

Brownfield Impacts on Residential Property Values:
A Case Study of
Rainier Court Brownfield Redevelopment Project
Seattle, Washington

by

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ABSTRACT

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The case study is at the Rainier Court brownfield redevelopment project in Seattle, Washington. This thesis examines the relationship between single-family residential property home values associated with brownfields redevelopment. The relationship of surrounding property is then examined based on distance from the Rainier Court redevelopment project. Literature supporting smart growth principles and sustainability goals are examined. Brownfields are defined as “real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant” (Public Law 107-118). The literature supports that brownfield redevelopment can increase tax revenues to communities and provide opportunities for economic developments, growth management, environmental protections conditions and community development. The findings conclude there is a positive linear relationship between single-family home over time. However, the relationship between single-family home values and brownfield sites is not fully explained based limits of the data. I conclude success around brownfield redevelopments can take generations to uncover while other outcomes can be seen more quickly. The externalities of brownfield redevelopment impacts are complex and difficult to measure. Understanding these spillover effects on surrounding home values can highlight the desirable outcomes of brownfield projects. More case studies may provide insights in regard to brownfield project size and various end use options. Further research can provide an opportunity to measure impacts to surrounding areas and support public funding.

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INTRODUCTION

Brownfields

Brownfields are contaminated properties that are abandoned or underutilized due to known or suspected contamination. Many issues surround brownfield redevelopment. The perception of contamination, liability risk and costs of remediation all impact redevelopment of these properties. These impacts all add complexities along the way. Measuring success of brownfield redevelopments remain multi-lateral, complex and can be difficult to quantify. Besides the impacts of contamination to the environment, brownfield sites also impact the economy and community to which they are located. Decreased revenue from idle brownfield properties affects both the economic longevity of a community as well as the social impacts of blight, thus stigmatizing surrounding properties. Through data analysis, previous roadblocks to brownfield redevelopment can highlight opportunities best utilized through an interdisciplinary perspective.

Legal barriers have historically enthralled redevelopment efforts on brownfield properties however, legislative precedence has given brownfield redevelopment an opportunity to gain footing in Washington State. Current growth management policy can support brownfield redevelopment with framing and postulating efforts of sustainability with smart growth principles. The advantage to brownfield redevelopment is trifold and is analogous to the systematics within the traditional three pillars of sustainability model; people, planet, profit.

The three pillars should be regarded as belonging collectively, otherwise sustainability is not obtained. The uses of this model can also be useful in analyzing brownfield redevelopment outcomes. First, a remediated brownfield site can achieve cleanup of contamination to state standards. Second, remediated brownfields can provide economic solutions to lost opportunities for jobs and development. Lastly, through the previous two accomplishments, redeveloped brownfields can relieve social stresses through local tax revenues, reduced attractiveness to crime and overall public health and safety. The purpose of this research is to highlight multiple efforts measuring success and provide context to why brownfield redevelopment and sustainability should be synchronized.

The central research questions addressed in this case study asks: Is the Rainier Court redevelopment in line with existing smart growth policies? Is there data to support claims that brownfield redevelopments increase residential property values? How can improvements be made to reach sustainability goals. To answer these research questions, quantitative data collected from county databases and qualitative interviews provide opportunities for analysis.

The Case Study

The predetermined brownfield site is Rainier Court, located in Rainier Valley, Seattle, Washington. The Rainier Court brownfield redevelopment project has a long history of illegal dumping and other misuses for 35 years and provides an opportunity to study before and after brownfield redevelopment conditions. Of the four phases of redevelopment, two are completed, one is underway as of the time of this study and the final one is expected to begin 2015. The first two completed phases of Rainier Court are named Courtland Place and The Dakota,

which support 208 senior housing units and 178 multi-family housing units. Both developments include mixed-use buildings including 18,000 square feet of retail space providing goods and services, and are close to public transportation (geoengineers.com/project/rainier-court-brownfield-development). The third phase, named Community Gardens at Rainier Court, is underway at the time of this research to be redeveloped as a 70-unit town house style senior housing. The fourth phase is anticipated to include additional townhouses.

The first two completed phases of the four-phase project of the Rainier Court redevelopment has won the Environmental Protection Agency Region 10 Phoenix Award, in 2005. The Phoenix Awards are widely recognized as the outstanding award for achievement of excellence in brownfield redevelopment. The contenders are judged on the magnitude of the problems and the project, use of innovative techniques, cooperative efforts of multiple parties, positive impacts on the environment, conservation or sustainability, as well as the project's general and long-term economic and/or social impacts on the community (phoenixawards.org).

Studies have shown brownfield redevelopment in Washington State can facilitate economic, community and the environment. While each brownfield site is a different scenario in terms of contamination, parcel size, location and zoning, these factors also drive the redevelopment process. The first phase of the Rainier Court project was expected to create 150 construction jobs and 25 long-term jobs (South East Economic Development, 2008). State grant and loan funding programs in Washington State mirror a national consensus in that job creation

generates corresponding increases in both state and local tax revenue. This in turn enables benefits for the community including services provided by increased tax revenue, construction of affordable housing, and civic pride through reduced blight and beautification of the site.

Environmental benefits of cleaned up brownfield sites also are economically associated. They can include reduced vehicle miles traveled, reduced sprawl development, and reduced exposure of contaminants to people, plants, animals and waterways, all of which impact the local economy and the environment, thus social conditions are also improved.

This research relies on methodology that incorporates both quantitative and qualitative data. The mixed methodology focuses on examining the impacts of brownfield redevelopment at Rainier Court Seattle, Washington. Temporal data collection provides a change evaluation to address a projects' influence on the community before and after Phase One and Two completions. Cartographic data provide geographic context to the research. Qualitative data collection provides insight to opinions on brownfield redevelopments and it's fit to sustainability goals. Statistical analysis provides insight to tangible measurements and insight to intangible effects of brownfields on communities.

Success of the brownfield redevelopment is defined through the research of literature and by conducting professional surveys from local brownfield project managers, housing authorities, nonprofits, community groups and environmental consultants involved in the Rainier Court redevelopment project. To supplement the quantitative data collected, I identify how social factors influence or are

influenced by brownfield redevelopments. From my analysis, I provide an interdisciplinary interpretation of findings. Finally, I make recommendations for further brownfield redevelopment case study analysis to conclude this thesis.

Through this research, I conclude that brownfield redevelopments, less tangible incentives, can be achieved by including a sustainable redevelopment viewpoint. Sustainability goals are identified through both local communities and goals of Washington State regarding growth management principles through the Growth Management Act, and commitments to public health and safety.

LITERATURE REVIEW

This literature review focuses on literature discussing the inclusion of brownfield property redevelopment as an element that could facilitate sustainability goals statewide. Economic development, environmental protection and social equity are three pillars of sustainability. The first part of this chapter discusses the theoretical worldview of this research. The second part of this literature review considers how sustainability is defined. The third set of literature describes the connections between sustainability and smart growth goals, then to brownfields. Brownfields are defined as “real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.” (Public Law 107-118). The fourth part focuses literature around social implications of neglecting to see the interconnectedness of smart growth goals, i.e., sustainability.

The last part of this literature review focuses on methodologies used to link the interconnectedness of social and economic systems and environmental protections and remediation. While several fundamental components deep in our social fabric are beyond the scope of this research, however, they are identified throughout this literature review. This literature review provides detailed analysis of social health and economic advantages and disadvantages of using brownfield as a development tool to meet sustainability goals.

Theoretical Worldview

From a research perspective, the theoretical lenses of brownfields redevelopment consume many worldviews to address confounding variables including post-positivism, constructivism, pragmatism, and participatory and advocacy (Creswell, 2009, p. 6). Commonly, a pragmatic worldview focused on

problem centered, real world situations fulfill research questions fit the environmental protection motivation. The limitations of such an approach can obfuscate the subjectivity and uniqueness of brownfield redevelopments. Intersections among views make identifying with one challenging. For example, Creswell explains that post positivism creates a basis for further research; while constructivism is based upon how humans engage within their world and as they understand it.

The myriad of stakeholders involved in brownfield redevelopments requires an intertwining of worldviews (Creswell, 2009). Consider traditional cause and effect supported by empirical science can effectively support a trajectory that raises concerns for further exploration into the subject, therefore pragmatic; and due to the change orientated collaborative nature of political issues within brownfield redevelopments; a participatory worldview can be applied. The theoretical context of mixed methods research is in line with organizational theory and social sustainability. Consequently, a transformative worldview stands out in that this research attempts to assess how we engage with social issues, within a particular context.

Sustainability

Ideals that shape the definition of sustainability have commonalities and discords. In recent literature, the term is commonly used to address economic, social and environmental goals with three interdependent pillars each affecting the other in a systematic linkage, a triple bottom line approach, in obtaining sustainability (Chakrapani & Hernandez, 2009). Usage of the term regularly stems from the development goals in relation to resource availability. Commonly, values are also equated and embrace systems thinking, resilience, and inclusion of

societal improvements. Values, while seemingly straight forward, can fundamentally shift and create disconnect in applications and interpretations (Kemp & Martens, 2007).

The Merriam Webster's Dictionary defines sustainable as an adjective:

- : able to be used without being completely used up or destroyed
 - : involving methods that do not completely use up or destroy natural resources
 - : able to last or continue for a long time
- Sustainable. (n.d). In Merriam-Websters online dictionary.

