Investigation of the Impacts of Rural Development on Iowa's Secondary Road Systems

Final Report
September 2010

IOWA STATE UNIVERSITY
Institute for Transportation

Sponsored by
the Iowa Highway Research Board (TR-548)
and the Iowa Department of Transportation
(InTrans Project 05-234)

About the Institute for Transportation

The mission of the Institute for Transportation (InTrans) at Iowa State University is to develop and implement innovative methods, materials, and technologies for improving transportation efficiency, safety, reliability, and sustainability while improving the learning environment of students, faculty, and staff in transportation-related fields.

Iowa State University Disclaimer Notice

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented herein. The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of the sponsors.

The sponsors assume no liability for the contents or use of the information contained in this document. This report does not constitute a standard, specification, or regulation.

The sponsors do not endorse products or manufacturers. Trademarks or manufacturers' names appear in this report only because they are considered essential to the objective of the document.

Iowa State University Non-discrimination Statement

Iowa State University does not discriminate on the basis of race, color, age, religion, national origin, sexual orientation, gender identity, sex, marital status, disability, or status as a U.S. veteran. Inquiries can be directed to the Director of Equal Opportunity and Diversity, (515) 294-7612.

Iowa Department of Transportation Statements

Federal and state laws prohibit employment and/or public accommodation discrimination on the basis of age, color, creed, disability, gender identity, national origin, pregnancy, race, religion, sex, sexual orientation or veteran's status. If you believe you have been discriminated against, please contact the Iowa Civil Rights Commission at 800-457-4416 or Iowa Department of Transportation's affirmative action officer. If you need accommodations because of a disability to access the Iowa Department of Transportation's services, contact the agency's affirmative action officer at 800-262-0003.

The preparation of this (report, document, etc.) was financed in part through funds provided by the Iowa Department of Transportation through its "Agreement for the Management of Research Conducted by Iowa State University for the Iowa Department of Transportation," and its amendments.

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Iowa Department of Transportation.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
InTrans Report 05-234 IHRB Report TR-548		

4. Title and Subtitle	5. Report Date
Investigation of the Impacts of Rural Development on Iowa's Secondary Road Systems	September 2010
	6. Performing Organization Code
7. Author(s) Gary Taylor, Reginald Souleyrette, Chris Albrecht	**8. Performing Organization Report No.**
9. Performing Organization Name and Address Institute for Transportation Iowa State University 2711 South Loop Drive, Suite 4700 Ames, IA 50010-8664	**10. Work Unit No. (TRAIS)**
	11. Contract or Grant No.
12. Sponsoring Organization Name and Address Iowa Highway Research Board Iowa Department of Transportation 800 Lincoln Way Ames, IA 50010	**13. Type of Report and Period Covered**
	14. Sponsoring Agency Code

15. Supplementary Notes

Visit www.intrans.iastate.edu for color PDF files of this and other research reports.

16. Abstract

Today, many of Iowa's counties are experiencing an increase in rural development. Two specific types of development were focused on for this research: rural residential subdivisions and livestock production operations. Rural residential developments are primarily year-round single-family homes, though some are vacation homes. Livestock production in Iowa includes hog, beef, and poultry facilities. These two types of rural development, while obviously very different in nature and incompatible with each other, share one important characteristic: They each generate substantial amounts of new traffic for Iowa's extensive secondary road system.

This research brings together economic, spatial, and legal analysis methods to address the impacts of rural development on the secondary road system and provide county engineers, county supervisors, and state legislators with guidance in addressing the challenges associated with this development.

17. Key Words	18. Distribution Statement
economic analysis—geographic information systems—rural development—secondary roads	No restrictions.

19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
Unclassified.	Unclassified.	62	NA

Form DOT F 1700.7 (8-72) **Reproduction of completed page authorized**

INVESTIGATION OF THE IMPACTS OF RURAL DEVELOPMENT ON IOWA'S SECONDARY ROAD SYSTEMS

Final Report
September 2010

Principal Investigator
Gary Taylor
Assistant Professor
Department of Community and Regional Planning, Iowa State University

Co-Principal Investigator
Reginald Souleyrette
Associate Director for Transportation Planning and Information Systems
Institute for Transportation, Iowa State University

Research Assistants
Bradley J. Grefe, Susan DeBliek, and Amanda Park
Institute for Transportation, Iowa State University

Authors
Gary Taylor, Reginald Souleyrette, Chris Albrecht

Sponsored by
the Iowa Highway Research Board
(IHRB Project TR-548)

Preparation of this report was financed in part
through funds provided by the Iowa Department of Transportation
through its research management agreement with the
Institute for Transportation,
InTrans Project 05-234.

A report from
Institute for Transportation
Iowa State University
2711 South Loop Drive, Suite 4700
Ames, IA 50010-8664
Phone: 515-294-8103
Fax: 515-294-0467
www.intrans.iastate.edu

TABLE OF CONTENTS

ACKNOWLEDGMENTS IX

EXECUTIVE SUMMARY XI

INTRODUCTION 1

- Iowa Land Use Patterns 2
- Land Use Change in Iowa 2
- New Development in Rural Iowa 3
- Traffic Impacts of New Development 3
- Community Build-Out Analysis 3
- Cost of Community Service Studies 4
- Iowa Fiscal Impact Studies 4
- Legal and Policy Issues 4

RESEARCH APPROACH 5

- Benefits 5
- Research Methodology 6
- Task 1: Determine the State of Existing Research Knowledge 6
- Task 2: Form Technical Advisory Committee (TAC) 6
- Task 3: Conduct Spatial Analysis of Rural Development in Iowa 6
- Task 4: Select and Develop Case Studies for Rural Development Impact Analysis 6
- Task 5: Arrange and Conduct Stakeholder Focus Groups 7
- Task 6: Develop and Test Rural Development Impact Assessment Tool 7
- Task 7: Conduct Case Study Service and Fiscal Analyses 7
- Task 8: Summarize Results and Develop Public Policy Implications 7
- Task 9: Prepare Outreach Materials 7
- Task 10: Technology Transfer 8

LITERATURE REVIEW 8

- Confined Animal Feeding Operations 8
- Rural Residential Subdivisions 9
- Infrastructure 11

SPATIAL ANALYSIS 13

CASE STUDY ANALYSIS 23

- Boone County Case Studies 23
- Madison County Case Studies 25
- Marshall County Case Studies 27

FOCUS GROUPS & SURVEY 29

IMPACT ASSESSMENT TOOL 31

- Adjusting Land Use & Economic Inputs 31
- Adjusting Cost Information 32

Evaluation 34
LEGAL AND POLICY ISSUES 35
Introduction 35
Background 35
Statutory Authority for Special Assessments – Iowa Code Chapter 311 36
Statutory Authority for Public Improvements and Impact Fees 37
Policy Options 43
REFERENCES 45
APPENDIX A 49
Virginia Impact Fee Legislation 49

LIST OF FIGURES

Figure 1. Confined Animal Feeding Operations in Boone, Madison, and Marshall Counties.....14
Figure 2. Confined Animal Feeding Operations in Boone County 15
Figure 3. Confined Animal Feeding Operations in Madison County.....16
Figure 4. Confined Animal Feeding Operations in Marshall County.....17
Figure 5. Rural Subdivisions in Boone, Madison, and Marshall Counties.....18
Figure 6. Rural Parcels in Boone, Madison, and Marshall Counties.....19
Figure 7. Rural Subdivisions and Parcels in Boone County.....20
Figure 8. Rural Subdivisions and Parcels in Madison County 21
Figure 9. Rural Subdivisions and Parcels in Marshall County.....22
Figure 10. Land Use Input Adjustments.....32
Figure 11. Rural Subdivision Input_Output Screen with other tabs highlighted 33
Figure 12. Cost Adjustment Tabs 34

LIST OF TABLES

Table 1. Comparison of percentages of animal feeding operations and rural subdivisions within one mile of a paved road.....13

ACKNOWLEDGMENTS

The authors would like to thank the Iowa Highway Research Board for sponsoring this research.

EXECUTIVE SUMMARY

Rural areas across the state of Iowa and the entire nation are facing a number of problems associated with increasing development. The impact of this development on rural road systems is one significant problem. While research has been directed at other impacts, such as loss of quality agricultural land, fragmentation of natural habitat, water quality, land use compatibility, and provisions for other infrastructure and government services, much of this work does not sufficiently address the physical impacts on local roadways. Furthermore, very little research is designed to provide local decision makers with tools for making day-to-day decisions on development proposals. Many counties in Iowa are increasingly faced with proposed rural developments, such as rural residential subdivisions and livestock production operations, that generate substantial new traffic on secondary road facilities. In fact, the creation of rural residential subdivisions is a much more significant producer of land use change in Iowa than is urbanization in the form of municipal annexation (Iowa State University Extension to Communities 2001).

In order to better understand the impact of rural development on the secondary road system, a geographic information systems analysis was used to quantify the spatial relationship between these developments and various physical features and illustrate the nature of the rural development impacts. Previous work conducted by the Center for Transportation Research and Education on land use change in Iowa indicates that rural residential subdivisions that provide primary residences appear to be locating in areas with excellent access to major transportation arteries within a half-hour commute of Iowa's metropolitan centers or other trade centers. They also tend to be locating near amenities such as surface water and forested land and not on prime farm land. This means that such subdivisions tend to be concentrated in areas that fit a specific spatial profile. On the other hand, livestock operation locations are regulated by the Department of Natural Resources' Master Matrix, and they tend to develop in rather isolated areas so that environmental and social impacts can be minimized. They appear much more randomly distributed across the map of Iowa.

This spatial analysis provides a better understanding of where and how rural development happens, ultimately providing local decision makers with better tools to quantify potential traffic generation, analyze build-out scenarios, estimate true costs of community services, and further understand the fiscal impacts and associated legal issues of such development.

INTRODUCTION

Today, many of Iowa's counties are experiencing an increase in rural development. Two specific types of development were focused on for this research: rural residential subdivisions and livestock production operations. Rural residential developments are primarily year-round single-family homes, though some are vacation homes. Livestock production in Iowa includes hog, beef, and poultry facilities. These two types of rural development, while obviously very different in nature and incompatible with each other, share one important characteristic: They each generate substantial amounts of new traffic for Iowa's extensive secondary road system.

An increasingly significant portion of new residential development taking place in Iowa is occurring in rural areas served by unpaved, gravel roads. New confined animal feeding operations are forced to locate on unpaved roads by the Iowa Department of Natural Resources (Iowa DNR) Master Matrix. This matrix awards points for separating facilities from most existing development (Iowa Department of Natural Resources, 2005). Each type of development presents its own unique set of challenges to the system, but both have some common problem characteristics. These common problems include the following:

- **Fiscal challenges** - As rural subdivisions bring increased traffic volumes, gravel roads suffer damage addressed through services such as grading or paving. This costs Iowa counties more money. An increase in the number of rural residents also increases the number of complaints about dust, ruts, washboarding, narrow bridges, and road width. Roads also suffer under the increased traffic and weight of vehicles traveling to and from livestock confinement operations. It is true that development brings increased tax revenues to the county, but do those revenues cover the increased costs associated with that development? What does the fiscal equation look like for new traffic and road budgets? County supervisors and engineers need tools with which they can estimate the fiscal benefits and burdens any proposed development will bring to the county.
- **Road capacity questions** - A separate, but related question concerns current road capacities and potential future demands on the road system. How much traffic is generated by the "typical" rural residence or livestock operation? What are the potential traffic impacts if land is developed according to existing county zoning regulations, or if livestock operations locate in areas the matrix calculations deem most appropriate? County officials need tools with which they can project future demands on gravel roads.
- **Citizen expectations** - Much of the debate surrounding secondary road service expectations has been characterized as a difference in values between "long time" rural residents (primarily farmers) and formerly urban residents "who don't understand rural life." This characterization may oversimplify reality. It is possible that many of these new residents are satisfied with current levels of service because they know that significant upgrades will likely draw increased development and traffic—the very conditions they sought to avoid by moving to a rural area. It may also be the case that new residents' expectations may exceed the typical service levels provided in a rural setting. This can lead to new demands for faster snow and ice removal, increased dust control, and even paving. County engineers and supervisors

simply do not have enough information to reasonably gauge (1) current residents' satisfaction with current levels of service, or (2) the expectations that new residents will likely bring with them to rural areas.

- **County policy responses** - Even if careful study of these questions yields good information, county boards of supervisors are limited in their ability to craft policy responses. The *Code of Iowa* and state court cases have prohibited local governments from developing many of the tools that other states use to recoup the true costs of development. Are there unexplored avenues for recovering service costs under existing statutes and case law? Do other states' laws provide Iowa legislators with some guidance for changes to the law that will give local units of government greater authority in this area? Legal and policy analysis of these questions is needed.

This research brings together economic, spatial, and legal analysis methods to address the impacts of rural development on the secondary road system and provide county engineers, county supervisors, and state legislators with guidance in addressing the challenges associated with this development.

BACKGROUND

Rural areas across the nation are facing several problems associated with increasing development. The impact of this development on rural road systems is just one significant problem. Others include the loss of quality agricultural land, the fragmentation of natural habitat, water quality impacts, land use compatibility issues, infrastructure development and the provision of other government services. Research has been directed at some aspect of all of these problems, yet very little of it is designed to provide local decision-makers with tools for making day-to-day decisions on development proposals. Furthermore, much of this work does not sufficiently focus on the impact on local roads to be useful for those making decisions about the local road system. Some of the existing research literature is summarized below.

Iowa Land Use Patterns

Land use in Iowa is dominated by private land ownership (98 percent of the total) and agricultural land cover. About 60 percent of Iowa's 35.8 million acres of land cover is cropland and another 28 percent is farm pasture or grassland. By contrast, only about 3 percent is surface water or wetlands, and 3 percent is artificial (urban land, highways, existing and former mineral quarries, etc.). Although Iowa is increasingly becoming an urban state demographically, it must continue to maintain a 90,000 mile secondary road system to support its agricultural economy (Kane, 2003).

Land Use Change in Iowa

Many counties in Iowa are increasingly faced with proposed rural developments that will generate substantial new traffic on secondary roads. These include rural residential subdivisions and livestock operations. According to an Iowa State University Extension analysis conducted in 1998, about 30,000 acres of land changes use each year. Around half of the total, about 15,000

acres, is converted from agricultural use to rural residential use every year. This means that each year several thousand people move to large lot rural residential subdivisions in Iowa. The other half of converted land moves into public ownership, forest reserve, or commercial and industrial use; or is annexed into cites. The number of acres annexed each year is far less than 15,000 acres, so the creation of rural residential subdivisions is a more significant producer of land use change in Iowa than urbanization (Iowa State University Extension to Communities, 2001).

New Development in Rural Iowa

The spatial distribution of new rural residential subdivisions and new livestock production facilities being developed in Iowa are very different. New rural residential subdivisions that provide primary residences appear to be locating in areas with excellent access to major highways and farm to market roads within a half hour commute of Iowa's metropolitan centers or other trade centers. They also tend to be locating on land with amenities such as surface water features, moderate slopes and forest cover. New livestock production locations are controlled by the Iowa Department of Natural Resources' Master Matrix. The matrix tends to locate these facilities in more isolated sites far from other development (for odor nuisance reasons) and surface water features (for water quality reasons). Recently, most of these facilities have been located in the northwest and north-central portions of the state—areas that produce abundant crops that can be used for feed.

Traffic Impacts of New Development

New rural developments have the potential to generate a substantial amount of new travel demand on secondary roads. According to the Institute of Transportation Engineers (ITE) Trip Generation Handbook, a new 10-unit rural residential subdivision will generate around 100 new vehicle trips per day on low-volume roads that often carry fewer trips than that to begin with. However, some recent travel demand modeling work being done in Appanoose County in southern Iowa suggests that actual trip making by typical rural residential households in Iowa is probably closer to seven trips per day. According to an Ohio State University Extension study, a relatively modest 1,000 animal unit hog-finishing operation might generate100 large truck trips per year to bring in feed and carry the finished hogs out to market. In addition, the production staff will generate new vehicle trips as they come to and go from the location. In fact, most new livestock production facilities are over 2,000 animal units in size (Ohio State University Extension 2001).

Community Build-Out Analysis

Good techniques are also in place for conducting community build-out analyses. In this case, these are projections of the number of single family residences that could be built in a given geographic area under current zoning and subdivision regulations (White 1996). Work in Michigan has applied some of these techniques to analyze gravel road capacity in two southeast Michigan counties (Wyckoff 2003). However, the study focuses on the consequences of current zoning regulations on the community as a whole and not on the specific impacts of proposed projects.

Cost of Community Service Studies

The American Farmland Trust (AFT) has developed guidance for local governments to use to conduct cost of community service studies on new residential development. AFT has also conducted many such studies on its own (see e.g., AFT 1992). While AFT's work consistently finds that residential development does not "pay its own way", in terms of tax revenue versus costs of services, economists working in community development and local government have pointed out significant weaknesses in AFT's model. The weakness most relevant to the present study is that the AFT model illustrates average costs and benefits for entire classes of development (Kelsey 1996; Deller 1999; Coupal, McLeod & Taylor 2001). While informative, the AFT model does not help local officials evaluate specific development proposals. Other fiscal impact models (Nelson 2004; Burchell and Listoken 1978) are prescriptive in nature but do not provide good, detailed analysis of the costs to the transportation network.

Iowa Fiscal Impact Studies

Fiscal impact analyses of new rural development in Iowa and other Midwestern states consistently indicate that rural residential subdivisions do not generate enough in property taxes and population-based revenues to make up for the additional costs of the new public services they require. Local governments may actually be losing money on every new rural subdivision. This appears to be especially true for lower value residential developments. This means that other land uses must make up the fiscal difference for local governments. The fiscal balance for transportation services considered in isolation appears to be less negative, but this becomes less true if there is enough new trip activity to require capital expenditures for improvements such as secondary road paving.

