commercial development suggests that the two communities will soon exist as one continuous suburb. Other Cache Valley communities are also merging into neighboring communities -- North Logan into Logan, and Hyde Park with Smithfield. The convergence of these communities reveals a sprawling, fragmented landscape of leapfrog housing developments, fragmented agriculture, and disenfranchised natural areas. The term "sprawling" describes the inefficient consumption of land for human development. Even smaller communities further distant from Logan such as Mendon, with a lower growth rate and smaller population than Hyde Park and North Logan, shows signs of sprawl. In Mendon's surrounding unincorporated areas, homes continue to grow along highway 23 between Mendon and Wellsville to the south, and are gradually increasing in density north of town towards Petersboro.

Suburban Atmosphere Undermining Rural Atmosphere

Another degradation of rural land by new development is the suburban character of new subdivisions. New development requirements in many small towns recreate suburbs typical of larger urban areas. These laws are frequently copied or adopted from suburban communities in an effort to "standardize" or "modernize" zoning and subdivision codes. Yet the acquired suburban design standards were initially created to accommodate increased automobile traffic flowing to and from larger metropolitan communities. The resulting street and neighborhood designs abandon rural precedents of a narrow road strip with grassy verges on either side, introducing instead a widely paved road area with curb and gutter to divert the extra water runoff (See Figures 4 & 5).

Figure 4 – A new street serving 5/8-acre residential lots in Mendon. The street pavement width from curb to curb exceeds 38 feet, requiring curb and gutter to channel away excess water runoff.

Small communities have a need to grow and host new residents, but should seek a development approach that reflects the look and feel of a rural area. The creation of suburbia in a rural town may send more residents fleeing out into the surrounding open space, attempting to claim and fence several acres of the desirable rural life. Unfortunately, the very process of claiming several acres in the country attracts more development, which eventually replaces open space with sprawling development.

Figure 5. A traditional street in Paradise with only 20-feet of paved area. Water runoff is absorbed or channeled away by the grassy verges on either side of the pavement (Photo by Ellis, 1996).

Rural Sprawl: Excessive lot Size

Another detriment to rural character - - the creation of larger lots (one acre to 10 acres or more) occurs when new residents create a country estate in hopes of guaranteeing some individual rural elbowroom. As further discussed in Chapter 2, a significant number of large lots (also known as ranchettes & hobby farms) may be integrated into a TDR open space conservation program, and serve as a critical buffer between medium density housing and preserved agricultural districts. Yet, left unchecked, the continuous creation of large lots leads to quicker consumption of a quality rural setting. Traditional country atmosphere should provide continuous open vistas of adjacent farmland or forestland surrounding a clustered village, town, hamlet or farmstead.

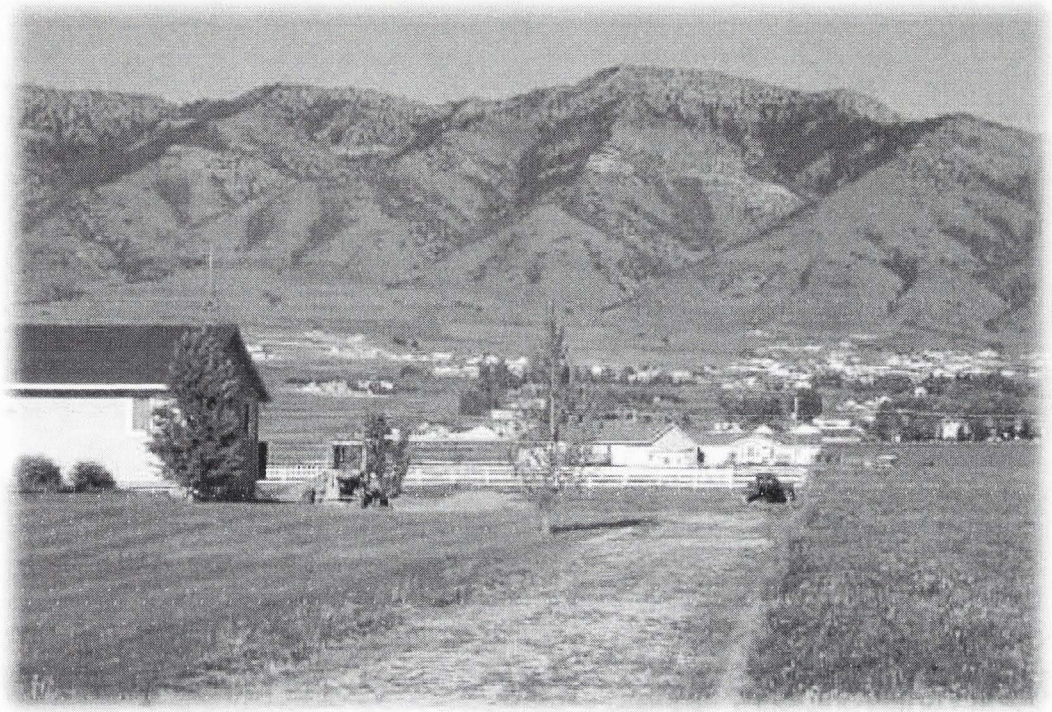


Figure 6. Large lots in North Logan disrupting farmland by extending roads and utility lines farther into the rural landscape.

Numerous large lots consume land at an increased rate and spread the visual clutter of low-density development further into the open landscape. This form of development frequently replaces crop production with large lawns that consume limited water resources for a few overworked yard owners. These large lots are prone to further subdivision by city annexations that may eventually follow and engulf the low-density development (See Figure 6). Home owners in an unincorporated low density area may seek annexation to further subdivide their lots after enough homes have beset the open countryside and tagged the land for further development. As utility lines stretch extra miles to provide urban conveniences to low-density areas (telecommunications, power, natural gas, school bus, police, fire, rescue, etc.), the cost of services per household rises, imposing on the local public for development subsidies (See Figure 7). "Growth" in the valley "may be inevitable, but unnecessary development of land is not inevitable (Hurlbert, 2000)." North Logan alone could accommodate Cache County's entire projected 20-year growth within its current annexed area, based upon the city's current zoning ordinances and vacant land area (Teuscher, 2001).

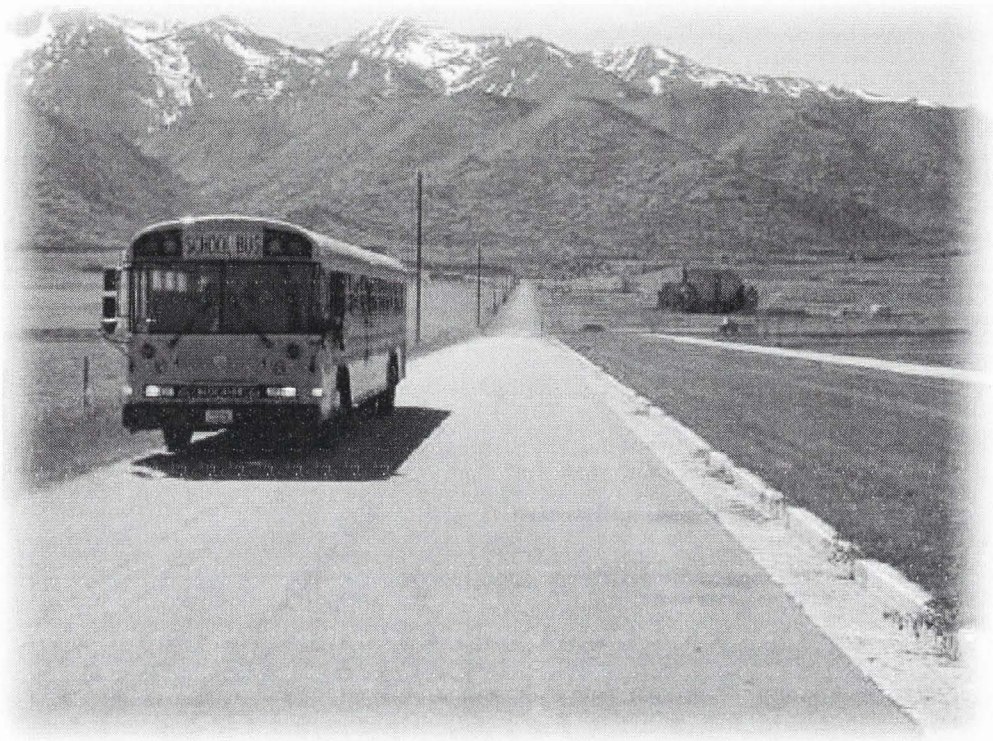


Figure 7. Isolated ranchettes in Wellsville increase local taxes by extended services to remote areas.

Despite this general criticism of large lots, they do serve a purpose in a rural environment. This study will explore how TDR can encourage a balance between medium-density and low-density lots in a rural environment. These findings will cater to a variety of homeowners, including those who desire more land to maintain rural hobby farm activities such as an equestrian operation, vegetable farming, or to earn side income through livestock and herd animal products. Communities such as Logan forbid farm animals in higher density zoning districts due to smell and sound externalities, whereas rural communities provide a compatible cultural environment for animal ownership and associated activities.

Historic Community Models

Growth Clustering residential housing and businesses within a surrounding greenbelt is not a new concept. It is a traditional concept practiced by our ancestors in European villages and in Pre-WWII towns across America. Citizens in this Swiss alpine community (Figure 8) minimized harsh winter conditions by

sharing snow removal and transportation routes, which facilitated the transfer of food and supplies throughout their

compact community. The settlement's high-density massing exceeds this study's recommended density and lot sizes for Cache County rural areas. However, the principle of clustering to reduce development costs, future maintenance costs, and conserving a surrounding green-belt are applicable. It is also important to note the scenic quality achieved by containing development and conserving the surrounding land. Today, dependence on automobile transportation, and large-scale building of freeways and highways, encourages departure from traditional community clustering practices. This shift from foot, bike, and public transportation reduces social interaction between neighbors, and increases dependency on oil energy products. Automobile dependency may also contribute to America's high obesity rate, as frequent car trips for shopping, recreation, work, etc., replace potential walking or biking opportunities.

Figure 8. Swiss alpine village showing traditional clustering pattern that maximizes community infrastructure and distribution of resources (unknown photographer).

The Mormon Village Pattern

Traditional Mormon towns in the mid-west states of Ohio, Missouri and Illinois, and in the Intermountain West region surrounding Utah, were initially designed to promote community interaction and interdependence. The Mormons -- a nickname given by critics to the Church of Jesus Christ of Latter Day Saints in the 1830s -- designed settlements to include a permanent greenbelt surrounding each

community for self-sustaining food production. Settlements in both regions shared many similarities, as well as notable differences that merit comparison and contrast. These development styles will be referred to by the names of presiding leaders who directed the settlement of new communities in each region. These styles include church founder Joseph Smith's Midwest style, and subsequent leader, Brigham Young's Intermountain West style -- a modified version of Smith's Midwest prototype.

From 1833 to 1846, Joseph Smith directed the establishment of church communities on the edge of the early 19th Century American frontier. Cities were established along the Mississippi River region of western Missouri, Illinois and Ohio, and were designed to accommodate a massive influx of immigrant church members from Europe and the eastern states. Community features included the common nineteenth-century gridiron street network, a wide street right-of-way, a central public square, the preservation of agriculture land surrounding each community, a population capacity limit set for each town, and lots that averaged ½-acre in size. Wide street right-of-ways were created to allow the turning about of a wagon team of oxen or horses.

In Utah, Brigham Young directed settlements to follow almost every aspect of the Midwest precedent, with one significant exception. Lots sizes within the preplanned blocks were increased to an average of 1 ¼ acres (2 ½ times the size of Smith's ½-acre lots) to accommodate agricultural storage within the town limits. In Smith's Midwest settlements, barns and granaries were built outside of town within the agricultural greenbelt. Young's contemplated switch from ½-acre lot averages to 1 ¼-acre lot averages in the west is visible throughout the entire state of Utah, as well as surrounding intermountain settlements in Wyoming, Idaho, Arizona and Nevada. This major shift in lot size is not so surprising considering the Mormon's recent expatriation from Midwest settlements in 1839. After a long and arduous journey by foot, team wagon, and handcart, and finding themselves obligated to settle in a strenuous desert environment, the Mormons could not afford to lose their crops to the potential extremities of nature, Indian threats, or expanding American or Mexican settlements. Agricultural resources in Utah were critical for survival, and determination to protect them within community custody was fueled by the recent memories of pillaging mobs, cultural persecution, and expulsion from Midwest settlements.

Today's standard of living seldom requires a barnyard of milk cows, chickens, grain sheds, an axe yard, or a super-sized garden behind a home. Nor must people fear the likelihood of renewed mob violence

and cultural eviction from established communities. The general need for 1 ¼-acre lots has expired, especially given our cultural shift from an agrarian society to our present technology and information age. Instead of producing life-sustaining food and material products such as leather and wool, large lots today often produce immense lawns rather than the garden and animal plots of yesterday's pioneer family. Today, limited water resources irrigate oversized turf grass areas (for home recreation and mowing activities) frequently larger than required for the average American family. For the independent gardeners in today's grocery store culture or for a family that desires a sizable lawn, a ½-acre (21,780 square feet) lot produces significant space for one family and still poses a financial challenge to keep respectable landscape maintenance and cleanliness standards.

Records of Mormon Midwest settlements recall early land use ordinances that transformed frontier land into an attractive ½-acre density living environment. In the 1830s and 1840s, Joseph Smith encouraged the owners of ½-acre lots in the city of Zion (Figure 9) at Independence, Missouri to build a house "twenty-five feet back from the street, leaving a small yard in the front, to be planted in a grove according to the taste of the builder; the rest of the lot for gardens; all the houses are to be built of brick and stone (cited in Rosenvall, p. 8)." The town of Independence, Missouri was comprised of 960 lots, with an intended maximum population of 15,000 to 20,000 people. This target population may have been overestimated, given the resulting 15 to 20 people per lot had the city flourished as planned (p. 9). However, 15-20 family members per household might have been achieved with the advent of polygamy. Today, households in Cache County average 3.27 individuals, which applied to Zion would have created a population of 3,139. In his book "Cities of the American West," John William Reps observes that a 10-acre block in the city of Zion would have held between 300 and 400 persons, or 30 to 40 people per acre (Reps, 1979, p. 290). This density exceeds this study's recommendation of medium density development for Cache County's rural communities. However, main streets of small Western towns have traditionally applied this density to mixed commercial and residential downtown areas, which today could provide a variety of housing types and commercial uses in a downtown zoning district. The intent of this historic analysis is to provide evidence that higher densities are in keeping with the early Mormon pioneer settlement patterns, and are the means by which surrounding rural land is preserved.

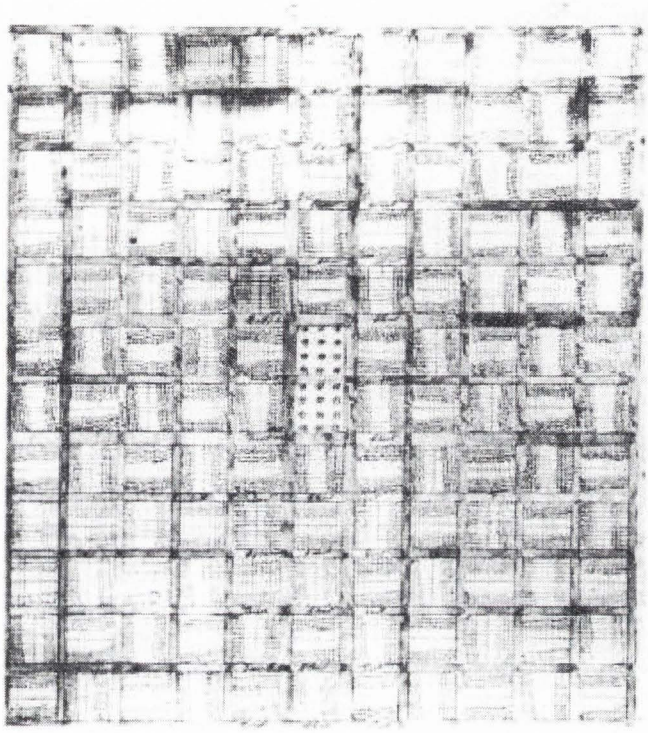


Figure 9. Plat of the City of Zion in Independence, Missouri. ½-acre lots are distributed over 10-acre city blocks. Two central blocks are reserved for religious/civic purposes. The altering orientation of lots from block to block appears to be a feature unique to Mormon cities, which allowed houses to not face each other on opposite sides of the street (LDS Church Historical Department).

Because land was cheap or available for claiming on the American frontier, the Mormons were able to plan hundreds of square miles for new communities. Today, land planning, land development, land acquisition, zoning reviews and the accompanying frequency of lawsuits creates a more difficult process for community planning and design. Another reason for early community planning success was the Mormon's renowned ability to share critical resources. Until the decade of the 1890's, the Mormon's townscape pattern persisted by influence of the United Order -- a religious law that required the equal distribution of land parcels or "inheritances," according to individual needs. Historian Charles Peterson explains that Utah agriculture shifted from a "self-sufficient farm village" phenomenon to an "Americanized agriculture" which changed the "physical as well as the social and economic forms of Utah agriculture (1973, p.2)." Peterson explains that farm holders in Utah villages had never owned their land

until federal and state land titles became available under the homestead act, state land sales (starting in 1896), railroad grants, and other federal land provisions. These changes "superimposed the American system of large, scattered parcel distribution and speculation upon the pioneer pattern (p. 6)." Figure 10 shows a remote Mormon settlement in south Cache County -- Newton, UT (population 705), with its visible pioneer pattern of a clustered community and a surrounding greenbelt.

Figure 10. Newton, Utah, still showing its early form as a clustered community with surrounding agricultural fields (Photo by Ellis, 1996).

The Church encouraged members to follow town-planning laws that allocated land according to need -- not speculation -- as a religious duty. Joseph Smith's journal records his admonition to Mormon men to live in planned cities and cultivate agriculture outside in the surrounding greenbelt:

> "Monday, August 6, 1838. I addressed the meeting on the propriety of the measure (locating the county seat at Far West in Caldwell county) and also on the duty of the brethren to come into the cities to build and live, and carry on their farms out of the cities, according to the order of God (cited in Rosenvall, p. 16)."

In today's complex landscape matrix of private land ownership, local governments must seek new planning tools if preservation of open greenbelt areas is desired or permitted as a local development option. A transfer of development right (TDR) program can channel the free market to simulate Utah's early greenbelt planning model without infringing on private property development rights.

CHAPTER 2: TDR - A FREE MARKET GREENBELT TOOL

Under a transfer of development right program, open space preservation no longer relies on financially secure property owners to donate development rights to a non-profit agency for tax savings. Nor does open space preservation rely on limited state or land trust matching grants, or local sales tax increases for public acquisition and preservation of land. Although these measures have many success stories throughout Utah and entire country, these influences are limited to individual projects and are less influential in creating broad, continuous open space corridors. TDR can better influence continuous open space by operating within local government zoning ordinances. The creation of a TDR policy can spark the local market to engage in development transfers, creating free market compensation for open space preservation areas. After selling or transferring development rights, ag-land owners may either continue farming practices or sell the farmland to another farmer at a reduced agricultural rate.

Applied to a Cache County rural setting, or an urban community located near a functioning agricultural landscape, a transfer of development right program could aid in preserving privately-owned agricultural landscapes, open grazing lands, forestlands, and marshlands. TDR zoning can respect current property development rights while channeling land development into an efficient community development pattern while preserving surrounding open space.

This section provides definition and description of TDR to raise awareness of local public officials and citizens. To provide a framework for TDR discussion, this section outlines key concepts while detailing a TDR program for a conceptual rural community. The general TDR subject categories explored in this section include: 1) the process of transferring development rights; 2) the general uses of TDR; 3) a legal discussion of TDR programs and potential takings issues; 4) common misunderstandings of TDR; 5) a TDR conditional annexation policy; 6) community in-fill and a multi-generation receiving zone; 7); TDR contrasted with cluster zoning; and 8), the economics of TDR.

The Process of Transferring Development Rights (Paraville, a Concept Community's Experience)

In a community or regional TDR program, sensitive land areas identified for preservation are called **"sending areas,"** and other land areas deemed suitable for development are called **"receiving areas."** Property owners within the sending districts may choose to sell or transfer their development

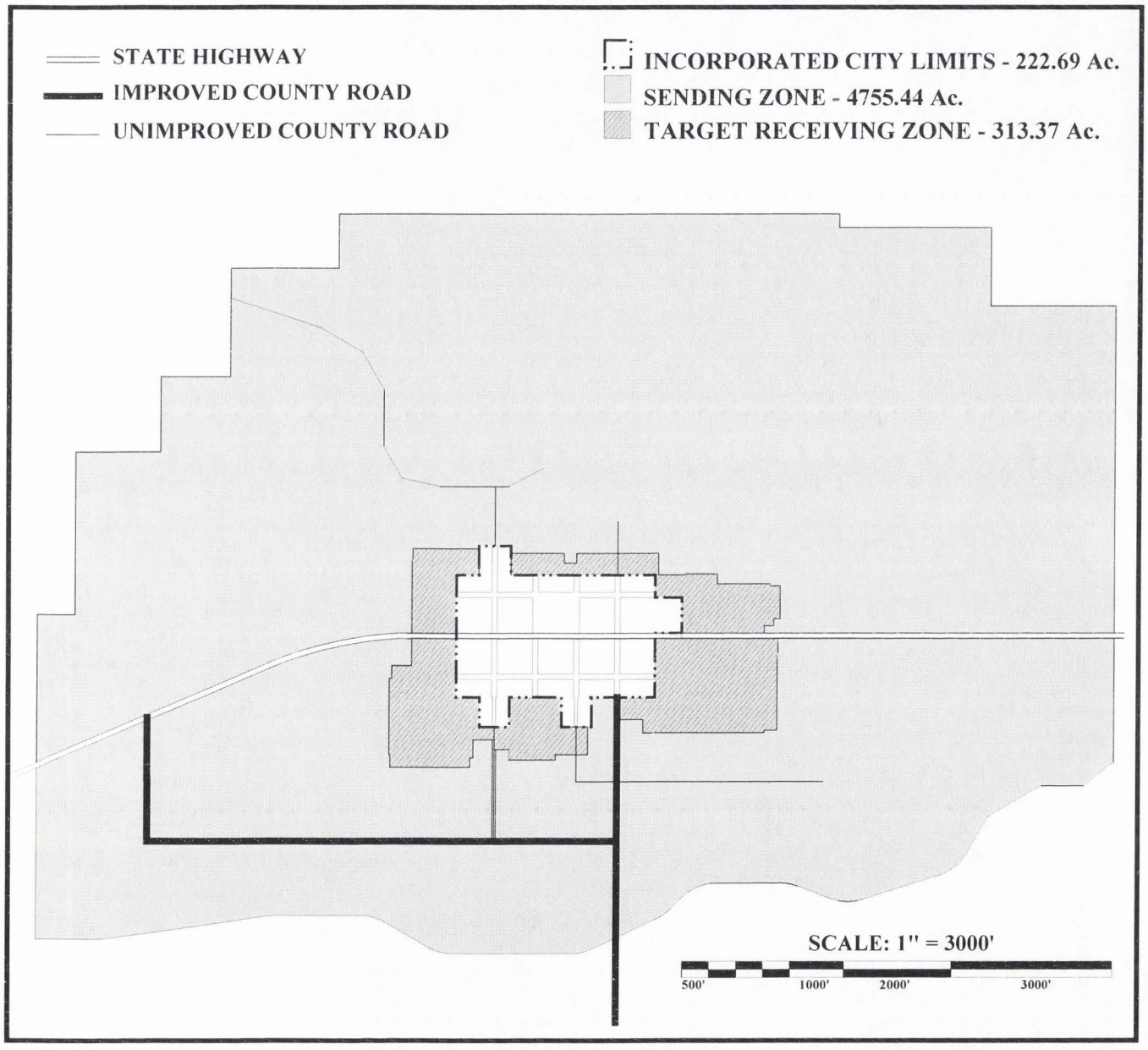
rights into a receiving area while keeping their land as open space for agricultural uses, or natural wildlife habitat. Development rights are considered to be one of several rights associated with property ownership. Property ownership can be defined in part as a set of rights that may include, for example, water rights, or mining rights. A common analogy used to describe property rights is a bundle of sticks which functions as a single package of multiple objects. Some sticks may be removed from the bundle and used or sold for other purposes, but the package still retains its identity as a bundle of sticks. So it is with property rights -- the combination of which, along with the property size, location, and its proximity to public services -- determines the full market value of a property parcel. Like water rights and mining rights, **property rights are severable** from the physical property itself, which means that these rights may be sold or transferred without selling the physical property itself. However, for local development transfers to transpire, a local government body must create a TDR zoning ordinance to create a market value for the purchase and sale of development rights.

Figure 11 shows receiving zone and sending zone areas delineated around a community that represents a small town in an imaginary county called Bear River County. The population and scale of this community is similar to a rural Cache County town such as Mendon or Paradise (refer to Figure 1), and will be named Paraville in this example. Paraville represents a small agrarian town with an imagined current population of 416, and a modest growth rate of 2.8 percent. The following development studies of Paraville (Figures 11 – 15) were created at a scale of 1 inch = 3000 feet in a computer drafting program to generate accurate cost requirements and demographic figures for meaningful TDR discussion. The scenarios represent studies created by a TDR committee -- a group of citizens appointed to explore and refine TDR options for the community of Paraville, with the aid of a planning consultant.

The total land area presented in this concept of Paraville and its surrounding area is 5291.51 acres. The incorporated city of Paraville itself currently contains 222.69 acres, of which 55.67 acres or 25% contains public improvement areas such as parks, road right-of-ways, utility services, etc. By deducting these public improvement areas from the total city incorporated area, a total of 167.02 acres of private land remain within the incorporated section.

After conducting a land use inventory within the community, and with the aid of aerial photographs, the TDR committee concludes that 25, acres or 15% of the community's private property is

Fig. 11 - PARAVILLE TDR STUDY
TARGET SENDING & RECEIVING ZONE AREAS



vacant and could someday accommodate additional development. This conclusion was based upon Paraville's current zoning standard that requires a 5/8-acre minimum lot size, which would create a total of 40 vacant lots anticipated for future in-fill development. Given Paraville's current household average size of 3.2 individuals, Paraville's vacant land could accommodate an additional 128 residents, or almost 10 years of the community's expected growth.

The Paraville committee next estimates the growth capacity of their chosen unincorporated TDR study area, which includes the unincorporated sending and receiving areas (5068.81 acres). This growth potential was estimated by applying Bear River County's current zoning standard of one unit per 10 acres as a future build-out density, and by examining parcel soils to see how many septic tanks, if any, would be permitted. The committee determined that roughly 200 acres of the total 5068.81 surrounding unincorporated area were unsuitable for septic tank development due to saturated soils, wetlands, and steep slopes. After deducting 200 acres from 5068.81, roughly 4869 acres were determined to be developable within the county, which (divided by a 10-acre lot minimum) equals 487 lots. The 487 total lot figure was then multiplied by the area's current household average size of 3.2 individuals per dwelling unit, to arrive at a figure of 1588 individuals. When added to Paraville's incorporated population growth potential of 128 individuals, a total of 1716 new individuals or 527 new lots were estimated as future growth capacity for the entire community and surrounding unincorporated area (1716 = 1588 + 128). Given Paraville's current growth rate of 2.8%, this population figure represents over 51 years of growth for the entire study area.