Disciplines ranging from economists and engineers, to humanitarians and environmental stewards all have slightly differing definitions and principles within the triad rubric of sustainability. The United States' Environmental Protection Agency (EPA) definition states:

Sustainability is based on a simple principle: Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. Sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony that permits fulfilling the social, economic and other requirements of present and future generations. (US EPA, 2014)

Definitions defined in 2002, World Summit on Sustainable Development, included three major foci of sustainable development: 1) eradicating poverty, 2) protecting natural resources, and 3) changing unsustainable production and consumption patterns (Wedding, 2007, p. 484). The most common cited context of sustainability comes from *Our Common Future* by The United Nations World Commission on the Environment and Development, 1987 known as The Brundtland Report. The report defines sustainable development as:

Sustainable development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs. (WCED, 1987, p. 37)

Measuring sustainability involves complex yet amorphous interpretations.

Reliant on consensus of the definition, there is a wide body of knowledge focused on defining social sustainability. Attempts to define social sustainability can range from descriptions of “Maintaining or preserving ways of living or protecting socio-cultural traditions” to conflicting interpretations focused in “equitable distribution of resources and opportunities” (Vallance, Perkins, Dixon, 2011).

Sustainability measurements are complex as they stem from a systematic design encompassing inputs and outputs and maintain resilience of the system over time.

Climate change is a power driver in the realm of sustainability. The growing global concern for sustainability has been illuminated recent in climate change reports (Yates, 2012). The 2011 Stockholm Memorandum *Tipping the Scales Towards Sustainability*, which states, “We are the first generation facing the evidence of global change. It therefore falls upon us to change our relationship with the planet, in order to tip the scales towards a sustainable world for future generations” (Stockholm Memorandum, 2011, p. 3). The memorandum also suggests a bimodal approach to addressing global issues:

We recommend a dual track approach: a) emergency solutions now, that begin to stop and reverse negative environmental trends and redress inequalities in the inadequate institutional frameworks within which we operate, and b) long term structural solutions that gradually change values, institutions and policy frameworks.

We need to support our ability to innovate, adapt, and learn.
(Stockholm Memorandum, 2011, p. 4)

The amorphous nature of sustainability inhibits a one size fits all definition. Three pillars of sustainability; social equity, environment, and economics encompass core components to sustainable systems and have been termed the three P's as in; People, Plant and Profit (Chakrapani & Hernandez, 2009). Sustainable urban development is comprised of challenges factoring the three P's. Population growth, efficacy, conservation and preservation, and infrastructure limitations all effect the urban environment in which people live and businesses thrive.

Increasing efforts to manage urban growth have become part of city planners and local government. Widespread contemporary land use patterns developed in the 1800's are no longer sustainable, or necessary largely due to improved transportation networks and sanitation technologies (Au-Yeung, Yigitcanlar, Mayere, 2009). Past patterns in planning fodder and embrace behaviors not supportive of a sustainable strategy.

Aside from managing daily operational functions of a city, such as the assessment of property development application and maintenance of streetscapes, local governments are now also required to undertake economic planning, manage urban sprawl, be involved in major national and state infrastructure planning and even engage in achieving sustainable development objectives. (Au-Yeung, et al., 2009, p. 1)

A wide body of literature recognizes sustainable development at a parcel level and larger citywide scales, each requiring its own consideration of complexity within the triad of factors influencing sustainability, economic,

environmental and social mechanisms (Eisen, 2007, p. 723). Authors from the Quality Growth Alliance 2009 *Urban Centers and Transit Orientated Development in Washington State* report agree use of conventional land use planning and development strategies no longer meet the goals of governments, support infrastructure and are costly to uphold (Au-Yeung, et al., 2009, The Quality Growth Alliance, 2009). Furthermore, the report stated:

President Obama has acknowledged the Federal government's role in the problem. Commenting at an urban affairs summit on July 13th 2009 [he] said that "for too long, Federal policy has actually encouraged sprawl and congestion and pollution, rather than quality public transportation and smart, sustainable development. (The Quality Growth Alliance, 2009, p. 7)

Sprawl

Literature addressing urban life amenities includes proponents of living outside of urban centers conflicts with sustainability goals. Authors argue the openness and tranquility relieves one from the stress of city living including, congestion, traffic, noise and other problems associated inner city living. Ironically it is argued, the attraction to open spaces is the reason open space is jeopardized. Additionally, each new development further ages existing areas causing *rings* of 20-30 year old aging sprawl developments, furthering the perception of urban decay (Snyder & Bird, 1998, p. 10). Characteristics of sprawl include "1) it usually has densities no higher than 12 people per acre, 2) it is compartmentalized, meaning that homes are separated from commercial and industrial areas, and 3) it is an urban form typified by branching street patterns and cul-de-sac" (Durning, 1996). Developments outside city limits distance themselves to public services as well. It's not a sustainable development strategy.

“Sprawl is generally defined as very low-density development outside of city centers, usually on previously undeveloped land” (Snyder & Bird, 1998, p. 3).

Authors aiming at quantifying the real costs of sprawl argue:

Nonetheless, sprawl is as much a product of poor land use planning, skewed market mechanisms, uneven tax policies, and fragmented government bodies as it is a product of personal preference. And while sprawl has its advantages, some would argue its costs to society outweigh its benefits. It is a problem primarily due to the hidden costs associated with it, namely greater car dependence, higher infrastructure costs, loss of open space and agricultural lands, more energy-intensive development, urban core disinvestment, and traffic congestion. (Snyder & Bird, 1998, p. 3)

The literature suggests careful consideration must be made when cost accounting the real costs to sprawl vs. infill developments. Social costs associated with sprawl is beyond the scope of this literature review but is discussed at length (Snyder & Bird, 1998). Additionally, supporting the claim to omit causes of sprawl from the scope of my literature review is a passage from Wilson & Chakraborty (2013) explaining academic journals are faulty in explaining causation of this favored land use:

At its core, urban sprawl is a complex and multifaceted phenomenon with no universally accepted definition [4–6] and these characteristics have had a profound impact on the way that sprawl research has been conducted. The lack of a standard definition has contributed to the longevity and contentiousness of debate, while the breadth of the issue has made it difficult to study in a comprehensive manner. (Wilson & Chakraborty, 2013, p. 3303)

Literature addressing problems surrounding greenfield development, undeveloped land or green spaces, is that they often lack infrastructure and do not have the necessary capacity for growth and require more capital investment.

Stemming from this sprawl-type behavior and unbridled growth furthers the community's risk to environmental dangers.

Unchecked growth also furthers a need for better policy and growth management integration in this arena. One example, as noted in a study measuring the extent of land use practices on contamination of drinking water supplies in New Jersey, the study found that because of mismanaged growth in 1993, over 100 people died from *Cryptosporidium* related to drinking water contamination and persistent through the chlorinated process of potable water (Greenburg et al, 2003, p. 1522). The distrust regarding levels of safety of the potable water supply was highlighted in a 2000 poll of which only 26% of New Jersey residents reported that they drink tap water, compared to the national average of 53% (Greenburg et al., 2003, p. 1522).

The fundamental end drivers of sprawl are beyond the scope of this research and therefore are discounted while still recognizing the primary relevance. "Urban decentralization, urban sprawl and low density residential areas at the outer fringe of a city have suggested as the underlying factors that are responsible of many of the undesirable and non-sustainable outcomes for cities" (Au-Yeung et al., 2009).

In comparison, rural communities also struggle with sustainable development, while different than that of metropolitan areas, it is equally as challenging. This struggle comes from both their geographic surroundings and a strong connection to heritage, traditional or resource based economic prosperity, which is integrated into the social fabric of the landscape. Greenfield development

can obstruct objectives identified in established growth management policy in Washington State. As a result of less perceived legal risks associated with greenfield development compared to brownfields, other difficult or unquantifiable factors accumulate and stress the disturbed ecological systems such as aquifer recharge areas and critical habitats for endangered species.

Greenfield development strains growth boundaries and defies most smart growth principles. Externalized costs associated with greenfield developments include diminished ecological services. Accounting for ecosystem services is important to public policy because nature's services contribute significantly to human welfare (Boyd & Banzhaf, 2006, p. 23). Furthermore, there is ecological, environmental and economic significance in leaving brownfields untouched and not cleaned up resulting in blight and further decay of urban centers and fostering costly sprawl style development away from established infrastructure.

Smart Growth

Literature from the established frameworks of sustainable developments has created a progression of city and state planning standards to achieve the ten smart growth principles (Appendix A). Various types of growth management programs exist within each state. They vary from mandatory to voluntary and in between. Federal guidelines assist local and state governments in managing for growth. Federally established Smart Growth principles encompass:

1. Mix land uses,
2. Compact building design,
3. Create a range of housing opportunities and choices,
4. Create walkable neighborhoods,
5. Foster distinctive, attractive communities with a strong sense of place,

6. Preserve open space, farmland, natural beauty and critical environmental areas,
 7. Strengthen and direct development towards existing communities.
 8. Provide a variety of transportation choices,
 9. Make development decisions predictable, fair and cost effective
 10. Encourage community and stakeholder collaboration, development decisions
- (International City/County Management Association and EPA, Smart Growth Network, 2006, p. 6).