Legal and Policy Issues

The issue of assessing impact fees to cover the cost of new development has been at the forefront of the development debate in many states. Several states, particularly in the fast-growing west and south, have enacted legislation giving local governments broad powers to assess impact fees for everything from roads and infrastructure to schools and social services. Iowa is still among the majority of states that have not adopted specific impact fee legislation. In *Home Builders Association v. West Des Moines*, the Iowa Supreme Court cast a cloud over the ability of local governments to assess impact fees on new development. The American Planning Association's Growing Smart project examined the status of impact fees across the 50 states and developed model enabling legislation; however, no one has looked specifically at existing Iowa statutes and case law to assess the scope of authority that does exist for other possible ways to recoup development costs, or to assess how model legislation, such as the APA's recommendations, could fit with Iowa's current statutes.

Based on these experiences, the potential exists to integrate these strands of previous efforts and build upon them to develop an interactive model that local governments can use to estimate the

true impacts of proposed new residential development and new livestock confinements on the secondary road system and fiscal resources of county government.

RESEARCH APPROACH

In accordance with the Iowa Highway Research Board's Request for Proposal (RFP), the purpose of this research was to examine the service, budgetary, and policy impacts created by rural growth for county secondary road departments. This study includes consideration of economic and policy impacts as well as discussion of customer expectations for county road service. The following research objectives were identified:

- Create, test, and document a small area spreadsheet model that county officials can use to assess the impact of proposed developments (both residential and livestock confinements) on the road capacity and fiscal resources of county governments.
- Study concepts including developer-paid impact fees, right of way dedication, and road surfacing/dust remediation that could help meet Iowa DNR requirements and current and future landowner expectations.
- Evaluate the appropriateness and legality of transferring road upgrade expenses to livestock operators and rural residential subdivision developers.
- Create policy recommendations, based on research of existing Iowa law and laws enacted in other states, that will give legislators and county boards of supervisors direction in creating/revising existing laws to enable local governments to assess the true costs of development on the road system.
- Develop educational materials and conduct workshops for local officials and stakeholders interested in using the spreadsheet model or learning about policy recommendations.
- Summarize findings and present case studies in a technical document appropriate to the engineering community as well as in an easy-to-read pamphlet geared towards a non-technical audience that includes county boards of supervisors, state legislators, and environmental and land use/zoning officials.
- Coordinate with the Iowa Local Technical Assistance Program (LTAP) to conduct technology transfer activities.

Benefits

This research will assist county secondary road staff in realistically assessing the service and fiscal impacts of proposed rural developments, whether for people or livestock. In addition, it will assist decision makers such as land use planners and zoning officials, environmental regulators, county supervisors, and state legislators to better understand the implications of development proposals for secondary road systems. Finally, the project will inform public policy discussions on the transportation impacts of rural development. Ultimately, the project may lead to new policies and new mechanisms for dealing with the service and fiscal impacts of rural development.

Research Methodology

The main focus of this research was to develop a simple impact assessment tool that can be used by counties in Iowa to assess the potential service and fiscal impacts of rural developments as they are proposed. This tool was applied to case studies of rural developments in Iowa in order to assess the service and fiscal impacts of rural development on secondary roads. The results of these case studies were used to conduct an assessment of various policies that address typical Iowa secondary road impacts of rural development, both residential and livestock production.

Ten research tasks were identified and carried out in this process:

Task 1: Determine the State of Existing Research Knowledge
Relevant literature, statutes, and case law were summarized for the research topic of rural development impacts on secondary roads. It appeared from a preliminary literature review that there is extensive research literature that can be brought to bear on this issue, but that the results needed to be integrated so that they could be applied to understanding the problem at hand.

Task 2: Form Technical Advisory Committee (TAC)
The second task was to form an advisory panel made up of interested Iowa Highway Research Board members, county engineers, city engineers, and other technical stakeholders such as county land use planners and zoning officials. This panel helped to guide the research project, for instance by identifying possible locations for case studies and helping to refine the proposed development impact assessment tool.

Task 3: Conduct Spatial Analysis of Rural Development in Iowa
Previous work conducted by CTRE on land use change in Iowa indicates that rural residential subdivisions tend to be concentrated in areas that are near metropolitan areas and other trade centers of the state, near major transportation arteries such as Interstates and other commuting routes, near amenities such as surface water and forested land, and not on prime farm land. This means that such subdivisions tend to be concentrated in areas that fit a specific spatial profile. On the other hand, livestock operation locations are regulated by the DNR Master Matrix and they tend to develop in rather isolated areas so that environmental and social impacts can be minimized. They appear much more randomly distributed across the map of Iowa. The spatial analysis is useful in two ways. First, it illustrates the nature of the rural development impacts. Secondly, the spatial analysis was helpful in selecting case study locations for project Task 4.

Task 4: Select and Develop Case Studies for Rural Development Impact Analysis
The best way to understand the potential traffic, service, and fiscal impacts of rural development on Iowa secondary road systems is to develop a variety of case studies for analysis. For this research, about six case studies were selected; representing various sizes of developments, various types of development and various road system situations. Some case studies were proposed developments while others could were in-progress or recently completed developments to evaluate the accuracy of the impact assessment tool.

Task 5: Arrange and Conduct Stakeholder Focus Groups
Focus groups were formed and conducted for this research project to involve selected stakeholders who represent rural secondary road system users. The idea behind the focus groups was to better understand the qualitative aspects of issues involving impacts of rural development on secondary roads in Iowa. Anecdotal evidence suggests that new rural residents may have expectations for city-type services (snow plowing, dust control, and paving) that may be unreasonably high given the level of property taxes and other revenues that they generate for their new jurisdiction.

Task 6: Develop and Test Rural Development Impact Assessment Tool
In order to determine the service and fiscal/budgetary impacts of rural development on Iowa secondary roads operations, a simple spreadsheet model system was developed. The tool is a small area model rather than a network model of an entire county. It was designed to systematically develop trip generation estimates for residential developments (using ITE trip generation estimates) and livestock production developments (using previous research). It also allows the traffic to be assigned to various roads in the vicinity of the proposed development using a "traffic shed" concept: Traffic sheds are similar to watersheds in that traffic tends to move towards a dominant destination, such as a nearby center of employment or a livestock market. The impact tool then was designed to calculate the service impacts and the incremental cost of new traffic generated by the development. It also was designed to calculate the incremental tax revenues that would come to the secondary roads budget. A net fiscal impact was calculated. The advisory committee assisted the research team in making sure the analysis results are reasonable. The development impact assessment tool was documented so that practitioners can use it effectively.

Task 7: Conduct Case Study Service and Fiscal Analyses
Once case study locations were chosen and the rural development impact assessment tool was been developed and tested, the tool can be applied for the case study locations.

Task 8: Summarize Results and Develop Public Policy Implications
During this task, the literature review, focus group results, analysis methodology, spatial analysis, and case study analyses were summarized. This summary allowed for the development of public policy recommendations. For instance, by this point in the research it should be clear whether rural residential subdivisions and livestock production operations are net negatives or positives for county secondary road operations. This conclusion will allow alternatives such as having developers pay for remediation to be considered in a meaningful way. Any public policies considered will be evaluated in the context of Iowa's current legal framework. If new legislation would be needed to implement a public policy approach, this will be indicated.

Task 9: Prepare Outreach Materials
One major deliverable for this research study is a pamphlet-type executive summary for a non-transportation professional audience. This summary will be prepared in an easy to understand manner and will emphasize the service impacts and fiscal impacts of typical rural developments in Iowa as well as potential public policy options.

Task 10: Technology Transfer
Results of this research will be disseminated through a variety of channels, including the Iowa Local Technical Assistance (LTAP) Center. In addition, the research team will work with the Iowa State Association of Counties, Iowa County Engineers Association, County Zoning Officials, the Iowa County Engineers Service Bureau, and Iowa Chapter of the American Planning Association, Iowa Department of Transportation, regional councils of government, and other groups as appropriate to make sure that the research results are widely distributed.

LITERATURE REVIEW

The following is a brief summary of much of the literature consulted for the project. It is arranged in three general categories regarding the effects of and policies for confined animal feeding operations, rural residential subdivisions, and rural infrastructure.

Confined Animal Feeding Operations

Iowa: Concentrated animal feeding operations air quality study— Iowa State University and the University of Iowa Study Group

This study has analyzed the animal production trend of rapid consolidation in the United States and Iowa changes in the past 50 years. As a result of this, there is an increase in air pollutants which cause adverse health effects. The researchers argue that the socioeconomic impacts of CAFO's on rural Iowa and its communities as well as their impacts on human and animal health need to be assessed. Some impacts include an increase in crime rate and the migration of young people out of rural areas. CAFOs are also inimical to rural Iowa communities because the decision-making for the CAFO is done at a higher level, and the business owners do not have a strong connection to the community.

Transportation Demands of Livestock and Poultry Enterprises— Ohio State University Extension

This study provides an estimate on the number of additional trips made by passenger and heavy vehicles over public roadways that are attributable to the operation of animal-confinement facilities. The trips include: the transport of feed, young animals, people employed by the facility, movement of animal manure, and finished outputs. Usually most inputs and outputs are transported with large vehicles.

Food, Fuel, & Freeways: An Iowa perspective on how far food travels, fuel usage, and greenhouse gas emissions— Pirog, R.; Van Pelt, T.; Enshayan, K.; & Cook, E.

The conventional semitrailers used in the food system travel nearly 17 times farther than the Iowa-based regional system. Food that is grown in a conventional manner uses 7.5 times the fuel, 8.5 times the CO2, and traveled nearly 3 times as far as local community-supported agricultural farmer's market trucks. Growing and transporting 10% more of the produce for Iowa consumption in an Iowa-based regional or local food system would result in savings ranging from 280-346,000 gallons of fuel, depending on the truck type, as well as a reduction in CO2 emissions of 6.7 to 7.9 million pounds.

An analysis of local benefits and costs of Michigan hog operations experiencing environmental conflicts—Abeles-Allison, M. & Conner, L.J.

This report examines local benefits and costs associated with hog operations for which odor complaints had been received in Michigan. A regression analysis approach was used to determine the implicit prices of hog odors on property values. Property values were regressed against household and neighborhood characteristics of residential properties surrounding these hog farms. The study indicates that the ratio of benefits to costs increase as State Equalized Valuation (SEV) declines. This means that damages are dependent upon property value. As the amount of property value in the area declines, damages decline. Results further indicate that locating residential properties further away from hog operations reduces property tax losses substantially. The study also shows that while all sizes of problem livestock operations have a negative impact on property values, larger hog operations have a greater impact than do smaller ones. This report's focus on local benefits and costs recognizes both township jurisdictions and the localized nature of many livestock manure management cases. It does not however, attempt to determine what level of benefits and costs is acceptable to a community. The report concludes with some suggestions for local governments and livestock operators."

Rural Residential Subdivisions

Preserving Iowa's Farmland: Why is it Important? How Can it be Done?— Cosner, Susan

In Iowa there is an increasing rate of sub-suburban, or rural, large-lot residential development. It is influenced by modern transportation and communications and has caused the loss of farmland. To allay the problems associated with this loss, local governments can utilize agricultural protection zoning, cluster zoning, comprehensive planning, corn suitability rating development restrictions, mitigation ordinances, transfer/purchase of development rights, and right-to-farm ordinances.

Exurban Residential Subdivision Development: Effects on Water Quality and Public Perception—Nassauer, J.I.; Allan, J.D.; Johengen, T.; Kosek, S.E.; & Infante, D.

This study is an investigation of how future alternative designs for exurban residential subdivision development in agricultural landscapes might affect aquatic ecosystems and public perceptions. The researchers questioned whether better aquatic ecological quality would correspond with public perceptions of greater landscape attractiveness. Comparing the alternative futures, rankings of aquatic ecological quality were consistent with public perceptions of attractiveness.

Paying for growth, prospering from development— Kinsley, M. & Lovins, H.

This article discusses why communities welcome growth to solve economic problems and gives reasons as to why choosing growth is not sustainable. There are four reasons towns encourage growth are because they are Hungry, Rusty, Debtor towns, and Booster towns. Though growth seems to make profitable gains for the community, there are great costs, which fall on the local government, resulting in a subsidy from the community to the developers. Instead of this subsidy, the authors advise towns to make sure that the revenues of new growth cover its actual costs. A town can have success without growth if it produces locally what it had normally

imported into the community by supporting existing businesses and stopping the unnecessary leaks of revenue from the community.

Measuring the economic efficiency of producing rural road services—Deller, S. C. & Nelson, C.H.

This study examined the ability of a sample of Midwest townships to produce low-volume rural road services in an economically efficient manner. The results suggest that more than half of costs may be unnecessarily incurred because of input use inefficiency and promote jurisdictional consolidation of production-related responsibilities.

Development Impact Study—Johnson County, Iowa

This study was a benefit-cost analysis of development and county-provided services and the revenue generated by different land uses. The conclusion was that residential development does not generate enough revenue from property taxes and population-based revenues to cover the cost of providing services. The study also found that it is to the county's benefit to choose projects that have higher ratio of property value to the trips they generate. The study also revealed a discrepancy between state projections of development and county spending patterns in regards to secondary roads.

Development at the urban fringe and beyond: Impacts on agriculture and rural land— Heimlich, R. & Anderson, W.

Development in the United States is both resulting in the expansion of urban areas and large-lot development in rural areas. Large–lot residential development consumes much more land per unit of housing than the typical suburb. There is a demand for low-density residential development from Americans that cannot be sustained. "Many people are willing to pay both the private and social costs of such auto-dependent development in exchange for the automobile's comfort, flexibility of use, low door to-door travel time, freight-carrying capacity (for shopping trips), and cheap long distance travel, as well as the aesthetic benefits of separated land uses associated with such development" (page 18). The investment in infrastructure that is necessary for rural development. When more people move into the rural areas and demand improved road systems, there will be additional development pressure. This type of sprawl created 74 percent greater capital costs than high-density planned development, "(page 26). And there is a strong relationship between low-density development and increased transportation and travel costs.

Land use impact costs of transportation— Litman, T.

This article argues that land use impact costs should be used for evaluating transportation decisions. It examines how transportation decisions impact land use and how land use impact costs can be evaluated. Because low density development patterns require significantly higher unit costs for utilities, roads, schools, and emergency services, rural residents traditionally accepted lower levels of public services, including private water and sewer, and unpaved roads. Residential sprawl into the rural areas encourages new residents with higher expectations to move. The impacts of exurban development are inequitable since many costs are not borne by

the people who benefit, and because people who benefit least from increased automobile use and sprawl include those who are economically, physically and socially disadvantaged.

Traffic Sheds, Rural Highway Capacity, and Growth Management—Kendig, L.

Even with zoning controls, rural counties suffer from residential developments that have large lots and densities that do not relate to the transportation network capacity. Conventional zoning may even encourage market forces that result in building in inadequately served areas. To counteract the problems that arise from a transportation network that is pushed beyond its capacity, planners have been using impact fees and adequate facilities ordinances, but a better tool of analysis for rural counties is traffic shed analysis. Rural counties experiencing growth should use the concept of a traffic shed to conduct network analysis so as to better understand what measures need to be taken to adequately serve residential areas without causing too much financial burdens or sprawl. After the analysis has been completed, landowners consider different development options as to how to deal with the available traffic shed capacity. Traffic shed capacity is shared equally among landowners and no property is down-zoned or prohibited from development. The range of options include road improvements, building at the current overlay density, using the current overlay density to plan for the future, no sale, adjusting the deal, choices in development patterns, and the transfer of development rights. The traffic shed system benefits the public by eliminating the subsidy for landowners and developers who benefit from sprawl and helping the community rationally plan for the expansion of services. The analysis can also be used to address the performance of existing water supply, sewer, and soil with respect to new residential developments.

Infrastructure

Transportation Impact Fees and Excise Taxes—Cooper, C.

In this study, twenty five jurisdictions were surveyed about how they finance arterial street improvements that are generated by new development. Sixteen of the jurisdictions use specific transportation financing ordinances (13 use impact fees and 3 use excise taxes) and nine jurisdictions use individualized development agreements and exactions. Impact fees were first developed in Florida, but faced challenges because road fees are related to a general governmental enterprise, and have no specific, controllable event. There are advantages to using excise taxes over impact fees, the taxes are less limited because they are not earmarked and they do not have restrictions to service areas or time limits.

Best Practices in Growth Management with Recommendations: Delaware-Franklin— Kendig, L.

Description, examples, benefits, disadvantages, legal issues and application of the following: impact fees, targeted infrastructure development, growth boundaries, utility extension policies, capacity allocation, traffic-shed planning, and transferable development rights.

How Much Development is Too Much: A guidebook on using impervious surface and gravel road capacity analysis to manage growth in rural and suburban communities— Wyckoff, M. & Manning, M.

This article is a discussion of sprawl and gravel roads in regards to the application of planning and zoning tools to maintain gravel road quality. Wyckoff states that "when new development exceeds gravel road capacity," the results are: "new safety issues, additional pressure on limited public moneys for gravel road improvements, further pressure on the relationship between local governments and road authorities, and negative impacts on rural character." (14). There is also information provided on the subject of calculating gravel road capacity.

Economics of Upgrading an Aggregate Road— Jahren, C.T., Smith, D., Thorius, J., Rukashaza-Mukome, M., White, D., & Johnson, G.