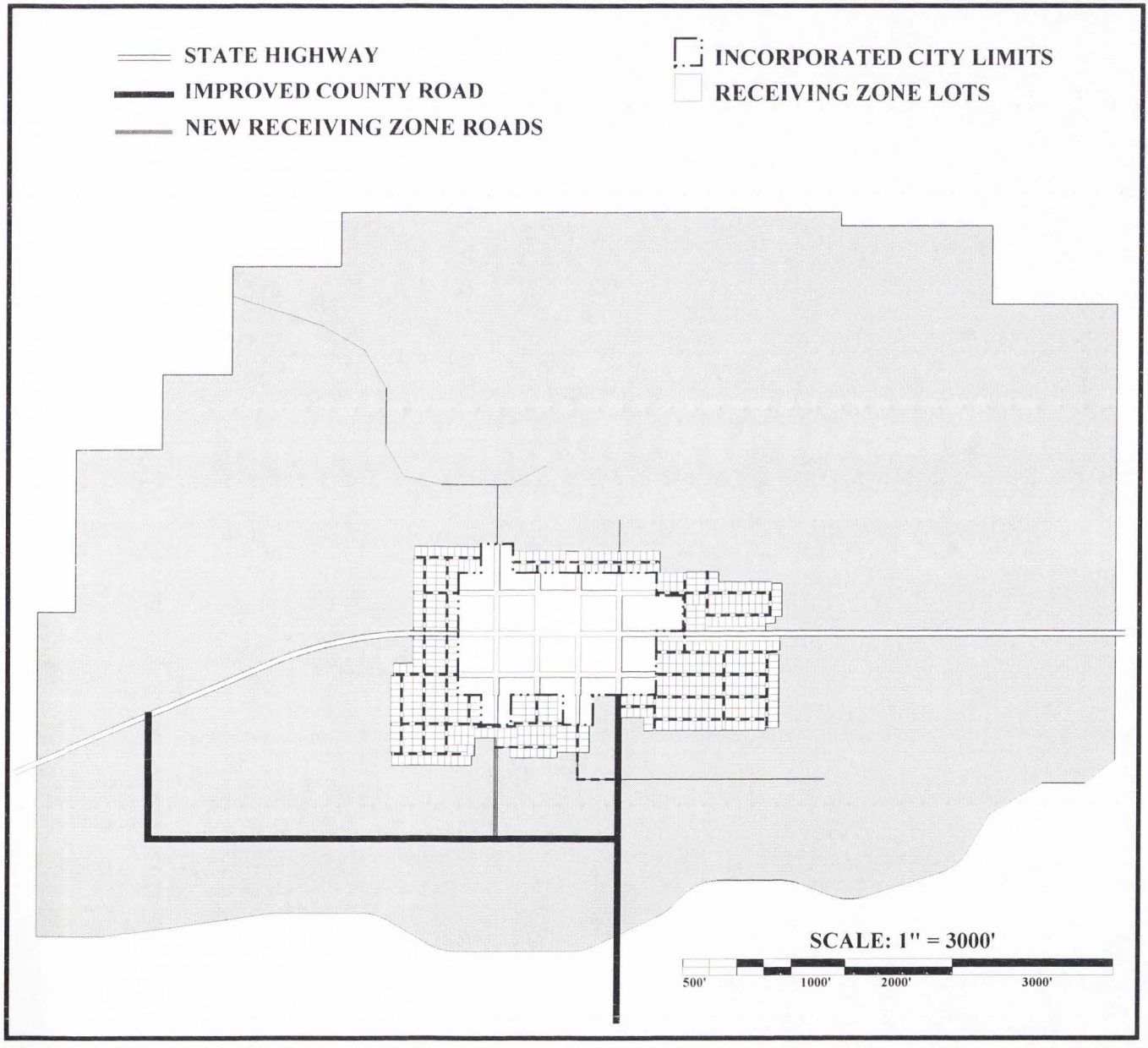
Paraville's Study of TDR Alternatives

Figure 12 shows the committee's first draft of a ½-acre lot receiving zone development next to Paraville's incorporated boundary, with the surrounding sending zone functioning as a supplier of development rights to achieve the higher density in the receiving zone. The chosen receiving zone areas lie adjacent to the incorporated city's existing infrastructure for convenient extension of roads, water lines, power lines, and future sewer system (Paraville is currently assumed to be on a septic system).

Paraville's receiving zone size and capacity for development rights (or dwelling units) from the sending zone were determined by considering the receiving zone's potential **as-of-right density**, and a **higher density limit** allowance. As-of-right density refers to the current density of the receiving zone

Figure 12. PARAVILLE TDR STUDY

TDR 1/2 - ACRE RECEIVING ZONE DEVELOPMENT



	New Lots	Rec. Zone	Private Lots	Public Impr.	Public Imp. %	New Roads	Sending Zone	Preserved Area
TDR.5 Acre	487	313.37 Ac.	245.63 Ac.	67.74 Ac.	0.276	41,706 l.ft.	4,755.44 Ac.	4,755.44 Ac.
TDR Large Lot	487	560.17 Ac.	484.21 Ac.	75.95 Ac.	0.157	46,617 l.ft.	4,508.65 Ac.	4,508.65 Ac.
Cluster	487	NA	249.93 Ac.	104.89 Ac.	0.296	76,150 l.ft.	NA	4,818.88 Ac.
County Large	487	NA	4,875.70 Ac.	194.23 Ac.	0.04	141,009 l.ft.	NA	NA

before any additional development rights are transferred in from the sending zone. Paraville's as-of-right density matches the current county density allowance of 1 unit per 10 acres. The higher density limit refers to the receiving zone's maximum density allowance permitted when transferring in development rights. Paraville's receiving zone was assigned a higher density limit of 2 units per acre or a ½-acre minimum lot size, a slight density increase from the 5/8-acre old-town density. The committee concluded that ½-acre lots would maintain the rural lifestyle of the community and facilitate yard maintenance, while still accommodating individual septic tanks. The committee also concluded that a slight density increase in their target receiving zone areas would increase incentive for developers to acquire development rights from the surrounding sending area. This conclusion was based on an expected increase of lots per development and resulting sales increase for developers.

Another key concept used to create this TDR scenario is the sending zone **base line density.** Base line density refers to the sending zone's density allowance, or the number of units that could be developed on the land parcel without participating in the TDR program. In the case of Paraville, the sending zone remains in unincorporated county jurisdiction, retaining the county's density allowance and minimum lot size of 1 unit per 10 acres.

Paraville's ½-acre receiving zone development at 313.37 acres includes 60 foot street right-of-ways that connect to the community's existing street network. The number of lots created in the receiving zone matches the county unincorporated density projection of 487 lots. The total land area devoted to public improvements (street right-of-ways, parks, utilities, etc.) within the receiving zone is 72 acres or 23% of the total receiving zone area. In this scenario, it is important to remember that the receiving zone's base line density of 1 unit per 10 acres accounts for about 83 of the total 487 development rights tucked into the receiving zone. With this TDR strategy, Paraville's committee projects the potential preservation of 4755.44 acres of surrounding open space through development right acquisition.

When development rights are transferred or severed from property, the sending parcels must undergo a **deed restriction** to prevent further development from occurring on the property, or to prevent additional development rights from being claimed and transferred in the future. A deed restriction is applied to property through a **conservation easement**, which is a legal agreement between the property owner and another party – usually a private nonprofit land trust. The agreement specifies that no further

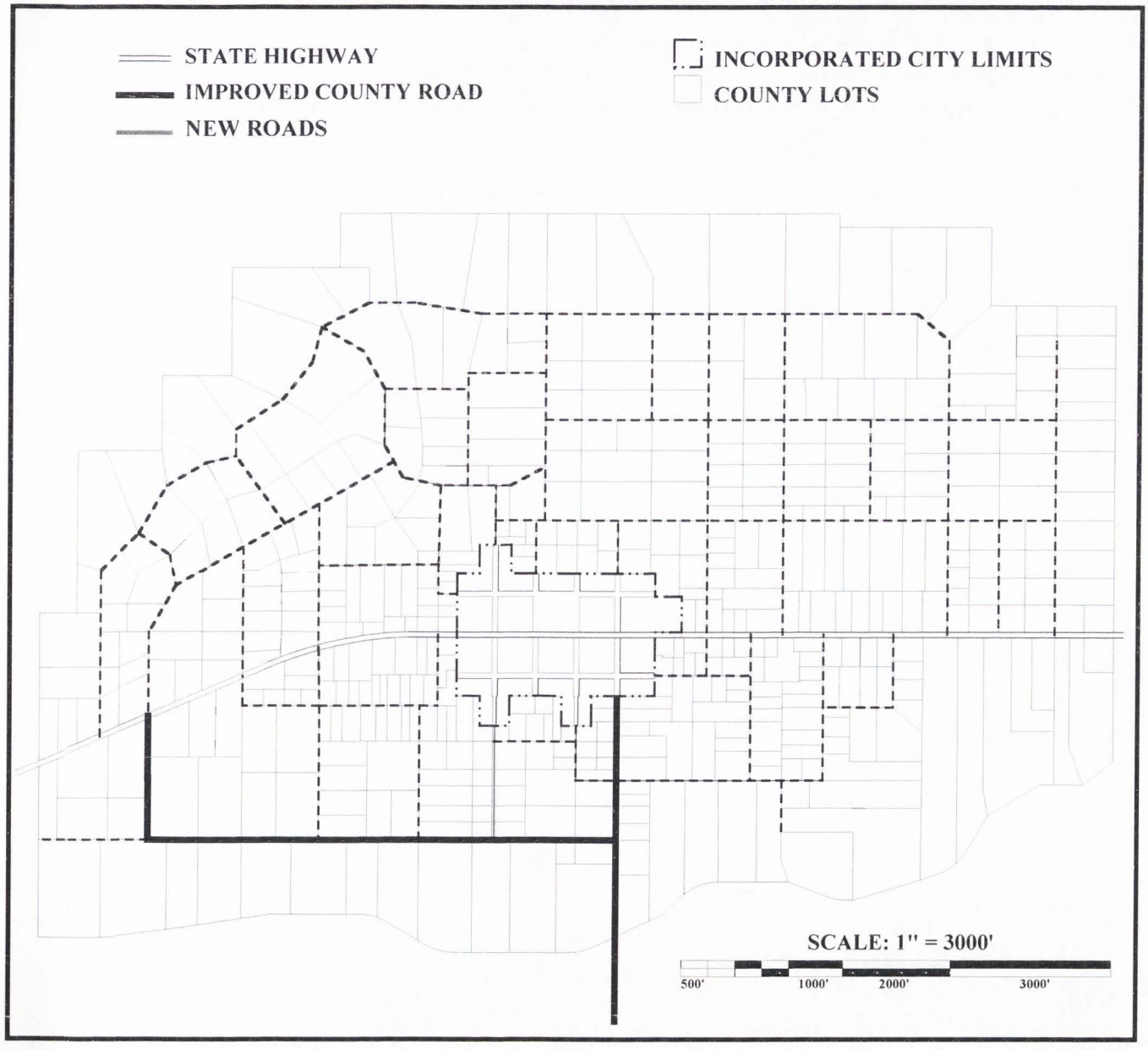
development will take place on the property, and spells out appropriate future practices on the property such as agriculture, outdoor recreation, etc. The private land trust assures that the deed restrictions are recorded in the county tax records and that participating landowners and local governments honor the conservation easement's provisions.

Figure 13 shows the undesired development potential of the entire unincorporated Paraville region under Bear River County's 1 unit per 10-acre lot size average. Notice the large quantity of new roads and extended distance of utilities such as power, telecommunications, natural gas, and services such as police, fire, school, and medical routes. The difference in utility expansion between the former receiving zone scenario and the county large lot scenario is astounding, considering that both developments accommodate the same number of lots and the same population count. **Total road lengths for the receiving zone concept (figure 7) amount to 41,706 feet, whereas the county large lot development scenario (Figure 8) produces 141,009 feet of road.**

The advantages of preserved farmland as outlined in the introduction collapse under the continuous large lot scenario. Paraville's quality-of-life diminishes as scattered houses and sheds interrupt quality views of the area. Local highways lose their function as an efficient transportation corridor, and the multiple driveway and road intersections increase the risk of automobile accidents. Inefficient expansions of utility lines are more costly and difficult to maintain, requiring taxpayers to subsidize these conveniences for relatively few individuals. The depicted large lots in Figure 13 are too small for traditional farming practices. Although smaller agricultural lots could produce truck farming products such as organic fruits, vegetables, and beef at smaller quantities, adequate water rights are necessary for full irrigation of a productive truck farm in the Intermountain West. Many large lot owners lack sufficient water rights to irrigate their lot and create a large, thirsty lawn or default to a weed farm. Traditionally, non-irrigated farming or dry farming of grain and alfalfa has applied better to a large contiguous agricultural landscape. Dry farming requires fewer operational disturbances from fences, driveways, and buildings. These interruptions also tend to collect weed seeds that pose an extra burden to farmers and adjacent landowners.

Paraville's TDR planning committee unanimously agreed that the TDR ½-acre scenario produces a superior build-out pattern compared to the county large lot scenario, but discovered two concerns with the proposed receiving zone area. First, a local farmer serving on the committee expressed concern that the

Figure 13. PARAVILLE TDR STUDY
COUNTY LARGE LOT DEVELOPMENT



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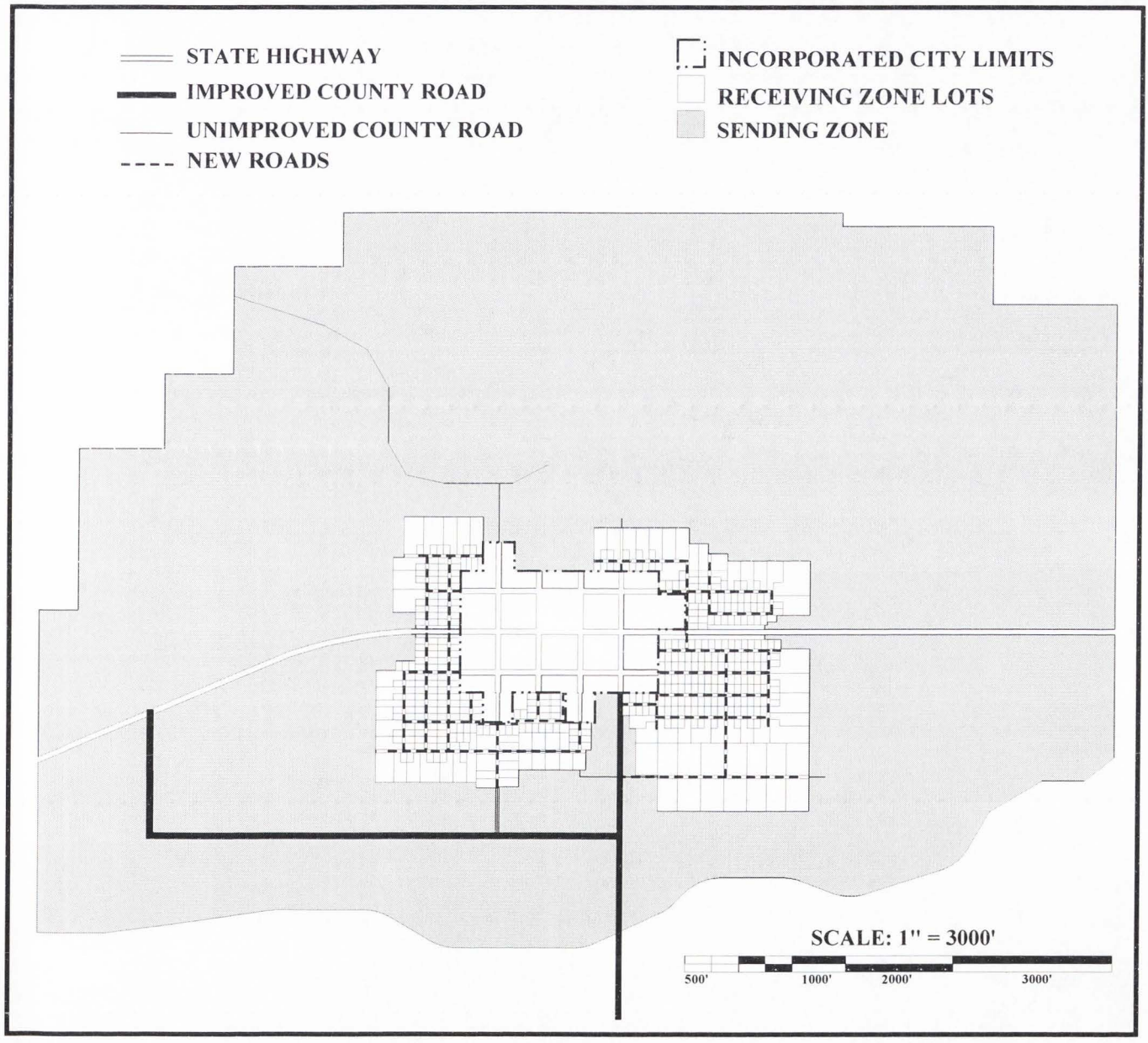
receiving zone's medium density would create land use conflicts between a preserved agricultural sending zone and new receiving zone development. The farmer was already familiar with complaints from new residents of manure odors, fertilizer blow over, dust, and noise from late night baling during the limited harvest seasons. The farmer also feared that close proximity to more compact development would increase incidents of crop theft and vandalism, as well as damage to his machinery from residential intrusions such as children's bicycles, or lawn chairs left or blown into fields.

Another committee member voiced concern that ½-acre density development failed to accommodate prospective homeowners seeking small hobby farms, horse farms, or organic produce farms. The committee agreed that a significant number of households demand a larger lot in a rural area where livestock and herd-animal ownership is permitted, and felt that such needs should be accommodated in their community.

Large Lots as Buffers to Agriculture

Through further research of agricultural TDR planning techniques, the committee learned that large lots can provide a key role in a community or regional TDR land preservation program. To address the problem of medium density housing in receiving areas conflicting with adjacent farmland in sending areas, the committee applied a buffer of large hobby farm lots around the receiving zone perimeter. This design solution addressed the farmland conflict potential and the large lot demand issues simultaneously. The TDR large lot buffer concept integrates lots with a deep back-lot area to create separation between the preserved agricultural area and the ½-acre building lots in the receiving zone. Figure 14 shows a large lot buffer applied to the receiving zone perimeter with lots ranging in size from 1 acre to 8.5 acres. The fronts of these hobby farm lots are nestled next to the ½-acre lots along the outer ring of the receiving zone, and access the same road for lot frontage. Viewed from the street, many of the larger lots might appear to be the same size as the ½-acre lots since they have the same road frontage width. The larger lots, however, extend between 420 feet and 550 feet beyond the rear of the ½-acre lots. Hobby farm owners, truck farmers and organic producers must assure that agronomic activities are compatible with the adjacent clustered development, with reduced sound, sight, and smell impacts.

Figure 14. PARAVILLE TDR STUDY
TDR LARGE LOT RECEIVING ZONE BUFFER



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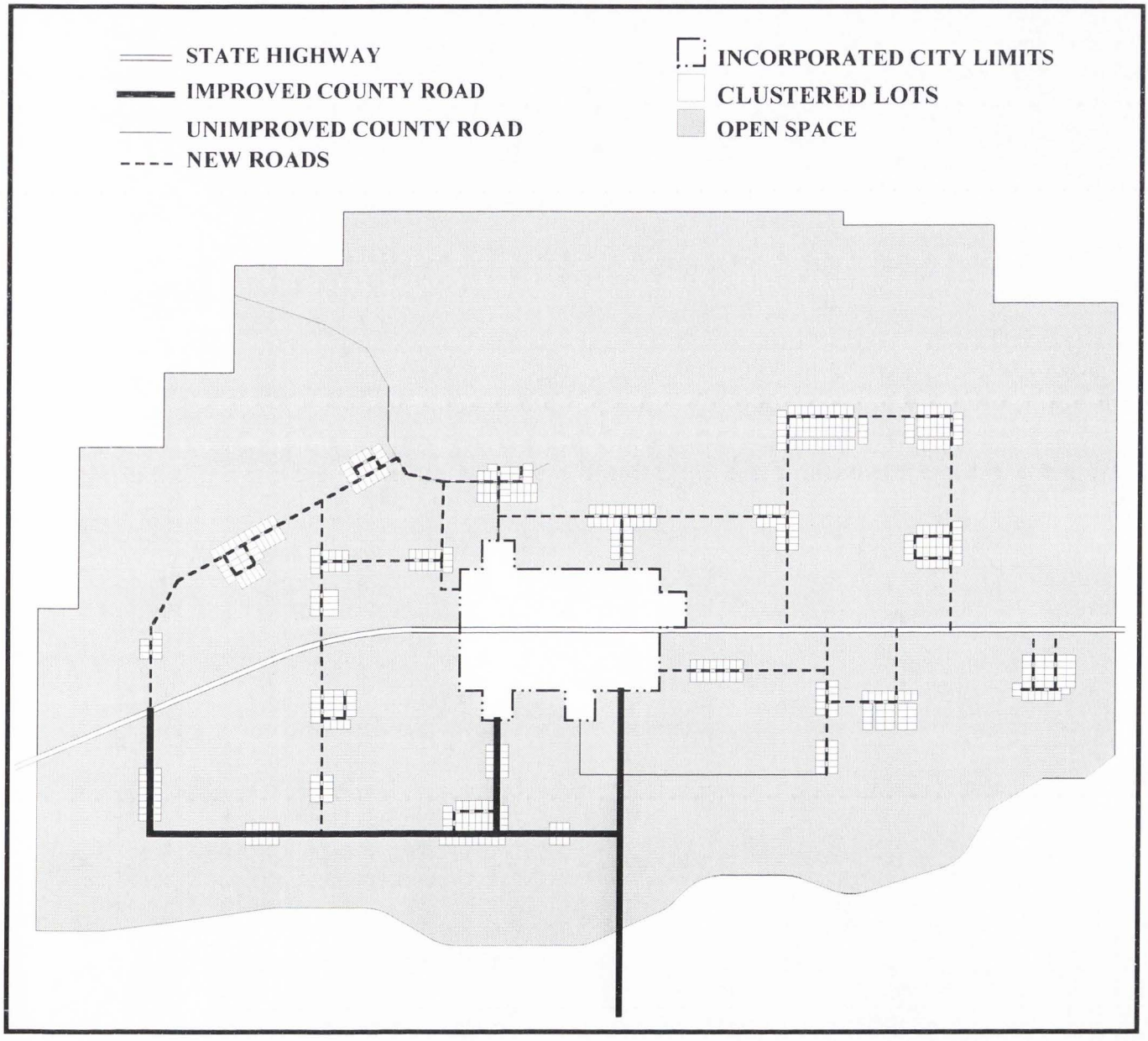
County Large	487	NA	4,875.70 Ac.	194.23 Ac.	0.04	141,009 l.ft.	NA	NA

In a 1997 compatibility study between farmland and adjacent residential development in Nova Scotia, Canada, compatible agricultural uses were classified in three categories: low, medium, and high. Compatible agricultural practices, or high ratings were assigned to 1) tree farming, 2) organic vineyards with minimal spraying, and 3) hobby farms. Moderate ratings were assigned to uses such as 1) organic orchards (with no spraying), 2) grain and corn row crops, 3) grazing pasture, 4) dairy operation with a grazing pasture buffer, 5) hay and alfalfa, 6) strawberry farms, 7) vegetable farm & market garden, and 8) blueberry farms. Low ratings for incompatible agricultural uses were assigned to 1) feedlot operations, 2) poultry farming, 3) hog farms, and 4) dairies or feedlots without grazing pasture as a buffer (Dunphy 1997, p. 114). The study recommends a 300-foot buffer between rural home sites and moderate agricultural practices, or a 500-foot buffer between low-density residences and non-intensive agriculture. A 1000-foot buffer is recommended to separate high-density residential units and low compatibility agricultural practices (p. 97). Buffers should incorporate moderate or highly compatible agricultural uses as well as a vegetation screen to minimize complaints from residential neighbors. This type of buffer could replace large hobby farm lots as separator between intensive agriculture and medium density receiving zone development.

In this large lot buffer scenario, the Paraville TDR committee restricted large lots near the community entrances along the state highway and county road. This action was aimed to prevent the community gateway image from portraying itself as a cluttered containment of animal shelters, feed lots, and personal belonging storage such as RV's, automobiles, snowmobile trailers, etc. A vegetative buffer was also proposed to hide such undesirable sights by screening the back lots from highway entrance views. This ag-buffer TDR scenario matches the 487 lots achievable under Bear River County's 10 acre lot size average. It is a comprised of 414 - ½ acre lots, and 73 larger lots for hobby farms. The total land area of the receiving zone (including the large lot buffer area) contains 560.17 acres, while the resulting sending zone area potentially preserves 4,508.65 acres of open space.

The Parville committee next created a cluster subdivision scenario to compare the county large lot and TDR development scenarios. Figure 15 shows 487 lots clustered into islands of development in the surrounding open space. Although this development technique saves more farmland than the TDR large lot buffer scenario (4,819 acres compared to 4,509 acres), the potential for conflict between residents in

Figure 15. PARAVILLE TDR STUDY
CLUSTER DEVELOPMENT



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isolated development clusters surrounded by agricultural activities creates a less desirable situation for the local farmers.

The table included in figures 11 through 15 shows in comparative summary, the consumption of land to accommodate 487 new units. The table also shows the total length of new utilities and the potential preservation of open space. Comparisons clearly show that the TDR large lot buffer scenario caters to a greater variety of landscape users than large lot development or clustering zoning, including farmers, hobby farm owners, and traditional medium density homeowners. Although the TDR large lot scenario in contrast to cluster zoning preserves 310.23 less open space acres, it preserves the agriculture industry better than the interruptions created by new development clusters.

Proof of reduced development costs and tax savings is found in the new roads column, which contrasts the length of roads and utilities between the TDR ag-buffer scenario, the county large lot scenario, and the cluster development scenario. The TDR ag-buffer scenario produces just under two-thirds or 61.2% the length of roads required in the cluster scenario, and one-third (33%) of the roads generated in the county large lot scenario. When considering the recurring public costs of road plowing, road maintenance, police and fire protection, and school bus routes, TDR factors decisively into tax savings for local citizens.

The General Uses of TDR

A variety of TDR programs have been applied by local governments in counties, townships, and municipalities throughout the United States, each with a unique set of preservation goals. Rick Pruetz, author of "Saved by Development," has identified 13 broad TDR classifications from his national survey of current TDR programs throughout the country. His classifications include Environmental, Farmland, Flexibility, Historic, Housing, Infrastructure Capacity, Landfill Buffer, Open Space, Recreation, Redeveloped Areas, Revitalized Downtowns, Rural Character and Urban Design. Preutz suggests that TDR "can be used to preserve – or create – just about any resource of importance to a community (Preutz, 1997)." This subsection merely skims over a few programs throughout the nation to shed light on TDR's versatility and ability to cater to unique preservation goals and needs of a community.

Examples of TDR programs catering to environmentally-sensitive lands include that of Collier County, Florida; its program is designed to preserve wetlands and coastal islands. San Bernardino,

California, has developed a program that entices development away from steep slopes, geologic hazards, and significant views. Utah's West Valley City has enacted a municipal program designed to preserve 350 acres of wetlands near the city's industrial and commercial zones. The preserved wetlands are intended to function as continued wildlife habitat, ground water recharge, and flood hazard prevention, to serve as a park and trail system.

Historic preservation, urban design, and redevelopment programs create incentives for developers to apply development volume rights towards other strategic city districts. For example, a historic preservation program can preserve significant historic structures by allowing transfers of additional volume rights or air rights (the right to build to a city's specified building height by district) to other development sites with increased volume or building height allowances. Pruetz sites Denver, Colorado, for example, as a program that rewards historic building renovation by allowing the transfer of four square feet of floor area for each square foot of floor area preserved or renovated in the landmark historic structure. In downtown San Francisco, at least 10 historic buildings have been prevented from destruction as owners have transferred unused development volumes to other projects in the city.

Pruetz sites the Malibu Coastal Zone of California as an example of an infrastructure capacity program that seeks to prevent growth near the rugged Santa Monica Mountains. Anticipated growth near the mountains appeared to require extensive future roadway expansion. The projected costs of new road improvements required significant public expenditures to build on the difficult terrain. TDR is being used to transfer residential development away from the Santa Monica Mountains to prevent the need of road expansion for regional commuting.

Perhaps one of the best known TDR programs in America -- Montgomery County, Maryland -- is an agricultural conservation program. Montgomery County's total population of 757,000 and total land area of 323,000 acres allows transfers to occur from a 91,591-acre sending zone into nine receiving areas. Since the program's inception in 1980, the county has preserved over 45,000 acres of agricultural lands (roughly half of the county's agricultural reserve sending zone) using development transfers and accompanying deed restrictions.