In 1961, Hawaii was the first state to implement statewide growth management legislation (Kelly, 1993). Ten other states followed including Vermont in 1973, Oregon in 1976, Florida in 1985, New Jersey in 1987, Rhode Island in 1988, and Georgia in 1989 (Anthony, 2004, p. 378-379). In the 1990's, the Clinton administration incorporated major features of Vice President Al Gore's "livability agenda". In its introduction, announced increased funding to environmental funds to state and local governments. The initiatives aimed at "smart growth" authorized \$9.5 billion for "Better America Bonds" which encouraged reusing unproductive urban land instead of spoiling "greenfield" land and curbing sprawl (Eisen 1999, p. 189). Washington followed suit in 1990, as well as Maryland in 1992, and Arizona and Tennessee in 1998.

Smart growth is a systematic way of thinking that considers past practices, recognizes potential shortfalls, and anticipates costs. States as well as counties, cities and municipalities apply the concept of smart growth across the county. The EPA and Smart Growth Network have assisted communities across the United States in committing to achieving better urban planning and livable communities. The overarching challenges many cities face is population growth, ageing

infrastructures and lack of easily buildable land. Application of smart growth principles is best facilitated at city and county level, where impacts to communities and resources are not obfuscated by statewide competition. Smart growth is defended by highlighting facts in urban planning and creating a vision of what city governments and city planners want for their communities.

Smart growth recognizes the many benefits of growth. It invests time, attention, and resources in restoring community and vitality to center cities and older suburbs. Smart growth in new developments is more town-centered, is transit and pedestrian oriented, and has a greater mix of housing, commercial and retail uses... “Smart growth is pro-growth. We know that developers, banks, and the entire community rely on growth to fuel the economy. The goal is not to limit growth, but to channel it to areas where infrastructure allows growth to be sustained over the long term”. Hugh L. McColl, Chairman and CEO, Bank of America (EPA, Smart Growth Factsheet, 2001)

Authors Au-Yeung et al.(2009) argue shifting from micro level urban development can drastically make up for the shortfalls in macro level land use and infrastructure planning. The gap therein suggests that applying smart growth principles will help alleviate city challenges such as affordable housing, mixed use development, transportation needs and encourage infill development to curb sprawl. Advantages to addressing sprawl at a city level where stresses to existing infrastructure and jeopardizes agricultural and environmentally sensitive land where state priorities might differ. While it has taken 60-70 years for smart growth policies to gain support at the State and Federal level, change to our urban landscapes has an even longer trajectory (Anthony, 2004). Once pristine lands are

built upon and ecological systems disturbed, returning to its original habitat is almost impossible and impractical.

Smart growth strategies are applied to urban and rural locations. Smart growth principles foster design elements to encourage social equity, environmental protection and conservation, and economic growth, all cores to sustainable development. “When communities engage in smart growth planning, they preserve the best of their past while creating a bright future for generations to come” (Heberle, 2006, p. 3). Some authors disagree on the effectiveness of smart growth legislation in that mitigating for sprawl, a term that has negative connotation dating back to the 1950’s, is inherent in many western modern settlement patterns (Duran & Lahr, 2009).

Authors argue a myriad of factors deter smart growth and encourage sprawl. For example, urban sprawl is not the problem but rather a symptom of the large issue of inner city crime. Middle class flight due to inner city crime has been discussed by authors (Cullen & Levitt, 1998, Duran & Lahr, 2009, Gibbs & Maynard, 1976). Gibbs and Maynard (1976) suggest crime rates are a result of the characteristics of city in relation to size and environmental positions of those cities and not so much the social, cultural, or economic conditions. Cullen & Levitt (1999), argue causality among crime and urban flight. “Violent crime rates in U.S. cities with populations over 500,000 in 1993, were four times higher than cities with populations below 50,000, and seven times greater than in rural areas” (ibid, p. 159).

While reasons for crime can be complex, Cullen and Levitt (1999), focus on changes in population and changes crime rates of 127 cities, the findings suggest households with higher education and or children are more responsive to crime rates and that rising city crime rates are linked to city depopulation. Other assumptions encouraging sprawl include fragmented transportation networks and aging inner city infrastructures in states without smart growth policies, while state's with smart growth programs are able to reduce sprawl (Duran & Lahr, 2009).

Infill Redevelopment

Infill redevelopment is at the heart of smart growth and sustainable development (Smartgrowth.org). Infill redevelopment is one strategy of smart growth design that alleviates pressures in existing infrastructure and reduces sprawl into green spaces, by efficient land use. For example, policy makers in Canada have valued infill development that accommodates a growing population. The infill development strategy also reduces pressure on open spaces and agricultural land as well as a way to revitalize city centers, making them more people focused, livable and raise the quality of neighborhoods and public life (Hayek, Arku & Gilliland, 2010). Ontario provincial government committed in its 2005 agenda that by 2015, a minimum of 40% of its new residential development will occur in already built up metropolitan areas and satellite communities (Government of Ontario, 2006). While the term *smart growth* is not seen in the Canadian review of the literature, terms such as *urban intensification* and *sustainability* are used instead and similarly aim at strengthening transportation,

agriculture, preserving resource land, making livable communities and nurturing economic growth (Hayek et al, 2010, Government of Ontario 2006).

Infill applications to infrastructure encompass a large body of knowledge. Authors agree that a collective neighborhood approach to smart growth intensifies the efficiency of available resources and improves communities through values. “Ideally, infill development involves more than the piecemeal development of individual lots. Instead, a successful infill development program should focus on the job of crafting complete and well-functioning neighborhoods” (Municipal Research and Services Center, 2013). For the remaining review of literature, infill is specific to existing built areas with contamination surrounding urban cores past and present.

Linking Brownfield to Smart Growth

A large body of literature supports the inclusion of brownfield redevelopment as a remedy in fostering infill development mimic smart growth strategies (Hayek et al, 2010, Wegmann & Nemirow, 2011, Smartgrowth.org). Often brownfield sites are not fully utilized due to legacy contamination that occurred in city cores. The Clean Ohio Revitalization Fund, implemented in 2000, is a place-based approach to infill strategies, rather than parcel-by-parcel approach. The Ohio project encompasses brownfield cleanup and redevelopment, ecological conservation, farmland preservation and recreation into the goals of the program as a region (Kurdila & Rindfleisch, 2007). The Clean Ohio Revitalization Fund’s brownfield component supports the assessment and cleanup of polluted properties as a catalyst for redevelopment (Kurdila & Rindfleisch, 2007). “Ohio’s fund differs from other state initiatives in its explicit recognition

of linkages between brownfield revitalization and greenfield protection” (Great Lakes Commission, 2001, p. 65). This is essentially the same as an area-wide approach as the term “place” highlights the unbounded nature of contamination within a landscape. This example highlights how benefits to multiple efforts in landscape preservation, habitat conservation and urban revitalization can be met.

Wisconsin’s smart growth policies also include promotion of brownfield redevelopment. The Wisconsin law states, “Economic development, with particular attention to brownfield redevelopment; intergovernmental cooperation; and land use, including current and future trends” (Great Lakes Commission, 2001, p. 62). Collaborative efforts to achieve goals in economic, environmental and healthy communities are vital to the successfulness of a brownfield redevelopment project. To summarize authors, state participation suggests having a smart growth plan is imperative to communicate goals and visions for brownfield redevelopment and sustainability for the future.

A 2011 publication entitled *Washington State Brownfield Policy Recommendation: Redeveloping Brownfields; Revitalizing Our Communities*, reports on meeting State needs socially, environmentally and economically through brownfield redevelopment programs. One of the study’s foci is on the importance of facilitating a legal framework to better empower Washington’s communities with a triple bottom line approach harnessing sustainability goals in achieving economic prosperity, and environmental health.

Brownfield redevelopments encompass many growth management goals already adopted by Washington States smart growth principles. While the term

brownfield is not codified in Washington State, it is explicitly linked to the current GMA (Washington State Department of Ecology (DOE), 2011, p. 37). Because of this disconnect, greenfields generally have less physical and legal restraints to development compared to brownfields. There are mutually beneficial outcomes of including brownfield redevelopment into smart growth goals would be that brownfield infill redevelopment can create new emphasis in sustaining a balanced and equitable process in land use policy and embrace other state goals as well. Washington State has recognized the challenge of supporting developing brownfields.

Washington State Department of Ecology (DOE) recognizes a need for improvement in growth management and by fully utilizing brownfields redevelopment as a tool to encourage and incentivize infill development strategies consequently meeting community health needs as well as economic goals (DOE, 2011). Additionally, the 2012 publication from Washington State Department of Commerce entitled *Urban Growth Area Guidebook: Reviewing, Updating and Implementing Your Urban Growth Area*, affirms connectivity between infill development and sustainability in meeting smart growth objectives.

Linking Brownfield to Sustainability

Brownfield redevelopments influence surrounding neighborhoods and communities. Socio-economic demographics can be an indicator of sustainable communities. Property values are one example that can drastically change a community. A study conducted in Minnesota, found that while size of development and impacts to existing infrastructure can influence change, values

ranging from 2.7% to 11.4% more suggest significant increases in property values of surrounding brownfield sites (DeSousa, Wu, & Westphal, 2012, p. 95).