A study was conducted to provide information as to when it is more advantageous to upgrade and pave gravel roads. The study discusses a historical cost analysis, the development of a method for estimating the cost of maintaining gravel roads, and an economic analysis example to aid decision-making. In Minnesota, there has been an increase in traffic volumes and the expectations of neighboring land owners as a result of the state's increasing population on the urban fringe, increase in the number of houses and cabins near lakes, increased traffic accessing recreation areas, and increased number of trips by traditional rural residents. Expectations for roads have increased, placing pressure on officials and budgets. An economic analysis was conducted to determine if the typical investment necessary to upgrade a gravel road to an hot mix asphalt (HMA) road can be justified by the amount of money saved with the lower maintenance costs afforded by an HMA surface. The analysis showed that the maintenance savings alone could not justify the investment in the HMA upgrade. However there is the possibility that the upgrade could be justified to improve the quality of life and to encourage economic development for the local area.

SPATIAL ANALYSIS

Previous work conducted by CTRE on land use change in Iowa indicates that rural residential subdivisions tend to be concentrated in areas that are near metropolitan areas and near major transportation arteries such as Interstates and other commuting routes. Additionally, they tend to locate near amenities such as water features and forested land, rather than on prime farm land. This means that such subdivisions tend to be concentrated in areas that fit a specific spatial profile, likely near paved roads. On the other hand, livestock operation locations are regulated by the DNR Master Matrix. These facilities tend to develop in rather isolated areas to minimize environmental and social externalities. They appear much more randomly distributed across the map of Iowa.

Figures 1 through 9 were developed from the spatial analysis of Boone, Madison, and Marshall Counties. As was expected, over twenty percent more rural subdivisions were located within one mile of a paved surface roadway than were confined animal feeding operations (CAFOs). Figure 1 shows a regional map of the distribution of CAFOs across the region as well as a table featuring the number and percent of CAFOs within certain threshold distances of a paved surface road. Figures 2 through 4 show greater detail of CAFO locations by county.

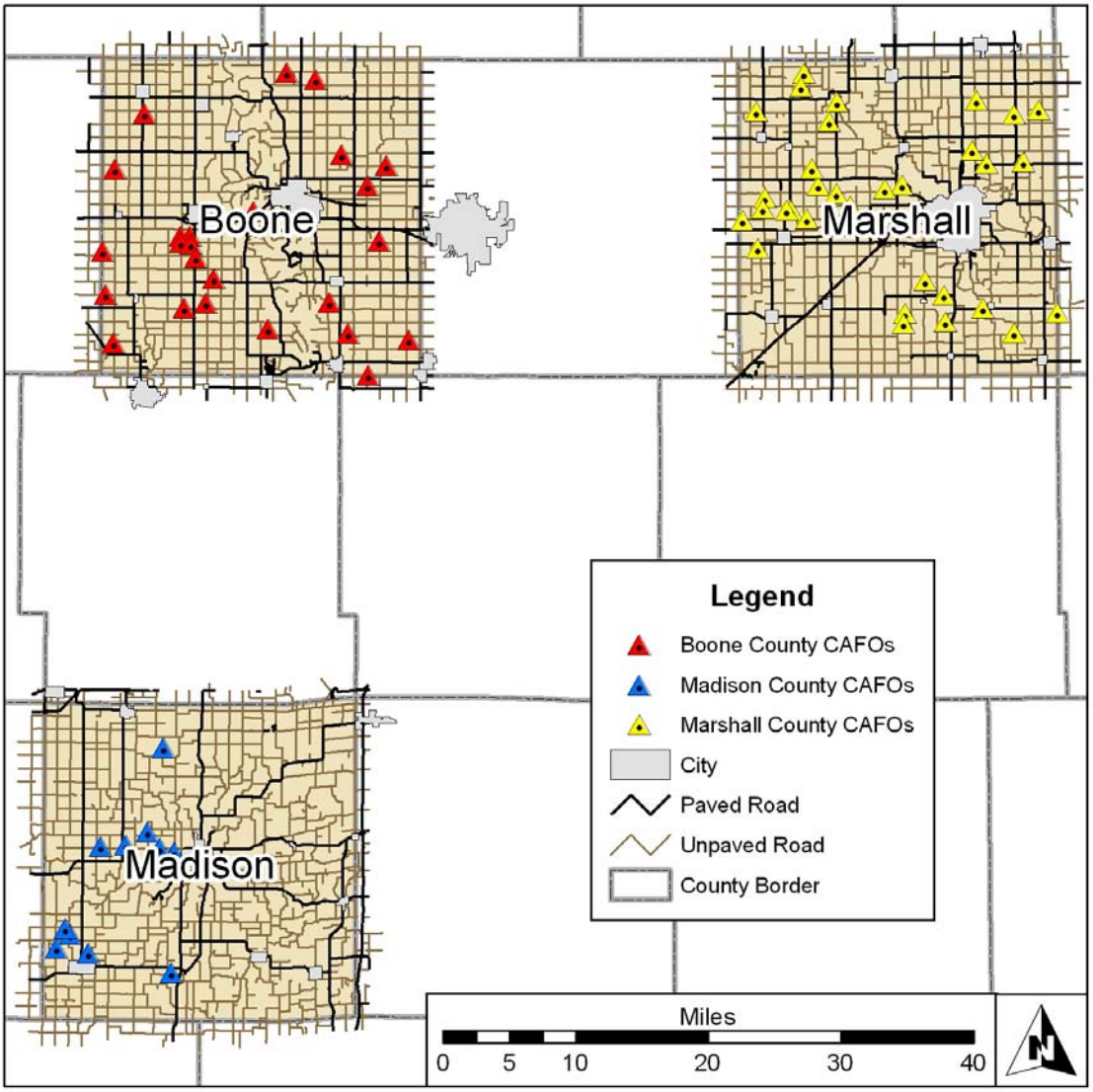
Table 1. Comparison of percentages of animal feeding operations and rural subdivisions within one mile of a paved road

	Animal feeding operation	**Rural subdivisions**
Boone County	65%	92%
Madison County	55%	70%
Marshall County	63%	83%
Average	**61%**	**82%**

Similarly, Figures 5 and 6 show the regional distribution of subdivisions and parcels within each subdivision, respectively, while figures 7-9 illustrate each county in detail. Figures 7-9 also indicate the locations of each case study subdivision that was investigated for Task 4.

Investigation of the Impact of Rural Development on Secondary Road Systems

Spatial Distribution of Feeding Operations



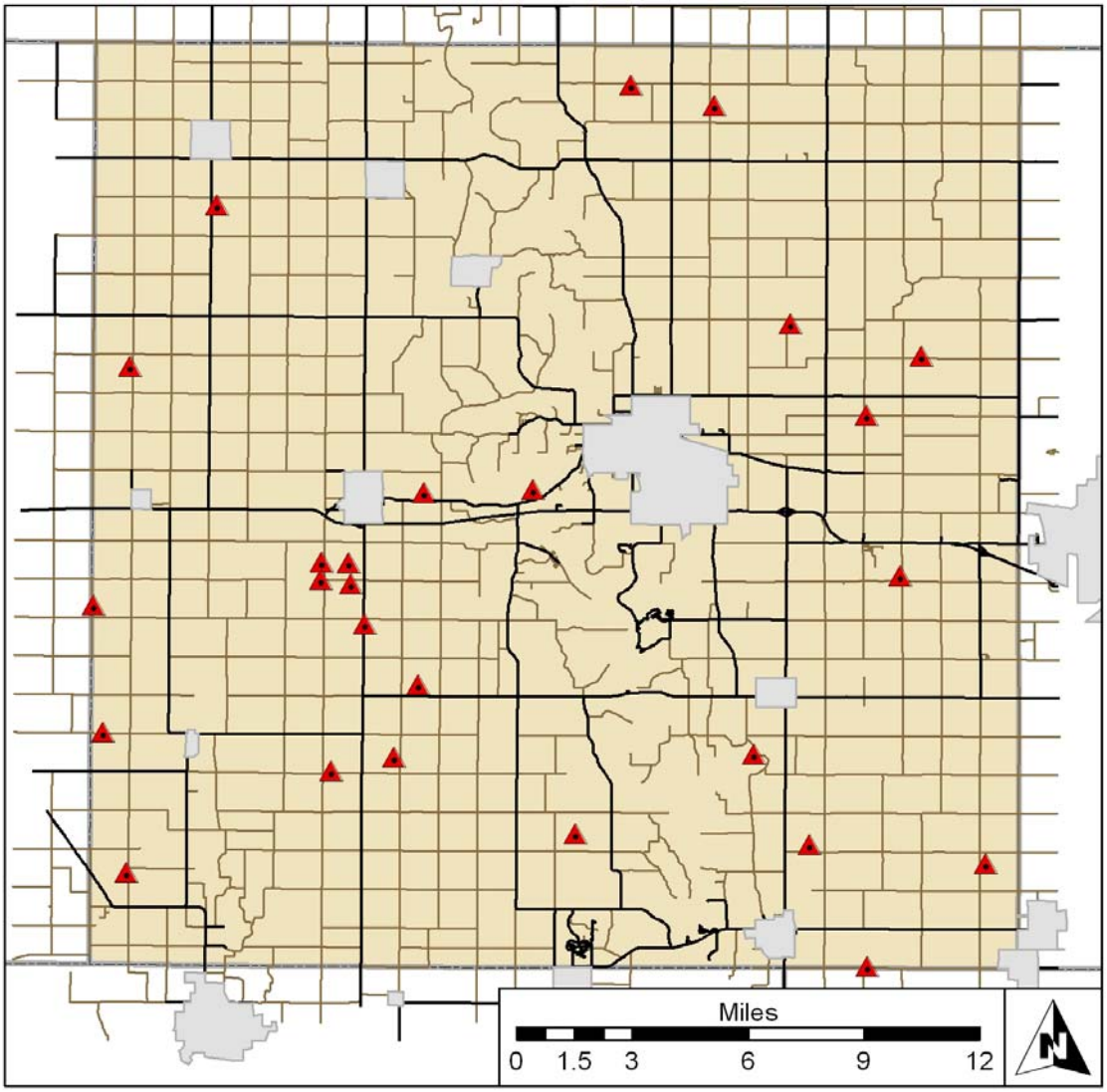
Distance to Paved Road

CAFOs	1/8 Mile		1/4 Mile		1/2 Mile		3/4 Mile		1 Mile		*Total*
Boone	1	4%	3	12%	8	31%	9	35%	17	65%	26
Madison	0	0%	2	18%	4	36%	5	45%	6	55%	11
Marshall	6	19%	8	25%	12	38%	15	47%	20	63%	32

Figure 1. Confined Animal Feeding Operations in Boone, Madison, and Marshall Counties

Investigation of the Impact of Rural Development on Secondary Road Systems

Feeding Operations in Boone County



Legend

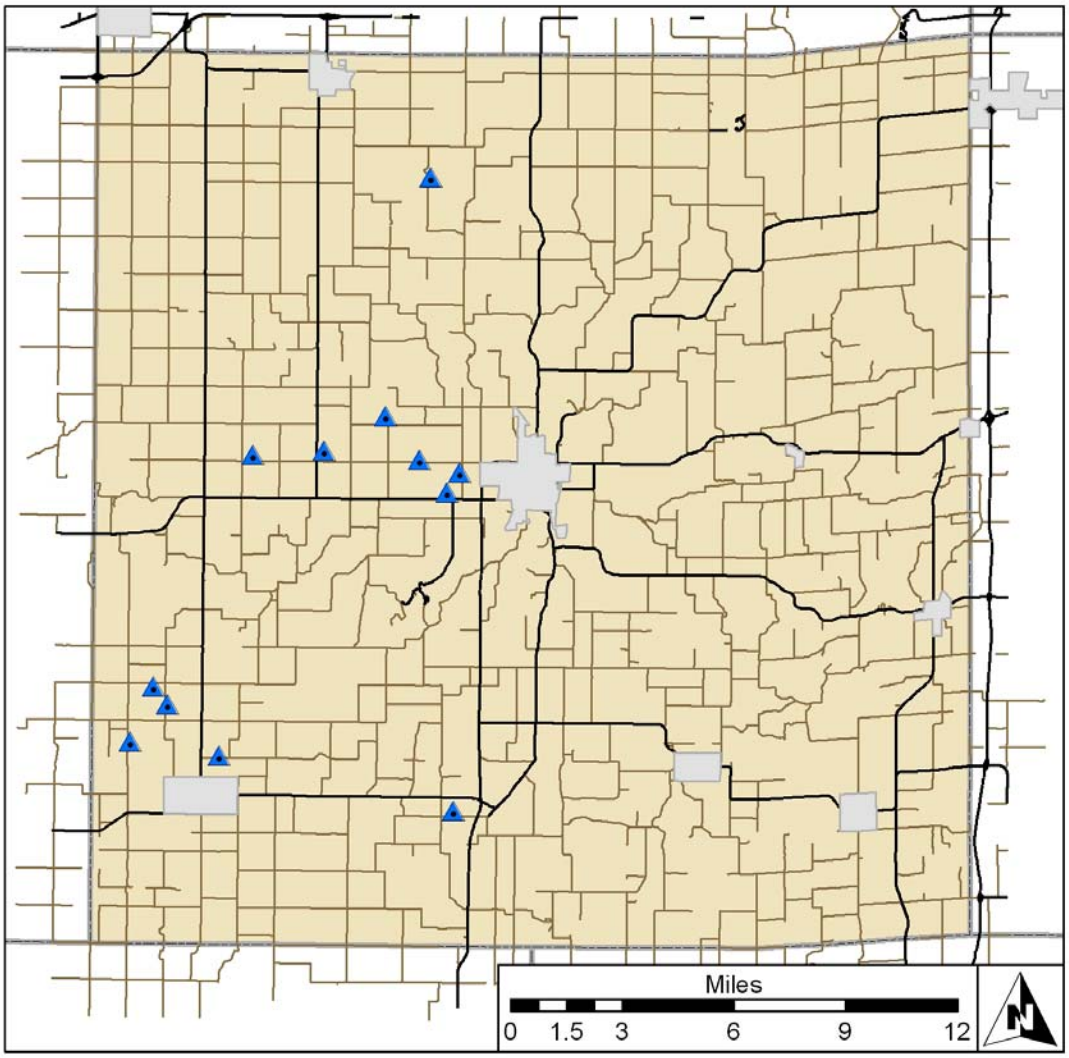
CAFO Paved Road Unpaved Road City County

	Distance to Paved Road										
Number	**1/8 Mile**		**1/4 Mile**		**1/2 Mile**		**3/4 Mile**		**1 Mile**		***Total***
CAFOs	**1**	4%	**3**	12%	**8**	31%	**9**	35%	**17**	65%	**26**

Figure 2. Confined Animal Feeding Operations in Boone County

Investigation of the Impact of Rural Development on Secondary Road Systems

Feeding Operations in Madison County



Legend

CAFO Paved Road Unpaved Road City County

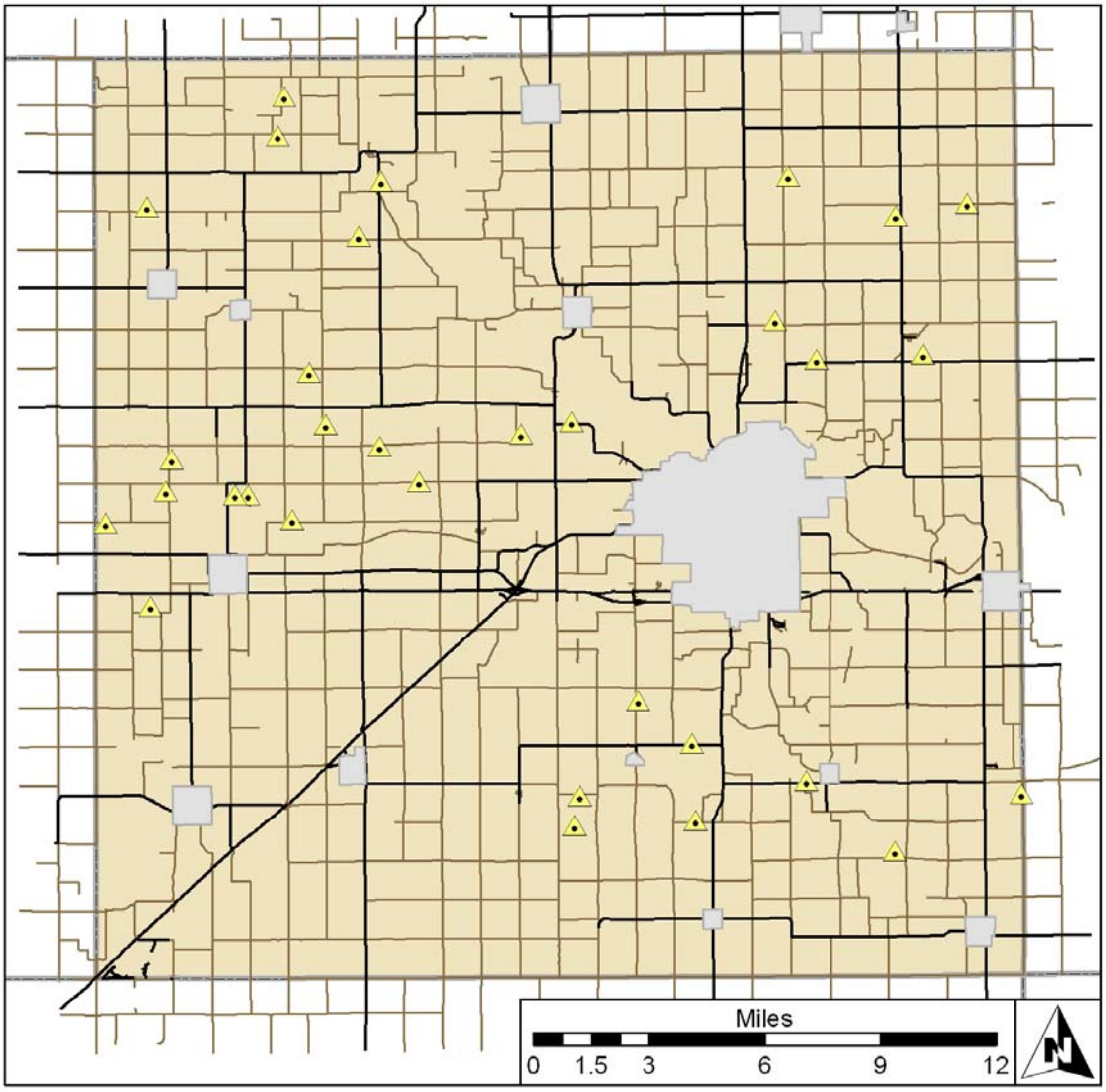
Distance to Paved Road

Number	1/8 Mile		1/4 Mile		1/2 Mile		3/4 Mile		1 Mile		*Total*
CAFOs	0	0%	2	18%	4	36%	5	45%	6	55%	11