In Montgomery County's TDR program, the sending zone was down-zoned to a lower baseline density, from 1 unit per 5 acres to 1 unit per 25 acres, but despite this decrease in density, landowners may

transfer development rights at the original rate of 1 unit per 5 acres. In TDR terminology, this concept is defined as a sending zone **transfer ratio**, or the total number of transferable development rights when a landowner participates in the TDR program. Transfer ratios usually express a net increase of development rights that may be transferred, such as 5:1 in Montgomery County. A transfer ratio of 5:1 suggests that for each development right owned in the sending zone, five units may be transferred into a receiving zone. A transfer ratio can serve as a strong incentive for TDR participation, and it can appease property owners that experience a significant down zone. A landowner in Montgomery County with 100 acres may choose between subdividing and building 4 homes on the property premises, or transferring 20 development rights into a receiving zone.

Developers in Montgomery County's receiving zones find it more profitable to purchase and build with transferred development rights than to purchase and develop in the sending zones at 1 unit per 25 acres. Sellers in sending zones also find strong profit returns by selling development rights to developers in the receiving zones. Montgomery County has supported their TDR program by implementing additional planning tools, including agricultural zoning, voluntary agricultural districts, a public TDR fund to stimulate the TDR market, and infrastructure funding to influence the location of utilities and subsequent development. To protect agricultural areas from the impacts of developing receiving areas, the county created a buffer of more than 13,000 acres of parkland. Since 1980, only 4,000 acres within the Agricultural Reserve have been converted to uses other than farmland (Preservation Alliance of Virginia, 2001). One criticism of Montgomery County's program is that it has not created inter-governmental agreements with incorporated cities to send development rights into incorporated communities. Inter-jurisdictional development transfers would allow communities to coordinate receiving zones areas with the county, and absorb development rights into incorporated boundaries.

Pitkin County, Colorado, has created inter-jurisdictional TDR agreements with three incorporated communities and one unincorporated community. These three communities receive development rights from the county's sending areas into city receiving zones. The Cities of Longmont (population 60,300), Lafayette (population 17,574), Boulder (population 95,000), and the community of Niwot (population 3,500), have all signed an inter-governmental agreement (IGA) with Pitkin County in a joint effort to preserve prime farmland and environmentally sensitive areas. Similar IGA discussions have occurred with

the City of Louisville (population 18,525), Erie (an unincorporated town of 2,070 people), and Lyons (also unincorporated with a population of 1,300). Participating municipalities create a projected preservation zone of county land surrounding their developed core and require a minimum percent of received development rights to come from this preservation zone. This enables community residents and new residents in the receiving zones to enjoy the immediate benefits of locally-preserved open space (Pruetz, 1997).

TDR programs appear to be functioning at a diverse scale range, from municipalities and townships to entire counties. One example of an emerging smaller scale agricultural TDR program is Washington Township, Berks County, Pennsylvania, with a population of 2,800. Although intensive development pressure has yet to hit this 15-square mile area, Washington Township's elected officials felt that preparation for growth was critical given the township's 35-mile commuter distance from Philadelphia on a state highway. Land use consultants carefully constructed Washington's TDR program with joint assistance from the Township Board, the Planning Commission, and the township's Agricultural Advisory Committee.

Washington Township's existing agricultural preservation area was established as the sending site, and the receiving site was placed between two unincorporated villages, Barto and Eshbach. The planning group concurred that a new public sewer system would soon be required to replace the villages' ailing septic systems, and determined that existing homes and businesses would benefit financially by connecting to the same receiving zone sewer system. The maximum as-of-right density of the receiving zone was established at one unit per acre. A developer may take advantage of higher density limits in three categories: 1) 1 unit per 37,500 square feet; 2) 1 unit per 25,000 square feet; or 3) 1 unit per 5,000 square feet (applicable to downtown commercial and mixed-use areas). These development options cater to a diversity of development interests and investment capabilities.

The base line density of the township's sending zone is factored on a sliding scale that allows the transfer of one development right unit from a 6-acre parcel, 2 units from a 15-acre parcel, 3 units from a 45-acre parcel, 4 units from a 90-acre parcel, and 5 units from a 175-acre parcel. An additional 100 acres beyond the 175-acre parcel qualifies for one additional development right. The development transfer ratios, however, start at 5:2 (five transferable development rights for every 2 base line density rights), and

in some zones reach as high as 15:2 (fifteen transferable development rights for every 2 base line density rights). A higher transfer ratio is placed on high priority sending zones to ensure participation and preservation of key land areas.

The program was adopted in 1993, and by 1997, 95 development rights had been created by deed restricting 300 acres on three farms. In an August 1995 edition of "Pennsylvania Township News," developer interest in the TDR program was reported to be high. By June of 1996, the first project under Washington Township's new TDR ordinance was approved in a commercial receiving zone -- a small food and drug retail store next to the state highway (Pruetz, 1997).

A Legal Discussion of TDR Programs and Potential Takings Issues

TDR can operate as a governmental regulation under the context of land use zoning. TDR was first sanctioned by the United States Supreme Court in 1979 as local government mitigation for development rights in a New York City historic preservation case. In 1969 the Penn Central Transportation Company requested permission to build a 53-story office tower directly on top of a historic landmark structure, The Grand Central Terminal. The City of New York denied the application, offering instead the opportunity to transfer development rights elsewhere in the city. The Supreme Court's 6-3 ruling resolved the "regulatory taking impasse which had inhibited local governments from exercising their police power to preserve threatened resources (Marcus, 1979).

In regulating development rights, a local government must assure that land use regulations mitigate, compensate, or reasonably relate to the public impacts caused by development. In the property right takings case of Dolan vs. the City of Tigard, Oregon, the Oregon court of appeals and the Oregon Supreme Court ruled against Tigard's demand for a public right-of-way donation. In response to Dolan's application to expand a commercial building and parking lot, the city conditionally approved the project based upon the dedication of a public green-way along an adjacent creek. The green-way was intended to absorb increased flood waters from the parking lot surface and provide additional space for a pedestrian/bicycle pathway. Although Tigard's flooding concerns were relevant to the expected increase of storm water, the city failed to show a reasonable relationship between their goal of a public pathway easement and the expansion of Dolan's business (U.S., 1994). Another property rights case, Nollan vs.

California Coastal Comm'n in 1987 ruled in favor of Nollan, who argued against the public easement dedication requirement in order to obtain a beachfront house permit. The US Supreme Court ruled that the easement requirement of the CC failed to "substantially advance" a "legitimate state interest (Mandelker, 1982)." Unlike these two cases, TDR does not require the donation of land for public uses. Rather it mitigates development constraints by offering the transfer or sale of property development rights to the free market.

In Utah, a local county or municipal government obtains its authority to administer a TDR zoning program from the state incorporation act. Under a state's incorporation act, a municipal or county government receives the state's policing power to administer local laws and ordinances created by vote of the local public (Pruitz, 1997, p. 84). Some states have created legislation to additionally support and encourage TDR by permitting development transfers between county and municipal jurisdictions. Utah has not yet created this type of TDR enabling legislation, which means that municipalities must either annex land to apply their TDR zoning policy, or as this study later explores, find a creative way to encourage density transfers amongst county parcel owners before permitting annexation (see "Inter-local Government TDR Agreement in Chapter 2)."

The state could greatly promote efficient expansion of communities by passing inter-jurisdictional TDR legislation. With the availability of inter-jurisdictional TDR, a community could annex adjacent properties as receiving zones at a low density, and then encourage development transfers from the county by permitting private acquisition and transfer of development rights. TDR has been lightly discussed in the Utah Legislature during the past year. The Agriculture and Environment Interim Committee listened to reports from Jodi Hoffman, an attorney specializing in TDR, who endorsed the technique as a winning situation for farmers, real estate developers, and communities. Open space is "a tool that will allow farms to be passed from one generation to another . . . Real estate values and communities are enhanced by open space, and taxpayers win because no public funds are used (Weibel, 2000)." Neil Lindberg, also an attorney specializing in TDR, described TDR as a commodity, such as a water right that could be transferred and sold from one property to another. Representative David Ure, R-Kamas, suggested that TDR is "something that's going to take place in Utah one way or another," implying that the absence of TDR enabling legislation will not stop programs from being developed (Weibel, 2000)." Summit County,

UT, has adopted a TDR program that encourages open space protection and transferred development into concentrated development pockets. Until TDR legislation is enacted, another strategy must be created to ensure that growth within incorporated cities occurs in exchange for the surrounding development value on county property parcels. Otherwise, city growth will continue as new donations of development rights to select property owners.

Devising a loophole to achieve inter-jurisdictional transfers despite the state's absence of TDR policy is possible for a community government determined to help their city grow within its means. To create an effective plan, however, a critical legal delineation between county development rights vs. city development rights must be explored. Consider the following hypothetical development example: Suppose that a county landowner purchases a parcel adjacent to an incorporated community and wishes to be annexed as a new subdivision. In compliance with the city's annexation requirements, the landowner purchases multiple development rights from several outlying parcels in the county. Upon assuring that the transferring sending properties place their land under conservation easements to prevent further development, the city annexes the adjacent county parcel with increased development rights or density obtained from other county parcels. Given the legal incompatibility of development transfers between county and city, what becomes of the condensed county development rights once the parcel has been annexed into the city? It could be that these development rights exist as a sellable commodity that may be re-transferred to another county parcel – despite annexation into the city. This topic requires further legal research to determine the status of county development rights in this scenario. There is however another annexation provision that a city could require of a developer, to assure the retirement of county development rights. A city could require that a developer donate the condensed development rights to a private land trust, which would assure that the development rights are no longer sellable on the TDR market. Donating the development rights could provide significant tax savings for the developer, in addition to earning the privilege of annexation and receiving of city services.

The extent to which TDR infringes as a taking of private property rights depends upon a TDR program's structure and application of density allowances. Some TDR programs operate as a mandatory TDR program; others are voluntary. In a **mandatory TDR program**, sending zones are restricted from all development options, permitting only the transfer of assigned development rights to a receiving zone for

development profit. In a **voluntary TDR program**, sending zone properties may either be developed at the baseline density, or development rights may be voluntarily severed from a parcel and transferred into a receiving zone. Voluntary TDR programs rely on incentives such as density transfer bonuses to prime the free market and encourage development right transfers.

In some voluntary TDR settings such as Montgomery County's agricultural TDR program, significant down-zoning takes place, yet a transfer ratio restores the original zoning density. Although Montgomery County approved a controversial down-zoning from one unit per 5 acres to one unit per 25 acres, property owners still retain a degree of development value without participating in the TDR program. This condition may still be classified as a voluntary TDR program -- but with a rather strong restriction applied. The county's application of a 5:1 transfer ratio provides compensation for the down-zoning while creating a market for development right exchange. A full range of restrictions and density assignments are possible within TDR, making it an extremely versatile and flexible zoning tool.

A voluntary TDR program appears to pose no threat of inviting property takings claims. However, communities considering a mandatory TDR program should proceed with caution to avoid creating the breeding grounds for takings lawsuits. In a mandatory program, a sending zone landowner may wish to transfer development rights and fail to find a buyer. In this case, the property may be restricted from all economic beneficial land use. Lawsuits may also occur if a developer in a receiving zone is restricted from developing land without first acquiring additional development rights – and available development rights are not to be found. To mitigate these possible concerns a community may instigate the operation and involvement of a **TDR bank,** or **TDR fund**. A TDR bank serves as a revolving fund with the sole purpose of purchasing and selling development rights, ensuring that the market for development rights remains active. This bank agency may exist under the administration of the local government, it may be run by a private non-profit agency, or it may be a service provided by a local real estate or title company. A TDR bank may be used in both mandatory and voluntary TDR programs.

Even with an operational TDR fund, a local government could find itself defending a mandatory TDR program in court. A 1997 Supreme Court ruling in the Bernadine Suitum v. Tahoe Regional Planning Agency (TRPA) case reversed two lower court rulings against a plaintiff who argued that her property rights were violated under the TRPA mandatory TDR program. The plaintiff, Mrs. Suitum, purchased a

small land parcel in 1972 for $5,000 in which she and her late husband intended to reside after retirement. At the time of their purchase, the land was in a residential area. Yet in 1987, the TRPA designated the parcel and surrounding area as a protected Stream Environment Zone (SEZ). The TRPA established a mandatory TDR program to compensate landowners in protected land areas that were established for preservation to improve and preserve water quality. This new zoning status restricted the Suitums from adding a "permanent land disturbance" to their property, such as their planned retirement home.

In 1989 Suitum applied for a building permit and was denied by the Tahoe Regional Planning Agency. Suitum sued in the District Federal Court, and in the Court of Appeals without pursuing the transfer or sale of her development right. Both courts dismissed Suitum's allegations based on a ripeness issue – meaning that the case lacked substantiated basis for adjudication because she had not attempted to sell her development right (LAO, 1999). By ruling in favor of the Tahoe Regional Planning Agency, the courts recognized Suitum's property development right -- created by a TDR program as "valuable property" that she had not yet attempted to sell for economic use (Berger, 1997, p. 93). Mrs. Suitum then appealed to the Supreme Court which overruled the ripeness rulings of the other two courts, enabling her to continue her takings claim at the District Circuit. Justice Scalia offered his concurring opinion with two other Supreme Court members: "TDR's should never be considered in determining whether a taking has occurred, but only in determining whether the land owner has been justly compensated for a taking (cited in Berger, 1997, p. 94). This statement applies to mandatory TDR programs, and less to voluntary TDR programs that maintain a baseline density development option for sending zone landowners.

Suitum and TRPA reached a settlement before advancing the case to the District Court. TRPA "conceded no liability" while paying $515,000 to Suitum to pay for her legal fees and to purchase the property parcel. An additional $85,000 covered court representation costs provided by the Pacific Legal Foundation. TRPA's regulations and TDR program remain intact, and "the TRPA does not expect the settlement to encourage other lawsuits, given that it took a decade to settle, did not result in a windfall for Suitum, and set no legal precedents (LAO, 1999)."

Many other court decisions have overruled mandatory TDR challenges, supporting TDR as a mitigation measure when restrictive density regulations severely limit a property's economic value. Voluntary TDR programs differ from the case of Suitum v. Tahoe Regional Planning Agency, or any other

mandatory TDR program that completely restricts development on private sending zone property. A voluntary TDR program appears capable of creating development transfer incentive while maintaining a limited development option for the landowner. A mandatory TDR program may be defendable in court as a compensatory measure in the event of a takings issue, but could seriously escalate a local government's annual legal fees.

Common Misunderstandings of TDR

A common misunderstanding of development transfers is that once development rights are sold, the future development potential of that land is permanently restricted. While some may view selling development rights as a shortsighted decision, it is less limiting than selling the physical property and development rights to a developer. After selling development rights through a TDR program, agricultural industry may continue into perpetuity, producing annual income that will eventually surpass the profit gained by selling the entire property deed set to a developer. For the inexperienced do-it-yourself developer, TDR can provide an immediate financial return without the costly investment risks of infrastructure development and persistent interest rates.

Farmers interested in expanding their agricultural business are likely to pay more for protected farmland that is separated from housing development and secured in an agricultural district. This has been the case in Montgomery County where some farmers expanding their enterprise are willing to pay more for preserved agricultural per acre than developers will pay to develop 25-acre home sites. Farmers will pay top dollar to operate farmland that is protected from future development under the county's TDR program. Developers would likely pay more for sending zone acreage if higher density development were permitted.

In some areas, farmland may not sell at such premium rates, particularly in the West where rainfall and water rights greatly determine production capacity of the ground. The total profit gained from severing and selling development rights to a developer, and selling the ag-land to another farmer can easily compare to selling all of the property to a developer. For retiring farmers reluctant to sell their land to new development, the option of severing and selling their development rights to developers, and selling their agricultural ground to another farmer will generate necessary retirement cash while saving their farming legacy. Whether the farm is transferred to other family members, young starting farmers, or to a

neighboring farm enterprise, the retiring farmer may feel satisfaction in saving the estate from any future development.

Some property owners of agricultural or natural land may find incentive in donating development rights to a land trust by placing their land under a protective conservation easement, without receiving direct compensation for development value. This process benefits land owners who intend to keep their land free from development for all future generations, who are financially secure, and who are satisfied with the reduced tax savings generated from the deed transfer. But many farmers need the option of selling their ag-land for housing or commercial development to support retirement, career changes, or to generate cash flow for the family farm business. A TDR community zoning option can support the local farming industry by creating incentives for landowners to participate in development right transactions, thereby preserving surrounding agricultural lands.

Misunderstandings that open space preservation requires infringement on individual property development rights are common. Although many residents in a rural area might wish to live near open farmland, pastures, and forests, protection of their own personal property rights is also of paramount concern. Residents in Cache Valley who choose to raise their families in a tranquil rural setting may feel troubled at seeing the surrounding open space consumed by development, but may not wish to pay extra taxes to purchase development rights from farmers. TDR provides an alternative that compensates development values and avoids proposing the sacrifice of development interests or raising public taxes.

As a TDR program creates open space through free market transactions, undeveloped rural land will create an attractive community surrounded by preserved countryside, enhancing the development value of all community properties. Residential properties will benefit from quality views of the surrounding open space, retail commercial properties will benefit from the efficient development of adjacent residential neighborhoods, and agricultural districts will benefit from the ease of farming away from the financial and cultural pressures of development.

The right to develop property holds little value without a substantial local housing demand -- a market largely created by public investments in roads, infrastructure, and community amenities such as parks and other public services. Encouraging the free market to work towards a common development goal of an attractive community will produce more winners in the land development arena.

Inter-local Government TDR Agreement

TDR will best function through coordinated efforts between Cache County and city governments. With the absence of TDR enabling legislation, Mark Teuscher, director of the Cache County-Wide Planning and Development office, recommends that local cities work together with the county in creating TDR programs as an inter-local agreement. Sending zone districts could be specified for each community to assure that development rights are transferred from immediate open space areas, rather than random areas throughout the county. This would increase a community's local quality of life, and encourage private participation amongst family members, relatives, and friends. This would also encourage and enable wealthy community investors to improve their community's aesthetic by purchasing development rights near the town perimeter.

Teuscher suggests that receiving zones remain within county jurisdiction, and that cities supply services such as water and sewer for an annual or monthly fee. As a condition for city services, county receiving zone developments should follow city density requirements, as well as city subdivision regulations. After a receiving zone development has filled with new homeowners, the city should annex the development after a minimum of 12 months of providing services to each resident. Utah annexation policy allows cities to annex land without petition or protest from county residents if services have been provided for at least one year.

An inter-local TDR agreement represents exciting possibilities in preserving local quality of life for Cache County, and other counties and cities in Utah, and America. Cache County has the advantage of an established regional planning office that was established in 1994 by vote of the public. The CCPD office is funded in part by the county as well as municipalities in the county. Teuscher intends to obtain grant funding to create and implement an inter-local TDR program throughout the county (2001).

A TDR Policy for County Farm Districts

In some areas of Cache County, particularly in north Cache Valley, population is somewhat scarce and growth rates are moderate to low. A necessary ingredient for a development right market is development interest within a TDR program's boundaries. In remote areas, lower real estate demands

encourage the gradual subdivision of farms into large country lots. The county could create its own TDR ordinance that encourages development transfers towards areas of higher development value with proximity to existing infrastructure, employment, entertainment, etc. The county could subsidize infrastructure improvements in these receiving zone areas by transferring savings from avoided road improvement and maintenance costs of scattered regional development. To enable farmland preservation, riparian vegetation and wetland preservation, and highway protection, the county could encourage development transfers by offering a transfer bonus to farmers in need of business cash or retirement savings.

The list of positive regional effects of this policy would include preserved farming districts, minimized county infrastructure costs, and the creation of a development buffer between farming districts and existing community development expansion. The receiving zone of a county would likely be medium to low density, or 1 to 2-acre lots without a public water system. These larger lots could create a transition and buffer from medium and high density development of existing communities to preserved agricultural districts in more remote county areas.

TDR Conditional Annexation Policy

Key to the success of an inter-local or inter-jurisdictional TDR program is the community government's strength in resisting annexation requests without development right acquisitions from sending zone parcel owners. By requiring a developer to first secure sufficient development rights from the city's target green belt area, the city sets in motion a TDR market between receiving zone and sending zone landowners. Land speculators who were planning on annexation without development right acquisition may not be pleased with this policy. To soften the impact of increased development investment, a receiving zone landowner could seek to partner with sending zone landowners by combining the value of receiving zone land with development rights from surrounding parcels, just as venture capitol is frequently invested amongst multiple business partners. A TDR conditional annexation policy may seem quite severe compared to the current standard of selective annexation practiced by local city governments. However, it creates a standard of equality to all landowners within a shared region and allows all private property interests to participate in the building and shaping of a quality community.

The consequences of annexing without privately transferred development rights are visible in west Logan, where a new subdivision, named "Green Meadows" could have advertised permanent visibility of surrounding meadows had Logan first required development right acquisition (Figure 16). This new residential neighborhood could have saved surrounding agricultural open space, wetlands, and riparian wildlife habitat to the benefit of the entire county. Instead, the expanded water and sewer lines will likely spur additional development expansion into Green Meadow's adjacent view of "green meadows" and riparian habitat.

Figure 16. Green Meadows Subdivision typifies unchecked growth expanding west of Logan.

Community In-fill and a Multi-Generational Receiving Zone

Setting in motion a community greenbelt growth strategy requires sufficient foresight to consider the long-term possibility that land within receiving zones may fill up with transferred development from the surrounding region. A community could potentially deed restrict all county parcels just outside the incorporated limits, and literally end the physical expansion potential of the town. What future awaits a community that stops its capacity for additional growth within a preserved green belt? Some might enjoy the thought of limiting growth to future generations to preserve rural lifestyle – but when considering that a new generation of local family members may not find a place to live in the community, a more progressive

planning strategy is required. Another drawback of limiting additional growth could occur as future requests for commercial development approach the community, and the entire community has either been developed or preserved as open space. Without a provision for future growth, a community could lose needed sales tax revenues or drive up local housing costs by limiting land supply.

Several planning strategies show promise for avoiding these limiting town forecasts. First, a community could allow higher density development to occur within select districts, such as an interior commercial district and multifamily residential districts. Some rural block interiors near the town core might be opened up for interior parking, and building expansion. Following the same principle of conditional annexation, a community could first require that landowners in designated downtown areas purchase development rights before qualifying for higher density project approval.

Higher density development need not apply to the entire town if the goal of the community is to keep a rural flavor to the townscape. The community of Wellsville has created an ordinance that seeks to find balance between rural medium density development and higher density in-fill development. This ordinance permits only two lots per block to create higher density town houses or apartments. The ordinance also calls for parking to be placed behind the structures, and requires architectural covenants such as reduced front door entrances to better integrate the structures into a single family neighborhood. In-fill development provides greater housing options to a diversity of income needs and lifestyles in a community.

In addition to in-fill development, a community may desire additional opportunity to expand and accommodate new growth opportunities. To allow for further expansion after a green belt has been preserved around a community, a TDR program could designate a secondary receiving zone area, beyond the perimeter of the preliminary receiving zone to accommodate a continuing inflow of development rights. This reserve area, or second generation receiving zone, would be activated and available for additional development transfers once a certain percent of the original receiving zone filled with transferred development. For example, a city could establish a 95 percent receiving zone in-fill policy before drawing a new receiving zone boundary. Landowners in this second-generation receiving zone would acquire development rights from a revised green belt region approved by the city. The city may otherwise choose to honor a new generation of development rights from parcels within the original sending and receiving

zones. Because sending zone parcels would be permanently protected from development by a conservation easement, these new development rights could only function as a real estate commodity for sending zone landowners – just as a water right is transferable throughout a designated watershed region. Setting up these provisions would require legal consultation from the inception of the TDR program to assure that conservation easements within the city's target secondary receiving zone are drafted to allow additional development transfers once the original receiving zone has filled with growth.

TDR Contrasted with Clustered Zoning

Many communities have adopted cluster zoning as a creative option to preserve open space in their community. Like TDR, cluster zoning allows development rights to be transferred to areas more suitable for development, but at a much smaller scale. This scale varies from small developments of a few acres to large combined projects of several hundred acres. The Natural Lands Trust, Inc., a well-known advocate of cluster zoning, promotes a four-step development process that saves open space by targeting sensitive areas for preservation.

1. Identify land that is worth preserving or saving, such as wetlands, steep slopes, flood plains, historical sites and farmland.
2. Designate remaining spaces less suitable for environmental, agricultural or historical preservation as housing areas. Apply the same number of homes allowed under the property's density zoning, but with smaller lots.
3. Connect the homes with a modest road width, and walking paths to maintain rural character.
4. The final step is to draw in the lot lines to define the property boundaries (Natural Land's Trust, 1995).

This four-step process applies only to individual land parcels or joint development efforts amongst private landowners, which limits cluster development in its ability to preserve continuous open space corridors. While the 4-step recipe promotes the creation of open space, it also promotes fragmented development clusters away from existing community fabric. Daniels suggest that cluster zoning is more a technique to maintain "rural character" than to protect an working agricultural landscape. "If cluster developments are allowed to disperse residences throughout the countryside, one could argue that the

function of open space zoning and cluster design is not to protect farmland, but to allow rural landowners to realize their anticipated capital gain, to encourage people to move farther out into the countryside, and to protect the viewshed of new, upper-income residents who enjoy looking at open space (Daniels, 1997, p. 136)."

The cluster method identifies and preserves quality farmland, but fails to address the resulting conflicts between intensive farming activities and adjacent clustered housing, an issue better solved by a community TDR large lot buffer program. The TDR process of severing development rights and transferring them from sending districts into receiving areas is the key difference between the two planning tools, and provides the means of protecting agricultural operations in a larger and more continuous landscape. TDR better addresses the land preservation needs of wildlife as well, by its ability to promote preservation of continuous habitat corridors that are uninterrupted by islands of clustered development.

Ardent suggests in his book "Rural by Design" that [cluster zoning] "is definitely a second best technique if not third best," and should not be seen as a tool for conserving farmland, but as a way to "save some rural character and open space" (cited in Daniels & Bowers, 1997, 123). Despite being a step in the right direction, clustering development in open space areas disrupts the rural landscape, and creates public safety hazards in fire prone states west of the Mississippi River. In temperate semi-arid climates, smaller, non-agricultural open space preserves become fire hazards in the late summer and early fall when drying grasses and plant materials create an ignitable tinderbox. Subdivisions flanking natural vegetation or a native grass meadow in the West must take extra precautions, i.e. irrigation and water expenses, herbicides, and mowers (fossil fuels) to mitigate the potential threat of fire from natural vegetation. A recent innovation for open space management in the West is contractual use of goat herds. At a cost of over $100 per acre, goats eat non-native broadleaf plants leaving room for native grasses to flourish, and their waste provides essential plant nutrients that fertilize the native vegetation (Pollon, 1999). Hurricane, UT, has recently started using goats to control the spread of noxious weeds on public open spaces. The spread of noxious weeds is also a problem when development construction brings in transplanted topsoil with weed seed for construction fill and landscaping purposes. If left unmanaged, drying weeds in the late summer months significantly increase the risk of fire in native vegetation areas.

Cluster zoning may be used more successfully, however, within the context of a community TDR program. For example, in the Paraville TDR concept, large lot buffer areas between agricultural sending zones and community receiving areas could apply cluster zoning to create a joint equestrian pasture or garden area. This type of open space pocket could also serve as a buffer between the agricultural sending zone and the medium density housing in the receiving zone. Cluster zoning can create a variety of open space types to serve as a buffer at the receiving zone edge, including parks, native grass meadows, walking / riding trails, inter-connecting open space corridors, hobby farms, truck farming, orchards, and organic agriculture. Clustering attempts to create parks, trails and other public preserves within a receiving zone should link to community parks, walking / riding paths and surrounding open spaces. These linkages greatly enhance the livability and value of a community, and should be designed and promoted in the community master plan.