Proximity studies have concluded that distance from known contaminated brownfield sites also effect residential population demographics (Mohal & Saha, 2007). Additionally, the study from 2009, entitled *The Contagion Effect of Foreclosed Properties* (Harding, Roseblatt & Yao, 2009) estimates 1 % of the local price trend on home values is affected by a foreclosed property. “We find that if there are three or more foreclosed properties within 300 feet of a non-distressed sale, the non-distressed property sells at a price approximately three percent below market” (ibid, p. 4). Foreclosed properties share some characteristics of a brownfield. They too can be abandoned, neglected, and add blight to the surrounding area. Similarly, brownfield sites don’t have any signs or disclosure posted of contamination, it is often a perception based stigma and therefore could influence home values from nearby brownfields.

Partnerships

The literature suggests a lack of transparency in stakeholder-driven brownfield redevelopment processes facilitates oversight within the redevelopment when minority populations are overlooked (Gute & Taylor, 2006). Community opinions have been sidelined during the planning process when dealing with contaminated properties and private developers. State funding mechanisms collectively aim to support partnerships in planning when state tax dollars are assisting cleanup funds. As a result, an evolution of planning and communities concerned with economic, environmental and social equity has driven brownfield redevelopment into a *third generation approach*. The third

generation approach is supported in the brownfields policy development discussion report by DOE “The goal of this policy planning process is to further the evolution of the State’s brownfield program into a “third generation” model that is strategic, efficient, and integrates economic forces and community perspectives to drive more environmental cleanups” (DOE, 2011, p. 35).

To summarize the trajectory of brownfields in Washington State, the first generation of state brownfield redevelopments encompassed a federal regulatory framework. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) approached fostered strict, joint and several liabilities that gridlocked redevelopment efforts of lenders, insurance and potential buyers. To help alleviate this gridlock, along with federal amendments to CERCLA and the Small Business Liability Relief and Brownfields Revitalization Act, second-generation state policies were intended to reduce these challenges through Voluntary Clean-up Programs (VCP) and highlight the property as an asset rather than a liability.

The second generation also falls short in that still didn’t place value on the potential of social equity gained or lost. Market driven VCP developments can lack community input and discussion of potential impacts to the existing community unless receiving federal EPA funding. Issues such as affordable housing, transit orientated development and displacement and not necessarily private sector concerns and therefore ignored. Private developers are also sensitive to changes in costs of cleanup; processes associated therefore could potentially fall short and run out of money due to new discoveries and lack of

funding or difficulty in obtaining cleanup standards (Eisen, 1999). Since the VCP cleanups are private sector investment projects that are susceptible to diminishing assets, they are more adverse to risk. As a result of this, VCP cleanup and redevelopment projects are often put on hold for extensive periods of time.

The inclusion of community, defined as individuals living and or working within the area, is an emerging a norm in how brownfield redevelopment projects are approached (Gute & Taylor, 2006, p. 542). Gute and Taylor also demonstrate that environmental education as well as communicating risk without creating panic is a challenge in the third generation approach. The American Society for Testing and Materials (ASTM) issued ASTM E 1984-98 *The Standard Guide for the Sustainable Restoration of Brownfield Properties*, encourage meaningful community involvement and is a voluntary effort to engage all parties. In Washington State efforts to mitigate disconnects between community, knowledge gaps, local governments, and developers through non-threatening third party environmental organizations:

Third-party brownfield outreach organizations provide information and support to local communities and property owners. They typically act as liaisons between communities and the regulatory agencies and provide guidance to project proponents. They are different from professional consulting firms in that they do not provide technical services such as environmental analysis or legal support and do not assume any liability exposure. (DOE, 2011, p. 54)

Therefore, by instilling partnership early on, third party organizations can provide assistance to communities, landowners and developers in channeling through the complex funding options at state, and federal grant and loan funding options. Federal grant programs issued by the Environmental Protection Agency

assist in funding many brownfield partnerships. Third parties such as Southeast Seattle Effective Development (SEED), Environmental Coalition of South Seattle (ECOSS), EnvrioIssues, and many other private consulting firms work closely with local, state and, federal agencies to facilitate process and understanding among developers and community needs. However, funding and resources remain one of the challenges of maintaining relationships in fostering communication among those involved. While efforts to reach a consensus and encouraging participation is an integral part of brownfield redevelopment, the process itself is not linear and can lead to fragmentation in practice.

Gentrification

While not always the case, low income and minority groups often are most sensitive to change (Wernstedt, Heberle, Alberni & Meyer, 2004, p. 7). The history in the United States around gentrification is highly complex and not uniform therefore beyond the scope of this literature review. However, gentrification discussions surrounding brownfield redevelopment should not to be overlooked. Gentrification is a concern because brownfield redevelopments improve property values and environmental risk. Redevelopments can also polarize communities and push out lower income inhabitant due to higher costs of living.

Historically, the United States moved from a manufacturing to a service based economy, a legacy of abandoned and contaminated buildings now scatter the landscape. In *The Western Journal of Black Studies*, Essoka, (2010), summarizes that this transformation paired with strict environmental federal laws, enabled economically distressed urban cores to be forgotten; only not forgotten by

those left behind. These areas are riddled with poor infrastructure, blight, environmental health hazards and high crime, and most often in minority communities. Essoka, (2010) states:

Brownfield represent a two-sided coin of risk and relief to inner city neighborhoods. On the one hand, these land parcels contaminate the area and blight the community. One the other hand, site remediation can bring investment dollars, beautify the surroundings and create jobs. (Essoka, 2010, p. 303)

In the quantitative study, statistical significance concludes that gentrification can be the consequence of brownfield redevelopments within EPA regions. "The findings help reinforce the assertion that brownfields redevelopment is indeed an essential factor in altering local racial landscapes regardless of changes on a larger scale are occurring" (Essoka, 2010, p. 311).

A case study of Kendall Yards brownfield redevelopment in Spokane, Washington, also suggests brownfield sites are "central" to gentrification in communities (Bryson, 2012). It is worth noting while this development was underway, the 2007-08 Stock Market at an all-time high and soon came to a drastic fall felt across the world. In an interview with a local city planner, Bryson states:

Indeed real estate speculation in the West Central neighborhood began almost immediately after the Kendall yard cleanup began... 'investment properties' on the northern border of the site 'started shooting up in price, and people started being forced out'. Within a year after the project was announced, average home prices in the neighborhood increased by almost a quarter of their value, and real estate was beginning to move quickly as investors purchased single-family homes and multi-family rental properties. (Bryson, 2012, p. 29)

Unfortunately, in this case, addressing where displaced families would find similar dwellings in their affordability range was not part of the developer's vision and overlooked by local government. Displacement was the result. Environmental justice groups challenged the policies allowing for such nearsightedness. The Environmental Impact Statement (EIS) (WAC 197-11-405), failed to address low income housing and the Spokane hearings examiner supported the development by stating the EIS did not have to address it, "because it is a socioeconomic issue. Socioeconomic impacts are not 'environmental impacts'" (Bryson, 2012, p. 30). However, juxtaposed to the GMA's concurrency requirement, socioeconomic impacts should have arguably been considered if part of a smart growth positioned infill development (WAC 197-11-235). Nevertheless, the development project went bankrupt due to other economic reasons and the new developer's plan looks to capture the missing community concerns. Bryson, (2012), lessons learned such as this are too commonly overlooked in brownfields redevelopment. Environmental and social justices are part of the social and environmental fabric strived for in sustainable development. Brownfield can be an opportunity to make sure we do better.

Studies in this literature review caution that brownfield redevelopment do not automatically equate to sustainable outcomes. Interest rates, loans and grants also weigh heavily in brownfield site redevelopment therefore businesses need integrated analysis to measure incentives and risks simultaneously with goals of the private and public sector. A multinational study found that lack of progression from a business standpoint was due to haphazard understanding of

development standards, policy and public and private sector commitments (Adams et al., 2008). Complicating the Adams et al. study, was brownfield site size as well as technical and legal jargon lost in direct comparisons as well as differing priorities of stakeholders. Most importantly, cultural motivations supporting brownfield redevelopment was lost in communication. The finding in this study is that within a globalized economy of today, regional cohesive rational would be greatly supported by communication and facilitation at a much smaller local level.

More public participation up front, such as with the third generation approach facilitation methods, could have alleviated some disconnect from the above-mentioned process involving brownfield redevelopment. Authors support the issue is fixable. Work on bridging the gap between community impacts and the economic objectives should not be left to investors and government alone (Greenberg & Lewis, 2000). The literature supports that collaboration is essential to the success of brownfield redevelopment projects and community participation is just as important. As discussed, not all stakeholders share the same needs or vision for the future. Multiple stakeholder input and community participation is key to the success of brownfield projects. Additionally, community trust building with local governments is essential for partnerships to succeed through the third generation process.

The added emphasis on community development in brownfield projects often involves building partnerships with state and federal government agencies, nongovernmental organizations (e.g., land trusts), community groups, educational institutions, and involved citizens. These collaborations facilitate creation of public

open space; preservation of historic and cultural resources; learning opportunities; and an economic and land use paradigm based on the intrinsic values of a community. (DOE, 2011 p. 9)

Existing Brownfield Studies

Market research studies have identified through impact factors such as property values, local employment, and civic pride and quality of life measurements can be compiled and translated to local governments (Chakrapani & Hernandez, 2008). In *Brownfield Redevelopment and the Triple Bottom Line Approach*, the mixed methods analysis approach was critical to the research (ibid) to address the interconnectivity of brownfield redevelopments. However, reuse options and public involvement is not identified through the study. Additionally, large road and surrounding infrastructure construction was necessary and may have skewed survey response results. Despite the fact that some findings were consequences of impacts by indirect external impediments in the immediate area studied, temporal business and residential qualitative data paired with GIS layering “brought the data to life” (Chakrapani & Hernandez, 2008, p. 6).