Figure 3. Confined Animal Feeding Operations in Madison County

Investigation of the Impact of Rural Development on Secondary Road Systems

Feeding Operations in Marshall County



Legend

CAFOs Paved Road Unpaved Road City County Border

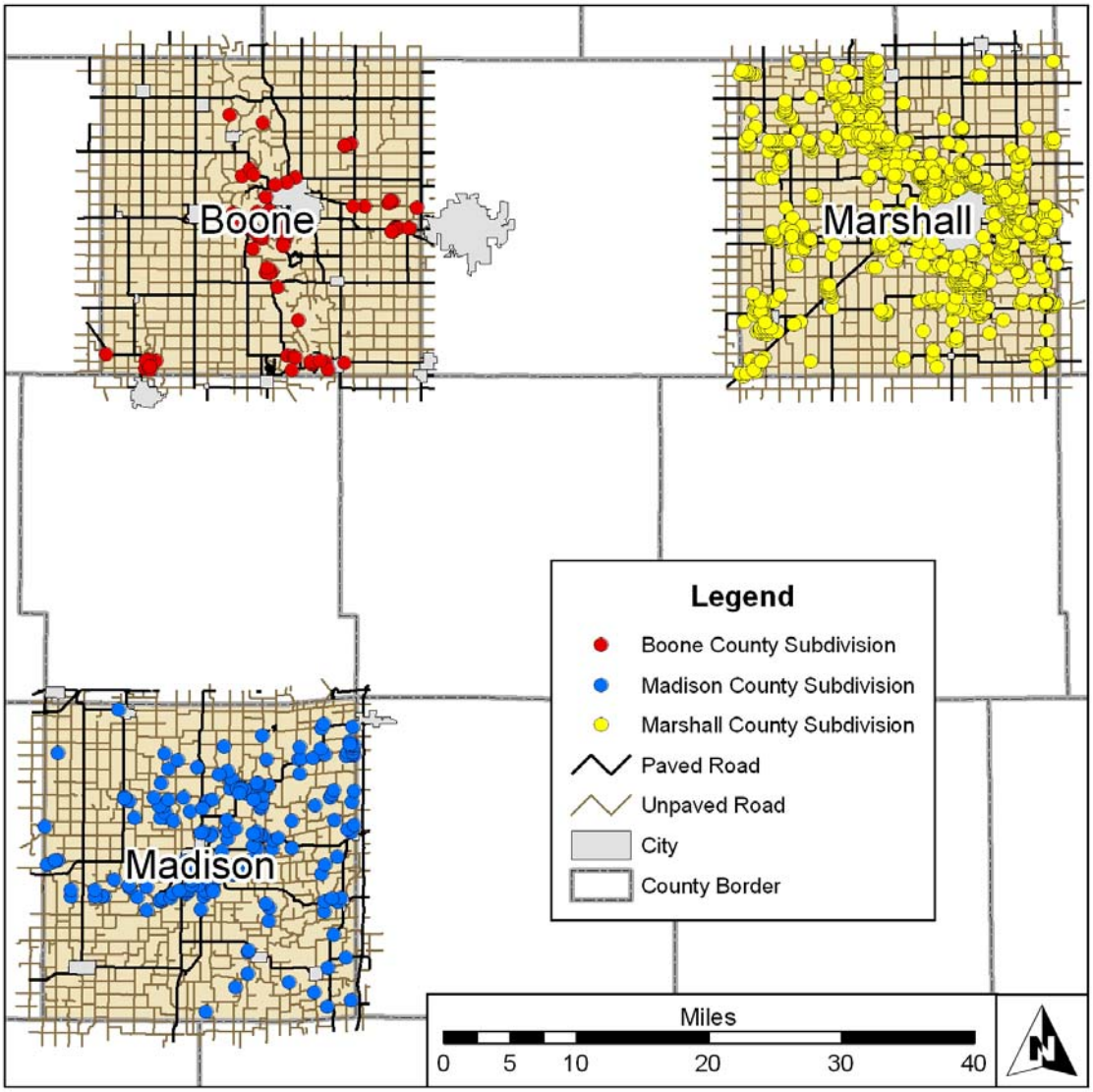
Distance to Paved Road

Number	1/8 Mile		1/4 Mile		1/2 Mile		3/4 Mile		1 Mile		*Total*
CAFOs	6	19%	8	25%	12	38%	15	47%	20	63%	32

Figure 4. Confined Animal Feeding Operations in Marshall County

Investigation of the Impact of Rural Development on Secondary Road Systems

Spatial Distribution of Rural Subdivisions



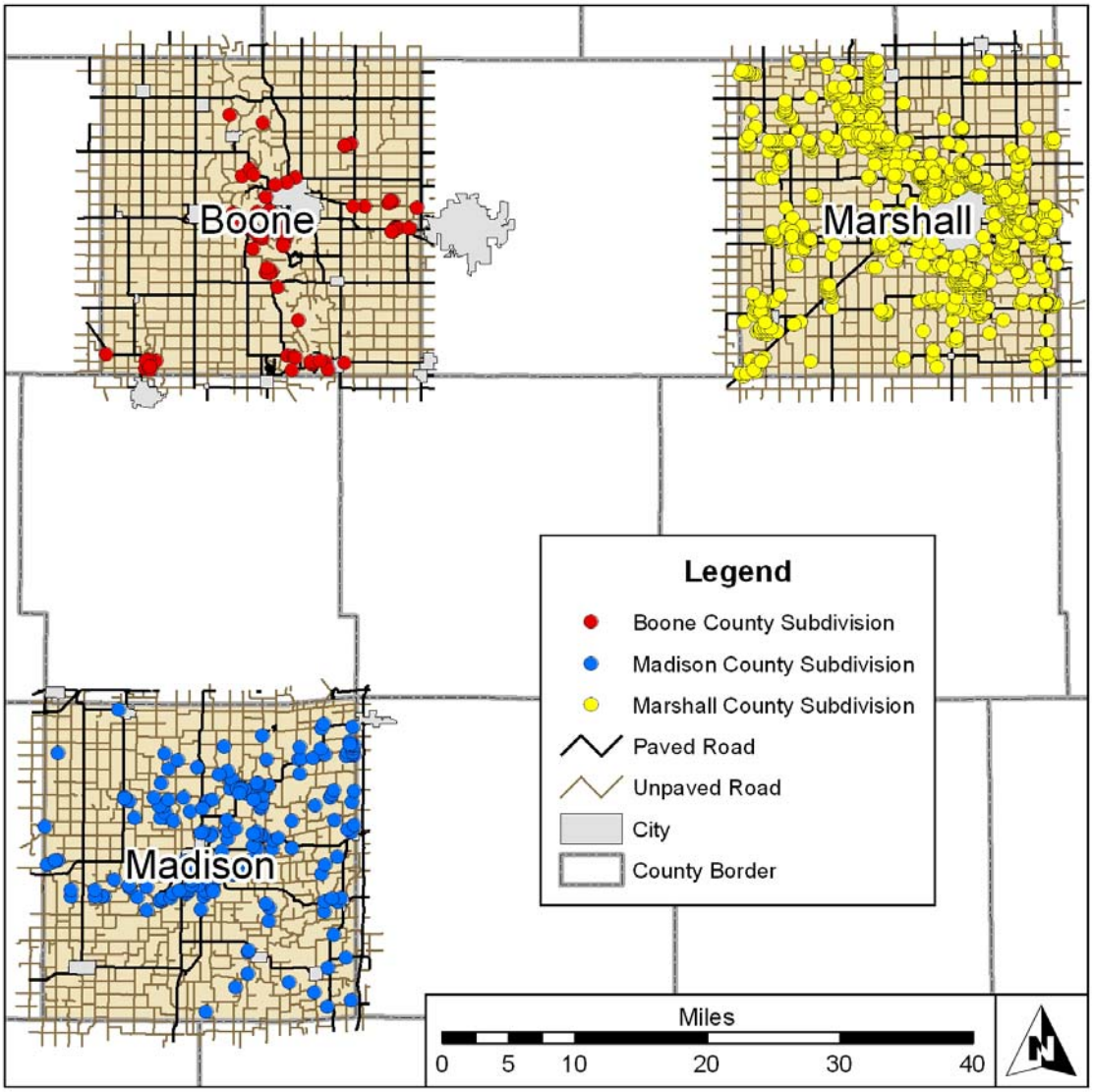
Distance to Paved Road

Subdivisions	1/8 Mile		1/4 Mile		1/2 Mile		3/4 Mile		1 Mile		*Total*
Boone	**34**	39%	**64**	73%	**73**	83%	**80**	91%	**81**	92%	**88**
Madison	**35**	19%	**50**	27%	**74**	40%	**102**	55%	**130**	70%	**186**
Marshall	**299**	28%	**467**	44%	**672**	63%	**805**	75%	**890**	83%	**1070**

Figure 5. Rural Subdivisions in Boone, Madison, and Marshall Counties

Investigation of the Impact of Rural Development on Secondary Road Systems

Spatial Distribution of Rural Parcels



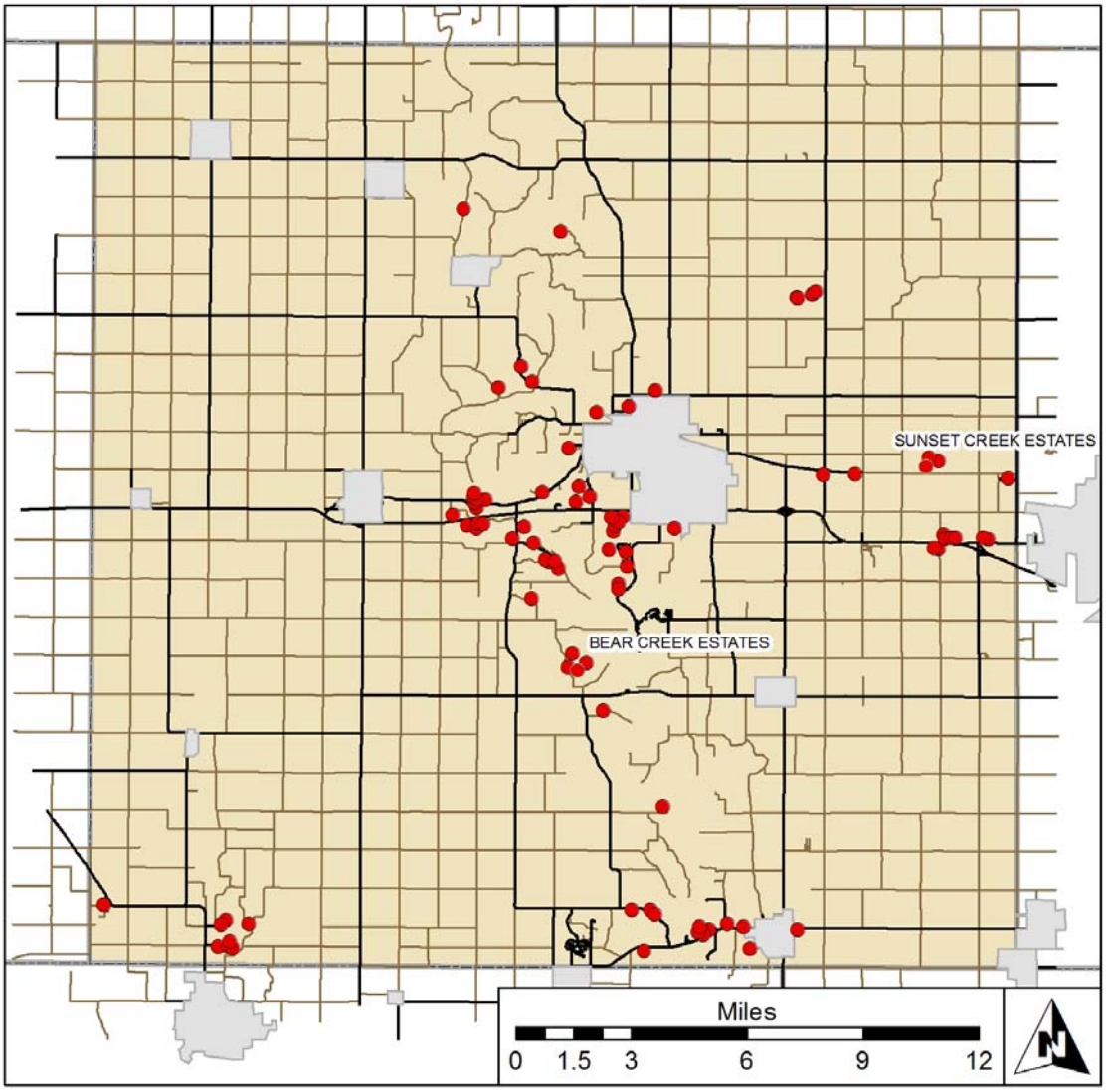
Distance to Paved Road

Parcels	1/8 Mile		1/4 Mile		1/2 Mile		3/4 Mile		1 Mile		*Total*
Boone	**379**	39%	**754**	77%	**819**	83%	**897**	91%	**902**	92%	**982**
Madison	**231**	21%	**355**	33%	**509**	47%	**634**	59%	**763**	71%	**1082**
Marshall	**1152**	42%	**1584**	58%	**2021**	74%	**2292**	83%	**2444**	89%	**2746**

Figure 6. Rural Parcels in Boone, Madison, and Marshall Counties

Investigation of the Impact of Rural Development on Secondary Road Systems

Rural Subdivisions in Boone County



Legend

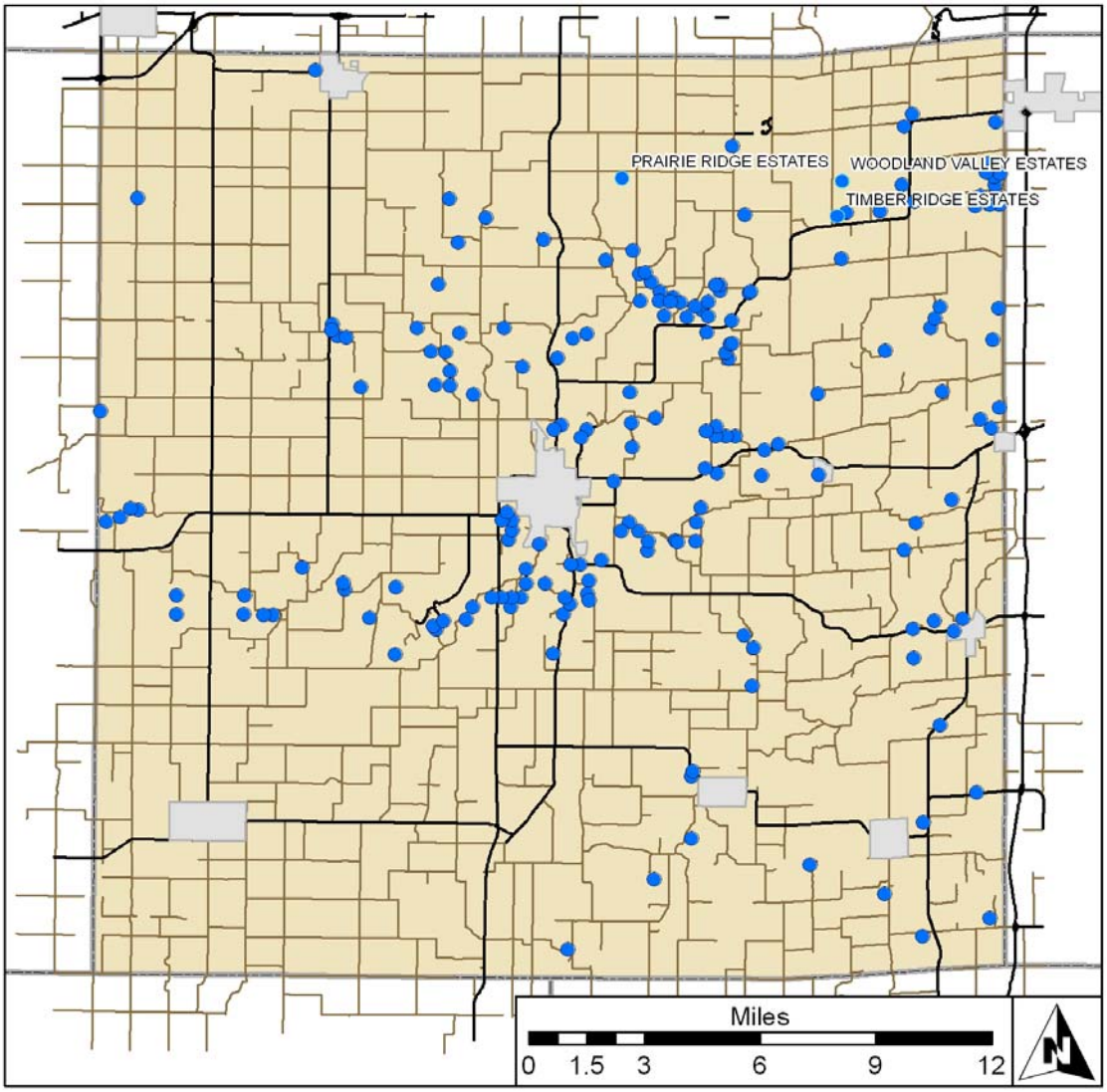
Subdivision | Paved Road | Unpaved Road | City | County Border