Left by itself, clustered zoning is an efficient form of sprawl when considering the extra infrastructure required to service disjointed satellite developments. Recalling the example of Paraville, Figures 11 and 12 provide a comparative glance of a TDR large lot buffer development pattern and a clustered development pattern. The required infrastructure numbers clearly indicate that a TDR build out pattern provides considerable savings to developers and taxpayers when compared to clustered subdivision development.

Other open space protection tools are available to individuals and local governments to support a TDR program. These include a variety of purchase options, including bargain sale, voluntary easements, fee simple acquisition, purchase and sell-back (after severing development rights), purchase and lease-back, purchase of development rights, purchase option, and right of first refusal. Protection tools available to local governments also include agricultural zoning, agricultural protection areas, building moratorium, exactions and dedications, impact fees, intergovernmental agreements, land and mitigation banking, limited development, performance zoning, preferential tax assessments, quality development standards, sensitive lands overlays, special area preservation / mitigation programs, transfer development taxes / conversion taxes, and urban growth boundaries (Lilieholm & Fausold, 1999).

The Economics of TDR

The amount that a developer is willing to pay to purchase a landowner's development rights varies according to the local real estate market. Pruetz has identified a simple formula to determine the amount a developer might pay for a development right while still earning a respectable investment return in a development venture. The formula divides the projected gross profit of a development by a target investment return, after which the total investments are subtracted. Assume in the concept community of Paraville that a 30-acre receiving zone development is proposed by a developer. This developer must purchase 46 development rights on top of his original 3 to achieve ½ acre density. The 3 original development rights are from the receiving zone as of right density at 1 unit per 10 acres. The developer figures that 18% of his development will become public right-of-ways, drainage areas, parks, or trails, which leaves 24.6 acres available for private lots. Given Paraville's receiving zone higher density limit of 1 unit per ½ acre, the developer must purchase an additional 46 development rights to develop a maximum of 49 units on 30 acres. Assuming that the projected costs of subdivision are $15,000 per lot, and that the developer expects to sell each lot at $27,500 with a minimal 25 percent investment return, the value of surrounding development rights can be calculated with Preutz's formula: [TDR = (Projected Profit / Projected Investment Return) – (Development Investment Costs)]. Applied to the developer in Paraville, the formula would read as TDR = [($27,500 / 1.25) – ($15,000)] (Pruetz, 1997, p. 153). This creates a value of $7000 per development right, and increases the cost of subdivision development from $15,000 per lot to $21,571 per lot [(46 lots x $7000) / 49) + ($14,000 per lot)].

Creating Incentive for Development Transfers

Requiring only modest street improvements to a new rural receiving zone will not only create development transfer incentive by reducing development costs, but considerably enhance the atmosphere of a rural community as well. A zoning revision that reduces development costs through design standard adjustments will enhance participation and increase involvement in a voluntary TDR program.

In his book "Rural by Design," Randall Arendt proposes the design of narrow roads to maintain the character of a rural community and to reduce improvement costs for developers. Narrow street widths are appropriate for residential medium densities of 3 units per acre or less, which according to Arendt,

provide room for two-car garages and driveways (1994, p. 179). Higher densities, starting at four units or more per acre, may create greater need for on-street parking and require additional pavement width. Bucks County, Pennsylvania, has produced a nationally recognized ordinance publication specifying street widths for residential development. An 18-foot pavement width is required for streets with 200 or less average vehicle trips per day (ADT - or daily traffic flow). Only two additional feet are required to handle up to 2,000 ADT (p. 180). Higher density developments should be created between 26 and 28 feet wide to accommodate two driving lanes and one parking lane, or 32 to 36 feet wide to accommodate two parking lanes and two traffic lanes (p. 181). These street widths are recommended for residential collector streets with speeds between 25 and 30 miles per hour.

Excessive road pavement creates disadvantages to communities, including increased driving speeds, increased road installation costs, increased road maintenance costs, increased water runoff, and increased ambient temperature by as much as ten degrees or more (cited in Ellis, 1996, p. 66). When comparing narrow pavement recommendations with the early Mormon community prototype endorsed in Chapter 1, a narrow road is not inconsistent with the Mormon's wide street tradition. A distinction between road right-of-way and actual paved road width is necessary. Today in Mendon, collector roads range between 18 and 25 feet of pavement width inside of a 100' right of way. Mendon's Main Street road is paved at 33' wide, and the regional state highway on 100 West is paved at a 40' width. Sumner Swaner, landscape architect and planner of Green Space Design, has observed this pattern of narrow pavement and resulting green paths along each side of the road throughout many traditional Utah communities. In his open space master plan design for Hyrum, UT, Swaner identified the grassy verges on either side of the street pavement as an open space trail system useful for rural town activities such as horseback riding and walking. He advocates continued pedestrian use and linkage to these traditional green corridor belts (Swaner, 1999).

Green right-of-ways next to street pavement absorb water runoff, and allow for horse riding, walking, and space to plant street trees. Road easements need not adhere to the 100-foot Mormon right-of-way presented in this study. In Mendon, for example, residential collector districts do not need the same separation from traffic as do the homes facing the busiest road in town -- Highway 23. Communities should determine road right-of-way and pavement width by calculating long term expected traffic volume.

A 100-foot street right-of-way is appropriate for an arterial commuter road, but not necessary for medium density residential districts. Reducing right-of-ways from 100 feet to 50 feet, for example, would consume less space for development, save more rural land, reduce development costs, and increase profits. In rural community settings, fewer pedestrian trips per day eliminate the need for a sidewalk on both sides of the street. One sidewalk would provide a place for children to ride their bicycles, a corridor for walking during the winter months, and would be a marked safety improvement for many rural streets that currently have no sidewalks at all.

The elimination of curb, gutter and one side walk would provide significant savings to a developer, preserve the traditional aesthetic of a rural community, and decreases the amount of storm runoff generated from the development. In communities where higher density is desired, curb and gutter may be necessary to handle the concentration of impervious surfaces such as roofs, driveways, and walkways that generate surface runoff. However, the increased density could allow additional units to be sold and generate more profit for the developer.

CHAPTER 3: POLICY CONSTRAINTS ON CACHE COUNTY DEVELOPMENT

To assure support of a TDR program in Cache County, determining an existing development value of surrounding county land parcels and providing parcel owners with competing development incentives will ensure TDR participation. By competing with financially feasible county development densities, cities can offer their TDR program as an incentive by which county property owners may gain income through transferring property rights to the town's target receiving areas. This section identifies various land use policies that influence the achievable densities within Cache County's jurisdiction, and explores value of development rights through financial analysis of county development scenarios (See Appendix B for cost sources).

Four main policy constraints influence development on a county parcel, and determine the costs of adding required infrastructure improvements before parcels may be subdivided and sold as new lots to the real estate market. These policies include: 1) state water right requirements (with local canal company restrictions); 2) state minimum lot sizes to host a septic tank and well; 3) state water quality requirements; and 4) county subdivision requirements.

State of Utah Water Regulations for Cache County

A relatively new water policy affecting Cache County exists as of September 1999. Due to rising concerns of water shortages in the Cache County and Box Elder County, the Utah Division of Water Rights conducted a study of current water flow rates and depleting surface levels from numerous new well permits. The state water engineer determined that water quantities of senior water rights holders were in jeopardy from over-extraction of ground water in the Cache Valley region of the Bear River watershed. The Division of Water Rights decreed for Cache County that no new well appropriations would be granted for subdivided property parcels created after September 1999. Existing property parcels created prior to September 1999 may claim and develop one well permit per parcel.

Pre-1999 property parcels with one well permit may extract 1.33-acre feet of water annually regardless of the parcel size. Table 3 shows the Division of Water Right's required water minimums for specific residential uses. A well with 1.33-acre feet of water covers domestic requirements - which include

0.45-acre feet for household usage and 0.13-acre feet for animal uses. This leaves 0.75 acre-feet of water for landscape irrigation purposes. In the Cache County region, the state recommends the application of 3 acre-feet of water per acre for landscape irrigation purposes. Based on this requirement, 0.75 acre-feet will water ¼ acre of unpaved landscape during the growing season. Prospective county homebuilders without additional water shares on larger lots will find themselves seriously short of water for irrigating the entire lot for pasture, hobby farming, etc.

Table 3. Utah Division of Water Rights Requirements

WATER USE DESCRIPTION	MINIMUM WATER REQUIREMENT
Domestic uses (bathing, laundry, kitchen, etc.)	0.45 acre feet
Irrigation of landscaping, pasture, etc.	3 acre feet per acre
Drinking water for an individual livestock animal (horses, cows)	0.028 acre feet per animal
Drinking water for an individual herd animal (sheep, goats)	0.0056 acre feet per animal

Source: (UDWR, 2001)

Water rights for additional irrigation or for a new well permit may be acquired within the Cache Valley basin. To secure a new well permit, the state of Utah requires a minimum of 1.25 acre-feet of water before a county residential building permit may be obtained. Water shares may be acquired across the state line into Idaho (within the Cache Valley basin only), but with a much more difficult application process, and with less chance of approval (Clark, 2001). The State's new water right policy appears to be creating a new water market in the Cache Valley region at a rather costly fee of $5,400 - $8,100 per acre-foot. These rates emerge from recent reports of water right sales at $5,400 from Spring Creek Ranch, a vacant ranching estate near the swampy confluence of the Little Bear River and Spring Creek. The Franklin County, Idaho, region that shares the same watershed valley as Cache County, reports water right transactions in excess of $8,000 per acre-foot. This rate projects a $6,750 average minimum investment to acquire the state's 1.25-acre foot minimum water requirement for a building permit.

Exception to the Well Permit Restriction Law of 1999

There is an exception to Cache County's water restriction on new well appropriations. A property owner may acquire historic water shares from another landowner and convert these shares to well permits through the State Division of Water Rights. The developing party must also prove to the state that the impact of the intended new well permits will not adversely affect adjacent wells and senior water rights

interests. This process requires a change application through the State Division of Water Rights to verify the validity of historic water ownership by assessing deed documents and reviewing past water right uses. Converting surface water rights to sub-surface well water in the Cache Valley watershed area follows a simple tripling formula. Generally in south Cache County, or in the Little Bear River Watershed, one surface water share, or one acre of irrigated land converts to three-acre feet of water for a well permit (Scott). Communities contained within this Little Bear River watershed region include Avon, Paradise, Hyrum, Mount Sterling, Wellsville, Mendon, and Petersboro. All other areas in the county may generally claim 4-acre feet of water for each water share.

The Local Irrigation Company

The ease or difficulty of converting surface water rights to well permits depends on the irrigation company that administers water rights as water shares to company members. Irrigation companies are a group of private water shareholders that collectively own a set portion of water rights from a water source. Irrigation companies elect officials to administer and track the use of water rights to the company shareholders. To begin discussion of irrigation companies, an important distinction between **water rights** and **water shares** deserves clarification and discussion. Water rights are held as a deeded property right by a landowner, and may be transferred in the free market to another owner. Water rights owned directly by a property owner may be filed to the state for conversion to ground water at any time. Water shares on the other hand are leased by a property owner through a local irrigation company. The administering irrigation company holds and regulates the deeded water rights to property share holders. Water shares must first be released by the canal company to the shareholder as a full water right before a change application is likely to pass through the State Division of Water Rights. Without sole ownership of water rights secured from the canal company (or conversion of water shares to water rights), a property owner will likely receive legal opposition from the canal company when applying for a change to ground water with the state Division of Water Rights.

The authority of a local canal company holds considerable power to decide whether full water right ownership will be granted to a share-holding constituent. With the arrival of the state's new policy

limiting additional well permits, a private canal company can prevent landowners from claiming their water shares as water rights and thwart an attempt to apply water to land development interests.

In the Mendon region, five irrigation companies administer water shares to private landowners. In a recent telephone survey, the author found differing opinions and policies towards water conversion. Two of the irrigation companies honor water share change requests and will reportedly sign legal documents that release their holdings on a water share. The third company was not sure that conversion of water shares to rights was possible, and reported that the company bylaws would have to be consulted. The fourth company stated that conversions from share holding to full water right ownership were not likely to occur under the present generation of administration. The fifth company, the Wellsville-Mendon Conservancy District, administers Federal water rights from the Hyrum Reservoir. These water rights are held by the Department of Interior / Bureau of Reclamation. Water shares from Federal reservoirs may not be acquired, sold, or transferred as a water right, but water-supported development may occur as a lease from the Federal Government. For example, communities or corporations may use ground water extraction to support development by allowing their surface water shares to remain in the canal. If a reservoir does not currently authorize irrigation shares or "project water" for municipal or corporate development, approval processes can be fairly intensive. A change in federal water share subscription requires federal congressional authorization, Department of Interior authorization, and a State Division of Water Rights water engineer approval (Pullan, 2001).

Inconsistencies among irrigation companies add to the complexity of evaluating water right development potential in Cache County. For policy modeling purposes, however, this study assumes that water share holdings will become less stringent over the course of time, and that canal companies will increasingly allow conversions to water rights. In Cache County and across the entire American continent, agricultural industries face the continuing struggle for survival under farming's depressed economy. Agricultural landscapes disintegrate as many farmers sell their acreage, challenging small canal companies to find purpose in administering water shares to the vacating agricultural market. The Utah Division of Water Rights reports that some irrigation companies in more developed areas of the state have initially refused the transfer of water shares, but later granted permission as development pressures replaced agricultural uses to developed land.

State Minimum Lot Sizes for Septic Tanks and Wells

The Bear River Environmental Health Department determines minimum lot size requirements for a new residence containing a home, a single well, and a septic tank on the same lot. The Department also establishes minimum area requirements for lots served by a public water system, without a sewer system. These standards consider soil percolation rates, soil structure, and the associated risk of polluting an adjacent well, or filling a neighborhood subsurface with excessive effluent that may rise to the ground surface. The Bear River Environmental Health Department conducts a thorough soil analysis for each dwelling unit application as part of the county's building permit approval process. An analysis may reveal additional limitations from geologic conditions such as steep slopes, proximity to surface water (canals, ponds, ditches), flood plains, high water table, high bedrock areas, pure gravel areas, pure clay areas, and community water source protection zones. Throughout the county, soil conditions exist that will not support any type of septic system. These areas include all gravel and clay soils, water tables reaching above 34" below the surface, and bedrock that lies within 58" of the surface. Despite the county's ½-acre minimum lot size requirement, the state's septic standards determine the appropriate minimum lot size for each new building permit.

To successfully generalize soil suitability, the Bear River Health Department recommends soil categorization into five classes of percolation rates. A percolation rate represents the speed at which water infiltrates through a soil type, from the ground surface into the soil's deeper geological layers. Generally speaking, low percolation rates result from fine soil particles that constrain the passage of sewage effluent into the soil substrate. As soil particles increase in size, percolation rates increase as spaces between particles permit more effluent to dissipate into the earth. If percolation rates are too high – or if the clay content is too high, percolation rates are excessively slow and restrict the infiltration of effluent. This condition presents the potential hazard of contaminants surfacing near the location of the septic system. On the other extreme, if percolation rates are to low – or if gravel content is without a mixture of finer particles, percolation rates are too fast and fail to disperse the effluent before polluting ground water, or percolating into surface water channels. Table 4 shows the Bear River Environmental Health Department's

recommended perimeters for classifying soil percolation rates, and the associated suitability rating and minimum lot size each soil classification.

Table 4. Soils Suitability Rating

Permeability Range	Comments	Minimum Lot Size	Suitability Rating
2.0 – 6.3 Inches / Hour	Generally contain gravel mixes	1 Acre	1
0.63 – 2.0 Inches / Hour	Generally contain sand mixes	1.25 Acres	2
0.2 - 0.63 Inches / Hour	Generally contain loam mixes	1.5 Acres	3
0.06 – 0.2 Inches / Hour	Generally contain silt mixes	1.75 Acres	4
Less than .02 Inches / Hour, or greater than 6.3 Inches / Hour.	Soils contain either too much gravel or too much clay, or soils may lie within a high water table (greater than 34") or above high bedrock (greater than 58").	NA	0

Source: (Cofferd, 2001)

State Water Quality Requirements

A major financial stipulation for county development is a state water quality regulation that requires the installation and on-going maintenance of a **public water system** for either 15 homes, or 25 people. The number of fifteen homes is misleading, given that the county average of 3.2 individuals per household surpasses 25 people after 8 homes are created. In some recent county residential development cases, the developers created only four home lots to assure that the subdivision population shied well away from reaching 25 individuals (Baustfield, 2001). Water requirements for subdivision applications are regulated through the Drinking Water Division of the State Department of Environmental Quality.

The number of lots may vary before the threshold of 25 people is passed and a public water system is required by the state. However, as the next section will reveal, county subdivision requirements create a financial blockade for more than five lots created from one parcel. This limitation is derived from an ordinance that requires curb, gutter, sidewalk, and oiled road for six lots or more. This creates the economic probability that county subdivisions will not attempt to create more than 5 lots to avoid costly road improvements, in addition to avoiding the costly requirement of a public water system.

A public water system is comprised of an elevated tank, either placed on an elevated slope or on a constructed tower. Ground level reservoirs -- often referred to as gravity-fed systems, are usually made of reinforced concrete or aluminum and are anchored to a foundation and concrete base pad. A reservoir on a suspended reservoir, or pole-fed system is used where topography change is limited to create adequate

water pressure for domestic use. A pole-fed system usually costs more than a gravity-fed system, although the cost of acquiring easements for access to an elevated area could greatly increase the costs of a ground reservoir distanced from the actual development site. The cost of purchasing and installing a water system varies immensely with variables such as topography, the proximity of water, the content and pressure of water, the cost of drilling a well, pumping water from a well to a reservoir, and the potential need to acquire a water line easement. Systems without sufficient water pressure require artificial pumping to fill the reservoir, which can significantly increase costs. Two recent bids for ½-million gallon ground level water reservoirs with two booster pumps near Salt Lake City, and Alpine, Utah ranged from $515,000 to $750,000. An 800,000-gallon tank could cost more than 160 percent the price of a 450,000-gallon tank (Reed, 2001). In addition to these significant expenses, a public water system requires ongoing monitoring by a licensed water operator who reports water quality conditions to the Utah Division of Water Quality. The cost of a water operator for a ½ million gallon tank could cost as much as $50,000 annually (Cache [1], 2000).

A public water system is not only limiting in its construction and maintenance costs, but also in its planning and implementation requirements. A developer must first secure sufficient water rights in order to transfer them to the state for groundwater well permits. This may not be possible with certain canal companies controlling the water rights of a particular water corridor, and may require the developer to purchase additional water rights before adequate water is secured. Given the rates of $5,400 to $8,100 an acre-foot reported in Cache Valley, a developer would have to pay between $16,875 and $20,250 for 2.5-acre feet of water for each proposed ½-acre subdivision lot.

Another major risk a developer takes when pursuing a public water system is the uncertainty of a new well's water pressure supply. A well must supply sufficient water flow to meet the state's daily domestic and fire storage capacity requirements. Table 5 shows a model of the State's water requirements for a subdivision of 213 homes. The model shows that a 456,000-gallon water tank would be required to meet the state's daily pressure requirements, the cost of which is roughly estimated at $505,000 for a pole fed system. The model calculates domestic water requirements per lot at 0.556-gallons per minute, irrigation requirements per lot at 1.635-gallons per minute, and a 1000-gallon per day requirement for fire pressure.

Table 5. Water Requirements for a Cache County Major Subdivision

	Inputs	Rates	Calculations	Notes
Water Tank Size				
Number of Lots	213			
Domestic Hook-up (gpm)		0.55556		Domestic Interior Use
Irrigation Zone 4 (Cache County) gpm		3.96000	1.63548	Irrigation Requirements
Total gpm / lot			**2.19104**	**Gallons per Minute**
Total gpd / lot		1440	3,155.09	Gallons per Day
Total Peak Source Capacity gpd / subdivision		213	672,034.43	Gallons per Day
Source Capacity gallons subdivision		0.5	336,017.21	1/2 of Peak Source
Fire Pressure - 1000 gpd - 2hrs			120,000.00	Gallons per Day
Total Source Capacity Gallons			**456,017.21**	**Tank Size (Gallons)**

Water Supply Requirements				
Required Well Pressure - gpm		1440	**316.68**	**Well Flow Requirement**
Required Well Pressure - Cubic fps		448.8	0.706	Cubic Feet per Second
Required Well Pressure - Acre Feet		1.98	1.397	Acre Feet per Day
Water Rights (Acre Feet)		**214**	**298.98**	**214 Days / Year**
Water Shares (Acres)		**3**	**99.66**	

Water Rights per Lot (Acre Feet)				**1.40**
Irrigation Water Shares per Lot (Shares)				0.468
Value of Water Rights per Lot	1.40	$ 5,400.00	$	7,579.82

Public Water System Prices - (Rough Estimates)		
450,000 Gallon Reservoir System	$	*505,000.00*
500,000 Gallon Reservoir System	$	*565,000.00*

The lower portion of Table 5 shows the required well flow at 316.68-gallons per minute, and the required water right ownership to apply for a well of this magnitude (298.98-acre feet). In Cache Valley, water pressure from wells varies according to geologic substrate layers and groundwater flow and supply. The Utah Division of Water Rights carries records of well diggings in Cache County that provide some indication of water pressure throughout the region. Water pressure is generally greater along the east rim of Cache Valley, given the high ground water flow from the Bear River Mountain Range, and the gravel deltas which are commonly found in geological substrate layers. Well pressure can range from 600 to over 1000 gallons per minute between Logan and Smithfield. The south and west edges of the valley, from Mount Sterling to Mendon, contain substrate layers of the Salt Lake formation, which can constrict water transmissivity to less than 300 to 600 gallons per minute. Some well attempts in Mount Sterling have failed to find even a trace of ground water. From the Petersboro area to Lewiston, the Salt Lake formations are especially constricting, challenging some homeowners to extract sufficient water from their wells for just one residence (Clark, 2001).

Cache County Subdivision Requirements

Cache County's subdivision requirements were updated and approved for use beginning on January 1, 2001. This section summarizes the county's development options and associated regulations. Cache County allows four development options under its subdivision ordinance, including: 1) a Lot Split; 2) a Minor Subdivision; 3) a Cluster and Farm Subdivision; and 4) a Major Subdivision.

Several requirements apply to all development options. First, all county development proposals that lie adjacent to the boundaries of a municipality, that are located within an unincorporated island or peninsula, or that are located within the Logan Urbanized Area, must first apply to the adjacent municipality. If the municipality refuses the development, or if the developer still wishes to develop under county ordinances, the county application may continue after three months of applying to the municipality. Another general provision requires all subdivisions occurring within 300 feet of the boundary of an agriculture protection area to place a notice on the development's official county plat maps of an "Agriculture Protection Area." This written statement forewarns new residents of the potential incompatibilities associated with living in an agricultural area and obligates new residents to accept

potential "annoyances or inconveniences" from agricultural practices. All subdivisions must provide onsite water for culinary use and fire protection, and may not haul water to a proposed subdivision site.

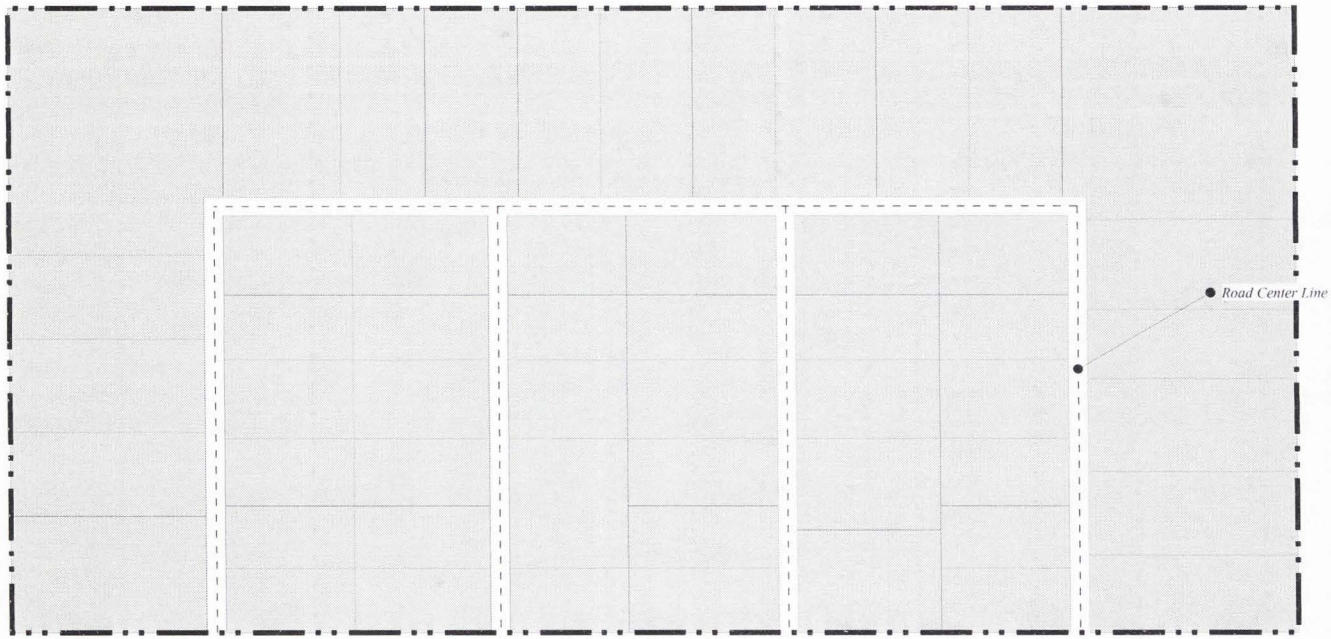
Option 1: Lot Split

A lot split allows for the division of a property parcel that has not been previously subdivided, and that exists as a legally created lot prior to January 1, 2001. A lot split may not occur on a parcel divided by a future road easement depicted in the county's general plan. The minimum road frontage width of a lot is 100 feet. Road construction requirements include a road right-of-way at 50'wide, and a 20-foot wide gravel road. This road profile contains an 8 inch by 38 foot base of granular borrow, and a top layer of 6 inch by 30 feet of ¾-inch untreated course gravel. The 20-foot width describes the actual driving surface of the road. The base gravel layer (at 38 feet wide) creates the shoulder of an 8 – 10 foot borrow pit that lies within the outside area of the easement. The 30-foot gravel surface layer creates a 5-foot shoulder at a 10:1 slope on both sides of the 20-foot road area. All lot split subdivisions must pass septic approval by the Bear River Health Department and well approvals by the Utah Department of Environmental Quality, and the Utah Division of Water Rights.

Option 2: A Minor Subdivision

A minor subdivision allows a parcel to be divided into 3 to 5 lots. These new lots may not be smaller than ½ acre, although the state's environmental health standards require a minimum of 1 acre to 2 acres for a septic tank and well on one lot. After a minor subdivision has occurred, no further minor subdivisions may be created on the same development site. The minimum lot road frontage and road profile for a minor subdivision share the same requirements described for the lot split subdivision. Approval of a minor subdivision also requires review from the Bear River Health Department, the Utah Department of Environmental Quality, and the Utah Division of Water Rights.

Figure 17 and Table 6 show the projected development costs of several continuous minor subdivisions applied to a 126.88-acre land area. This land area represents a concentration of county parcels that average 10 acres each, a size which is relatively small compared to many other county parcels that range from 20 acres to 140 acres. Typically in Cache County, parcels near communities are smaller on



Existing Town Development

ITEM	S.F.	ACRES	PERCENTAGE	COUNT
Land Area	5,527,085 s.f.	126.88 Ac.		
Total Lot Count	5,193,047 s.f.	119.22 Ac.		54
Public Improvement	334,039 s.f.	7.67 Ac.	0.06	
Resulting Density	102,353 s.f.	2.35 Ac.		1 Unit / 2.35 Ac.