The holistic integration of tools and information can speak to problems, opportunities, and solutions. Similarly, data can be used to better assist communities in establishing sustainable growth policy and a better environmental understanding by creating an impetus in brownfield redevelopment through a multi-stakeholder planning process.

Studies have shown businesses have an important role in brownfield redevelopment projects in meeting these objectives of urban renewal. Several authors conclude that risks associated with unintended consequences of

brownfield identification could potentially raise the costs associated with cleanup and redevelopment of other brownfield properties and surrounding properties therefore, an area-wide approach would be beneficial to community revitalization as opposed to a parcel-by-parcel approach (Eisen, 2007, p. 723, Wernstedt, et al, p. 4). Journals have identified firms such as Home Depot who has “reclaimed 15,000 sites across the country” (Davidson, 2011, p. 14). While each brownfield redevelopment is unique in its level of contamination, remediation challenges and costs, utilizing existing infrastructure remains a critical factor in assessing feasibility of redevelopment. Recent modeling scenarios have given investors insight on forecasting market values and sustainability goals (Schadler et al., 2011, p. 835).

Evaluation of Existing Research Methods: A Need for More Case Studies and Mixed Methods Research

Brownfield sites that are not cleaned up correspond to lost opportunities for economic development and for other community progress. Through use of an integrated system approach and using tools such as geographical information systems (GIS), risk can be better recognized with collaborated efforts (Snyder & Bird, 1998). A pushback of acceptance is expected regarding a public GIS databases due to privacy rights and the fourth amendment (Kubasek & Silverman, 2008, p. 36). These authors also suggest more multi-criteria evaluations, using GIS tools, available databases and knowledge of the surrounding cultures, can foster better decisions addressing the three P’s simultaneously. Furthermore, contamination of multiple parcels, especially effecting groundwater, further complicates cleanup with multiple stakeholders and jeopardizing human health

will defeat any agreements. Knowledge of all stakeholder concerns is vital to successful partnerships.

Strong recognition of community needs is essential to a successful brownfield project. Authors support the need of case studies in brownfield redevelopment. Mixed method studies better capture the holistic nature of brownfield redevelopments (Mohal & Saha, 2007, Essoka, 2010, De Sousa et al., 2009). Values including impacts to human health, whether perceived or real, can stop or turn idle land into revenue producers and affect equity in social conditions by involving community throughout the redevelopment process. In analyzing perceived priorities to preferred objectives in stakeholder groups, Brill (2009), emphasized stakeholder goals can vary, “While economic factors were important to both perceived and preferred objectives, quality-of-life factors held increased weight in the preferred objective” (p. 59). This is not entirely surprising as the “preferred” objectives comprised of social problems such as crime prevention, property values, vulnerable populations and public health are all close to the heart matters.

Through case study analysis, a synthesis of economic models, GIS and sustainable design goals can highlight the complexities of brownfield redevelopment while identifying potential opportunities and solutions for the future. GIS software is widely used to illustrate demographic and site specific information on basic cartographic overlays (Chakrapani & Hernandez, 2008, Brill, 2009, Spielman & Thill, 2007, Hayek et al, 2002). In the *Journal of Planning Practice & Research*, Hayek et al. (2010), conclude GIS analysis

provides city planners with tools to systematically describe site-specific variables that are less communicated otherwise such as historical contexts and potential contamination. “Building a comprehensive database of brownfield land is clearly a worthwhile project for municipal governments, providing a tool to aid in the management and redevelopment of sites; however, the creation of such a system is not without costs (time and money)” (Hayek et al., 2010 p. 465). Mixed methods approach comprising GIS software, demographic data and multi-stakeholder survey data, best contrast brownfield redevelopment success and planning shortfalls on a site-specific basis. This framework is also supported in mitigating for sprawl while accommodating population growth (Snyder & Bird, 1998).

By incorporating sustainability values, studies can provide an unsurpassed potential when combined with geospatial data, interviews by providing a holistic assessment of potential brownfield site redevelopment influences to a site-specific location (Chakrapani & Hernandez, 2008). By providing data driven facts with values based opinion, a mixed methods approach to brownfield redevelopment projects at a site-specific scale will provide opportunities for better planning with multi-stakeholder preferences in mind. Relationships among all variables in holistic approaches can be difficult to clearly state. As a result, a comparison analysis through case studies can illuminate overlooked linkages in practice and provide better outcomes for all stakeholders.

Conclusion

Through the reviewed literature, Washington Research Council concluded in 2002 on the subject, “For goals to have meaning in state law, it must be

attached to a plan.” The literature research objective here is to provide some context to achieving sustainable smart growth goals and remediating brownfield properties. The legacies left by an era of industry are scattered in our landscape. History and pride are instilled in these idle and vacant brownfield lots across the nation. These once robust acclimated businesses hold a special place in our hearts. These places hold both history and value to communities near them, each in differing ways. Facilitating community level planning and encouraging municipalities to develop increased tax flow and highlighting successes in creative ways, will better meet the needs of fruitful, happy and healthy communities.

The issue surrounding the implementation of brownfields incorporation into land use planning principles stems from the developers and local government’s level of commitment to restoring the property to environmentally safe standards. An article by Joel Eisen, *Brownfield at 20: A Critical Reevaluation* discusses the industry of brownfield redevelopments and how successes have been measured. Washington State’s current approach, mirrored nationally, has led to patchwork developments that discourage infill, therefore incentivizes greenfield development and sprawl that is at the heart of GMA’s stated goals and concerns (Appendix B) (Eisen, 2007, p. 723). Alternatively, as mentioned above, Eisen, (2007) emphasizes that brownfield practices are at a turning point in current practice standards and as expectations increase regarding human health concerns and sustainable growth can also lose meaning and promise. Eisen, (1999) argues many reject “sustainability” as a “manipulative and

confusing slogan” or a “meaningless post hoc label used to justify the status quo” (p. 197). To counter the status quo, it is important to differentiate between advancing components of sustainable redevelopment and reflecting guidelines (Eisen, 1999, p. 201). A shared vision can evolve in most situations by instilling a mechanism for respectful community-based involvement, creativity and collaboration (DOE, 2011).

An interdisciplinary methodology can achieve objectives of sustainable brownfield redevelopment. Further prolongation and allowing contaminated properties to sit idle causes blight to neighboring communities and affect residences as a whole in a multitude of indeterminate ways. As a result of this literature review, this research design brings new, fresh, useful and significant analysis that will supplement current understandings of importance in using an interdisciplinary approach in combining brownfield redevelopment and sustainability.

The connections that need to be made to achieve a sustainable development come from a wide array of factors, each with its own discipline. This is why an interdisciplinary research is necessary to communicate with all stakeholders. Authors represented in this literature review come to the same general conclusions; there needs to be more site-specific case studies, more data collection, more multi-stakeholder participation and a more holistic sustainable approach to brownfield redevelopments.

BACKGROUND BROWNFIELD REDEVELOPEMNT

A short history of environmental brownfields policy

In the era of Rachel Carson's book *Silent Spring* (1962), environmental concerns of health and safety were demanded by the public for more federal regulation, oversight and accountability. The need was eminent, as the environmental movement as the 1960's demanded the federal government to act. New federal regulations supported management of previously unmanaged hazardous substances and supported state and local governments in implementing their own programs. The history surrounding defining a brownfield, understanding what it takes to clean up contamination and the legal liability involved added levels of complexity to brownfield redevelopment projects. The maturity surrounding such redevelopment projects and their complexities continue.

In 1996, the United States Environmental Protection Agency (EPA) defined brownfields as "abandoned, idle or underused industrial and commercial sites where expansion or redevelopment is complicated by real or perceived environmental contamination that can add cost, time or uncertainty to a redevelopment project" (epa.gov/brownfields/overview/glossary.htm). The restriction of this definition pushed residential properties out of the picture. Since contamination does not recognize parcel boundaries, residential land impacted remained idle or vacant due to suspected or unknown contamination nearby, and left acres in flux regarding cleanup alternatives and public safety. This segregation in zoning furthered the perception of danger, depreciating land values, furthering blight and attracting crime. Additionally, this restrictive definition, did

not account for potential in land reuse option, stemming from an uncertainty in liability from contamination presence and lack of community involvement.

In 2002, amendments to the term "brownfield site" was amended to include a broader and more inclusive definition by additions of the term, "real property" by the Small Business Liability Relief and Brownfields Revitalization Act (Public Law 107-118). The amended definition no longer limited brownfields to commercial and industrial properties and included residential property as means "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant." (Public Law 107-118). Brownfield sites can be small one-parcel units of land and expand to acres of contamination. Since contamination is not confined to established property boundaries, brownfield contamination often extends to multiple properties.

Brownfield properties are often old landfills, automotive service stations and dry cleaners. The vacant businesses leave behind under used and distressed urban areas that were once economic mechanisms in a thriving economy. In contrast to a brownfield, "greenfield" is a term used in urban planning to describe an area free of such past land uses and often encompass pristine undeveloped areas free of an industrial legacy. These terms are important to establish as growth management policies work to curb greenfield development in efforts to reduce sprawl, allow for open space, and encourage transportation networks within existing communities and address environmental protection.