Distance to Paved Road											
Number	**1/8 Mile**		**1/4 Mile**		**1/2 Mile**		**3/4 Mile**		**1 Mile**		***Total***
Subdivisions	**34**	39%	**64**	73%	**73**	83%	**80**	91%	**81**	92%	**88**
Parcels	**379**	39%	**754**	77%	**819**	83%	**897**	91%	**902**	92%	**982**

Figure 7. Rural Subdivisions and Parcels in Boone County

Investigation of the Impact of Rural Development on Secondary Road Systems

Rural Subdivisions in Madison County



Legend

Subdivision City Paved Road Unpaved Road County Border

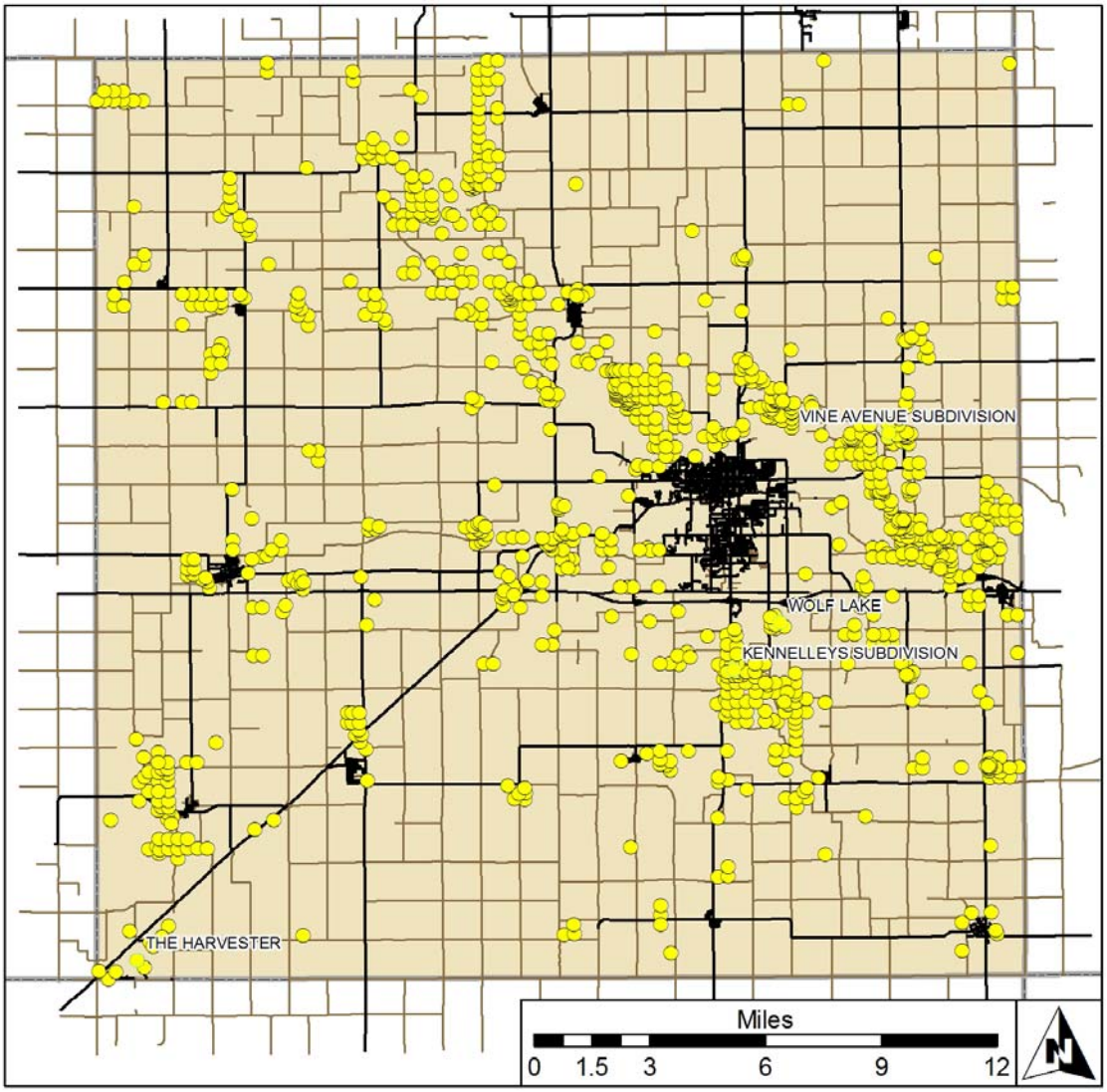
Distance to Paved Road

Number	1/8 Mile		1/4 Mile		1/2 Mile		3/4 Mile		1 Mile		*Total*
Subdivisions	**35**	19%	**50**	27%	**74**	40%	**102**	55%	**130**	70%	**186**
Parcels	**231**	21%	**355**	33%	**509**	47%	**634**	59%	**763**	71%	**1082**

Figure 8. Rural Subdivisions and Parcels in Madison County

Investigation of the Impact of Rural Development on Secondary Road Systems

Rural Subdivisions in Marshall County



Legend

Subdivision | Paved Road | Unpaved Road | County Border

Distance to Paved Road

Number	1/8 Mile		1/4 Mile		1/2 Mile		3/4 Mile		1 Mile		*Total*
Subdivisions	**299**	28%	**467**	44%	**672**	63%	**805**	75%	**890**	83%	**1070**
Parcels	**1152**	42%	**1584**	58%	**2021**	74%	**2292**	83%	**2444**	89%	**2746**

Figure 9. Rural Subdivisions and Parcels in Marshall County

CASE STUDY ANALYSIS

For this study, a rural subdivision is defined as a tract or parcel of land outside city limits that is divided into three or more lots. The researchers assumed that all of the spatial data about subdivisions they received from the participating counties referred to residential, and not commercial or agricultural subdivisions.

Boone County Case Studies

Bear Creek

The Bear Creek Subdivision is located south of Boone off of Magnolia Road, a winding gravel road. The subdivision's road, Maple View Place is one mile from the nearest paved road to the north and west, and a quarter of a mile from a paved road to the south and east. The two-part subdivision is divided into eleven lots, only three of which have been built upon. The average value of the houses in 2005 was

$220,419.

The houses are located on either side of a gravel road and are surrounded by a forest through which Bear Creek runs before entering the Des Moines River. One unusual feature to the subdivision is Sparks Cemetery (created in 1882) located off of the subdivision entrance.

Sunset Creek

Sunset Creek is located on the eastern edge of Boone County off of 210th Street. It is surrounded by agricultural land that has slightly rolling terrain and few trees. Many of the lots feature horse stables and there is a public pasture for horses in the center of the subdivision.

Two additions have been made to the initial subdivision development. A creek and surrounding wooded greenbelt separate the northern third addition and southern second and

first additions. The third addition has only recently been approved by Boone County; roads have been cut and the lots are marked. At the eastern edge of the subdivision there is a forest preserve.

When the subdivision was created, the road setbacks were in place for a paved road, but it has not yet been paved. The subdivision is 1.5 miles from the nearest paved road, 210th Street. That road, which runs east to west, becomes gravel between U Avenue and Y Avenue (4.5 miles). The houses at Sunset Creek range in value from $202,000 to $367,000 and the thirty-five lots range in acreage from 0.87 to 4.45 acres.

Madison County Case Studies

The three case study subdivisions are all located northeast of Winterset in Madison County Iowa. That part of the state has beautiful rolling hills and wooded areas that surround the Des Moines River and its tributaries. Two parks, Pammel Park and Fellowship Forest, are located in that area. The soil and terrain is poor for farming, but agricultural fields exist here nonetheless.

Timber Ridge Estates

Timber Ridge Estates is located on the corner of Timber Ridge Avenue, a gravel road, and Cumming Road, a paved road. So far there are two of sixteen lots that have been developed in first phase of the subdivision. The second phase will feature another twenty-two lots, but has yet to be approved. The development features a pond and common area on the northwest side of the development. The first plan for the subdivision was changed so that the access would be off the paved road. The two homes that have already been built are $250,000 and $455,000.

Woodland Valley Estates

Woodland Valley Estates is located one mile north of Cumming Road (paved) on Timber Ridge Avenue (gravel). The first phase of the development (81 acres) has fourteen lots, and the second phase will add on another fourteen. Few houses have been built in the first of the two-part development, and the road has been cut for the second addition. When the road is fully completed, it will make Upland Avenue a through street. The change will increase the amount of traffic on Timber Ridge Avenue, which is a gravel road.

The development is south of Badger Creek and features two conservation easements. All of the lots are wooded and one features a pond. Four of the twenty-eight homes have been built; the cost of the homes ranges from $225,000 to $375,000. The majority of the owners of the lots are households from Des Moines and West Des Moines, so it can be assumed that they will be commuting to work in the central city.

Prairie Ridge

Prairie Ridge is almost fully completed; of the twenty-four lots, sixteen have houses built on them. The subdivision is located on the corner of Old Portland Road and 130th Street, two miles east of Highway 169 and almost six miles from Cumming Road. Badger Creek passes through farmland north of 130th Street and the surrounding land is mostly agricultural. The acreage of the lots ranges from 1.2 to 9.9 acres with the total acreage of the subdivision at 137 acres. The Madison County engineer believes that the subdivision will impact not only the roads around the subdivision, but also the roads to the north which are pathways for commuters of Des Moines.

Marshall County Case Studies

Marshall County is a relatively low-income Iowa county impacted by the fact that it is far from any major trade center. Three case study subdivisions were created in the 1960's and 1970's and one subdivision on the southwest border of the county has recently started to develop.

Kennelley Subdivision

Located three-quarters of a mile south of Marshalltown, Kennelley Subdivision is situated along two gravel roads. The subdivision was built in 1971 on farmland owned by the Kennelley family and has 20 lots. The homes built there range from a building date of 1948 to 1998 and house values range from $78,000 to $241,000. Ninety percent of the households have Homestead or Homestead Military tax credits. The subdivision's two streets, 260th Street (east-west) and Ridge Road (north-south), pass through the subdivision for less than one mile before connecting to Highway 14. According to the county engineer, 260th Street carries 90 vehicles per day (VPD), and Ridge Road (north-south) is listed at 50 VPD.

Wolf Lake

Wolf Lake Subdivision is located southeast of Marshalltown off of Smith Avenue (paved). When Wolf Lake Subdivision was built in the 1960s, a paved road was constructed with the good top soil from the housing construction sites. This left clay as the main substance used around the septic tanks, which continues to cause septic problems. The subdivision has fifty-four lots and a total land area of 45 acres. There is a pond on the east end of the subdivision. The homes range in values from $42,000 to $135,000. Eighty-three percent of the households have Homestead or Military Homestead tax credits.

Vine Avenue Subdivision

Vine Avenue is a gravel Y-shaped road east of Marshalltown that connects two paved roads. The houses in the forty-two acre subdivision are all a half of a mile from each paved road, Wallace Avenue and Main Street Road. Because it was built in the 1970's, the subdivision has property values that are lower than case studies in other counties and the acreage is smaller. The house prices range from $35,000 to $145,000 and average lots of 1.2 acres.

The subdivision is surrounded by farmland and features a baseball diamond on its northeast corner. The daily traffic count in 1997, 170 vehicles per day, is relatively high. The high value could be attributed to construction on that road or some other volatile factor.

The Harvester

Unlike the other subdivisions in Marshall County, this subdivision is very recently developed in a predominantly agricultural area. Although the surrounding roads are gravel, the road from Highway 330 to the subdivision was paved with funding by the developer. The road, although paved, is a very cheap ($300,000) improvement that is projected only to last for a few years.

At the time of writing, only twenty percent of the development is owned by households, most of which have homes. The structures going in are very expensive compared to the homes in other Marshall County subdivisions with prices ranging from $222,000 to $414,000. The ninety-three

lots have an average acreage of 1.2 acres. The Harvester development is located adjacent to a golf course of the same name.

FOCUS GROUPS & SURVEY

Three counties in Central Iowa were selected for the focus group meetings: Boone, Madison, and Marshall. One subdivision was chosen from each county and invitations to the focus group were sent out to each household. Sunset Creek was chosen from Boone County because it is a larger development, Prairie Ridge was chosen from Madison County because it is also a relatively large development and because most of its residents are presumed to commute to Des Moines, and Kennelly Subdivision was chosen from Marshall County. Three people attended the focus group in Boone County, no one attended the Madison County focus group, and five people attended in Marshall County.

The goal of each focus group was to gain an understanding of household location choices, which is usually based on availability of services, environmental quality, and existing community. At each focus group, the participants were asked to complete a survey and participate in a discussion about the expectations for the subdivisions and reasons that motivated them to move there. Survey respondents were asked a variety of questions about how long they have lived in their current subdivision, the communities they moved from, and their expectations for the rural subdivision (i.e. dust control, emergency services, and snow removal) and how those have been met. These same surveys were later mailed to all residents in each of the subdivisions because the attendance at the focus groups meetings was very low; 50 of the 104 that were sent out were returned.

The data procured from this survey was analyzed using GIS tools to describe the relative proximity of the rural subdivisions to paved roads, environmental amenities and urban centers. Observations drawn from the data collected in the survey has been summarized below. Inferences drawn from the spatial analyses of the data have been explained in detail in the spatial analysis section of this report.

Household location choices are based on accessibility to public services and surrounding cities, landscape or regional characteristics/environmental amenities, and length of moves. These factors usually overlook the fact that it is common for the subdivisions to lack access to urban level services as a result of the low densities of the developments.

When asked why they moved to the subdivision, many of the answers had to do with the quality of life associated with rural living. Some reasons were: “can look at the stars”, “cheap land and not too far from city life”, “have room to raise horses”, “have space for kids to play”, “ have access to hunting grounds”, and “being close enough to neighbors when you need help, but far enough away to enjoy your property.”

With regard to service expectations, the majority of the focus group participants were aware of the problems associated with living on a gravel road in a low density area. All wanted to pressure the county legislature to pave their road. Many of them did not understand the true cost of road paving and asked questions about why certain areas of their county had paved roads while theirs is still gravel.

Surveys were sent to all of the residents of Prairie Ridge and Timber Creek in Madison County because those two were the most developed of the three rural subdivisions in Madison County. Of the twenty surveys that were sent out, ten were returned. Half of those who replied had a commute to work over thirty minutes, and thirty percent had a commute that was less than fifteen minutes. Before moving to the subdivision, seventy percent of the responders lived within city limits (30% in a city with a population larger than 100,000 people). When asked whether or not the subdivision met their expectations, all of the respondents replied that it had.

Respondents replied that motivations to move to Prairie Ridge were because they wanted to live in the country where there was acreage and privacy, have access to good schools, and a less hectic lifestyle. A respondent from Timber Creek replied that their family raises horses and needed land. When asked if the gravel roads caused significant problems and if they contacted county officials, Prairie Ridge respondents replied that they did not previously realize the pitfalls of driving on gravel and complained of pot holes, mud, and poor maintenance. Despite these drawbacks, Prairie Ridge residents seemed to be quite content at the subdivision remarking that they “love it.” Residents in Timber Creek also stated that they were very happy with the subdivision overall.

In Marshall County’s Harvester subdivision, residents said that they moved there for the golf course, the view, acreage, small community for children, service levels, sewer, large lot sizes, access to major highways, and the promise of a paved road,. Their concluding opinion of the subdivision is that it is: great, the highway infrastructure generally well maintained, view is beautiful; the neighborhood is peaceful and quiet. Fifty percent of those surveyed have a commute that is longer than 30 minutes and 75 percent have a commute longer than 15 minutes. In the Vine Avenue subdivision, residents stated that they moved there for the rural livelihood, small school system, and strong community ties. Concern was expressed in regards to dust control and high traffic volumes.

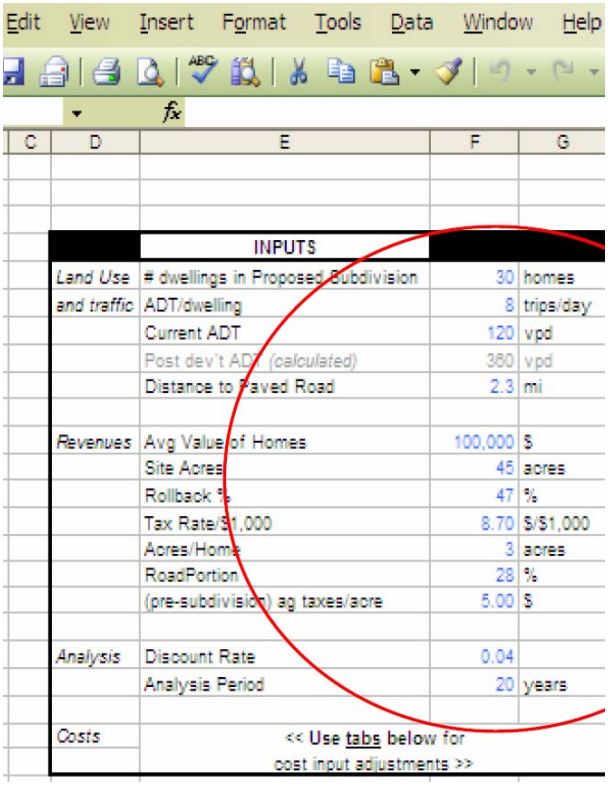
IMPACT ASSESSMENT TOOL

The first spreadsheet is for land use changes that occur when a parcel of previously agricultural land is proposed to become a rural subdivision. This is increasingly common in Iowa, and often results in a significant increase in the amount of traffic on adjacent roads. This increase in traffic is accompanied by an increase in maintenance costs, and this tool can evaluate and compare the costs of different road surfaces.