SCALE: 1" = 500'

100' 100' 100' 200' 500'

Figure 17. COUNTY MINOR SUBDIVISION DEVELOPMENT CONCEPT

Table 6. COUNTY MINOR SUBDIVISION DEVELOPMENT COST / PROFIT

DESCRIPTION	NOTES	TAKEOFF QTY.	COST/UNIT	TOTAL $
Site Clearing	60' Road Right of Way	336,492 s.f.	$ 0.05	$ 16,824.58
Mobilization	1 Time Charge	1	$ 2,500.00	$ 2,500.00
Earthwork	60' Road Right of Way	336,492 s.f.	$ 0.14	$ 47,108.83
Pit Run, Base	No Pavement	188,435 s.f.	$ 0.57	$ 107,408.14
24" Curb, Gutter		0 l.f.	$ 12.00	$ 0.00
30" Curb, Gutter	(Standard)	0 l.f.	$ 14.00	$ 0.00
4' SideWalk, Gravel	One Side of Street		$ 12.00	$ 0.00
6" Concrete Approach	35' per intersection (c&g)	0	$ 24.00	$ 0.00
Asphalt Patching	350 s.f / Intersection (c&g)	0.00 s.f.	$ 2.50	$ 0.00
Water line Stub-Ins	Per Lot Charge	0	$ 800.00	$ 0.00
Domestic Well	150' Lower Land @$30/l.f.	8,100 l.f.	$ 30.00	$ 243,000.00
Domestic Well	500' Bench@$30/l.f.	0 l.f.	$ 30.00	$ 0.00
8" Sewer Line		0	$ 18.70	$ 0.00
Man Holes		0	$ 1,500.00	$ 0.00
Sewer Line Sub Ins	per dwelling	0	$ 500.00	$ 0.00
8" Fire Line		0 l.f.	$ 21.25	$ 0.00
Fire Hydrants	Every 660'	0	$ 2,800.00	$ 0.00
18" Storm Drain		0 l.f.	$ 20.50	$ 0.00
Curtain Drain		0	$ 18.00	$ 0.00
Borrow Pit	2 Sides of Road	13,460	$ 1.50	$ 20,189.50
Curb Catch Basin		0	$ 800.00	$ 0.00
Catch Basin Grate		0	$ 50.00	$ 0.00
Trench - Tel. & El.	2x Strt., Sand, Conduit	13,460	$ 6.25	$ 84,122.92
Power Supply	$300 / Lot	54	$ 300.00	$ 16,200.00
Landscaping	Streetscape	0 s.f.	$ 1.50	$ 0.00
Gas	Trench (2x Roads)	13,460	$ 2.00	$ 26,919.33
Superintendent	$5000, 21 lots / mo.	2.57	$ 2,500.00	$ 6,428.57
Truck Allowance	$500, 21 lots / mo.	2.57	$ 500.00	$ 1,285.71
Temp. Toilet	$100 / month	3	$ 200.00	$ 514.29
Testing Budget	293 / lot	54	$ 0.00	$ 0.00
Temp. Electric	1 time hook up	1	$ 450.00	$ 450.00
Temp. Electric Utility	$50 / month	2.57	$ 50.00	$ 128.57
Mobile Phone	$200 / month	2.57	$ 200.00	$ 514.29
Field Office (50mi. +)	1 time mobilization	1	$ 300.00	$ 300.00
Survey/Layout/Stakes	$475 / lot	54	$ 100.00	$ 5,400.00
Sub Contractor Total				***$ 579,294.74***
Sales Tax	6.25% of 5% Sub.	$ 28,964.74	0.0625	$ 1,810.30
Contingency	2%	581,105	0.02	$ 11,622.10
Contractor's Fee	10%	592,727	0.1	$ 59,272.71
Total Construction				***$ 651,999.85***
Engineering Fees	$300 / Lot	54	$ 300.00	$ 16,200.00
Real Estate Fees	6% of Gross	$ 2,970,000.00	0.06	$ 178,200.00
Total Expenses				***$ 846,399.85***
Raw Land Value	$7000 / Acre	126.88 Ac.	$ 7000	$ 888,190.95
Total Investment				***$ 1,734,590.80***
Cost / Lot				***$ 32,122.05***
Lots		54	$ 55,000.00	$ 2,970,000.00
Total Gross Income				***$ 2,970,000.00***
Net Profit	***Gross - (Raw + Exp.)***			***$ 1,235,409.20***
Investment Return	inv. / net.			0.712

average whereas parcels that lie away from developed areas tend to be larger in size. By analyzing an area with a smaller parcel size average, the density potential of continuous minor subdivisions was modeled to determine the profitability against other development types in this study. This acreage area represents county parcels just east of Mendon with loam soils that can accommodate a 1.5-acre minimum lot for a well and septic tank on one lot. With this soil requirement applied, and a maximum of 5 lots applied per parcel, the average size of subdivided lots came to 2.35 acres after public road areas were added.

The development costs of this 126.88 acre development model amount to $32,122 per lot, which includes a gravel road with a borrow pit on either side, trenching for gas & electricity, telephone lines, and the digging and capping of one well per lot.

Option 3: A Cluster and Farm Subdivision

A cluster and farm subdivision is intended to preserve farming practices and natural features, and to encourage the creation of subdivision open space and other amenities within county developments. Like the minor subdivision, this development option permits 3 to 5 lots that may not be smaller than ½ acre, and that must meet state water and septic standards. The remaining open space areas must be restricted from further development through a deed restriction that is recorded in the County Recorder's office on the subdivision plat map. The lot road frontage, lot size minimum, road profile, well, and septic requirements for this development option share the same requirements as described for a lot split subdivision. The cluster and farm subdivision allows multiple property owners to combine their parcels into one development proposal, which enables development transfers from one parcel to another within the proposed development. Costs of developing a cluster and farm subdivision are likely comparable to the smaller lot version of a county minor subdivision.

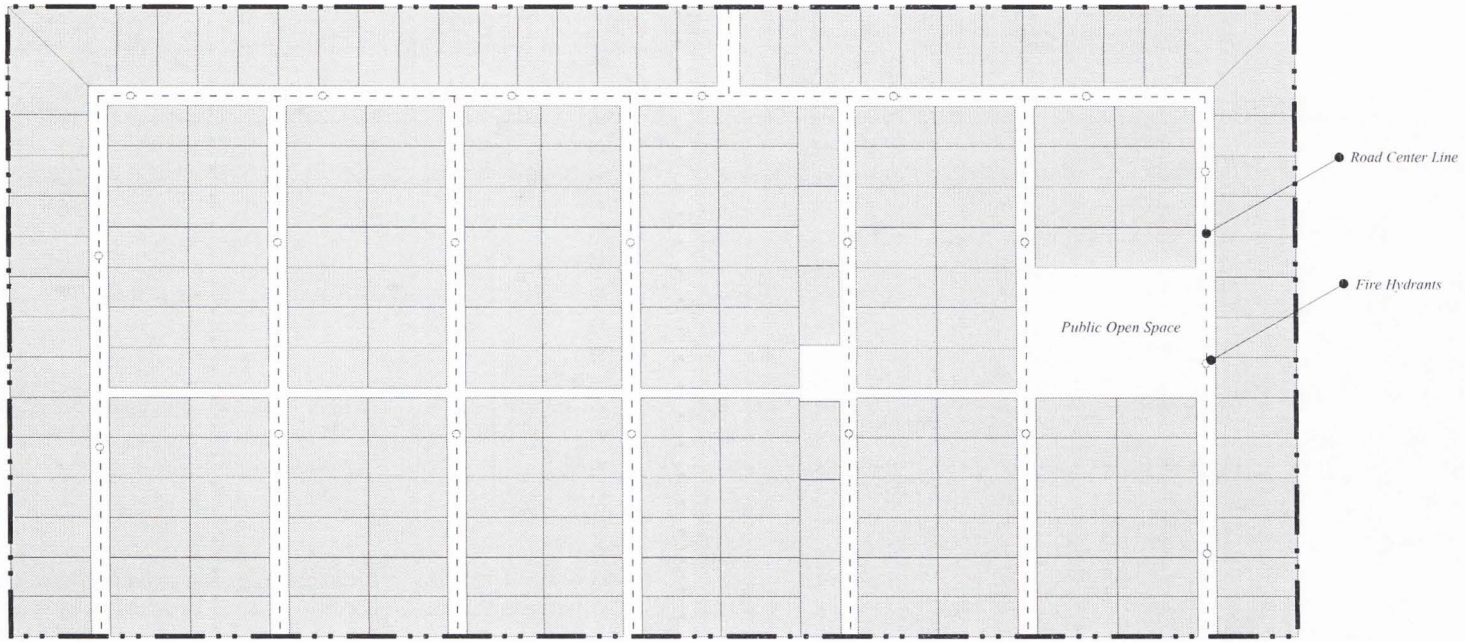
Option 4: A Major Subdivision

Major subdivision standards are required for the development of 6 or more lots, requiring the installation of curb, gutter, sidewalks, and paved roads. The county's minimum lot size of ½-acre is achievable under this option with the installation of a public water system. For full irrigation rights on a half acre lot, 2.5 acre feet of water would be required to meet the state's water supply standards for

domestic and landscape uses (Baustfield, 2001). A subdivision may create landscaping covenants that require the use of native or xeric vegetation to reduce water consumption for irrigation. The state will permit less water per lot if codes are officially adopted and enforced by the development or community.

The minimum lot frontage facing a road remains at 100 feet, creating a likely minimum lot size of 100 feet by 217.8 feet. The street standards for a major subdivision require the addition of a 2-inch thick, 20-foot wide bituminous pavement surface (asphalt) over the two gravel layers required for a minor subdivision. The county does not currently provide a dimensioned street profile showing curb, gutter and sidewalk requirements. This is perhaps due to the fact that a developer has not yet created a county major subdivision that requires a full set of road improvements. It could be assumed that a standard 2-foot curb and gutter is required on both sides of the paved area as well as a 4 foot sidewalk on both sides of the street, and fire hydrants matching the county fire code standards for residential development. Fire code standards require that fire hydrants be spaced no less than 500 feet along a street, and that all homes are located within 250 feet of a fire hydrant. The fire code also requires a water pressure minimum of 1000 gallons per minute within a public water line (Cache County Fire Dept., 2001).

In Figure 18, and Table 7, the same 126.88-acre land area east of Mendon (as shown in the county minor subdivision scenario) has been developed as a county major subdivision. This development shows the creation of 213 ½-acre lots, and projects the associated development costs and potential profit to be encountered by a developer. The development profile shows a public improvement figure of 18 percent that includes roadways, landscape detention basins, and a public park. Curb, gutter and sidewalks are included on both sides of the street, and a 24-foot paved surface caps the automobile road area. This county major subdivision scenario assumes that the developer already owns a sufficient quantity of water rights, and was able to convert them to ground water for the creation of a large well to supply a public water system. With the inclusion of a public water system as outlined in Table 5, the projected development costs for this county major subdivision scenario are estimated at $20,275 per lot (Table 4).



Existing Town Development

ITEM	S.F.	ACRES	PERCENTAGE	COUNT
Total Land Area	5,527,085 s.f.	126.88 Ac.		
Total Lot Count	4,700,989 s.f.	107.92 Ac.		213
Public Improvement	826,097 s.f.	18.96 Ac.	0.149	
Resulting Density	25,949 s.f.	0.60 Ac.		1 Unit = .6 Ac.

SCALE: 1" = 500'

100' 100' 100' 200' 500'

Figure 18. 1/2 AC. COUNTY MAJOR SUBDIVISION DEVELOPMENT CONCEPT

Table 7. 1/2 AC. COUNTY MAJOR SUBDIVISION DEVELOPMENT COST / PROFITS

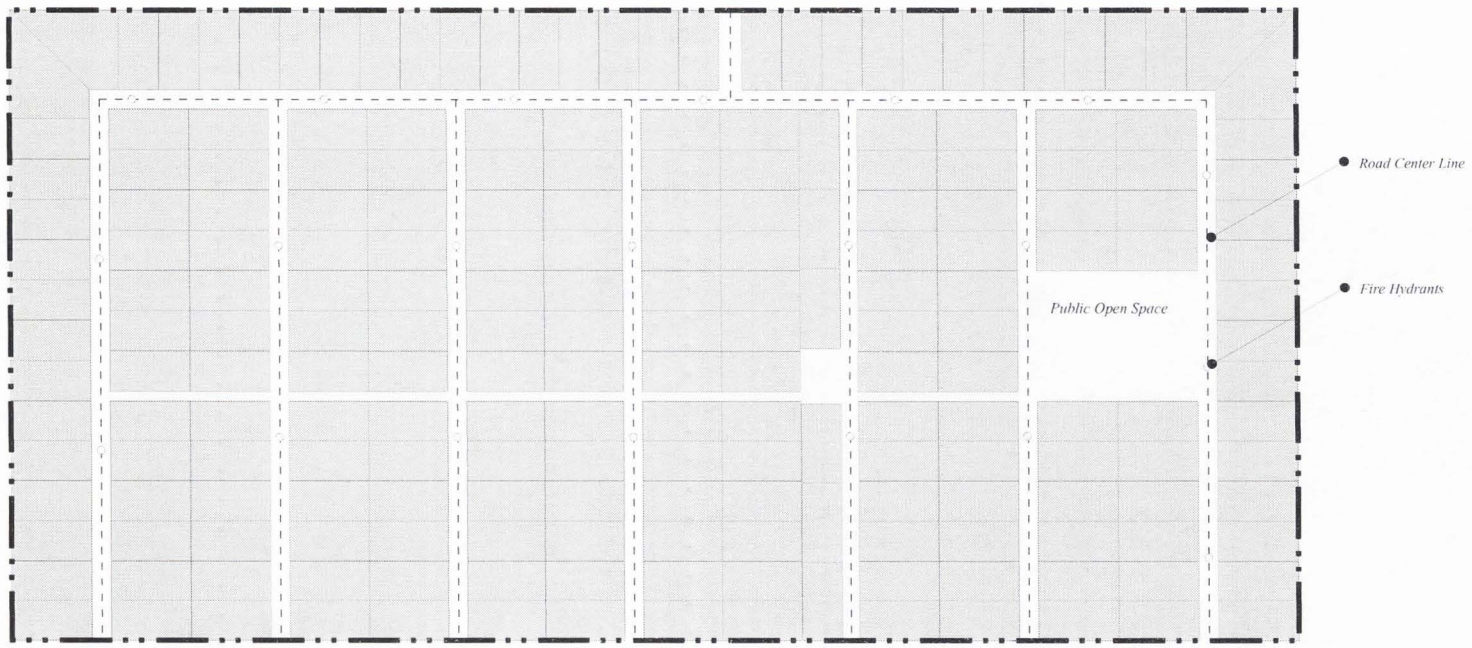
DESCRIPTION	NOTES	TAKE OFF QTY.	COST / UNIT	TOTAL COST
Site Clearing	50' Road Right of Way	651,373 s.f.	$ 0.05	$ 32,568.65
Mobilization	1 Time Charge	1	$ 2,500.00	$ 2,500.00
Earthwork	60' Road Right of Way	651,373 s.f.	$ 0.14	$ 91,192.21
Base, Asphalt	24' Wide Pavement	325,686 s.f.	$ 1.02	$ 332,200.19
24" Curb, Gutter		26,055 l.f.	$ 12.00	$ 312,659.00
30" Curb, Gutter	(Standard)	0 l.f.	$ 14.00	$ 0.00
4' SideWalk, Gravel	Both Sides of Street	26,055 l.f.	$ 12.00	$ 312,659.00
6" Concrete Approach	35' per intersection (c&g)	490	$ 24.00	$ 11,760.00
Asphalt Patching	350 s.f / Intersection (c&g)	4,900.00 s.f.	$ 2.50	$ 12,250.00
Water line Stub-Ins	Per Lot Charge	213	$ 800.00	$ 170,400.00
Domestic Well	150' Lower Land @$30/l.f.	0 l.f.	$ 30.00	$ 0.00
Domestic Well	500' Bench@$30/l.f.	0 l.f.	$ 30.00	$ 0.00
8" Sewer Line		0	$ 18.70	$ 0.00
Man Holes		0	$ 1,500.00	$ 0.00
Sewer Line Sub Ins	per dwelling	0	$ 500.00	$ 0.00
8" Fire Line		13,027 l.f.	$ 21.25	$ 276,833.49
Fire Hydrants	Every 500'	21	$ 2,800.00	$ 58,800.00
18" Storm Drain PUBLIC OPENSPACE		100 l.f.	$ 20.50	$ 2,050.00
Curtain Drain		1,500	$ 18.00	$ 27,000.00
Borrow Pit		2,000	$ 15.00	$ 30,000.00
Curb Catch Basin		20	$ 800.00	$ 16,000.00
Catch Basin Grate		20	$ 50.00	$ 1,000.00
Trench - Tel. & El.	2x Strt., Sand, Conduit	26,055	$ 6.25	$ 162,843.23
Power Supply	$300 / Lot	213	$ 300.00	$ 63,900.00
Landscaping	Streetscape	0 s.f.	$ 1.50	$ 0.00
Gas	Trench (2x Roads)	26,055	$ 2.00	$ 52,109.83
Superintendent	$5000, 21 lots / mo.	10.14	$ 5,000.00	$ 50,714.29
Truck Allowance	$500, 21 lots / mo.	10.14	$ 500.00	$ 5,071.43
Temp. Toilet	$100 / month	10	$ 200.00	$ 2,028.57
Testing Budget	293 / lot	213	$ 293.00	$ 62,409.00
Temp. Electric	1 time hook up	1	$ 450.00	$ 450.00
Temp. Electric Utility	$50 / month	10.14	$ 50.00	$ 507.14
Mobile Phone	$200 / month	10.14	$ 200.00	$ 2,028.57
Field Office (50mi. +)	1 time mobilization	1	$ 300.00	$ 300.00
Survey/Layout/Stakes	$475 / lot	213	$ 475.00	$ 101,175.00
				$ 505,000.00
Sub Contractor Total				***$ 2,665,840.95***
Sales Tax	6.25% of 5% Sub.	$ 133,292.05	0.0625	$ 8,330.75
Contingency	2%	2,674,172	0.02	$ 53,483.43
Contractor's Fee	10%	2,727,655	0.1	$ 272,765.51
Total Construction				***$ 2,946,937.21***
Engineering Fees	$500 / Lot	213	$ 500.00	$ 106,500.00
Real Estate Fees	6% of Gross	$ 6,283,500.00	0.06	$ 377,010.00
Total Expenses				***$ 3,430,447.21***
Raw Land Value	$7000 / Acre	126.88 Ac.	$ 7000	$ 888,190.95
Total Investment				***$ 4,318,638.17***
Cost / Lot				***$ 20,275.30***
Sale of Lots		213	$ 29,500.00	$ 6,283,500.00
Total Gross Income				***$ 6,283,500.00***
Net Profit	***Gross - (Raw + Exp.)***			***$ 1,964,861.83***
Investment Return	inv. / net.			0.455

County Major Subdivision Compared with TDR Receiving Zone Development

To compare the costs of developing in a city receiving zone with a county major subdivision, the cost of acquiring development rights from a sending zone must be weighed against the costs of installing a public water system. Figure 19 and Table 8 show an identical ½-acre subdivision to the major county subdivision presented in Figure 18, but with reduced road standards more appropriate for a rural community. In this receiving zone cost profile, curb and gutter have been eliminated from the street standards, and a sidewalk is placed on only one side of the street. The complete expenditures prior to acquiring development rights amount to $14,975 per lot.

To determine the market value of a development right, this scenario assumes that each lot will sell for $30,000, and that the developer expects at least a 40% profit return (not including interest charges). The expected selling price of $30,000 is $500 more than the ½ acre lots sold in the county major subdivision scenario at $29,500. This assumption is based on the probability that a TDR green belt program would provide increased value to a community due to a net increase of surrounding open space. Applying Pruetz's development right value formula [TDR = (Projected Profit / Projected Investment Return) – (Development Investment Costs)], would create the following equation: [($30,000 / 1.4) – ($14,975)] (Pruetz, 1997, p. 153). This creates a value of $6453 per development right, or roughly $6,500 per development right.

In this scenario, the receiving zone area of 126.88 acres contains an as-of-right density of 55 development rights, which necessitates the acquisition of 158 total development rights (213 units – 55 units). This number is based on the density potential of a county major subdivision at one unit per 2.35 acres, an achievable density on county parcels adjacent to Mendon. The full cost of all 158 development rights is significant, totaling to $1,027,000 (158 units x $6500). However, the total cost of development per lot is $19,796, $479 below the cost per lot in the county major subdivision scenario at $20,275. The total amount of land saved by transferring development rights from the surrounding sending zone would vary according to the average size of sending zone parcels. As lot sizes increase, the amount of preserved land would also increase given the maximum of 5 lots per parcel under the county minor subdivision ordinance. As previously explored, a farmer with a larger parcel may be limited to 5 transferable development rights, but also has the opportunity to sell or operate more agricultural land. At a minimum, the preserved sending



Existing Town Development

ITEM	S.F.	ACRES	PERCENTAGE	COUNT
Total Land Area	5,527,085 s.f.	126.88 Ac.		
Total Lot Count	4,700,989 s.f.	107.92 Ac.		213
Public Improvement	826,097 s.f.	18.96 Ac.	0.149	
Resulting Density	25,949 s.f.	0.60 Ac.		1 Unit = .6 Ac.

SCALE: 1" = 500'

100' 100' 100' 200' 500'

Figure 19. 1/2 AC. RECEIVING ZONE DEVELOPMENT CONCEPT

Table 8. 1/2 AC. RECEIVING ZONE DEVELOPMENT COST / PROFITS

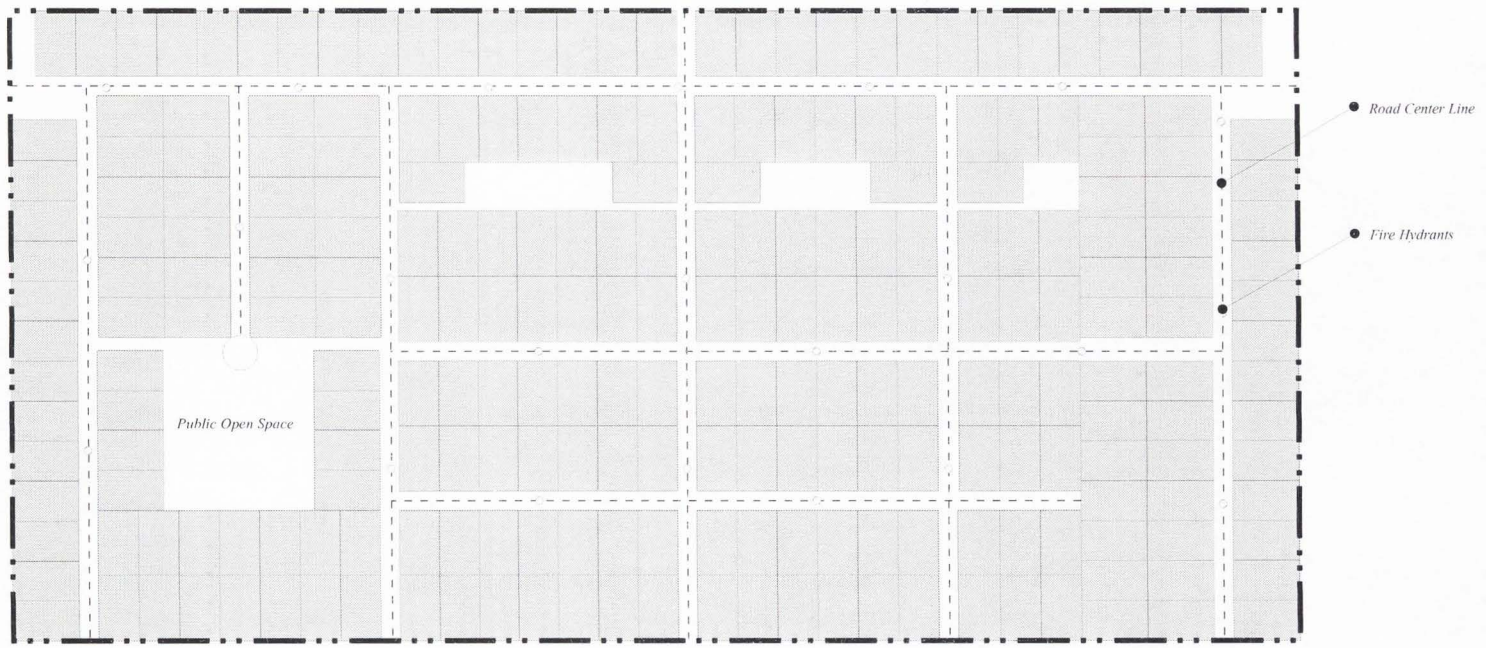
DESCRIPTION	NOTES	TAKE OFF QTY.	COST / UNIT	TOTAL COST
Site Clearing	50' Road Right of Way	651,373 s.f.	$ 0.05	$ 32,568.65
Mobilization	1 Time Charge	1	$ 2,500.00	$ 2,500.00
Earthwork	50' Road Right of Way	651,373 s.f.	$ 0.14	$ 91,192.21
Base, Asphalt	25' Wide Pavement	325,686 s.f.	$ 1.02	$ 332,200.19
24" Curb, Gutter		0 l.f.	$ 12.00	$ 0.00
30" Curb, Gutter	(Standard)	0 l.f.	$ 14.00	$ 0.00
4' SideWalk, Gravel	One Side of Street	13,027 l.f.	$ 12.00	$ 156,329.50
6" Concrete Approach	35' per intersection (c&g)	490	$ 24.00	$ 11,760.00
Asphalt Patching	350 s.f / Intersection (c&g)	4,900.00 s.f.	$ 2.50	$ 12,250.00
Water line Stub-Ins	Per Lot Charge	158	$ 800.00	$ 126,400.00
Domestic Well	150' Lower Land @$30/l.f.	0 l.f.	$ 30.00	$ 0.00
Domestic Well	500' Bench@$30/l.f.	0 l.f.	$ 30.00	$ 0.00
8" Sewer Line		0	$ 18.70	$ 0.00
Man Holes		0	$ 1,500.00	$ 0.00
Sewer Line Sub Ins	per dwelling	0	$ 500.00	$ 0.00
8" Fire Line		13,027 l.f.	$ 21.25	$ 276,833.49
Fire Hydrants	Every 500'	21	$ 2,800.00	$ 58,800.00
18" Storm Drain		100 l.f.	$ 20.50	$ 2,050.00
Curtain Drain		1,500	$ 18.00	$ 27,000.00
Borrow Pit	Both Sides of Road	26,055	$ 1.50	$ 39,082.38
Curb Catch Basin		20	$ 800.00	$ 16,000.00
Catch Basin Grate		20	$ 50.00	$ 1,000.00
Trench - Tel. & El.	2x Strt., Sand, Conduit	26,055	$ 6.25	$ 162,843.23
Power Supply	$300 / Lot	158	$ 300.00	$ 47,400.00
Landscaping	Streetscape	0 s.f.	$ 1.50	$ 0.00
Gas	Trench (2x Roads)	26,055	$ 2.00	$ 52,109.83
Superintendent	$5000, 21 lots / mo.	7.52	$ 5,000.00	$ 37,619.05
Truck Allowance	$500, 21 lots / mo.	7.52	$ 500.00	$ 3,761.90
Temp. Toilet	$100 / month	8	$ 200.00	$ 1,504.76
Testing Budget	293 / lot	158	$ 293.00	$ 46,294.00
Temp. Electric	1 time hook up	1	$ 450.00	$ 450.00
Temp. Electric Utility	$50 / month	7.52	$ 50.00	$ 376.19
Mobile Phone	$200 / month	7.52	$ 200.00	$ 1,504.76
Field Office (50mi. +)	1 time mobilization	1	$ 300.00	$ 300.00
Survey/Layout/Stakes	$475 / lot	158	$ 475.00	$ 75,050.00
Sub Contractor Total				***$ 1,615,180.14***
Sales Tax	6.25% of 5% Sub.	$ 80,759.01	0.0625	$ 5,047.44
Contingency	2%	1,620,228	0.02	$ 32,404.55
Contractor's Fee	10%	1,652,632	0.1	$ 165,263.21
Total Construction				***$ 1,817,895.34***
Development Rights		158	$ 6,500.00	$ 1,027,000.00
Engineering Fees	$500 / Lot	213	$ 500.00	$ 106,500.00
Real Estate Fees	6% of Gross	$ 6,283,500.00	0.06	$ 377,010.00
Total Expenses				***$ 3,328,405.34***
Raw Land Value	$7000 / Acre	126.88 Ac.	$ 7000	$ 888,190.95
Total Investment				***$ 4,216,596.29***
Cost / Lot				$ 19,796.23
Sale of Lots		213	$ 29,500.00	$ 6,283,500.00
Total Gross Income				***$ 6,283,500.00***
Net Profit	***Gross - (Raw + Exp.)***			***$ 2,066,903.71***
Investment Return	inv. / net.			0.49

zone acreage achieved from acquiring 158 development rights would be 371 acres (158 development rights x 2.35 acres).