Commonly, brownfield sites are divided into four categories of potential reuse as described in The Book entitled: *Brownfields, A Comprehensive Guide to Redeveloping Contaminated Property* (Davis, 2002, p. 5). For purposes of redevelopment as well as for public tax revenue accounting, these potential reuses have significant difference in the impact they have on the economy and surrounding property:

1. Sites that- despite needed remediation- remain economically viable, due to sufficient market demand;
2. Sites that have some development potential, provided financial assistance or other incentives are available;
3. Sites that have extremely limited market potential even after remediation; and
4. Currently operating sites that are in danger of becoming brownfields because historical contamination will ultimately discourage new investment and lending.

Nationally, a negative cycle of economic decline, environmental and social injustice, a past of little or no regulation and enforcement, as well as environmental degradation of the landscape, can be observed in the brownfield downward tailspin. Viable brownfields “are defined as underutilized properties with actual or perceived environmental liabilities that, due to their inherently positive market attributes, may be economically developed into positive assets” (Davis 2002, p. 5). Davis, 2002, further divides brownfield sites into five commonly used categories that further stigmatize the real estate surrounding these perceived contaminated sites (p. 6-7).

1. A property owner, unwilling or unable to sell contaminated property, mothballs it, thus undermining the local tax base.
2. Vacant facilities deteriorate and invite arson, illegal dumping and vandalism, including the stripping of parts and materials.

3. Unaddressed contamination may spread, further eroding the property values, escalating the cleanup cost, and threatening the economic viability of adjoining properties.
4. Potential investors, faced with uncertain cost and legal abilities, seek development opportunities elsewhere
5. Brownfields sites become unwanted legal, regulatory and financial burdens in the community and its taxpayers.

While more regulation has ceased some undesired practices, these same environmental regulations have widened the gap in achieving successful redevelopment of brownfields depending on the strength of planners' and regulators' commitments and extent of contamination.

Resource Conservation Recovery Act

The Resource Conservation and Recovery Act of 1976 (RCRA), protects human health and the environment for waste disposal practices previously unregulated. The RCRA regulations aim to achieve a cradle-to-grave management system that uses tracking and permitting to monitor and control hazardous waste in a top down regulatory manner (EPA, 2002). The act also identifies objectives to reduce the amount of waste generated, and establishes methods in handling and storage and treatment in a controlled environment. "The RCRA statute, regulations, and programs were created at a time when we did not know how much waste was produced or what happened to it. What we knew for certain was that waste needed to be safely managed" (EPA, 2002). Later amendments to RCRA established EPA programs to implement the acts' corrective action requirements, cleanup standards, permitting, and civil and criminal enforcements.

Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), also called "Superfund" characterizes

contaminated sites based on the known contaminants, extent of contamination and the threat level to human health and the environment. It is important to note and differentiate terms within environmental policy. The term “brownfield” differs from “superfund” as established by federal law. Sites listed as “superfund”, have a ranking and listing on the National Priorities List (NPL). Brownfields are not listed on the NPL. The NPL allows the EPA to clean up such sites and to compel responsible parties to perform cleanups or reimburse the government for EPA-lead cleanups (EPA, 2002).

RCRA and CERCLA are two different statutes that govern the federal management of hazardous waste facilities and response to abandoned, uncontrolled hazardous waste sites respectively. The development of CERCLA was a reaction to the conditions of the time of unregulated industry, and lack of legal liability and protective measures and compensation to communities affected by legacy of unbridled industry. They are not identical statutes but there are many similarities and consistent outcomes.

Kubesk and Silverman (2008), advocate that public participation is most welcome and overdue in amending the legislation to meet the needs of both industry and communities alike. Before CERCLA, the federal government was removed from active oversight in regards to hazardous spills and site contamination. In attempts to regulate accountability, identifying potentially responsible parties (PRP's), became a means to identify temporally as well as degree of involvement to the environmental hazards. CERCLA states, “strict, joint and several liabilities” in assigning liability (Public Law 96–510). The PRP

liability identification encompasses many players and processes contributing to the environmental contamination.

Liability can include those involved, past or present, owner and operators; with ownership transactions as in *United States v. Carolawn Chemical Company*; financial lenders as in *United States v. Fleet Factors Corporation*; persons who arrange treatment of disposal, and transportation of contaminants as in *United States v. Mottolo* (Kubesk & Silverman, 2008, p. 322-323). Many times as a result from fear of liability, businesses, investors and developers steered clear of such risky parcels. As a result, industry and commerce developed elsewhere. Consequently, this fueled the demand for developing on greenfields and further contributing not only to the enhancement of the preconceived notion of brownfield sites, but also to loss of productive farmland, open spaces ideal for other land uses.

For those sites not listed on the NPL, they became identified as brownfields. Brownfield sites, often abandoned, are a result of fear mongering, avoidance, perceptions of risk and liabilities. They remain burdensome to taxpayers as unproductive use of land, lack tax revenues to sustain city needs and pose health risks due to unmanaged contamination. Brownfields also often attract illegal dumping, crime, reducing property values and diminishing urban cores and encourage urban sprawl.

Brownfields in Washington State

To overcome the stagnation of redevelopment of brownfield sites, states have developed legal mechanisms for incentivizing the reuse of potentially contaminated land. Voluntary Cleanup Programs (VCP) have popped up in states

all over the country. “The goals of these programs include integrating issues involving legal liability, technical requirements and economic incentives” (Davis, 2002, p. 13). The VCP approach is known in Washington State as a second-generation approach to brownfield clean ups following the stricter first generation under the CERCLA framework.

In Washington State, the VCP is used to remediate brownfield sites with little State oversight in attempts to obtain closure from a legal state document designation in that the site requires no further action (NFA Letter). The NFA is a Model Toxics Control Act, 1988 (MTCA), closure mechanism that enables the property owner to conduct investigative studies and remediate contamination with regulatory consultation and provides lenders with minimal risk (173-340 WAC). Lenders and environmental insurance providers are often accepting of this type of “closure”. The advantages of this type of cleanup, while not a “state assured” (nothing is absolutely final) closure, implies that corrective action was taken through MTCA regulatory framework. A NFA Letter does not provide a legal remedy to liability but rather a legal letter of opinion, of which the State may change due to circumstance.

Washington State (DOE, 2011, p. 28) identifies five major characteristics in the brownfield dilemma:

1. Threats to public health and the environment
2. Blight and stigma that impact the value of surrounding properties
3. Diminished local and state tax revenues
4. Lost opportunities for jobs and economic development
5. Attractive nuisance for vandalism and crime

The impacts of brownfield sites in communities have been quantified in many ways. Identification of core values within a sustainability approach, to address current the conditions, may provide measurable progress. Economic drivers and environmental remediation are easier to quantify. However, community benefits are no less important in measuring sustainability (DOE, 2011). Washington State is migrating it's brownfield redevelopments to a third generation approach that mimics the triple bottom line archetype to sustainability with interdependence among economic development, environment and community, see figure 1. The 2011, *Washington State Brownfield Policy Recommendations*, emphasis is toward a need for a collaborative, values based approach:

The added emphasis on community development in brownfield projects often involves building partnerships with state and federal government agencies, nongovernmental organizations (e.g., land trusts), community groups, educational institutions, and involved citizens. These collaborations facilitate creation of public open space; preservation of historic and cultural resources; learning opportunities; and an economic and land use paradigm based on the intrinsic values of a community. (DOE, 2011, p. 36)

To supplement the need for a proactive solution in achieving contaminated property redevelopment, challenges and opportunities are identified in the executive summary of the 2011, (p. 17-18) *Washington State Brownfield Policy Recommendations*:

Challenges:

- An estimated 8,600 - 19,200 brownfield sites in Washington State
- 150 completed cleanups are approved per year, but 300 sites are added each year
- Average costs of cleanup can range from \$600,000 - \$1,000,000, representing a huge barrier in redevelopment of these properties.

- The demand for state grants is three times the forecasted budget for the next ten years.
- Cleanup can take 4-5 years depending on the state cleanup program entered into.

Opportunities:

- Brownfield redevelopments generate estimated \$500,000 annual local tax revenue per site.
- Hundreds of units of affordable housing and dozens of acres of public open space have been created on remediated brownfields
- Cleanup and redevelopment of brownfields transform blighted properties that detract neighborhoods into productive community assets.

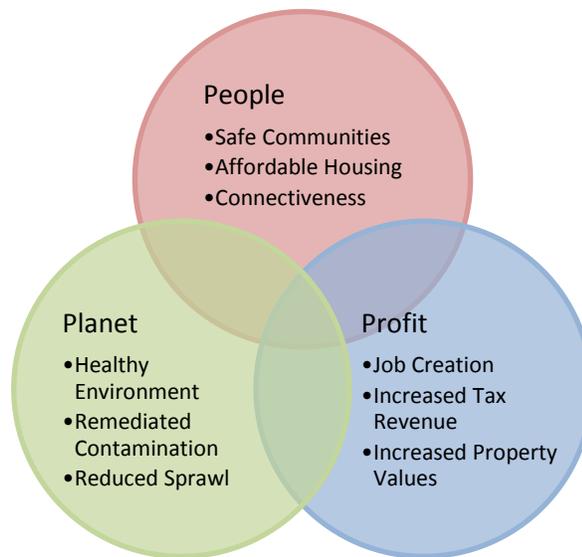


Figure 1: Illustration of the three pillars of sustainability and brownfield redevelopment Adapted from Washington State Policy Recommendations, DOE, 2011. Drawn by Laura Thelen, June 2014.