1. Open the Microsoft Excel File (rural_tool.xls)
2. At this time, it is a good idea to save this file with a new name, so as to not affect the "master file" in case of an error that affects the formulas.

Adjusting Land Use & Economic Inputs

3. Adjust the values in blue on the INPUT_OUTPUT tab in the Excel spreadsheet to fit local and/or project values, if available. The relevant quantities are circled in Figure 10. These are values for the development, as well as county tax revenues. Note that any field in grey color is calculated by the tool, not manually adjusted by the user.
4. In Figure 10, "Current ADT", etc. refers to the land use and ADT before the proposed development. "Post Dev't ADT" refers to the land use and induced traffic conditions after the land use has changed to the subdivision. This value is calculated using the "# dwellings in Proposed Subdivision" and "ADT/dwelling" fields, and should not be manually adjusted.
5. These inputs will be used for both the gravel maintenance estimates as well as the HMA maintenance/construction estimates. Instructions for adjusting cost estimates are described next.



	INPUTS		
Land Use	# dwellings in Proposed Subdivision	30	homes
and traffic	ADT/dwelling	8	trips/day
	Current ADT	120	vpd
	Post dev't ADT *(calculated)*	360	vpd
	Distance to Paved Road	2.3	mi
Revenues	Avg Value of Homes	100,000	$
	Site Acres	45	acres
	Rollback %	47	%
	Tax Rate/$1,000	8.70	$/$1,000
	Acres/Home	3	acres
	RoadPortion	28	%
	(pre-subdivision) ag taxes/acre	5.00	$
Analysis	Discount Rate	0.04	
	Analysis Period	20	years
Costs	<< Use tabs below for cost input adjustments >>		

Figure 10. Land Use Input Adjustments

Adjusting Cost Information

6. The following procedure can be followed for both the gravel and HMA construction costs.
7. On the bottom of the rural_tool.xls spreadsheet are four “tabs”. Clicking on the “Gravel Maintenance Costs” or “HMA Construct_Maintenance Costs” tab allows the user to adjust the cost information to local or project values. Figure 11 below highlights the location of these tabs.

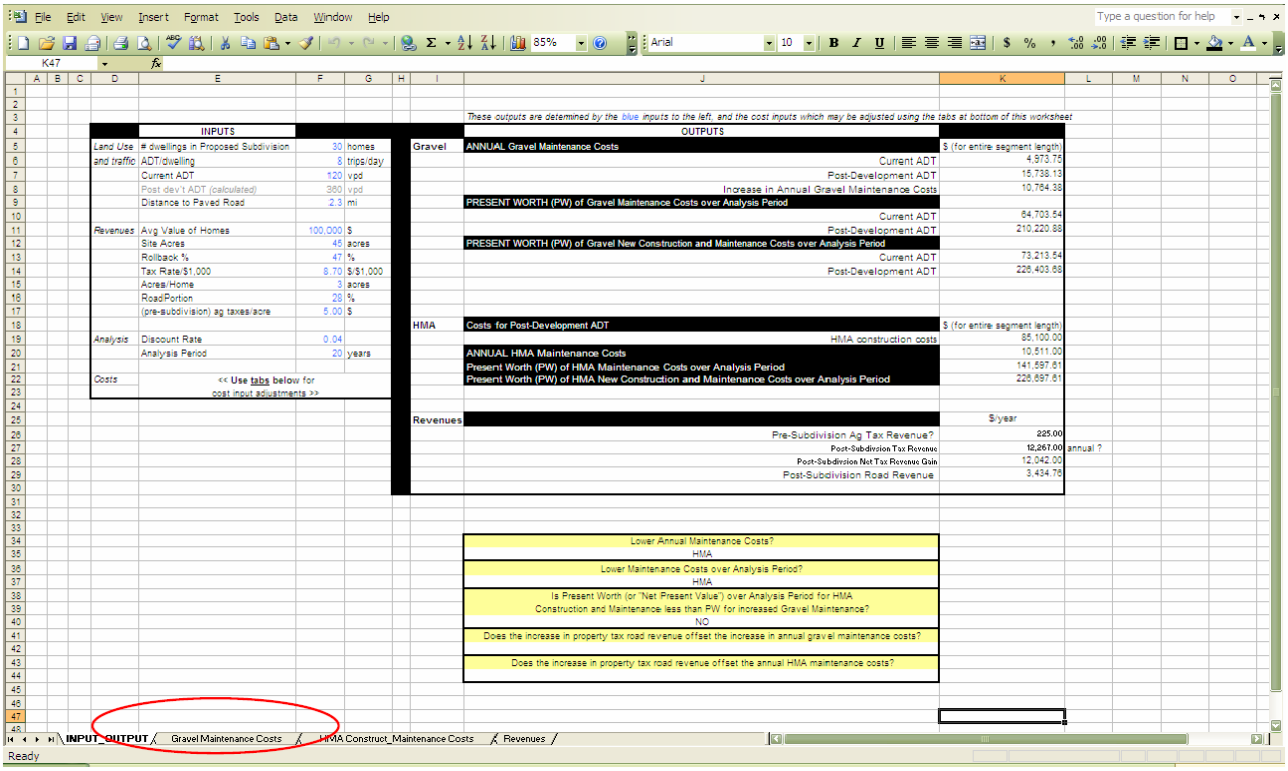
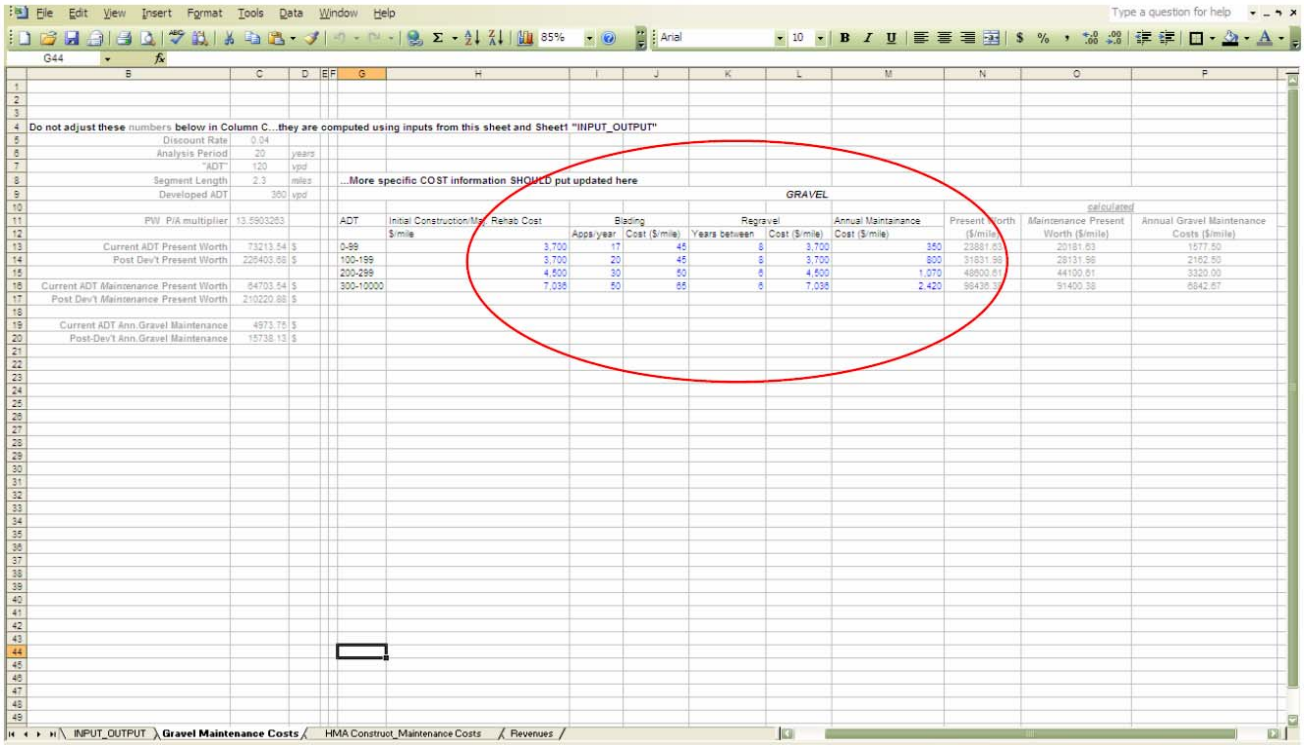


Figure 11. Rural Subdivision Input_Output Screen with other tabs highlighted

8. Click either the "Gravel Maintenance Costs" or "HMA Construct_Maintenance Costs" tabs. [Note: The revenues tab is used for computation and the values therein should not be adjusted]. A spreadsheet such as the one shown in Figure 12 will appear.



Do not adjust these numbers below in Column C...they are computed using inputs from this sheet and Sheet1 "INPUT_OUTPUT"

Discount Rate	0.04	
Analysis Period	20	years
"ADT"	120	vpd
Segment Length	2.3	miles
Developed ADT	360	vpd
PW P/A multiplier	13.5903263	
Current ADT Present Worth	73213.54	$
Post Dev't Present Worth	225403.68	$
Current ADT Maintenance Present Worth	64703.54	$
Post Dev't Maintenance Present Worth	210220.88	$
Current ADT Ann.Gravel Maintenance	4973.75	$
Post-Dev't Ann.Gravel Maintenance	15738.13	$

...More specific COST information SHOULD put updated here

GRAVEL

ADT	Initial Construction/Maj. Rehab Cost $/mile	Blading Apps/year	Blading Cost ($/mile)	Regravel Years between	Regravel Cost ($/mile)	Annual Maintainance Cost ($/mile)	Present Worth ($/mile)	Maintenance Present Worth ($/mile) (calculated)	Annual Gravel Maintenance Costs ($/mile)
0-99	3,700	17	45	8	3,700	350	23881.63	20181.63	1577.50
100-199	3,700	20	45	8	3,700	800	31831.98	28131.98	2162.50
200-299	4,500	30	50	6	4,500	1,070	48600.61	44100.61	3320.00
300-10000	7,038	50	65	6	7,038	2,420	98436.3	91400.38	6842.67

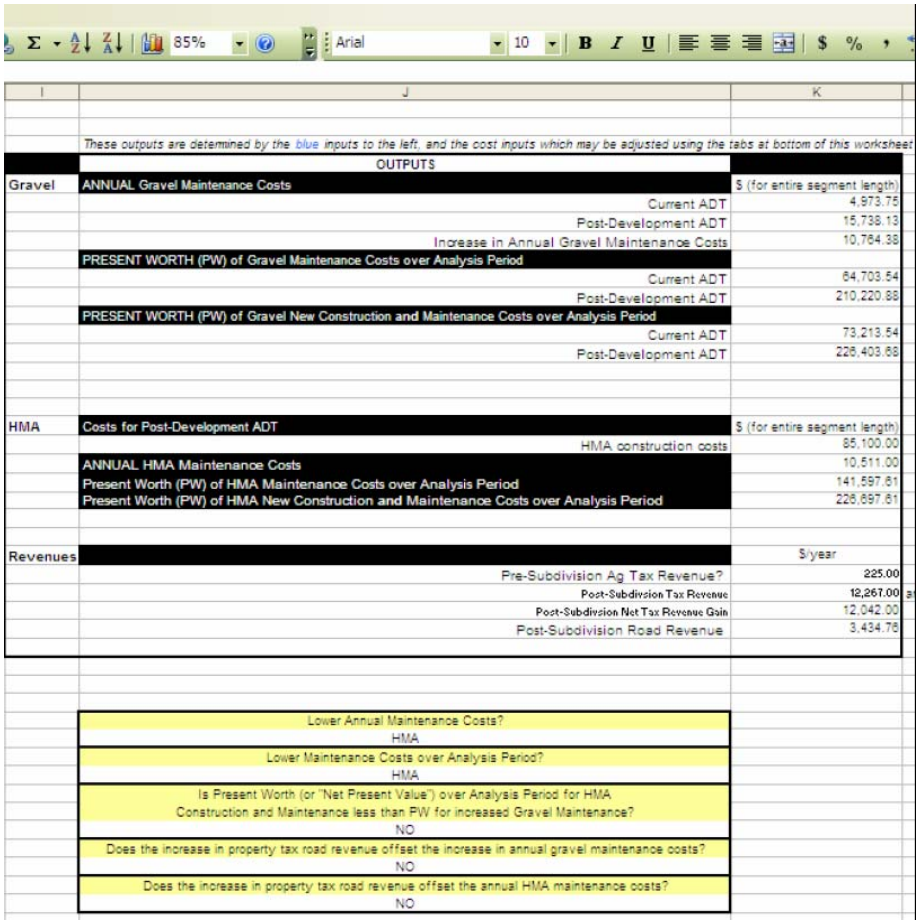
INPUT_OUTPUT | Gravel Maintenance Costs | HMA Construct_Maintenance Costs | Revenues

Figure 12. Cost Adjustment Tabs

9. The values in blue, highlighted in Figure 12 above are cost inputs that should be adjusted for local or project values, if available. The same can be done for the other tab. Values colored grey are calculated and should not be adjusted here.

Evaluation

10. Once the appropriate cost and land use inputs have been adjusted as in the steps above, the user returns to the INPUT_OUTPUT worksheet tab to review the calculated cost estimates, which are located in the area highlighted in Figure 13.
11. In addition to the cost estimates, the spreadsheet provides answers to "common questions" anticipated for the user, such as the lowest cost alternatives. The user may have other questions, and these can be programmed in by the user by or evaluated by considering the outputs.



	These outputs are determined by the blue inputs to the left, and the cost inputs which may be adjusted using the tabs at bottom of this worksheet	
	OUTPUTS	
Gravel	ANNUAL Gravel Maintenance Costs	$ (for entire segment length)
	Current ADT	4,973.75
	Post-Development ADT	15,738.13
	Increase in Annual Gravel Maintenance Costs	10,764.38
	PRESENT WORTH (PW) of Gravel Maintenance Costs over Analysis Period	
	Current ADT	64,703.54
	Post-Development ADT	210,220.88
	PRESENT WORTH (PW) of Gravel New Construction and Maintenance Costs over Analysis Period	
	Current ADT	73,213.54
	Post-Development ADT	226,403.68
HMA	Costs for Post-Development ADT	$ (for entire segment length)
	HMA construction costs	85,100.00
	ANNUAL HMA Maintenance Costs	10,511.00
	Present Worth (PW) of HMA Maintenance Costs over Analysis Period	141,597.61
	Present Worth (PW) of HMA New Construction and Maintenance Costs over Analysis Period	226,697.61
Revenues		$/year
	Pre-Subdivision Ag Tax Revenue?	225.00
	Post-Subdivision Tax Revenue	12,267.00
	Post-Subdivision Net Tax Revenue Gain	12,042.00
	Post-Subdivision Road Revenue	3,434.76
	Lower Annual Maintenance Costs?	
	HMA	
	Lower Maintenance Costs over Analysis Period?	
	HMA	
	Is Present Worth (or "Net Present Value") over Analysis Period for HMA Construction and Maintenance less than PW for increased Gravel Maintenance?	
	NO	
	Does the increase in property tax road revenue offset the increase in annual gravel maintenance costs?	
	NO	
	Does the increase in property tax road revenue offset the annual HMA maintenance costs?	
	NO	

Figure 13. Cost Output Screen

LEGAL AND POLICY ISSUES

Introduction

The issue of making "growth pay its own way" has been at the forefront of the development debate in many states. One key question arises when examining the impact of animal confinements and residential subdivisions on the rural road system: Can counties require the developer to fund improvements to the roadway to compensate for the impacts of the development? This section will review relevant Iowa statutes, and court cases from Iowa and other jurisdictions that address this important topic.

Background

Despite the broad grant of "home rule" authority given to Iowa cities and counties through the Iowa Constitution, Iowa courts have narrowly construed the authority of Iowa cities and counties to regulate land use, and require landowners to contribute to the provision of public infrastructure generally. The courts have consistently held that, with regard to the power to assess for public improvements, local governments are limited to that authority expressly granted or necessarily implied by state statutes. The statutory powers can be generally categorized into

two types: (1) the authority given to local governments to impose special assessments on adjacent/nearby landowners; and (2) the authority of local governments to require landowners to provide uncompensated public improvements or pay monetary fees as a condition of the approval of some type of land development application.

Statutory Authority for Special Assessments – Iowa Code Chapter 311

Chapter 311 of the Iowa Code contains the authority for counties to establish secondary road assessment districts. A secondary road assessment district shall be no more than one-half mile wide on each side of the road or roads to be improved by the district. Iowa Code § 311.2. If a secondary road assessment district is established, assessments in the aggregate amount of not less than fifty percent of the total estimated cost of improvement of the road shall be apportioned and levied on the lands included in the district. Iowa Code § 311.3. The key provisions in Chapter 331 for establishing secondary road special assessment districts are Sections 311.6 and 311.7, which are different in a number of ways.