The increased cost of development rights to developers requires a reduced set of street standards, or an increase in the receiving zone's higher density limit to compete with the profit potential of a ½-acre county major subdivision. Another incentive a community could create is a development right purchase bonus – given to developers that purchase development rights from sending zone landowners. For example, a city could explore a 1:5 purchase bonus, where one extra development right would be offered to a developer for every 5 development rights purchased from sending zone landowners. Figure 20 and Table 9 show a reduced lot size development in a community receiving zone (using the same 126.88-acre development site) with a minimum lot size of 18,000 square feet (just above 3/8 of an acre). In this scenario, 20.2 percent of the land area is used for public improvements, and the total lot count is 246. Assuming a 1:5 purchase bonus, a developer would have to purchase 160 development rights to achieve the city's 18,000 square foot receiving zone density. The total cost of development right acquisition would be $1,040,000, but with an increased number of lots the total cost per lot would drop to $18,418. The total profit return in Table 9 shows a 52 percent increase without interest charges.

A community could also consider offering a 2:5 purchase bonus, or 2 extra development rights offered as a bonus for every 5 development rights purchased by a receiving zone developer. In the same 126.88-acre receiving zone development scenario (with an 18,000 square-foot higher density limit), this would require the developer to purchase only 95 development rights instead of 158, and would reduce the development right investment from $1,027,000 to $617,500. This bonus option would reduce the cost of developing each lot to $17,157, which lies comfortably below the cost per lot of a county major subdivision at $20,275.

If farmers were reluctant to sell their development rights from a sending zone, a transfer bonus could be offered to encourage TDR participation. A sending zone transfer bonus could be structured in the same manner as a receiving zone purchase bonus – either as a 1:5 transfer ratio, or as a 2:5 transfer ratio. If a 1:5, or 2:5 transfer ratio were offered to farmers, and a 2:5 purchase bonus were offered to receiving zone developers, the higher density limit of the receiving zone should be increased to accommodate additional development rights. In the 126.88-acre development site for example, if the higher density limit were



Existing Town Development

ITEM	S.F.	ACRES	PERCENTAGE	COUNT
Total Land Area	5,527,085 s.f.	126.88 Ac.		
Total Lot Count	4,411,557 s.f.	101.28 Ac.		246
Public Improvement	1,115,529 s.f.	25.61 Ac.	0.202	
Resulting Density	22,468 s.f.	0.52 Ac.	1 Unit = .52 Ac.	

SCALE: 1" = 500'

100' 100' 100' 200' 500'

Figure 20. 18,000 S.F. RECEIVING ZONE DEVELOPMENT CONCEPT

Table 9. 18,000 S.F. RECEIVING ZONE DEVELOPMENT COST / PROFITS

DESCRIPTION	NOTES	TAKE OFF QTY.	COST / UNIT	TOTAL COST
Site Clearing	50' Road Right of Way	771,513 s.f.	$ 0.05	$ 38,575.67
Mobilization	1 Time Charge	1	$ 2,500.00	$ 2,500.00
Earthwork	50' Road Right of Way	771,513 s.f.	$ 0.14	$ 108,011.87
Base, Asphalt	25' Wide Pavement	385,757 s.f.	$ 1.02	$ 393,471.80
24" Curb, Gutter		0 l.f.	$ 12.00	$ 0.00
30" Curb, Gutter	(Standard)	0 l.f.	$ 14.00	$ 0.00
4' SideWalk, Gravel	One Side of Street	15,430 l.f.	$ 12.00	$ 185,163.20
6" Concrete Approach	35' per intersection (c&g)	490	$ 24.00	$ 11,760.00
Asphalt Patching	350 s.f / Intersection (c&g)	4,900.00 s.f.	$ 2.50	$ 12,250.00
Water line Stub-Ins	Per Lot Charge	160	$ 800.00	$ 128,000.00
Domestic Well	150' Lower Land @$30/l.f.	0 l.f.	$ 30.00	$ 0.00
Domestic Well	500' Bench@$30/l.f.	0 l.f.	$ 30.00	$ 0.00
8" Sewer Line		0	$ 18.70	$ 0.00
Man Holes		0	$ 1,500.00	$ 0.00
Sewer Line Sub Ins	per dwelling	0	$ 500.00	$ 0.00
8" Fire Line		15,430 l.f.	$ 21.25	$ 327,893.17
Fire Hydrants	Every 500'	23	$ 2,800.00	$ 64,400.00
18" Storm Drain		100 l.f.	$ 20.50	$ 2,050.00
Curtain Drain		1,500	$ 18.00	$ 27,000.00
Borrow Pit	Both Sides of Road	30,861	$ 1.50	$ 46,290.80
Curb Catch Basin		20	$ 800.00	$ 16,000.00
Catch Basin Grate		20	$ 50.00	$ 1,000.00
Trench - Tel. & El.	2x Strt., Sand, Conduit	30,861	$ 6.25	$ 192,878.33
Power Supply	$300 / Lot	160	$ 300.00	$ 48,000.00
Landscaping	Streetscape	0 s.f.	$ 1.50	$ 0.00
Gas	Trench (2x Roads)	30,861	$ 2.00	$ 61,721.07
Superintendent	$5000, 21 lots / mo.	7.62	$ 5,000.00	$ 38,095.24
Truck Allowance	$500, 21 lots / mo.	7.62	$ 500.00	$ 3,809.52
Temp. Toilet	$100 / month	8	$ 200.00	$ 1,523.81
Testing Budget	293 / lot	160	$ 293.00	$ 46,880.00
Temp. Electric	1 time hook up	1	$ 450.00	$ 450.00
Temp. Electric Utility	$50 / month	7.62	$ 50.00	$ 380.95
Mobile Phone	$200 / month	7.62	$ 200.00	$ 1,523.81
Field Office (50mi. +)	1 time mobilization	1	$ 300.00	$ 300.00
Survey/Layout/Stakes	$475 / lot	160	$ 475.00	$ 76,000.00
Sub Contractor Total				***$ 1,835,929.23***
Sales Tax	6.25% of 5% Sub.	$ 91,796.46	0.0625	$ 5,737.28
Contingency	2%	1,841,667	0.02	$ 36,833.33
Contractor's Fee	10%	1,878,500	0.1	$ 187,849.98
Total Construction				***$ 2,066,349.83***
Development Rights		160	$ 6,500.00	$ 1,040,000.00
Engineering Fees	$500 / Lot	246	$ 500.00	$ 123,000.00
Real Estate Fees	6% of Gross	$ 6,888,000.00	0.06	$ 413,280.00
Total Expenses				***$ 3,642,629.83***
Raw Land Value	$7000 / Acre	126.88 Ac.	$ 7000	$ 888,190.95
Total Investment				***$ 4,530,820.78***
Cost / Lot				$ 18,417.97
Sale of Lots		246	$ 28,000.00	$ 6,888,000.00
Total Gross Income				***$ 6,888,000.00***
Net Profit	***Gross - (Raw + Exp.)***			***$ 2,357,179.22***
Investment Return	inv. / net.			0.52

increased to 1/3-acre (14,520 square feet), 295 lots could be created with 22.5 percent of the land area used as public improvements. This is an increase of 82 lots above the ½-acre receiving zone scenario, and 25 more lots than achievable under the 3/8-acre receiving zone scenario.

In a 1/3-acre receiving zone, if a total of four bonus development rights were offered for every 5 development right transfers (2 purchase bonus and 2 transfer bonus development rights), 134 development rights would need to be acquired from the sending zone {[(295 DR's –54 As of Right Density DR's) / (5 Base line Density DR's + 4 bonus DR's)] x (5 Base Line Density DR's)}. This would preserve a minimum of 315 acres (134 x 2.35 acres), which is down 56 acres or 15% from the 371 acres preserved in the ½-acre receiving zone scenario, without any transfer or purchase bonus units. To preserve a 371-acre sending zone area while offering four total bonus development rights, a total of 158 development rights would need to be purchased from the receiving zone (371 acres / 2.35 average lots per acre). This would create a total bonus package of 126 units {[158 purchased development rights / (5 base line density units)] x 4 bonus units}. The total number of development rights to be assembled in the receiving zone would be 338 (158 purchased DR's + 126 bonus DR's + 54 as-of-right density DR's). The higher density limit of the receiving zone area (126.88 acres) would need to be one unit per .285 acres, or 12,427 square feet to accommodate 338 lots [(126.88 acres – 24%) / 338 development right units]. This formula was deducts a 24 percent area for public improvement in the receiving zone.

These transfer incentives would attract developers and farmers, and encourage them to participate in the TDR program instead of creating adjacent county major or minor subdivisions. If transfer bonuses were offered and the receiving zone higher density limit was not increased, a 20 or 40 percent reduction in the target sending zone area would result, significantly reducing the community's sphere of influence to preserve surrounding land as a permanent greenbelt.

A community would be wise to hire an economic consultant to further analyze the costs of developing a county major subdivision, and to determine how a TDR program might create competing development cost and profit options for their target receiving zones. Further financial analysis should consider that developers of a county major subdivision and a public water system must endure significant pressure to sell enough lots to cover the initial costs of an expensive water system and associated interest fees. This pressure could mount as the major subdivision developer competes against other lot sales within

the region's limited market. To assist developers in a community receiving zone, a city could permit the acquisition of development rights in phases as market demand requires, creating lower interest fees and reduced pressure to sell lots.

Another issue requiring further study is how a city might transfer the cost of providing water rights to new developments instead of placing the cost on the existing community residents. If the city charged a significant water impact fee for each new building permit, the total development costs might match or exceed the cost of a county major subdivision. Municipalities might instead enact a monthly water fee service fee to new lot owners for a period of time, until the costs of obtaining water rights are repaid to the city. This would enable the developer to transfer water costs directly to the new residents, and make entrance into a new community lot more marketable by spreading impact fees out through monthly installments.

A new county major subdivision presents significant financial risk considering that only 613 new dwelling units were added to the county during the year 2000 (Cache County Census, 2001). Given the county's current growth rate of 2.8%, rural areas outside of the Logan Urbanized Area and away from existing communities are not likely to create demand to support such a sizable investment.

A community TDR program must explore a variety of incentives, including a development right acquisition bonus, reducing road improvement costs, and by permitting incremental development right acquisitions. Such measures may be used to compete with the profitability of a county subdivision option. By providing a cost competitive TDR program, adjacent developers will gravitate towards community receiving zones. Supporting this strategy is the county's new subdivision ordinance that requires development proposals of properties adjacent to a municipality or within the Logan Urbanized Area to first apply to the incorporated city. With TDR programs in place, developers could compare receiving zone profits with county development options, including a major subdivision, a minor subdivision, or a farm cluster subdivision.

County Minor Subdivision, Farm Cluster Subdivision, and Development Transfer Comparisons

In a voluntary TDR program, a city cannot predict whether adjacent parcel owners will acquire development transfers to seek annexation, or refuse participation and create a minor county subdivision or

farm cluster subdivision instead. This is perhaps the main drawback to a conditional annexation policy. It is, however, better for the community to let lower density development occur in the county than to continue annexing and creating medium density without preserving any nearby open space. Annexing land without condensed, transferred development rights creates medium density development that will spread outward and collide with county developments in the surrounding area. A community may think that it has control of the surrounding landscape when it annexes land and administers subdivision laws. In reality, this only adds to the existing net number of development rights in the county and hastens the conversion of open space to developed land.

Cache County subdivision requirements are greatly influenced by state environmental health regulations for water quality standards and septic tank permits. Due to the state's protective water quality requirements, the county's minimum lot size of ½-acre is achievable only through a major subdivision option and the prerequisite of a public water system. Given the county's ample supply of land and building lots, and given the high costs associated with major subdivision / public water system development, county subdivisions are more likely to occur as lot splits and minor subdivisions from 2 to 5 lots, or as a single dwelling unit on an existing parcel.

A community would do better to be surrounded by county farm cluster subdivisions that preserve farming parcels into perpetuity than to continue creating new development rights through annexation. Farm cluster subdivisions are likely to occur given the increased profit potential under this option compared to a county minor subdivision. Tables 10 through 14 show county development options contrasted with each other and with a community TDR option. The associated costs and potential profits for county farm parcel owners are modeled under five development options. These options include a minor subdivision, a farm cluster subdivision, a TDR option (with a maximum of 5 transferable units), a TDR 1:5 transfer bonus option (one development right bonus for every 5 development rights transferred), and a TDR 2:5 transfer bonus option (a two development right bonus for every 5 development rights transferred). This series of comparative models is created for several parcel sizes, including a 10-acre parcel (Table 10), a 15-acre parcel (Table 11), a 25-acre parcel (Table 12), a 50-acre parcel (Table 13), and an 80-acre parcel (Table 14). The models assume that each parcel owner has secured water rights for well permit transfer, and has

adequate soil conditions for development. Development costs are based on the county minor subdivision development scenario, represented in Figure 15, and Table 6.

Each development scenario compares profits over a four-year time period. Real estate profits are increased when investments are made to create minor subdivisions or farm cluster subdivisions. However, a four-year investment of TDR and agricultural land sales into a mutual fund shows competitive profits with lower risk. Agricultural land sales in these scenarios show a $2,500 an acre value, which represents the lower end average of dry farmland sales in Cache County. Ag-land would sell for more, with water irrigation shares or farm buildings. Also, farmers may be willing to pay more per acre for ag-land that is protected from encroaching development by a community TDR program, as has been the case in Montgomery County (see General Uses of TDR in Chapter 2).

The farm cluster subdivision requires less investment than a minor subdivision due to the reduced infrastructure necessary for a smaller development area, and it allows the remaining agricultural area to be sold for additional profit, or farmed into perpetuity for a continuing annual profit. For farmers who are unwilling to invest or borrow money to develop a minor subdivision or a farm cluster subdivision, the TDR option provides competitive value without the risk of slow lot sales in an unpredictable market.

At the moment a community adopts a conditional TDR annexation policy, and as developers explore the option of developing in a community's target receiving zone, a new development option exists for county parcel owners within a specified region surrounding an incorporated area. Farmers in need of retirement from their laborious industry, or who find themselves short of venture capital may enjoy a cash profit from their land and assure that the farming enterprise is passed on to future agricultural ownership.

Table 10. TDR Sending Zone Profits Contrasted with County Minor Subdivision and County Farm Cluster Subdivision Profits

10 Acre Parcel	Units	Investment / Lot	Total Investment	4 Year Interest	Price per Unit	Unit Sales	Ag Price	Ag Profit	Net Profit
Minor Subdivision	5	$ 33,750.00	$ 168,750.00	$ 28,750.00	$ 51,500.00	**$ 257,500.00**			**$ 60,000.00**
Farm Cluster	5							$ -	$ -
TDR	5	$ -	$ -		$ 6,500.00	**$ 32,500.00**	$ 2,500.00	**$ 25,000.00**	**$ 57,500.00**
TDR 1:5 Transfer Bonus	6	$ -	$ -		$ 6,500.00	**$ 39,000.00**	$ 2,500.00	**$ 25,000.00**	**$ 64,000.00**
TDR 2:5 Transfer Bonus	7	$ -	$ -		$ 6,500.00	**$ 45,500.00**	$ 2,500.00	**$ 25,000.00**	**$ 70,500.00**

Minor Subdivision		**$ 168,750.00**	**Payment**
Loan Interest at 6.6%	1	$ 130,512.50	$ 49,375.00
(4 Year Loan)	2	$ 89,751.33	$ 49,375.00
	3	$ 46,299.91	$ 49,375.00
	4	$ (19.29)	$ 49,375.00
Total Payments			$ 197,500.00
Total Interest Paid			**$ 28,750.00**

Farm Cluster		**$ -**	**Payment**
Loan Interest at 6.6%	1		
(4 Year Loan)	2		
	3		
	4		
Total Payments			
Total Interest Paid			

TDR Profits Placed in a Mutual Fund Over a 4-Year Period

TDR Profit Reinvestment		**TDR**	**1:5 TDR**	**2:5 TDR**
Mutual Fund		**$ 57,500.00**	**$ 64,000.00**	**$ 70,500.00**
Profit Return at 8%	1	$ 62,100.00	$ 69,120.00	$ 76,140.00
(4 Year Investment)	2	$ 67,068.00	$ 74,649.60	$ 82,231.20
	3	$ 72,433.44	$ 80,621.57	$ 88,809.70
	4	**$ 78,228.12**	**$ 87,071.29**	**$ 95,914.47**

Table 11. TDR Sending Zone Profits Contrasted with County Minor Subdivision and County Farm Cluster Subdivision Profits

15 Acre Parcel	Units	Investment / Lot	Total Investment	4 Year Interest	Price per Unit	Unit Sales	Ag Price	Ag Profit	Net Profit
Minor Subdivision	5	$ 33,750.00	$ 168,750.00	$ 28,750.00	$ 55,000.00	**$ 275,000.00**			**$ 77,500.00**
Farm Cluster	5	$ 32,122.00	$ 160,610.00	$ 27,350.00	$ 55,000.00	**$ 275,000.00**	$ 1,000.00	**$ 8,000.00**	**$ 95,040.00**
TDR	5	$ -	$ -		$ 6,500.00	**$ 32,500.00**	$ 2,500.00	**$ 37,500.00**	**$ 70,000.00**
TDR 1:5 Transfer Bonus	6	$ -	$ -		$ 6,500.00	**$ 39,000.00**	$ 2,500.00	**$ 37,500.00**	**$ 76,500.00**
TDR 2:5 Transfer Bonus	7	$ -	$ -		$ 6,500.00	**$ 45,500.00**	$ 2,500.00	**$ 37,500.00**	**$ 83,000.00**

Minor Subdivision		**$ 168,750.00**	**Payment**
Loan Interest at 6.6%	1	$ 130,512.50	$ 49,375.00
(4 Year Loan)	2	$ 89,751.33	$ 49,375.00
	3	$ 46,299.91	$ 49,375.00
	4	$ (19.29)	$ 49,375.00
Total Payments			$ 197,500.00
Total Interest Paid			**$ 28,750.00**

Farm Cluster		**$ 160,610.00**	**Payment**
Loan Interest at 6.6%	1	$ 124,220.26	$ 46,990.00
(4 Year Loan)	2	$ 85,428.80	$ 46,990.00
	3	$ 44,077.10	$ 46,990.00
	4	$ (3.81)	$ 46,990.00
Total Payments			$ 187,960.00
Total Interest Paid			**$ 27,350.00**

TDR Profits Placed in a Mutual Fund Over a 4-Year Period

TDR Profit Reinvestment		**TDR**	**1:5 TDR**	**2:5 TDR**
Mutual Fund		**$ 70,000.00**	**$ 76,500.00**	**$ 83,000.00**
Profit Return at 8%	1	$ 75,600.00	$ 82,620.00	$ 89,640.00
(4 Year Investment)	2	$ 81,648.00	$ 89,229.60	$ 96,811.20
	3	$ 88,179.84	$ 96,367.97	$ 104,556.10
	4	**$ 95,234.23**	**$ 104,077.41**	**$ 112,920.58**

Table 12. TDR Sending Zone Profits Contrasted with County Minor Subdivision and County Farm Cluster Subdivision Profits

25 Acre Parcel	Units	Investment / Lot	Total Investment	4 Year Interest	Price per Unit	Unit Sales	Ag Price	Ag Profit	Net Profit
Minor Subdivision	5	$ 33,750.00	$ 168,750.00	$ 28,750.00	$ 60,000.00	**$ 300,000.00**			**$ 102,500.00**
Farm Cluster	5	$ 32,122.00	$ 160,610.00	$ 27,350.00	$ 55,000.00	**$ 275,000.00**	$ 2,500.00	**$ 42,500.00**	**$ 129,540.00**
TDR	5	$ -	$ -		$ 6,500.00	**$ 32,500.00**	$ 2,500.00	**$ 62,500.00**	**$ 95,000.00**
TDR 1:5 Transfer Bonus	6	$ -	$ -		$ 6,500.00	**$ 39,000.00**	$ 2,500.00	**$ 62,500.00**	**$ 101,500.00**
TDR 2:5 Transfer Bonus	7	$ -	$ -		$ 6,500.00	**$ 45,500.00**	$ 2,500.00	**$ 62,500.00**	**$ 108,000.00**

Minor Subdivision		**$ 168,750.00**	**Payment**
Loan Interest at 6.6%	1	$ 130,512.50	$ 49,375.00
(4 Year Loan)	2	$ 89,751.33	$ 49,375.00
	3	$ 46,299.91	$ 49,375.00
	4	$ (19.29)	$ 49,375.00
Total Payments			$ 197,500.00
Total Interest Paid			**$ 28,750.00**

Farm Cluster		**$ 160,610.00**	**Payment**
Loan Interest at 6.6%	1	$ 124,220.26	$ 46,990.00
(4 Year Loan)	2	$ 85,428.80	$ 46,990.00
	3	$ 44,077.10	$ 46,990.00
	4	$ (3.81)	$ 46,990.00
Total Payments			$ 187,960.00
Total Interest Paid			**$ 27,350.00**

TDR Profits Placed in a Mutual Fund Over a 4-Year Period

TDR Profit Reinvestment		**TDR**	**1:5 TDR**	**2:5 TDR**
Mutual Fund		**$ 95,000.00**	**$ 101,500.00**	**$ 108,000.00**
Profit Return at 8%	1	$ 102,600.00	$ 109,620.00	$ 116,640.00
(4 Year Investment)	2	$ 110,808.00	$ 118,389.60	$ 125,971.20
	3	$ 119,672.64	$ 127,860.77	$ 136,048.90
	4	**$ 129,246.45**	**$ 138,089.63**	**$ 146,932.81**

Table 13. TDR Sending Zone Profits Contrasted with County Minor Subdivision and County Farm Cluster Subdivision Profits

50 Acre Parcel	Units	Investment / Lot	Total Investment	4 Year Interest	Price per Unit	Unit Sales	Ag Price	Ag Profit	Net Profit
Minor Subdivision	5	$ 33,750.00	$ 168,750.00	$ 28,750.00	$ 86,000.00	**$ 430,000.00**			**$ 232,500.00**
Farm Cluster	5	$ 32,122.00	$ 160,610.00	$ 27,350.00	$ 60,000.00	**$ 300,000.00**	$ 2,500.00	**$ 100,000.00**	**$ 212,040.00**
TDR	5	$ -	$ -		$ 6,500.00	**$ 32,500.00**	$ 2,500.00	**$ 125,000.00**	**$ 157,500.00**
TDR 1:5 Transfer Bonus	6	$ -	$ -		$ 6,500.00	**$ 39,000.00**	$ 2,500.00	**$ 125,000.00**	**$ 164,000.00**
TDR 2:5 Transfer Bonus	7	$ -	$ -		$ 6,500.00	**$ 45,500.00**	$ 2,500.00	**$ 125,000.00**	**$ 170,500.00**

Minor Subdivision		**$ 168,750.00**	**Payment**
Loan Interest at 6.6%	1	$ 130,512.50	$ 49,375.00
(4 Year Loan)	2	$ 89,751.33	$ 49,375.00
	3	$ 46,299.91	$ 49,375.00
	4	$ (19.29)	$ 49,375.00
Total Payments			$ 197,500.00
Total Interest Paid			**$ 28,750.00**

Farm Cluster		**$ 160,610.00**	**Payment**
Loan Interest at 6.6%	1	$ 124,220.26	$ 46,990.00
(4 Year Loan)	2	$ 85,428.80	$ 46,990.00
	3	$ 44,077.10	$ 46,990.00
	4	$ (3.81)	$ 46,990.00
Total Payments			$ 187,960.00
Total Interest Paid			**$ 27,350.00**

TDR Profits Placed in a Mutual Fund Over a 4-Year Period

TDR Profit Reinvestment		**TDR**	**1:5 TDR**	**2:5 TDR**
Mutual Fund		**$ 157,500.00**	**$ 164,000.00**	**$ 170,500.00**
Profit Return at 8%	1	$ 170,100.00	$ 177,120.00	$ 184,140.00
(4 Year Investment)	2	$ 183,708.00	$ 191,289.60	$ 198,871.20
	3	$ 198,404.64	$ 206,592.77	$ 214,780.90
	4	**$ 214,277.01**	**$ 223,120.19**	**$ 231,963.37**

Table 14. TDR Sending Zone Profits Contrasted with County Minor Subdivision and County Farm Cluster Subdivision Profits

80 Acre Parcel	Units	Investment / Lot	Total Investment	4 Year Interest	Price per Unit	Unit Sales	Ag Price	Ag Profit	Net Profit
Minor Subdivision	5	$ 33,750.00	$ 168,750.00	$ 28,750.00	$ 90,000.00	**$ 450,000.00**			**$ 252,500.00**
Farm Cluster	5	$ 32,122.00	$ 160,610.00	$ 27,350.00	$ 60,000.00	**$ 300,000.00**	$ 2,500.00	**$ 175,000.00**	**$ 287,040.00**
TDR	5	$ -	$ -		$ 6,500.00	**$ 32,500.00**	$ 2,500.00	**$ 200,000.00**	**$ 232,500.00**
TDR 1:5 Transfer Bonus	6	$ -	$ -		$ 6,500.00	**$ 39,000.00**	$ 2,500.00	**$ 200,000.00**	**$ 239,000.00**
TDR 2:5 Transfer Bonus	7	$ -	$ -		$ 6,500.00	**$ 45,500.00**	$ 2,500.00	**$ 200,000.00**	**$ 245,500.00**

Minor Subdivision		**$ 168,750.00**	**Payment**
Loan Interest at 6.6%	1	$ 130,512.50	$ 49,375.00
(4 Year Loan)	2	$ 89,751.33	$ 49,375.00
	3	$ 46,299.91	$ 49,375.00
	4	$ (19.29)	$ 49,375.00
Total Payments			$ 197,500.00
Total Interest Paid			**$ 28,750.00**

Farm Cluster		**$ 160,610.00**	**Payment**
Loan Interest at 6.6%	1	$ 124,220.26	$ 46,990.00
(4 Year Loan)	2	$ 85,428.80	$ 46,990.00
	3	$ 44,077.10	$ 46,990.00
	4	$ (3.81)	$ 46,990.00
Total Payments			$ 187,960.00
Total Interest Paid			**$ 27,350.00**

TDR Profits Placed in a Mutual Fund Over a 4-Year Period

TDR Profit Reinvestment		**TDR**	**1:5 TDR**	**2:5 TDR**
Mutual Fund		**$ 232,500.00**	**$ 239,000.00**	**$ 245,500.00**
Profit Return at 8%	1	$ 251,100.00	$ 258,120.00	$ 265,140.00
(4 Year Investment)	2	$ 271,188.00	$ 278,769.60	$ 286,351.20
	3	$ 292,883.04	$ 301,071.17	$ 309,259.30
	4	**$ 316,313.68**	**$ 325,156.86**	**$ 334,000.04**

CHAPTER 4 - A CUSTOM TDR PROGRAM FOR MENDON, UT

This section applies the information of this study to a specific community TDR case study in Cache County, and simultaneously describes the methodology used throughout its creation. Mendon, Utah, was chosen as a featured community in response to TDR interest and questions posed by members of the City Council. TDR would enable Mendon, a community without a sales tax future in sight, to better grow within its means by requiring minimal utility addition and reducing tax burdens to the community. With most of the County's growth occurring within the Logan Urbanized Area, retail oriented businesses find little incentive to locate in an isolated rural town that lies 15 minutes outside of Logan (See Figure 1). Despite a detailed focus on the community of Mendon, this case study process will show direct relevance and application to other municipalities in the county, as well as relevance to other communities throughout the state and Intermountain Region.