Why a Case Study?

Case study analysis is a missing component measuring success of brownfield redevelopments in Washington. Research has identified sustainable development components are difficult to measure and are not a one size fits all solution to brownfields redevelopments. By coupling known data within an identified community and fundamentals in sustainability, my research concludes relationships exist and can be used to promote and focus redevelopment. This

case study highlights the impacts of brownfield redevelopment and illustrates a relationship and perhaps a model in addressing community needs and all aspects of sustainability collectively. The Rainier Court, Brownfield Redevelopment Project is located in the Rainier Valley area of Seattle Washington. This area and site were chosen for this study because they provide an opportunity to observe change over time supported by historical documentation.

The Surrounding Area: Southeast Seattle, Rainier Valley, Washington 98118, 98108, 98144

Located southeast of downtown Seattle the Rainier Valley area is bordered to the west by Interstate 5, to the north by Interstate 90, to the East by Lake Washington and extends south to the next city Renton, Washington. The areas' population is approximately 54,068 with an area of 72 square miles. Located within Rainier Valley are several micro-neighborhoods including Garlic Gulch, Genesee, Columbia City, Hillman City, Brighton, Dunlap, and Rainier Beach. The Rainier Valley area is considered one of the most culturally diverse in country (Rainier Chamber of Commerce webpage, 2014). The area neighbors three adjacent zip code boundaries encompassing Rainier Valley, see figure 2. The area is geographically elongated with three major thoroughfares Beacon Avenue South, Martin Luther King Jr. Way South, and Rainier Avenue South running its length. Seattle's Link Light Rail extends nearly the whole length of the area following Martin Luther King Jr. Way and has been key to transit oriented economic development supporting affordable housing projects in the community (The Quality Growth Alliance, 2009).



Figure 2: Zip code boundaries surrounding Rainier Court (identified in green) redevelopment project: 98118, 98108, and 98144.

The population of the Rainier Valley consists of moderate to low income households. The area has a long history of boom and bust development cycles stemming from defense work during periods of war and the growth and decline cycles of the local aeronautics industry. Predominant industries in the area since World War II include Boeing Aerospace, Isaacson Ironworks, and Todd shipyards (Hoole, 2011, p. 2). After World War II the boom time continued. The area could not keep up with the growing population of new families and returning soldiers. This created a time of hurried construction to meet demand. As supply met demand, a cycle of economic decline followed. The most affluent of the population enabled by the extended commute the automobile provided, relocated to less industrial areas of the region.

Two large public housing projects, Rainier Vista and Holly Park are located in this area. Partially as a result, the area has a history of crime and isolation. "In the early days of public housing, this was seen as an opportunity to

shape and improve the lives of people in the communities they were building"(Hoole, 2011, p. 3). A resulting polarization became apparent between those residing in re-purposed barracks style public housing and those of moderate income residing in craftsman style single-family homes.

The "Self-contained mini-communities" soon grew out of these shelters and became pockets of isolation and crime (Hoole, 2011, p. 3). Many households were made up of single mothers with little or no access to employment centers or health facilities (Hoole, 2011, p. 7). The housing projects went through several decades of redevelopment and transition. In 1979, the crime rate peaked. During this time, residents and workers were targets for robbery and businesses were vandalized. "White flight" and "red-lining" became more and more common and obvious. The Seattle Police Department reported an estimated peak of 1,400 crack houses in operation in the Rainier Valley (Hoole, 2011, p. 7).

After continued unsuccessful attempts to fix the social issues in the aging Department of Defense housing turned public housing, the federal government supported a new approach to public housing. The Homeownership and Opportunity for People Everywhere (HOPE VI, a plan by the Department of Housing and Urban Development) aspired to relieve the isolated poor from distressed and dilapidating environments. The HOPE VI project would redevelop an area in a manner to which the physiological satisfaction could also be nourished. The traditional barracks like cul-de-sac design was replaced with a mix of housing stocks from apartments to single-family homes. The design was on a grid system, with a neighborhood feel and the multi-story heights and

varying colors of the dwelling added a craftsman like feel and “eclectic” and “organic” neighborhood (Hoole, 2011, p. 10). Although design itself cannot change poverty and crime overnight, the attempts to include rather than isolate the projects has had notable success.

In 2000, success was measured as the Seattle Housing Authority reported that in New Holly Park (one of three Seattle Housing Authority communities initially designed to house defense workers during World War II) “crime dropped by 64 percent over a three year period” (Hoole, 2011, p. 11). Residents once deprived of common large chain retail establishments now enjoy grocery stores, hardware stores and cafes that have found successful locations in the area. HOPE VI funded projects have also supported plans to build community centers, parks and a City of Seattle public library extension. The improvement efforts have also had some negative consequences in the form of displacement of residents and the shift of low-income housing needs to other areas in Rainer Valley. The social problems created by housing will continue as any mitigation effort takes time and creates need for adjustment.

Rainier Court Brownfield Redevelopment

The study site location is 3500-3700 Rainier Avenue South, Seattle, WA 98144. The Southeast Effective Development (SEED) is a nonprofit that focuses on affordable housing and other community development related needs. The 2002, *Site-Specific Community Involvement Plan for Rainier Court Development*, (Appendix C), was provided in compliance to receive the EPA’s Coalition Brownfields Cleanup Revolving Loan Funding (BRLF). In 1999, SEED purchased the site for affordable housing and mixed use including services and

retail developments to support an area wide approach to light rail, pedestrian activity, transportation and density improvements and economic development. The BRLF “is designed to empower states, communities, and other stakeholders to work together in a timely manner to prevent, assess, safely clean up, and sustainably reuse brownfields. The EPA provides technical and financial assistance for brownfields activities through an approach based on four main goals: protecting human health and the environment, sustaining reuse, promoting partnerships, and strengthening the marketplace” (EPA BRLF Factsheet, 2009).

Approximately 90 property parcels were obtained through partnerships between SEED and the City of Seattle Housing Authority to address the need for more affordable housing opportunities in the area. During construction activities at Rainier Court, a seven-acre project, contamination was encountered, see figure 3. The properties within the seven acres had had past uses including an electrical company, wrecking yard, an unregulated dump and a magnet for crime and drug activities. Health concerns included carcinogens, air quality and groundwater contamination.

Contaminates found included carcinogenic polycyclic aromatic hydrocarbons (PAH’s), petroleum hydrocarbons and some metal. Since contamination knows no legal boundaries, the large lot had been an economic and environmental nightmare for the community goals. Further investigation of past uses uncovered polychlorinated biphenyls (PCB’s), potentially from the electrical company historically known to operate there. PCB’s, banned in 1979, can be especially difficult and costly to remediate. PCB’s are an environmental risk as

they are persistent in the air, water and soil and bio-accumulate in plants, small organisms and fish and the animals that eat them.



Figure 3: The brownfield site before the redevelopment process at Rainier Court. Hazardous chemicals from illegal trash dumping contaminated the site. (Retrieved from: <http://www.geoengineers.com/project/rainier-court-brownfield-development>)

The property at the time, being publicly held, provided an opportunity to receive funding through federal brownfield programs. The local government applied for and received a Targeted Brownfields Assessment (TBA), a federally funded study conducted by EPA contractors, to determine the nature and extent of contamination (2007, EPA, Targeted Brownfields Assessment Fact Sheet www.epa.gov/brownfields). EPA site assessment characterized the site and produced an extensive four-inch report including natural background levels in the soil.

The extensive nature of the EPA contracted report halted progress, as filtering the scientific documents' contents to communicate potential risk was

cumbersome. A contracted third party was necessary to understand the nature and extent of the liability now owned by the city's housing authority. ECOSS (Environmental Coalition of South Seattle), a nonprofit organization, encourages urban redevelopment and a healthy environment by providing education, resources and technical assistance to diverse businesses and communities in the Puget Sound region (www.ecoss.org). The contamination extent was better understood due to this collaborative process.

The remedy for the contamination was excavation and capsulation, a common practice with contaminated sites. Fortunately, for developers, a large portion of the project already included a large amount of excavation for an underground parking garage. The extensive excavation needed due to the known PCB's was more feasible to remediate by installing a cap after excavation. Capping after excavation is common remedial activity as once the contamination is known and no longer mobile or a threat to groundwater. Isolating the known remaining contaminants is common practice. The project became known as Rainier Court and comprises of four phases of redevelopment of brownfield properties, see figure 4.

The Rainier Court Redevelopment Project is divided into four phases. Phases One and Two were done simultaneously providing affordable housing for families and seniors and include retail and services at out ground level. Phase Three is underway at the time of this research and will provide additional affordable senior housing units. Phase Four remains in the planning process and

have included a pocket park completed in 2011, and infrastructure improvements to accommodate potential apartments or townhomes in the future.