Section 311.6 allows for a petition signed by a minimum of fifty percent of the owners of land within the proposed district, or fifty percent of the owners of land within the proposed district who reside within the county. The petition must describe the road or roads proposed to be improved, the nature of the proposed improvement, the percentage of the estimated cost of improving the road proposed to be assessed against the property (no less than fifty percent of the total estimated cost of improvement), and the lands proposed to be included in the district. Section 311.11 describes the hearing and notice procedure for the establishment of a secondary road assessment district. Section 311.17 allows the owner of any land on which the assessment is more than one hundred dollars to agree to pay the assessment in ten annual installments plus interest if the landowner waives any objection to the assessment. Section 311.28 allows the county board of supervisors to issue "road certificates in the name of the county in an aggregate amount not exceeding the then unpaid amount of the special assessment levied in the district" in order to "render immediately available that amount of the estimated cost of an improvement which has been specially assessed."

Section 311.7 also provides for improvements on secondary roads by petition and the payment of at least fifty percent of the costs thereof by private funds. Section 311.7 requires that a petition be filed by the owners of not less than seventy-five percent of the lands adjacent to or abutting upon the road proposed for improvement, and that the petition request the assessment or payment of not less than fifty percent of the cost of the proposed improvement by the adjacent land owners. The primary distinction of Section 311.7, however, is that it allows the county to proceed with the improvement of the road without a special assessment "if the owners of all the lands included in any special secondary road assessment district under this section, subscribe and deposit with the county treasurer an amount not less than fifty percent, or a greater portion as provided in the petition, of the engineer's estimated cost of the improvement of the road included in the project…."

The primary limitation of Chapter 311 in seeking landowner-compensated improvements to the roadway is its voluntary nature; requiring the initiation of a petition by a significant percentage of adjacent/nearby landowners to set up a secondary road special assessment district. A second

limitation is the geographic limitation on the size and location of the special assessment district. If the new development lies beyond one-half mile on either side of the road proposed for the improvement then the local government has no mechanism for reaching out to include the development that is, in fact, producing the impacts on the roadway.

Statutory Authority for Public Improvements and Impact Fees

Local zoning and subdivision regulations generally require a developer applying for a permit to provide public improvements as a condition of permit approval, on the basis that the proposed development will cause an increased burden on the public infrastructure of the community. The imposition of these conditions can take several forms: requirements to install infrastructure on the development site; requirements to make improvements to facilities located elsewhere, but clearly affected by the proposed development; requirements to dedicate land for an on-site public facility; or money in lieu of land dedication that the community can use to purchase land for a public facility. State law, either through statutes or court cases, defines the reach of local governments' authority to impose exactions, and states vary considerably in the authority they grant.

The litigation surrounding such conditions generally focuses on one of two issues: (1) whether state statutes authorize local governments to require developers to make improvements to public facilities (a sub-issue is whether the courts make a distinction between improvements required to be made "off-site," as opposed to those on the site for which the permit is being requested); and (2) whether state statutes authorize local governments to charge monetary fees the local government can then use to pay for improvements to facilities impacted by the new development. Such fees are generally referred to as "impact fees." The examples given above have been adopted in various communities across the country and confirmed by their respective states' courts; however, the full scope of authority granted to Iowa cities and counties to impose these requirements is not well-defined.

The following discussion highlights the statutory provisions addressing such requirements, and the small number of court cases, federal and state, that give shape to this authority. It will be confined to the context of improvements to rural county roads, as there are various statutes that apply only to cities, and others that apply to other types of improvements (such as sewer and water infrastructure) that are irrelevant to this discussion. It is important to note at this point that the key to the following discussion is that a triggering event; i.e., the application for some type of development permit, must take place before the local government can exercise its authority to impose such conditions. For example, a proposal for an animal confinement operation that requires no rezoning or special use permit, nor triggers site plan approval requirements in the county zoning ordinance will not be subject to the imposition of conditions. Similarly, rural subdivisions proposed in counties without subdivision ordinances, or development activities in subdivisions already approved without conditions by counties will not be subject to conditions.

County Zoning Act – Chapter 335.

Zoning is the primary regulatory tool employed by local governments to bring about orderly land development. Zoning divides the community into districts and assigns compatible land uses to those districts, while at the same time separating incompatible uses from each other. While the number and types of districts vary greatly from community to community, traditional zoning regulations have separated land uses into residential, commercial, industrial, and agricultural classifications. In addition to regulating uses, zoning controls the density, intensity, and bulk of structures. There are two parts to the zoning ordinance: a zoning map and a zoning text. The zoning map shows the boundaries and labels of the zones into which the community has been divided. The zoning text is the local law containing the use, density and bulk regulations of the jurisdiction.

Chapter 335 of the *Iowa Code* empowers counties to adopt zoning regulations. A 2005 survey conducted by the Iowa County Zoning Officials (CoZO) found that 78 of Iowa's 99 counties have adopted zoning regulations. Of these counties, four have limited their zoning jurisdiction to specified areas of their counties ("partially-zoned" counties).

The local zoning ordinance is essentially a permitting system that requires landowners to seek approval from the county in order to change the zoning classification of the land or change the use, or initiate a new use, of the land. Chapter 335 authorizes counties to impose development exactions in two instances: (1) upon a request to rezone a parcel of land from one classification to another; and (2) upon a request for approval of a site development plan.

Conditional rezoning. *Iowa Code* § 335.7, which authorizes the county to amend its zoning ordinance, either on its own initiative or upon request by a landowner, also authorizes imposition of conditions on any landowner-initiated rezoning approval. *Iowa Code* § 335.7, provides, in part, that:

> as a part of an ordinance changing land from one zoning district to another zoning district or an ordinance approving a site development plan, a board of supervisors may impose conditions on a property owner which are in addition to existing regulations if the additional conditions have been agreed to in writing by the property owner before the public hearing required under this section or any adjournment of the hearing. The conditions must be reasonable and imposed to satisfy public needs which are directly caused by the requested change.

The local government and the landowner are essentially permitted to enter into a contract (usually called a zoning agreement or development agreement) that spells out details concerning the development to take place on the rezoned land, and the steps the landowner will take to mitigate the impacts of the changes brought about by the development. The contract is usually executed and recorded as a covenant running with the land that is contingent upon the final approval of the rezoning by the elected body. Conditional zoning agreements are usually negotiated by the city/county attorney or other representative of the elected body.

Site plan review. As set out above, Iowa Code § 335.7 authorizes the imposition of conditions on approval of "site development plans." Although the language found in *Iowa Code* § 335.7

implies that a "site development plan" is a separate procedure that must be approved through the adoption of an ordinance, The Iowa Supreme Court has confirmed the legal status of a site plan as "part of the mechanics for enforcing the [community's] zoning code; it is an administrative device whereby the [community] exercises oversight and control." *Kane v. City of Cedar Rapids*, 537 NW2d 718 (Iowa 1995).

The zoning ordinances of most communities require the submittal of a site plan or, at minimum, a sketch plan, as part of the approval process for several types of development. They are generally required for developments with significant impacts on their surroundings and the community in general, such as industrial and commercial uses, multi-family developments, and innovative proposals. The site plan will show how the combined effects of the physical characteristics of the land and the various regulations impact the development plan. Similar to conditional rezoning, the steps the landowner will take to mitigate the impacts of the development on the county are the subject of negotiations between the local government and the landowner. The conditions are made a part of the site plan approval.

The key phrase for determining the reach of county authority to impose exactions as part of a conditional rezoning or site plan review is in the requirement that conditions be "reasonable and imposed to satisfy public needs which are directly caused by the requested change." *Iowa Code* § 335.7. Considering the amount of litigation that the subject of requiring improvements has brought in other states it is remarkable that no Iowa Supreme Court or Court of Appeals cases have addressed this language in Chapter 335. On the positive side this means that the vast majority of issues regarding the provision of public improvements through the zoning process indeed are being resolved through the good faith efforts of county officials and land developers without resort to litigation. Improvements, including improvements to transportation facilities, have been negotiated as part of the approval process. Unfortunately this also means that, with the exception of the broad guidelines provided by the US Supreme Court (and discussed following) Iowa county officials lack clearly-defined legal parameters that outline the extent of "permissible" exactions.

Special exceptions/conditional uses. Zoning districts have two use categories. *Permitted uses* are those listed by the ordinance as being allowed by right in any location. *Special exceptions* (also frequently referred to in ordinances as conditional uses or special uses), in contrast, are those uses listed by the ordinance as being permissible at the discretion of the zoning board of adjustment. They are generally uses that make them unique, and slightly out of character, with permitted uses.

With appropriate conditions, a special exception can be made to "fit" into its surroundings. Special exceptions will only be approved after discretionary review by the county board of adjustment to determine whether the use complies with requirements, standards and procedures contained in the zoning ordinance. *Iowa Code* § 335.10 permits the board of adjustment to grant special exceptions "subject to appropriate conditions and safeguards." As with conditional rezonings and site plan approval discussed above, county officials are guided by the broad parameters provided by the US Supreme Court (and discussed below) to determine the extent of permissible conditions.

Subdivision Act – Chapter 354

Chapter 354 of the *Iowa Code* regulates the division of land, and applies to both counties and cities. A subdivision plat is required by Chapter 354 whenever a tract of land is divided into ”three or more lots, either simultaneously or by repeated division, any of which are described by metes and bounds description and for which no plat of survey is recorded.” Chapter 354 requires neither that cities or counties adopt their own ordinances to regulate the subdivision of land, nor that every division of land be subject to regulation in those communities that have chosen to adopt regulations. Under *Iowa Code* § 354.8, Cities and counties that choose to adopt subdivision regulations are authorized to review and approve subdivision plats prior to recording. *Iowa Code* § 354.8 also provides local governments with subdivision ordinances the authority for “requiring the installation of public improvements in conjunction with approval” of a subdivision plat.

A 1994 Attorney General’s opinion states that a county has the authority, under general home rule powers, to establish a more stringent platting threshold (i.e., a division into *two* or more parcels) through its subdivision ordinance; however, in the recent case of *City of Cedar Rapids, v. James Properties*, Inc., 701 N.W.2d 673 (Iowa 2005) the Iowa Supreme Court concluded that it was beyond the scope of the city’s home rule authority to define “subdivision” broader than it is defined in state law, at least for the purposes of exercising extraterritorial review. Presumably, *Iowa Code* § 354.4(2), which subjects parcels within plats of survey to the “regulations and ordinances of the governing body” should provide sufficient authority to apply some controls and conditions to two-parcel land divisions.

Key Iowa Court Cases. Two Iowa court cases add to our understanding of the permissible scope of conditions placed upon subdivision approval. In *Homebuilders Association of Greater Des Moines v. City of West Des Moines*, 644 N.W.2d 339 (Iowa 2002) the Iowa Supreme Court was asked to determine the legality of the city’s ordinance requiring payment of a mandatory parkland dedication fee by residential subdividers and applicants for residential building permits. The Court found that the charge was unlawful because (1) statutory authority for charging impact fees does not exist; (2) the charge went beyond the scope of permissible “regulatory fees,” characterized by the Court as “charges to cover administrative expenses [such as] inspecting, licensing, supervising or otherwise regulating”; (3) even if the fee were characterized as a tax, it did not fit within the definition of any taxes permitted by state law; (4) the charge went beyond the authority provided to local governments by *Iowa Code* § 354.8 for “requiring the installation of public improvements in conjunction with approval” because of the fact that it was a monetary charge and not a requirement to install a public improvement.

While the Court was sympathetic with the “sound reasons for allowing a City to require a monetary exaction from a developer in lieu of a dedication of parkland,” it concluded that “the decision to extend that power to local government is for the legislature, not this court.” Thus the Court illuminated the need for state legislation permitting impact fees before fees can be charged that go beyond those needed “to meet the expenses of the city in exercising its regulatory authority.”

Some state courts will make a distinction between requirements to make improvements on the site of the platted subdivision and requirements for *off-site* improvements – for example a public street that provides access to the site, but is not part of the plat. Courts in a number of states have found that requiring such off-site improvements as a condition of plat approval is improper. Iowa courts have not directly addressed this question. In *Blumenthal Investment Trusts v. City of West Des Moines*, 636 N.W.2d 255 (Iowa 2001) the Iowa Supreme Court specifically declined to address the question raised by the plaintiff whether requiring the subdivider, as a condition of plat approval, to agree to be specially assessed for improvements to an abutting public street was contrary to state law. The Court did, however, comment on the "liberal approach to subdivision decisions" discussed in the *Oakes Construction* case (discussed above), noting that "a platting authority has the flexibility to disapprove plats or condition approval for reasons that are not spelled out in so many words in the governing statutes and ordinances."

*Extraterritorial Review***.** *Iowa Code* § 354.9 provides that if a city has adopted subdivision regulations, it may extend its review and approval authority to subdivision plats and plats of survey proposed in the territory up to two miles beyond the city limits. The city must adopt an ordinance clearly specifying its intent to exercise extraterritorial review. The ordinance must specify the area subject to the city's review and approval, which may be identified by individual tracts, by describing the boundaries of the area, or by including all land within a certain distance, up two miles, from the city's boundaries. The ordinance must be recorded in the office of the recorder and filed with the county auditor.

A city may exercise its extraterritorial jurisdiction whether or not the extraterritorial area is located in a county with its own subdivision regulations. If a county has, in fact, adopted its own subdivision regulations, then any subdivision or plat of survey in the city's extraterritorial review area is subject to approval by both the city and county. The standards and conditions applied by a city or county for review and approval shall be the same standards used for review and approval within the city limits unless the city and county agree otherwise by intergovernmental agreement under Chapter 28E of the Iowa Code. *Either the city or county may, by resolution, waive its right to review subdivisions or plats of survey, waive its right to review any particular subdivision or plat of survey, or waive the requirements of any of its standards or conditions for approval. The resolution must be certified and recorded with any plat to which the resolution applies. If two or more cities that are within 4 miles of one another establish overlapping areas of review outside their boundaries, then the cities shall establish by agreement pursuant to Chapter 28E reasonable standards and conditions for review of subdivisions within the overlapping area. If no agreement is reached then the city closest to the boundary of the subdivision shall have authority to review the subdivision.*

Overarching Legal Considerations – US Supreme Court

The United States Supreme Court cases of *Nollan v. California Coastal Commission*, 483 U.S. 625 (1987) and Dolan v. City of Tigard, 512 U.S. 374 (1994) established the broad "essential nexus" and "rough proportionality" standards for judging the legality of demanded conditions imposed through a permit granting process. These broad standards must be considered by county officials when asking for public improvements as a condition of approval for any of the zoning or subdivision actions discussed above.

In *Nollan v. California Coastal Commission*, 483 U.S. 625 (1987) the Court determined that there must exist an "essential nexus" between the condition being imposed and the action being requested by the developer. In other words, the condition must be designed to ameliorate the negative impacts created by the use. A community cannot use conditions to accomplish community goals unrelated to the impacts of the development. A requirement to make improvements to an intersection not impacted by traffic from the proposed development is an example of an exaction lacking an essential nexus.

Seven years later in *Dolan v. City of Tigard*, 512 U.S. 374 (1994) the Supreme Court further refined the proper scope of permissible conditions. It ruled that the requirements must be "roughly proportional" to the impacts created by the use. A community cannot require one landowner or developer to shoulder the entire burden to provide infrastructure necessary to, and utilized by the community as a whole.

Summary of Current Legal Issues

The statutes and cases referenced above must be read within the particular context of any given situation being faced by a local government; however, the following generalizations are appropriate:

- Chapter 311 of the Iowa Code permits counties to establish secondary road special assessment districts for the improvement of secondary roads. The usefulness of this authority is limited by the necessity for a petition of affected landowners to initiate a district, and the geographic limitation on the reach of the special assessment district.
- The county zoning act permits counties to place conditions on rezoning requests and site plan approvals that are "reasonable and imposed to satisfy public needs which are directly caused by the requested change."
- The county zoning act also permits county boards of adjustment to grant special exceptions/conditional use permits "subject to appropriate conditions and safeguards."
- Neither the county zoning act, nor court cases interpreting its provisions, has specifically disallowed the requirement of off-site improvements as a condition of approval of rezoning, site plans or special exceptions.
- The subdivision act permits counties that have adopted subdivision ordinances to place conditions on plat approval that "require the installation of public improvements in conjunction with approval."

- The subdivision act permits cities that have adopted subdivision ordinances to exercise extraterritorial jurisdiction over subdivisions and plats of survey within two miles of their borders. This is the case in all counties (counties with or without subdivision regulations).
- Neither the subdivision act, nor court cases interpreting its provisions, has specifically disallowed the requirement of off-site improvements as a condition of plat approval.
- Any conditions imposed under either the county zoning act or the subdivision act must meet the U.S. Supreme Court requirements of "essential nexus" and "rough proportionality."
- The Iowa legislature has not adopted legislation authorizing local governments to charge impact fees to offset the burdens placed on public infrastructure by new developments.
- The Iowa Supreme Court has ruled that, absent impact fee enabling legislation, local government monetary charges associated with permit approval are limited to charges to cover administrative expenses, and not allowed to compensate the local government for development impacts on public infrastructure.

When the effects of the statutes and cases are assembled they pose a challenge to counties trying to keep up with the demands on secondary roads created by new development. The secondary road special assessment provisions rely on the voluntary desire of the landowners to improve the roadway. Iowa currently has no legislation authorizing the collection of impact fees, and the *Homebuilders Association* case indicates that without that enabling legislation, fee generation schemes designed to cover the impacts of new development are not authorized.