The fundamental ideology of this TDR growth model is based on a voluntary program that encourages development transfers through financial incentives. To ensure success of this TDR program, Mendon's Planning Committee and City Council would need to end further density increases or annexations without landowner participation in a TDR program. In other words, community land annexations and concurrent density increases should be awarded only when development rights are transferred from the unincorporated green belt into community receiving zones. Otherwise, TDR exists as wasted effort and holds no incentive for development transfers to occur. A developer in a receiving zone would not purchase development rights from a farmer in the surrounding unincorporated vacant area if a proposed 5/8-acre or ½-acre development was likely to be annexed and approved into the City without TDR involvement. The potential success of a community TDR program depends upon the continuing understanding, commitment and strength of a local city government in administering TDR as the community's underlying development strategy.

To assemble a TDR program, Mendon's expected future growth must be anticipated by investigating current growth rates, and understanding current zoning policies in the surrounding county unincorporated area. As explored previously, a variety of policies control land developments in Cache County and influence the number of economically feasible development rights.

Step 1. Defining Regional Context and Expected Growth Patterns

Mendon, situated beneath the fortress-like Wellsville Mountians, offers a rural atmosphere only 8 miles away from Logan, the county seat of Cache County. Mendon residents enjoy the convenience of Logan's urbanized services while living near the tranquility of open farmland, recreational access to forests, minimal traffic flow, and stunning views of the surrounding mountains. Ominous to this current tranquility, Logan's emerging role as a central urban economy in northern Utah will likely send more individuals seeking Mendon's rural lifestyle. Logan's growth patterns are spreading westward towards Mendon, infringing into the grazing land and wildlife marshes that separate the two communities. Isolated ranchettes appear increasingly between along Mendon's highway connector routes, a change that is increasing the commuting time to and from Mendon.

Mendon currently has a very low tax base from 50 business licenses issued to citizens in the town. The types of businesses include a small nursery, a cabinet shop, a roofing business, hair salons, and other trades. At one time Mendon claimed two retail oriented businesses: a small grocery store and a restaurant. Both businesses have since departed due to limited demand for their services in a rather remote community setting. The current master plan of Mendon shows annexation intentions towards the Valley View Highway to claim road frontage for more visible commercial activity. The costs of growth researched in

Figure 21. Mendon, Utah

this study suggest that Mendon could do without seeking retail from an area distant to its traditional town core. The town could better reduce its taxes by discouraging sprawling growth towards the Valley View Highway, and encourage county development to occur in adjacent receiving zones. Although this concentrated development would not capture the busier traffic along the Valley View highway, it would better support small downtown businesses by placing more customers within walking or bike riding distance of businesses.

Step 2. Projecting Mendon's Population Growth

Like all communities with reasonable access to economic interchange of goods and services, Mendon will experience growth. Based on Mendon's consistent growth rate of 2.8 percent, its year 2000 population estimate of 898 individuals will likely reach 1183 persons by 2010, and 1560 persons by 2020. With an average household size of 3.27, the town should increase from 262 current homes to 349 homes by the year 2010, and 464 homes by 2020. In the next twenty years, 662 new individuals or 202 homes will need land for building and living. This is not an astronomical increase of new homes over a 20-year period, but depending on the average lot size of each new residence, a disproportionate amount of land could be consumed to accommodate this new housing. Compared with the state of Utah's growth average of 2.6 percent annually, or 29.6 percent per decade, Mendon's growth rate ranks just slightly above average, yet the town lacks a significant base population to create astronomical growth. Utah's growth rate ranks 4th among all 50 states, although it ranks 34th in actual population. Cities with high growth rates in Utah that have greater population than Mendon include Bluffdale city, population 4,700 with a growth rate of 8.1 percent, Park City city, population 7,371 with a growth rate of 5.1 percent, and Draper City, population 25,220 with a growth rate of 13.3 percent (UGOPB, 2000). If Park City had the same growth rate of Mendon at 2.8 percent, it would increase by 2,344 individuals in 10 years – 784 more persons than calculated in Mendon's 20-year growth projection.

When planning for population growth, communities must decide in advance how much land is necessary to accommodate new homes. Issues of lot size, resulting land consumption, and location of future development should be of principle concern to community members that wish to maximize existing public service and infrastructure investments.

Added to Mendon's growth is surrounding unincorporated growth, located in the Cache County-Wide Planning and Development Census Tract number 2013 (See Figure 22). This census boundary is located between the Valley View Highway to the north, roughly half the distance between Mendon and Wellsville to the south. It contains Mendon's critical viewshed land area between the Little Bear River on the east and the Forest Service to the west. The total number of new dwelling units for this region in the year 2000 was 12 units, with an average of 3.42 individuals per unit. Totaled together, Mendon and its surrounding regional are currently at 1,436 individuals, and will reach 2,429 individuals by the year 2020, 4,220 individuals by the year 2040, and 5,561 individuals by the year 2050.

Step 3. Targeting a Community Green Belt as a Sending Zone

The county's census tracts provide a logical starting point for creating a series of coordinated greenbelt zones for communities throughout the county. In the case of Mendon, census tract 2013 provided population data for a geographic area bound by the natural building constraints in the marshes along the Little Bear River, and the Forest Service boundary to the west. The census tract was modified upon examination of individual land parcels to create a target preservation area around Mendon. To delineate Mendon's greenbelt zone, GIS mapping software was used to illustrate natural and cultural boundaries as an outer limit for the target sending zone area. Land parcels that will remain as open space were also used as the outer perimeter of the target preservation area. These parcels include federal forest land to the west, flood easements in the Cutler Reservoir owned by Pacificorp to the southeast, and the state wildlife reserve located south of Mendon, near the Little Bear River and the highway to Logan. The most logical border to the west of Mendon is the county's FR-40 (Forest Recreational, 40-acre minimum) boundary, which contains privately and publicly owned federal forestland. The county's FR-40 ordinance permits only one recreational unit per 40 acres on private forest parcels that may be inhabited for only three months out of the year. Development rights in this zone could be factored into Mendon's TDR program. However, because the Wellsville Mountains lack larger streams and water bodies for fishing and water recreation, the market for cabins in this area seems to be limited. Figure 23 shows the completed target greenbelt from which development rights ought to be acquired for Mendon's new community growth.

Figure 22. Census Tract 2013

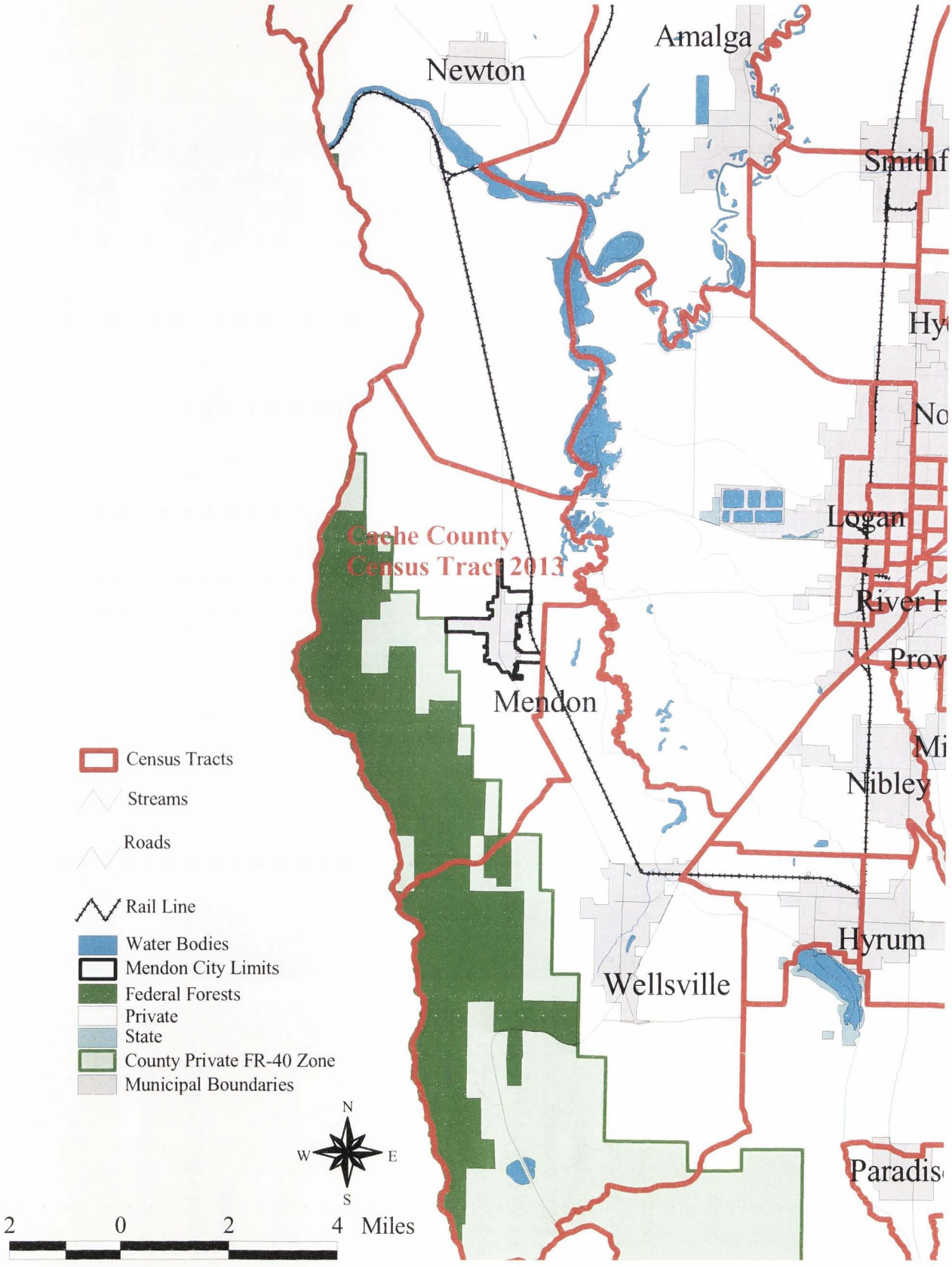
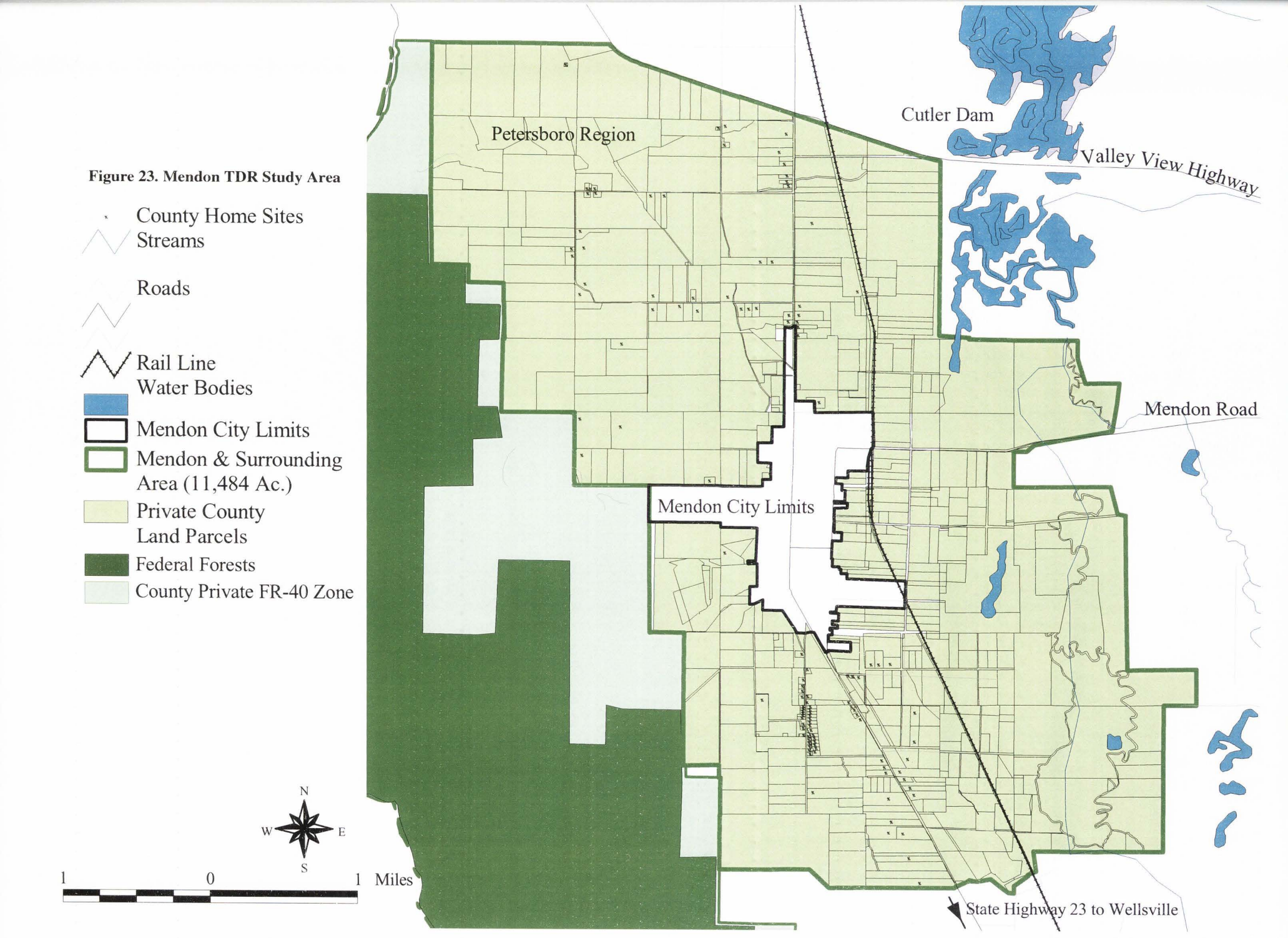


Figure 23. Mendon TDR Study Area



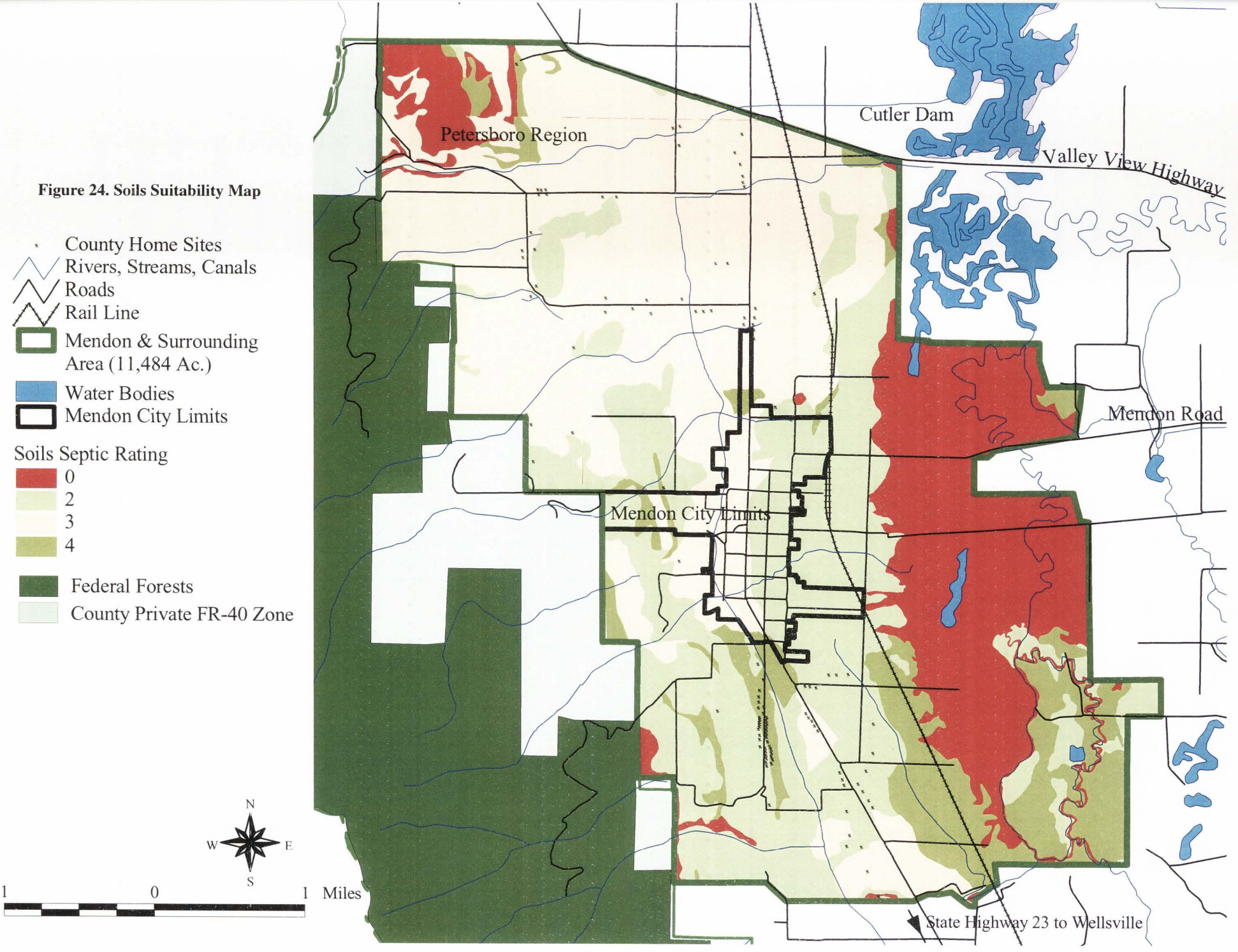
Step 4. Assemblage of Mapping Data

Delineating Mendon's target sending zone required use of the county's GIS shape files and associated databases. Critical files included the county's parcel data, which provided size and ownership information for each parcel. Also important was Mendon's community corporate limits footprint which required updating to reflect recent annexations of county parcels. Land ownership and county zoning layers showed where the Forest Service boundary separated standard county subdivision ordinances from recreational cabin zones within private forest service jurisdiction. Physical features such as soils, water bodies, rivers, roads, railroads, canals, steep slopes, flood plains, and high water tables provided key information for building limitations and opportunities within the region. After clipping these shape files to the community's target sending area, a preliminary map of county parcels, roads, hydrological features and the incorporated city area was printed for field identification of parcels that had a dwelling unit built on the premises. Houses were added as a point layer to show where current utilities and infrastructure are being developed, and where further growth may be anticipated.

The county soils database provided a platform on which to add septic permeability ratings, which were used to produce the soils suitability map shown in figure 24. Grouping soils data by percolation rate required a visit to the Bear River Environmental Health Department to obtain soil perimeters for permitted or restricted septic tanks. Once a data field in the soils database was created and updated with a septic suitability rating between 0 and 4, soil suitability distribution was generated and shown for comparison with the county parcels. Appendix A. shows a table created to determine the number new lots achievable on a county parcel based on soil type.

Existing Historic Water shares were digitized as a new data layer to show which county parcels may someday convert water shares to water rights. The data also showed dry farming parcels that would require the purchase of water rights before obtaining well permits. Parcel owners with water irrigation shares could eventually convert these shares to water rights and sell them to other individuals for well permits, or create a new public water system for a county major subdivision. Given the emerging value of water rights in Cache County, which compare rather closely to the projected value of a local development right, some communities may offer receiving zone development rights within the city receiving zone as a

Figure 24. Soils Suitability Map



trade for water rights within the county. The ramifications of this concept present a wide range of transfer possibilities, but cannot be explored in this report. A local water share map serves as a guide to show properties with higher land values from potential water right ownership. Given the struggling condition of agriculture, farmers with irrigation rights may eventually sell the majority of their water rights to communities and developers for development, and either convert their ground to a dry farming enterprise or create a minor county subdivision with fewer remaining water rights.

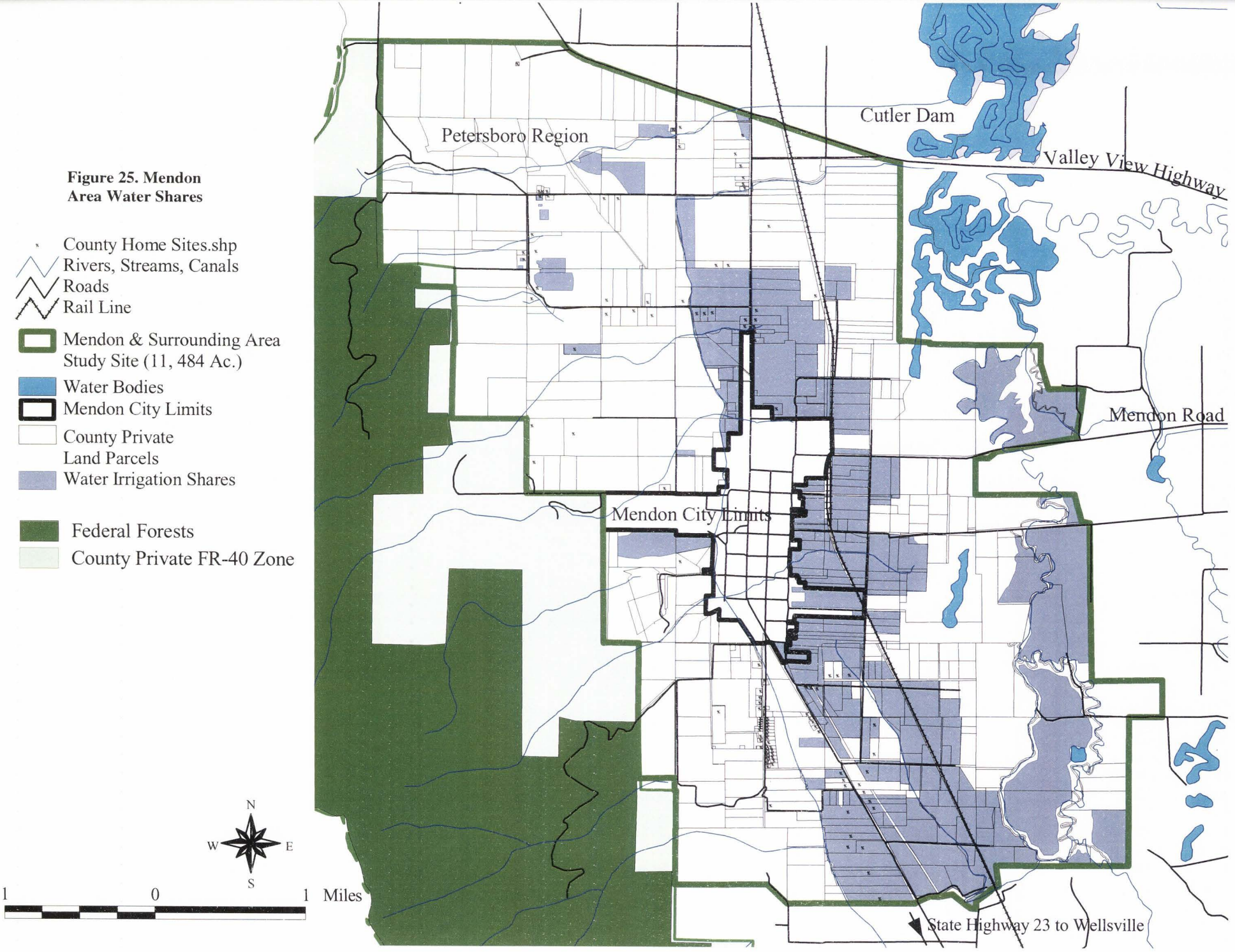
In the case of Mendon, dry farmland on the west bench lands owns less water and therefore has less agricultural and development value. This factor could facilitate private acquisition of development rights and enable Mendon to preserve views of the mountain bench. The benefits of preserved bench lands also include easier access to the public forests, and retention of a fire and flooding buffer for the community. Water right maps were digitized from historic water share and water right maps from the Utah Division of Water Rights web site (UDWR, 2001). Figure 25 shows irrigation water shares in the Mendon region placed on top of county private parcels.

Step 5: Combining Data to Determine Development Right Potential

The next step required comparison of each individual county parcel within the sending zone to the newly generated soils suitability map. Lot sizes were compared to site soil limitations to determine the likely number of permitted septic tanks on the parcel. Although many parcels could accommodate numerous septic tanks, the county minor subdivision caps the number of potential units at five per parcel. Given the economic limitations of a major county subdivision and a public water system, a development value of 0 units to a maximum of 5 potential dwelling units was allocated to each county parcel in the Mendon target sending zone region (See Appendix A). 5 lots, or five development rights matches the maximum number of lots permitted in a county minor subdivision, or a farm cluster subdivision.

Some soil types within the study area contain a variable water table depth that can infringe on the state's 34-inch depth to ground water requirement. To determine the developability of these subjective soil areas, inquiries to local farmers and residents revealed water tables that are visible at the ground surface during the spring season. County parcels received a 0 rating for areas of reported high water table even though the soils suitability map indicates the area acceptable for septic tanks.

Figure 25. Mendon Area Water Shares



Once a market development value was established for each county parcel in Mendon's target sending zone, a map showing the number of development rights per parcel was generated by assigning a color legend for each development category (Figure 26). These include Orange which represent 5 lots per parcel, Yellow representing 4 lots on a parcel, Dark Green representing 3 lots per parcel, Light Green representing 2 lots per parcel, Brown representing 1 lot per parcel, and Red representing restricted lots, or 0 lots per parcel. A tally of all projected development rights revealed a total of 1373 unincorporated development rights in Mendon's surrounding target sending zone. This figure does not include the potential development rights from 115 parcels that currently have one home developed on the property. Some of these lots – particularly the smaller lots (10 acres or less) are less likely to be further subdivided. County lots that were approved after January 2001 will not have the right to further subdivide based on the county's new development ordinances. Some lots may lack sufficient water rights to provide wells for a new county subdivision. Given these variables, it is difficult to anticipate which lots will attempt to create subdivisions, or which lots will transfer development rights. Lots with existing home sites could develop a farm cluster subdivision where utilities and road area already present at the parcel, and earn greater profits than a county minor subdivision. However, home owners may wish to sell development rights to maintain isolation from neighbors.

Step 6. Establishing Target Receiving Zone Areas

To determine a necessary receiving zone size, the total number of projected development rights was divided by ½-acre as a higher density limit allowance, or maximum density permitted in the receiving zone. This division creates an acreage requirement of 685.5 acres, which when added to an 18 percent public improvement figure (123.5 acres of roads, drainage basins, parks, etc.) creates a receiving zone need of 808 acres (Figure 27). ½-acre was chosen as a slight density increase from Mendon's existing 5/8 acre lot size minimum, and because ½-acre lots contain sufficient softscape to absorb water runoff, eliminating the need for curb and gutter to channel away runoff from increased roof and drive areas. Reduced road costs would create additional incentive for TDR participation by requiring road profiles without curb and gutter, and a sidewalk on only one side of the street.

Figure 26. Anticipated Development Rights on County Parcels

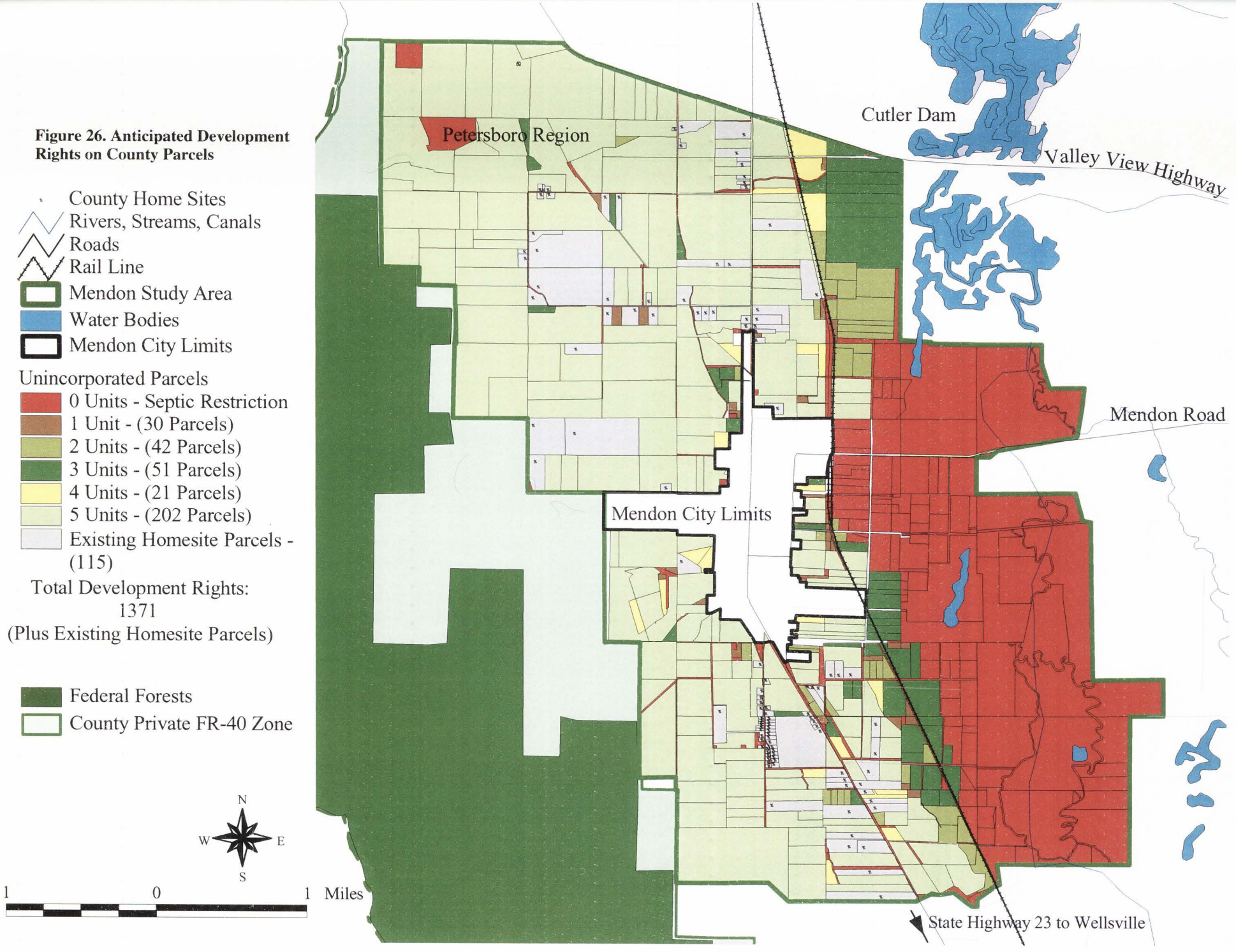
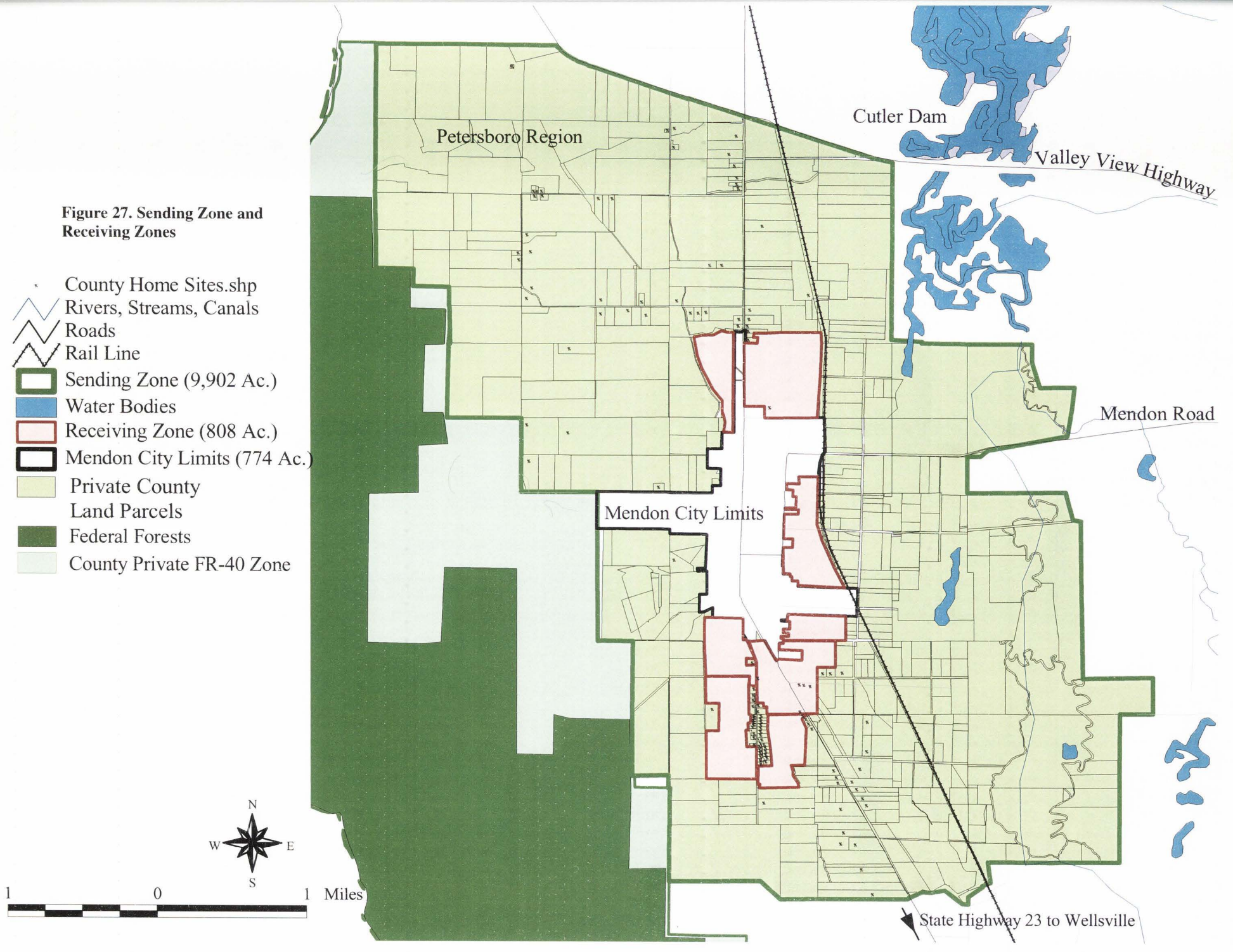


Figure 27. Sending Zone and Receiving Zones



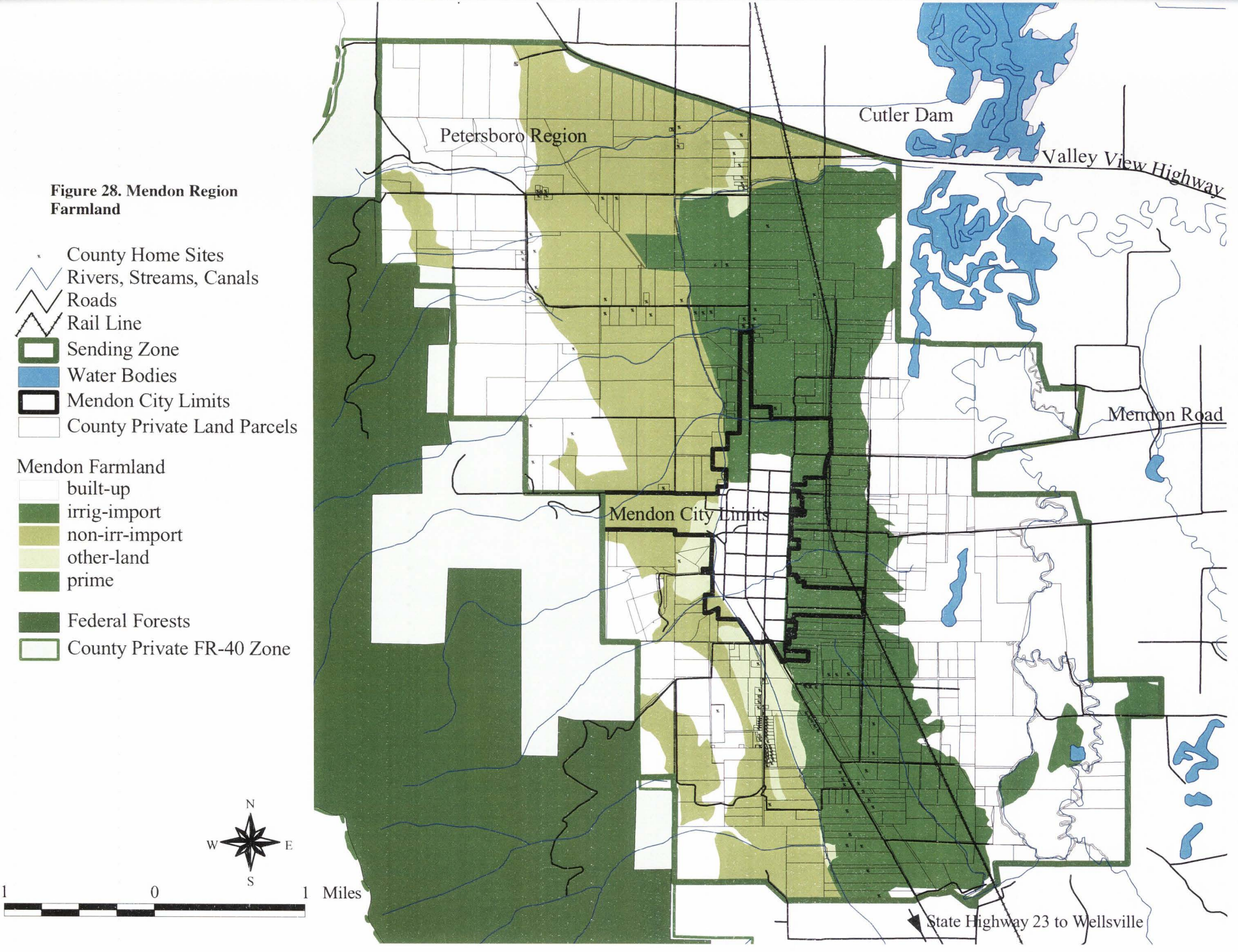
Mendon could allow more development to occur within its target receiving zone areas, and save more surrounding open space by creating a narrower street right of way that matches the county's right-of-way requirement at 50 feet. When choosing a road right of way, minimum lot size, and appropriate street design standards, a delicate tradeoff between receiving zone elbowroom and surrounding community open space must be considered with public input. Local community leaders may not realize that Cache County residents favor living in medium density development. In a recent county survey of 1000 individuals throughout the county and local communities, 37 percent answered that they would prefer to live on a 1/3-acre lot, 25 percent preferred a ¼-acre lot, and 19 percent preferred a ½-acre lot. Only 6 percent of those polled preferred to live on a 1 acre lot, 8 percent didn't know, and 5 percent preferred a 1/5 acre lot (Teuscher, 2001). A ½-acre minimum lot size for Mendon instead of a 1/3-acre minimum is also recommended to avoid or prolong the necessity of an expensive sewer system upgrade in the community.

Placement of the receiving zone should be placed away from quality agricultural districts, away from wildlife and riparian corridors, away from community views of the surrounding mountain and valleys, and be nestled near areas of recent growth. It is especially critical is that future growth occur within the service shadow of existing water reservoirs to avoid excessive public expense of water utilities. Figure 27 shows Mendon's target receiving zones placed within serviceable land areas that connect to the existing community framework. Figure 28 shows Mendon's regional farmland, with prime and irrigated farmland separated from dry farmland. In creating Mendon's receiving zone, some prime farmland east of town was sacrificed to create a consolidated community and prevent island development in the surrounding ag-land.

With this growth strategy applied, Mendon could potentially influence the preservation of 9,902 acres surrounding its community. The carrying capacity and duration of the proposed ½-density receiving zone can be estimated by adding the total number of local development rights or potential dwelling units in the sending zone and receiving zones (1083 + 290 = 1,373). By multiplying the total number of development rights, or dwelling units -- 1,373 by 3.27 (the average population per dwelling unit in Mendon), a figure of 4,483 individuals is derived. The growth capacity of Mendon's incorporated vacant land area must also be determined to project a complete population capacity of the community.

Although a land use survey of the incorporated Mendon area was not completed for this study, a quick estimate can reveal a reasonable figure for the city's incorporated growth potential. To successfully

Figure 28. Mendon Region Farmland



describe this estimate, a brief outline of the town's vacant land, associated zoning, and utility development is necessary. In 1969, Mendon annexed a 140-acre agricultural corridor west of the community that follows the city's main water line towards the foothills. Water pressure is minimal along this corridor, and complete services such as natural gas have not yet expanded to the district – a condition that increases costs for the land's potential development. Extensive development of this corridor would disappoint many community residents that hope to see limited development on the upper benches of Mendon. These factors may influence city officials to permit development transfers from this agricultural corridor to receiving zone areas with better services. Under its current zoning density of one unit per 1 ¼ acre, this land area of roughly 140 acres could generate up to 90 lots when factoring in 20% as a public improvement land area. To retain sufficient receiving zone capacity, reducing the size of the target sending zone area by 90 units or 18 parcels (90 units / 5 county minor subdivision units) may be necessary, or increasing the size of the receiving zone by 53 acres [(90 units x .5 acre) + 18% public improvement], or a combination of both methods.

The traditional core area of Mendon constitutes 624 acres, of which roughly 25 percent or 156 acres is likely used as public right-of-ways, parks, civic property, etc. Of the remaining 468 acres of private land -- perhaps 8 percent is vacant land that has sufficient road frontage to accommodate housing units (Mendon does not permit development within block interiors). Given Mendon's current 5/8-acre density for the core area of town, 37.44 acres of vacant land could hold roughly 60 new units.

When adding the development potential of Mendon's upper bench area (90 units) with the town core area (60 units), 150 additional units, or 495 individuals could be accommodated (150 units x 3.3 residents per unit). When totaled with Mendon's target receiving zone population (495 + 4490) the entire city could accommodate roughly 5,000 residents, or 1,529 units on 1,572 acres (808 acre receiving zone + 764 acres within Mendon City's current limits), or on 1,485 acres if Mendon's upper bench area transfered development rights into an enlarged receiving zone ([764 acres – 140 acres] + [808 acres + 53 acres]).

In a voluntary TDR program, not all county property owners will participate in the free market exchange of development rights. Mendon and other communities could explore additional incentives to ensure strong participation from the greater unincorporated community. If for instance Mendon chose to increase its higher density limit to 18,000 square feet, roughly 1,600 development rights could be

accommodated in its target receiving zone areas. The Bear River Environmental Health Department permits an 18,000-square foot lot on loam soils where housing units are connected to a public water system. Increasing the density in this manner creates a surplus of 230 development rights that could be offered as a transfer ratio bonus to key properties that front local highways, contain historic farms or buildings, protect local views, or protect critical water recharge areas.

Table 15. Summary of TDR Case Study (Mendon, UT)

Total Study Area	11,484 Acres
Receiving Zone	808 Acres
Sending Zone	9,902 Acres
Current Mendon City Limits	774 Acres
Total Development Rights (Current Unincorporated Limits)	1373 (+Existing County Home Sites)
Existing Home Sites on Sending Zone Parcels	115
Development Rights in Sending Zone (Base Line Density)	1083
Development Rights in Receiving Zone (As-of-Right Density)	290
1:5 Transfer / Purchase Bonus	+ 180 Units
2:5 Transfer / Purchase Bonus	+ 433 Units

Another receiving zone alternative could be considered if Mendon installs a sewer system in the coming years. With a town sewer system, select areas could accommodate ¼-acre or 1/3-acre lots as community in-fill development or receiving zone development without fear of overloading local soils with effluent. Select areas of the downtown district could also be built at higher densities with mixed uses, such as traditional town offices or stores with apartments on the second level. This would recreate traditional western main street elements in Mendon's town center, and create a meaningful hub for town gatherings and a future regional transit center. Mendon may also consider integrating design guidelines that ensure the addition of properly designed multifamily units -- dwellings that are disguised as a single family home within the town. This type of development would resemble early Mormon settlements that integrated polygamist duplexes and bed and breakfast hotels into single family neighborhoods. By integrating a variety of densities, Mendon could offer a 2:5 transfer bonus or purchase bonus as shown in Table 15.

Through careful community design and planning, these density increases can occur while maintaining an agrarian theme for the community. Rural character can be maintained by reducing street pavement widths and eliminating curb, gutter, and one sidewalk. Also key is integrating a mixture of lot sizes and types, including larger lots as a buffer between the receiving zone and preserved agricultural districts, medium density lots (1/4 acre to 5/8) in the town core and receiving zones, and higher density

mixed housing and commercial in centralized areas. Providing a variety of lot styles would allow for a variety of income levels to live in the community, provide visual interest and variety to the townscape, and aid in preserving a surrounding community greenbelt.

A count of larger lots (functioning as a buffer around Mendon's receiving zone) was not included in the receiving zone capacity calculation, given the possibility that large lots may be substituted with compatible adjacent agricultural buffers and practices. Large lots can be counted within the receiving zone by substituting between 4 and 20 medium density lots as one hobby farm. Or, the medium density lot on the edge of the receiving zone may be counted as the construction zone area of a larger lot, with the back lot area functioning as part of the agricultural sending zone.

Step 7. A Requirement Checklist for Annexation

To assure that open space is preserved into perpetuity, Mendon would need to adopt the following requirements in an inter-local government TDR agreement with the county.

1. The Developer must own county property in Mendon's / Cache County's established receiving zone areas.
2. The Developer must acquire sufficient development rights to create Mendon's desired density on the receiving zone parcel.
3. The development rights must be acquired from sending zone owners within the city's / county's target preservation zone, or sending zone.
4. The sending zone owners must place their land under a deed restriction that prevents further development or development transfers from taking place. The developer must present legal records as proof that the sending parcels are deed restricted from development.
5. The developer must donate the complete set of county development rights on the receiving zone parcel to a private non-profit land trust in exchange for an equal number of development rights within the city's annexation of the property. This would prevent the developer from re-transferring the development rights to a new development.

6. The developer follows Mendon City's development guidelines to obtain water services (and perhaps sewer services in the future). Mendon charges the new residents a monthly fee for use of their public services.
7. After 12 months of providing services to an adjacent county subdivision, the city may annex the development without petition or protest from the residents.

CONCLUSION

The principles of TDR applied to Cache County and the incorporated communities stand as a solid framework from which each community may implement its own set of quality growth objectives. With the powerful tools of TDR, incorporated and unincorporated communities may broaden their focus and apply a growth strategy to their greater area. Communities lacking in future self-vision may find guidance from the issues presented in this report, and thereby acquire an approach enables all property owners to participate in the building and preservation of the valley's rural heritage. Through the application of TDR, land developers can become catalysts for balanced growth and simultaneous preservation of open space, to be seen as local heroes rather than villains who take local quality of life from the people and place the profit in a bank account. The responsibility leans on local governments -- not on the developers -- to establish TDR development strategies and guidelines that reflect the desired lifestyle of the larger community.

The message to local governments is that growth can be best managed by minimizing or eliminating current annexation trends. Rather, communities should participate in inter-local agreements with the county that would channel an abundant, accessible supply of county development rights into adjacent receiving zones. As development rights are transferred from surrounding county parcels, preserved green belts of farmland or natural habitat land will be secured as a permanent component of the community landscape. Municipalities should market their water and sewer services to adjacent county receiving zone residents, so that once fully developed, adjacent receiving zones may be annexed by a city without petition or protest. This strategy requires no restructuring of existing government, and could operate independent of state TDR enabling legislation. This customized, smart-growth strategy for Cache County holds promise for saving local quality of life, enhancing real estate sales, and securing efficient business transportation to and from the valley.

This thesis is structured to assist in bringing this message forward -- a feat that will require steady effort from local planners, conservation organizations, local governments, university extension services, farming cooperatives, and conservation-minded developers. Developers should receive literature that reveals the economic advantages of building in marketable open space venues, with quality views of countryside, efficient commutes to major business centers, and other augmented land values associated with local open space preservation. Further study is required by way of exploring the legal ramifications of

inter-local and inter-jurisdictional development transfers. Perhaps state enabling TDR legislation will soon permit inter-jurisdictional transfers, or, the auspices of the Cache County-wide Planning and Development Office may successfully rally local communities toward the creation of inter-local TDR programs in each district of the County. The realization of these concepts requires local promotion and education of TDR to generate sufficient interest from the public. Local planning agencies and near by universities can help by capturing grants to promote TDR zoning ordinances, and encouraging community design scenarios that further enlighten local governments of the need to implement change.

TDR should be explored as a means of coordinating the development and preservation of land surrounding communities, and frontages to critical commuter highways such as the valley's main entrance along the Logan-Wellsville highway corridor. Commercial development nodules should be clustered as pockets along commuter highways to prevent a continuous string of development that counters the public function and safety of the highway, and prevents agricultural land preservation. Commercial nodules should be concentrated as attractive pockets with alternate frontage routes and turning lanes included for a safe interface with the highway. These nodes could present an agrarian theme to businesses, much like the Albertson's complex in Lehi, Utah that was designed to match the community's landmark historic flour mill in the downtown area (Figure 29). Requiring development transfers for creation of commercial nodes could ensure that surrounding fields remain as agriculture, and prevent excessive highway frontage from being developed.

Can Cache County governments adequately engage the growing need and demand for new cooperative development guidelines? Communities such as Mendon may be isolated enough from attractive commercial districts to avoid annexation disputes with neighboring communities. This has certainly not been the case for other communities within the Logan Urbanized Area, between Smithfield and Nibley. Coordinating efforts for greater community causes will benefit citizens, business owners and visitors from all local communities. As shown in this study, a progressive city government with the aid of a planning consultant could create an effective TDR program exclusively for their area as exemplary growth planning visible to the entire county. There is no question that greater achievements in community and regional growth patterns could result from a collaborated effort between county and city governments through inter-local government agreements.

Figure 29. Albertson's Agricultural Theme Commercial Complex – Lehi, Utah

Some citizens in Cache County hope for a unified form of local government, and encourage a streamlined system that replaces the current competitive interaction of local governments. Proponents of a streamlined governing alternative suggest that consolidated government fits within Cache County's predominantly conservative thinking with expectation of reduced taxes to operate a condensed body of planning, administrative, and public works services. Under this government alternative, a more equal distribution of regional sales tax dollars would become available to the 91,000 citizens that patronize the county's growing chain of local businesses.

Proponents of unified government argue that citizens would be better represented by regional districts throughout the county for fair use and distribution of tax revenues. A common planning interest would better realize a balance between public and private land use goals, and assure quality of life across a broader spectrum. Under consolidated government, regional districts could maintain planning options and advise voting representatives of needs and goals particular to their community or region.

TDR has proven itself as a zoning tool that can channel individual free market interests into a more desirable outcome for the greater community. The degree of influence and effectiveness of TDR

methodology can be increased as self-governance represents or combines to represent a greater geographic area or body of citizens. Regardless of the jurisdictional scale of governmental policy, channeling free market development rights from rural areas to existing communities will produce more livable, economically viable, and aesthetically acceptable growth patterns in Cache County. Community TDR growth strategies can reward individual landowners who seek financial gain from their property, and at the same time reward tax paying citizens who bear liability in the growth and development of their community.

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APPENDIX A. Cache County Soils and Resulting Lot Sizes for Minor Subdivisions

Gravel Mixed Soils (Permeability Range: 2.0 – 6.3 inches per hour)

	Reference Parcel Size (Acres)	*1.00*	*1.99*	*3.01*	*4.00*	*5.00*
Minor Subdivision	Resulting Lot Size-5 Lots (Acres)	0.20	0.40	0.60	0.80	1.00
	Resulting Lot Size-4 Lots (Acres)	0.25	0.50	0.75	1.00	1.25
	Resulting Lot Size-3 Lots (Acres)	0.33	0.66	1.00	1.33	1.67
(Lot Split)	Resulting Lot Size-2 Lots (Acres)	0.50	1.00	1.50	2.00	2.50
1 Dwelling Unit	Resulting Lot Size-1 Lots (Acres)	1.00	1.99	3.01	4.00	5.00
	Required Parcel Size (Acres) (Plus 8%)	1.00	2.15	3.25	4.32	5.40
		1 Lot Min.	*Min. for 2 Lots*	*Min. for 3 Lots*	*Min. for 4 Lots*	*Min. for 5 Lots*

Sand Mixed Soils (Permeability Range: .63 – 2.0 inches per hour)

	Reference Parcel Size (Acres)	*1.25*	*2.50*	*3.75*	*5.00*	*6.25*
Minor Subdivision	Resulting Lot Size-5 Lots (Acres)	0.25	0.50	0.75	1.00	1.25
	Resulting Lot Size-4 Lots (Acres)	0.31	0.62	0.94	1.25	1.56
	Resulting Lot Size-3 Lots (Acres)	0.42	0.83	1.25	1.67	2.08
(Lot Split)	Resulting Lot Size-2 Lots (Acres)	0.62	1.25	1.87	2.50	3.12
1 Dwelling Unit	Resulting Lot Size-1 Lots (Acres)	1.25	2.50	3.75	5.00	6.25
	Required Parcel Size (Acres) (Plus 8%)	1.25	2.70	4.05	5.40	6.75
		1 Lot Min.	*Min. for 2 Lots*	*Min. for 3 Lots*	*Min. for 4 Lots*	*Min. for 5 Lots*

Loam Mixed Soils (Permeability Range: .20 – .63 inches per hour)

	Reference Parcel Size (Acres)	*1.50*	*3.01*	*4.49*	*6.01*	*7.49*
Minor Subdivision	Resulting Lot Size-5 Lots (Acres)	0.30	0.60	0.90	1.20	1.50
	Resulting Lot Size-4 Lots (Acres)	0.38	0.75	1.12	1.50	1.87
	Resulting Lot Size-3 Lots (Acres)	0.50	1.00	1.50	2.00	2.50
(Lot Split)	Resulting Lot Size-2 Lots (Acres)	0.75	1.50	2.24	3.01	3.75
1 Dwelling Unit	Resulting Lot Size-1 Lots (Acres)	1.50	3.01	4.49	6.01	7.49
	Required Parcel Size (Acres) (Plus 8%)	1.50	3.25	4.85	6.50	8.09
		1 Lot Min.	*Min. for 2 Lots*	*Min. for 3 Lots*	*Min. for 4 Lots*	*Min. for 5 Lots*

Clay Mixed Soils (Permeability Range: .06 – .20 inches per hour)

	Reference Parcel Size (Acres)	*1.75*	*3.49*	*5.25*	*6.99*	*8.74*
Minor Subdivision	Resulting Lot Size-5 Lots (Acres)	0.35	0.70	1.05	1.40	1.75
	Resulting Lot Size-4 Lots (Acres)	0.44	0.87	1.31	1.75	2.19
	Resulting Lot Size-3 Lots (Acres)	0.58	1.16	1.75	2.33	2.91
(Lot Split)	Resulting Lot Size-2 Lots (Acres)	0.87	1.75	2.63	3.49	4.37
1 Dwelling Unit	Resulting Lot Size-1 Lots (Acres)	1.75	3.49	5.25	6.99	8.74
	Required Parcel Size (Acres) (Plus 8%)	1.75	3.77	5.67	7.54	9.44
		1 Lot Min.	*Min. for 2 Lots*	*Min. for 3 Lots*	*Min. for 4 Lots*	*Min. for 5 Lots*

APPENDIX B. Development Cost Sources

1. Kier Construction Corporation
   2710 Quincy Avenue
   Ogden, Utah 84403
   Phone: (801) 627-1414

2. Neilen, D.R. Construction
   (435) 245-3889

3. Jack B. Parson Companies
   250 N. 300 E.
   Smithfield, Utah
   Phone: (435) 563-3242