The tipping point for the need for road widening or road improvements is usually reached after a number of new developments are created over a number of years. Local governments are seriously hindered by the inability to collect funds proportionate to each new development's impact over a number of years, and apply them to road construction costs when that tipping point is reached. Even if the on-site vs. off-site improvements distinction is never recognized by the Iowa courts, the inability to collect road improvement fees and apply them when needed poses a significant challenge. Other methods of attempting to recoup the costs of development leave local governments running the risk of violating the "rough proportionality" test of the US Supreme Court.

Policy Options

In order to make growth truly pay its own way, the first and best policy alternative to the current legal regime would be for the Iowa legislature to explicitly authorize counties to collect roadway impact fees during the development process. As of July 2006, twenty seven states had adopted some form of impact fee enabling legislation (Duncan and Associates 2006). Road impact fees are the most common type of fee permitted by these legislative acts. These acts incorporate the constitutional standards of "essential nexus" and "rough proportionality" developed by the US Supreme Court, unless the individual state's courts have articulated a more onerous standard. In order to meet the standards, six elements are usually found in state impact fee enabling legislation:

1. A limitation on the distance between the development paying the fee and the facilities constructed with the fee;
2. A limitation on the period of time elapsing between the collection of the fee and the construction of the facilities;
3. A method of calculating the fee in relation to the actual costs of the facilities;
4. A method of apportioning the fee between developments that takes into account the burden created by the development;
5. A requirement that the facilities constructed with the fees indeed satisfy the needs resulting from the development; and
6. An assurance that the fees collected are restricted solely for the provision of the facilities for which the fees are collected ("earmarking").

It should also be noted that these state enactments make the adoption of impact fee ordinances and the collection of fees completely optional for local governments.

While there is no "typical" state impact fee enactment, the Virginia legislation included as Appendix A addresses most of the six elements outlined above and contains language specifically addressing roadway improvements. Of course, any Iowa legislation would need to be specifically tailored to meet the state's unique constitutional, statutory and case law tests.

REFERENCES

Abeles-Allison, M. & Conner, L.J. (1990). *An analysis of local benefits and costs of Michigan hog operations experiencing environmental conflicts*. Agricultural Economics Report No. 536, Department of Agricultural Economics, Michigan State University, East Lansing. Available at: http://web1.msue.msu.edu/imp/modae/53609801.html.

Akorseth, K. & Selim, A. A. (2000). *Gravel roads maintenance and design manual*. US Department of Transportation Federal Highway Administration and South Dakota Local Transportation Assistance Program.

Baumel, C. P.; Baumhover, S.B.; Lipsman, M.A.; & McVey, M.J. (1991). *Alternative Investments in the Rural Branch: Railroad and County Road Systems.* Midwest Transportation Center.

Bell, K.P. & McMahon, M. (2003). A Spatial Analysis of Household Location Decisions in Maine.

Burchell, Tischler, Nicholas, Duncan, & Freilich (2006). Calculating the Costs of Growth. APA National Conference 2006: San Antonio.

Cho, S.H.; Newman, D.H.; & Wear, D.N. (2003). Community Choices and Housing Demands: A Spatial Analysis of the Southern Appalachian Highlands. Housing Studies, 20, (4), 549-569, July 2005.

Cooper, Connie (2000). Transportation Impact Fees and Excise Taxes (PAS 493).

Cosner, Susan (2001). *"Preserving Iowa's Farmland: Why is it Important? How Can it be Done?"* Iowa State University, College of Design, Extension to Communitees, Land Use Series Publication PM 1868b, Feb. 2001. Available at: http://www.extension.iastate.edu/Publications/PM1868B.pdf.

Deller, S. C. & Nelson, C. H. (1991). Measuring the economic efficiency of producing rural road services. American Journal of Agricultural Economics.

Development Impact Study, Johnson County, Iowa. Available at: http://www.johnson-county.com/zoning/reports/dev_impact_rpt.shtml.

Duke, D.; Quinn, M.; Butts, B.; Lee-Ndugga, T.; & Wilkie, K. (2003). Spatial Analysis of Rural Residential Expansion in Southwestern Alberta.

Duncan and Associates. 2006. *State Impact Fee Enabling Legislation.* Accessed October 4, 2006 at www.impactfees.com.

Exurban Change Program: Analyzing Rural-Urban Change: Ohio State University College of Food, Agricultural and Environmental Science. "Defining Exurbia" Available at: http://www-agecon.ag.ohio-state.edu/programs/exurbs/def.htm.

Fisher, P.S. (1979). The Impact of Rural Non-Farm Residential Development on the Provision of Local Public Services. Iowa Land Use Research Report Series.

Frost (2001). Making Growth Pay Its Way: Combining Facilities Districts with Impact Fees to Fund Infrastructure.

Greenstein, J. (1995). "Issues related to planning and administration of low-volume roads," *Transportation Research Circular* 446, pp. 7-8.

Heavner (2000) Paving the Way: How Highway Construction Has Contributed to Sprawl in Maryland. Available at: http://www.marypirg.org/sprawl/Paving.pdf.

Heimlich, R. & Anderson, W. (2001). *Development at the urban fringe and beyond: Impacts on agriculture and rural land.* U.S. Department of Agriculture ERS Agricultural Report No. 803. Washington, D.C.: U.S. Department of Agriculture.

Institute of Transportation Engineers, "Trip Generation Handbook," 2nd Edition, 2004.

Iowa Department of Natural Resources, Iowa DNR Animal Feeding Operations website, http://www.iowadnr.com/afo/matrix.html.

Iowa Department of Transportation. Instructional Memorandums to County Engineers, Chapter 3: Project Development: 3.2: Design. Available at: http://www.dot.state.ia.us/local_systems/publications/county_im/county_im_toc.htm.

Iowa State Univerisity and the University of Iowa Study Group. *Iowa: Concentrated animal feeding operations air quality study.* (Feb. 2002). Available at: http://www.public-health.uiowa.edu/ehsrc/CAFOstudy/CAFO_final2-14.pdf.

Irwin, E. G., Bockstael, N.E. (2001). Interacting agents, spatial externalities and the evolution of residential land use patterns. Department of Agricultural, Environmental, & Development Economics, The Ohio State University, Working Paper: AEDE-WP-0010-01.

Jahren, C.T., Smith, D., Thorius, J., Rukashaza-Mukome, M., White, D., & Johnson, G. (2005). *Economics of Upgrading an Aggregate Road.* Report MN/RC-2005-09, Minnesota Department of Transportation and Minnesota Local Roads Research Board, January 2005.

Kane, K. (2004). *Iowa GAP Report.* Iowa State University Geographic Information Systems Support and Research Facility, January 26, 2004.

Kendig, L. (2003). Best Practices in Growth Management with Recommendations: Delaware-Franklin. Duncan Associates.

Kendig, L.(1999). Traffic Sheds, Rural Highway Capacity, and Growth Management.

Kinsley, M. & Lovins, Hunter (1995). Paying for growth, prospering from development.

Litman, T. (1995). Land use impact costs of transportation. World Transport Policy & Practice, 1, (4), 9-16.

Madison/Pierce County, Nebraska. Moving to the Country. Available at: http://www.co.madison.ne.us/planning/country.htm.

McConnell, V., Kopits, E., & Walls, M. (2003). *How well can markets for development rights work? Evaluating a farmland preservation program.* Discussion paper 03-08. Washington, D.C.: Resources for the Future. Available at: http://www.rff.org/Documents/RFF-DP-03-08.pdf

Mercier, C.R., Jesse, L.R., Richardson, L.E. (1991). Cost Analysis for Restoration, Rehabilitation, Resurfacing, or Reconstruction of Secondary Roads. Transportation Research Record.

Municipal Infrastructure Planning and Cost Model: Calculating the True Costs of Growth, March 2003.

Murphy, S.; Lilliston, B. & Lake, M. B. (2005). *WTO Agreement on Agriculture: A Decade of Dumping.* Institute for Agriculture and Trade Policy.

Nassauer, J.I.; Allan, J.D.; Johengen, T.; Kosek, S.E.; & Infante, D. (2004). Exurban Residential Subdivision Development: Effects on Water Quality and Public Perception.

Nelson, A. C. & Duncan, J. B. (1995). *Growth Management Principles & Practices*. American Planning Association. Chicago, IL.

North Central Regional Center for Rural Development. Bringing home the bacon? The myth of the role of corporate hog farming in rural revitalization. Report to Kerr Center for Sustainable Agriculture, Poteau, OK 1-67(1999). Available at: http://www.kerrcenter.com/RDPP/hog%20report1.pdf.

Ohio State University Extension, "Transportation Demands of Livestock and Poultry Enterprises".

Palmquist, R., Roka, F., & Vukina, T. (Feb. 1997). Hog operations, environmental effects and residential property values. *Land Economics, 73*, (1), 114-124.

Pirog, R.; Van Pelt, T.; Enshayan, K.; & Cook, E. (2001). Food, Fuel, & Freeways: An Iowa perspective on how far food travels, fuel usage, and greenhouse gas emissions.

Porter, D.R. (1998). *Making the Land Use/ Transportation Connection in Multi-Modal, Multi-Jurisdictional Transportation Planning: The U.S. 301 Transportation Study in Maryland.* AICP Press: Proceedings of the 1998 National Planning Conference.

Schwab, J, (1998). Planning and Zoning for Concentrated Animal Feeding Operations (PAS 482).

Tocknell, Stephen (2002). Traffic Sheds in Williamson County, Tennessee (from APA 2002). Available at: http://www.asu.edu/caed/proceedings02/TOCKNELL/tocknell.htm.

Wood, D.L. & Wipf, T. J. (1999). Heavy Agricultural Loads on Pavement and Bridges".

Wyckoff, M., & Manning, M. (2003). *How Much Development is Too Much: A guidebook on using impervious surface and gravel road capacity analysis to manage growth in rural and suburban communities.*

Zimmerman, K.A. & Wolters, A.S. (2004). Local Road Surfacing Criteria: Automated Software User's Guide. Applied Pavement Technology.

APPENDIX A

Virginia Impact Fee Legislation

15.2-2318. Definitions.

As used in this article, unless the context requires a different meaning:

"Cost" includes, in addition to all labor, materials, machinery and equipment for construction, (i) acquisition of land, rights-of-way, property rights, easements and interests, including the costs of moving or relocating utilities, (ii) demolition or removal of any structure on land so acquired, including acquisition of land to which such structure may be moved, (iii) survey, engineering, and architectural expenses, (iv) legal, administrative, and other related expenses, and (v) interest charges and other financing costs if impact fees are used for the payment of principal and interest on bonds, notes or other obligations issued by the locality to finance the road improvement.

"Impact fee" means a charge or assessment imposed against new development in order to generate revenue to fund or recover the costs of reasonable road improvements necessitated by and attributable to the new development. Impact fees may not be assessed and imposed for road repair, operation and maintenance, nor to expand existing roads to meet demand which existed prior to the new development.

"Impact fee service area" means land designated by ordinance within a locality, having clearly defined boundaries and clearly related traffic needs and within which development is to be subject to the assessment of impact fees.

"Road improvement" includes construction of new roads or improvement or expansion of existing roads as required by applicable construction standards of the Virginia Department of Transportation to meet increased demand attributable to new development. Road improvements do not include on-site construction of roads which a developer may be required to provide pursuant to §§ 15.2-2241—15.2-2245.

15.2-2319. Authority to assess and impose impact fees.

Any applicable locality may, by ordinance pursuant to the procedures and requirements of this article, assess and impose impact fees on new development to pay all or a part of the cost of reasonable road improvements attributable in substantial part to the new development. Prior to the adoption of the ordinance, a locality shall establish an impact fee advisory committee. The committee shall be composed of not less than five, nor more than ten members appointed by the governing body of the locality and at least forty percent of the membership shall be representatives from the development, building or real estate industries. The planning commission or other existing committee that meets the membership requirements may serve as

the impact fee advisory committee. The committee shall serve in an advisory capacity to assist and advise the governing body of the locality with regard to the ordinance. No action of the committee shall be considered a necessary prerequisite for any action taken by the locality in regard to the adoption of an ordinance.

15.2-2320. Impact fee service areas to be established.

The locality shall delineate one or more impact fee service areas within its jurisdiction. Impact fees collected from new development within an impact fee service area shall be expended for road improvements within that impact fee service area. An impact fee service area may encompass more than one road improvement project.

15.2-2321. Adoption of road improvements program.

Prior to adopting a system of impact fees, the locality shall conduct an assessment of road improvement needs within an impact fee service area and in the locality and shall adopt a road improvements plan for the area showing the new roads proposed to be constructed and the existing roads to be improved or expanded and the schedule for undertaking such construction, improvement or expansion. The road improvements plan shall be adopted as an amendment to the required comprehensive plan and shall be incorporated into the capital improvements program or, in the case of the counties where applicable, the six-year plan for secondary road construction pursuant to §§ 33.1—70.01.

The locality shall adopt the road improvements plan after holding a duly advertised public hearing. The public hearing notice shall identify the impact fee service area or areas to be designated, and shall include a summary of the needs assessment and the assumptions upon which the assessment is based, the proposed amount of the impact fee, and information as to how a copy of the complete study may be examined. A copy of the complete study shall be available for public inspection and copying at reasonable times prior to the public hearing.

The locality at a minimum shall include the following items in assessing road improvement needs and preparing a road improvements plan:

1. An analysis of the existing capacity, current usage and existing commitments to future usage of existing roads, as indicated by (i) current valid building permits outstanding, (ii) approved conditional rezonings, special exceptions, and special use permits, and (iii) approved site plans and subdivision plats. If the current usage and commitments exceed the existing capacity of the roads, the locality also shall determine the costs of improving the roads to meet the demand. The analysis shall include a plan to fund the current usages and commitments that exceed the existing capacity of the roads.

2. The projected need for and costs of construction of new roads or improvement or expansion of existing roads attributable in whole or in part to projected new development. Road improvement needs shall be projected for the impact fee service area when fully developed in accord with the comprehensive plan and, if full development is projected to occur more than ten years in the

future, at the end of a ten-year period. The assumptions with regard to land uses, densities, intensities, and population upon which road improvement projections are based shall be presented.

3. The total number of new service units projected for the impact fee service area when fully developed and, if full development is projected to occur more than ten years in the future, at the end of a ten-year period. A "service unit" is a standardized measure of traffic use or generation. The locality shall develop a table or method for attributing service units to various types of development and land use, including but not limited to residential, commercial and industrial uses. The table shall be based upon the ITE manual (published by the Institute of Transportation Engineers) or locally conducted trip generation studies.

15.2-2322. Adoption of impact fee and schedule.

After adoption of a road improvement program, the locality may adopt an ordinance establishing a system of impact fees to fund or recapture all or any part of the cost of providing reasonable road improvements required by new development. The ordinance shall set forth the schedule of impact fees.

15.2-2323. When impact fees assessed and imposed.

The amount of impact fees to be imposed on a specific development or subdivision shall be determined before or at the time the site plan or subdivision is approved. The ordinance shall specify that the fee is to be collected at the time of the issuance of a certificate of occupancy. The ordinance shall provide that fees (i) may be paid in lump sum or (ii) be paid on installment at a reasonable rate of interest for a fixed number of years. The locality by ordinance may provide for negotiated agreements with the owner of the property as to the time and method of paying the impact fees.

The maximum impact fee to be imposed shall be determined (i) by dividing projected road improvement costs in the service area when fully developed by the number of projected service units when fully developed, or (ii) for a reasonable period of time, but not less than ten years, by dividing the projected costs necessitated by development in the next ten years by the service units projected to be created in the next ten years.

The ordinance shall provide for appeals from administrative determinations, regarding the impact fees to be imposed, to the governing body or such other body as designated in the ordinance. The ordinance may provide for the resolution of disputes over an impact fee by arbitration or otherwise.

No impact fees shall be assessed or imposed upon a development or subdivision if the subdivider or developer has proffered conditions pursuant to §§§§ 15.2-2298 or 15.2-2303 for off-site road improvements and the proffered conditions have been accepted by the local government.

15.2-2324. Credits against impact fee.

The value of any dedication, contribution or construction from the developer for off-site road improvements within the impact fee service area shall be treated as a credit against the impact fees imposed on the developer's project. The locality may by ordinance provide for credits for approved on-site improvements in excess of those required by the development. The locality also shall calculate and credit against impact fees the extent to which (i) developments have already contributed to the cost of existing roads which will serve the development, (ii) new development will contribute to the cost of existing roads, and (iii) new development will contribute to the cost of road improvements in the future other than through impact fees.

15.2-2325. Updating plan and amending impact fee.

The locality shall update the needs assessment and the assumptions and projections at least once every two years. The road improvement plan shall be updated at least every two years to reflect current assumptions and projections. The impact fee schedule may be amended to reflect any substantial changes in such assumptions and projections.

15.2-2326. Use of proceeds.

A separate road improvement account shall be established for the impact fee service area and all funds collected through impact fees shall be deposited in the interest-bearing account. Interest earned on deposits shall become funds of the account. The expenditure of funds from the account shall be only for road improvements within the impact fee service area as set out in the road improvement plan for the impact fee service area.

15.2-2327. Refund of impact fees.

The locality shall refund any impact fee or portion thereof for which construction of a project is not completed within a reasonable period of time, not to exceed fifteen years. Upon completion of a project, the locality shall recalculate the impact fee based on the actual cost of the improvement. It shall refund the difference if the impact fee paid exceeds actual cost by more than fifteen percent. Refunds shall be made to the record owner of the property at the time the refund is made.