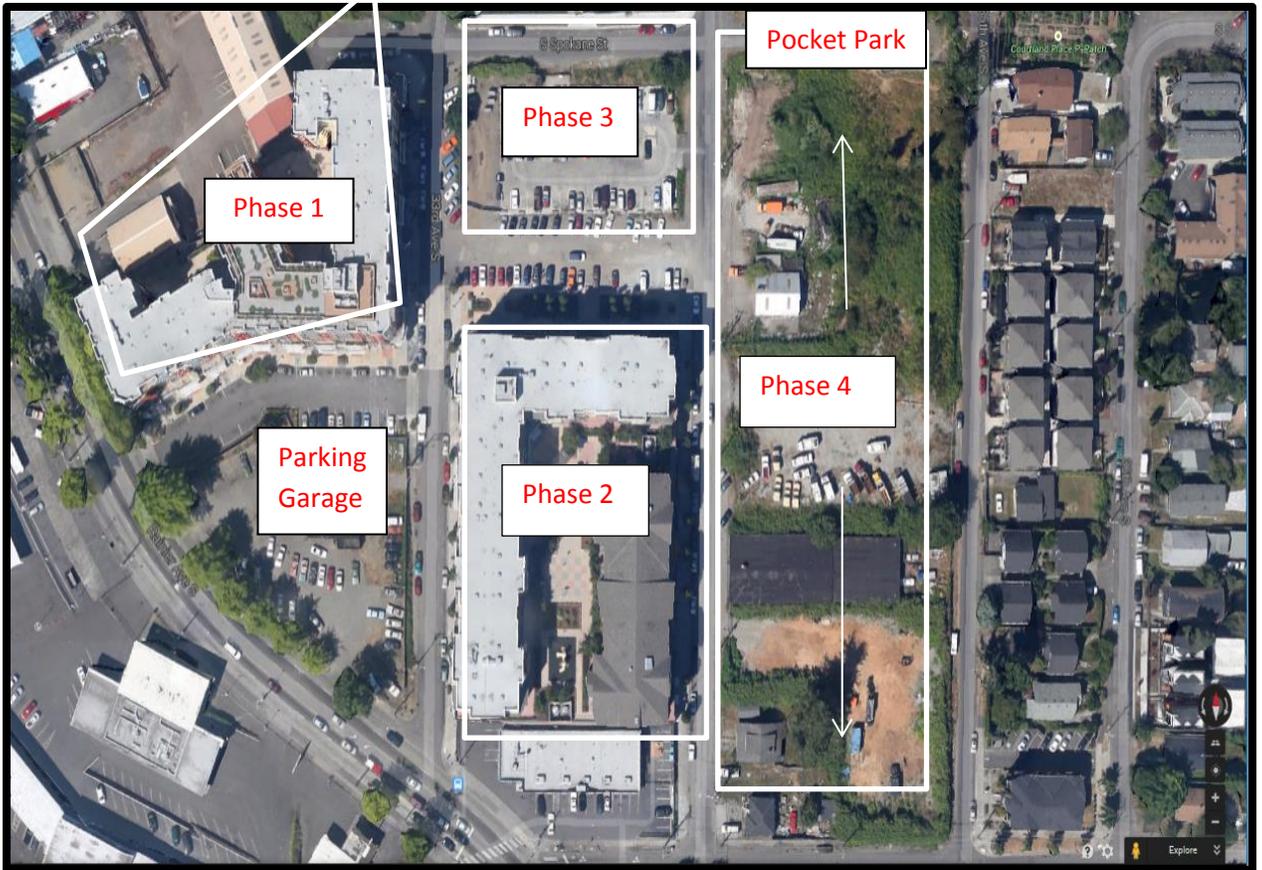


Figure 4: Aerial photo with added illustration of the Four Phases of the Rainier Court brownfield redevelopment project. Retrieved from google maps. 05/10/14

Phase I- The Courtland Place, completed 2005, see figure 5.

- Started in 2003.
- Supports 208 senior housing in 30% to 60% of median income range.
- Includes plans for parking garage, in construction process at time of this research.

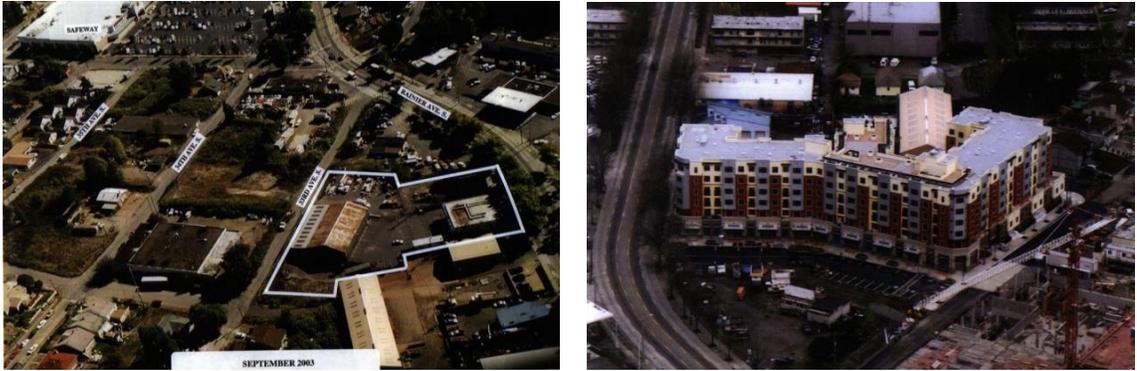


Figure 5: The Courtland Place, Phase One of the Rainier Court Redevelopment Project. Images are before (2003) and after(2005) remediation, respectively. (Retrieved from: <http://www.intercitycontractors.com/?portfolio=courtland-place-3>)

Phase II- The Dakota, completed 2006, see figure 6.

- Started in 2003.
- 178 affordable family housing units.
- Supports affordable housing 50% to 60% of median income range.



Figure 6: The Dakota development, Phase Two of the Rainier Court Redevelopment Project. Images are illustrate before (2003) and after(2005) remediation, respectively. (Retrieved from: http://www.intercitycontractors.com/?page_id=82)

Phase III- Community Gardens at Rainier Court, 2012-present, see figures 7 & 8.

- Started 2012.
- Final project will create 70 new town house style senior housing units for annual incomes between \$17,000 and \$35,000.



Figure 7: Phase Three of the Rainier Court redevelopment before redevelopment (Retrieved from: SouthEast Effective Development (SEED) fact sheet).



Figure 8: Photo of townhomes under construction at the Community Gardens at Rainier Court, Phase Three. Photo shows current conditions at time of research. 05/11/14.

Phase IV- The Rainier Court Phase IV, not yet started, see figure 10.

- Pocket park at northern end completed in 2011.
- Located between 34th and 35th Avenues South immediately east of the Dakota
- City water line installed to accommodate future plans
- Redevelopment considerations include apartments and townhomes.



Figure 9: Photo of vacant houses at south end of site, Phase Four. Current conditions at time of research include temporary parking, over grown weeds and a junkyard warehouse. 05/11/14

DATA ANALYSIS

Methods

The central research questions addressed in this case study asks: Is the Rainier Court redevelopment in line with existing smart growth policies? Is there data to support claims that brownfield redevelopments increase residential property values and what is the geographic scope? Is there data supporting blighted brownfield sites decrease residential property values? How can improvements be made to reach sustainability goals? To answer these questions, a mixed-method approach was chosen to gain a comprehensive perspective of the research question.

To answer my research questions, quantitative data collected from county databases and qualitative interviews provide opportunities for analysis. The mixed methods approach provides context to the quantitative analysis. A regression analysis is used to explain a relationship in home values over time, incrementally, and evaluate any differences of the physical location of values in distance from the Rainier Court redevelopment. Tests for significance indicate relationships regarding home values increase over time. The survey response rate was approximately 50 %. Participants were from government brownfield programs (n=3, 75%) and, private environmental consulting firms, (n=1, 25%).

Limitations of data

Factors affecting the housing market values are complex. Other factors that may have influence not studied in this research such as attractiveness of the location, income, and demographics. Environmental health, safety and crime perceptions were not part of this study.

Quantitative Data

The purpose of this data collection is to establish potential growth and economic development to the area of study through evaluating single-family residential property values and their relationship to distance from a brownfield site. The quantitative data provides a before and after brownfield redevelopment analysis as well as area wide and localized impacts to single-family residential property values. Quantitative data was collected using various methods and scale. The King County Geographic Information Systems (KCGIS) interactive mapping tool, iMap, provided parcel identification within designated buffers distanced at 300, 500, 1320, and 2460 feet from the central brownfield redevelopment project at 3700 Rainier Avenue South, Seattle, Washington 98144. Single-family residential home taxable value data was obtained from occupied single-family residential properties using KCGIS property research tool to access King County Assessor's reports. Micro-level taxable values from parcel data surrounding the Rainier Court brownfield redevelopment area were collected. The data includes years 2000, before redevelopment to 2010, after redevelopment, and present, 2014.

Micro-level data was collected from parcel data randomly selected from 100 single-family residential properties from one half mile (2640 ft.) radius and one quarter mile (1320 ft.) radius from the Rainier Court redevelopment (n= 100, n= 100). 46 single-family residential parcels were collected from the 500 foot radius (n= 46). 20 single-family residential parcels were collected from the 300 foot radius (n= 20). The decline in sample size was a result of a diminishing sampling group.

Based on trends visualized from the collected data; residential home values over time, a regression analysis was used to evaluate the relationship. Resampling methods were used because the data did not meet all the assumptions for parametric analysis. The assumptions not met were the assumption of normality, most likely due to explainable outliers in my data set. The resampling method provides statistical significance of assure the validity of the model statistic used.

Statistical Analysis and Results

Data were examined using a regression analysis. Resampling methods were used as a result of a non-normal distribution. Data were analyzed using Resampling Stats for Microsoft Excel Version 4.0 and Microsoft Excel provided by Microsoft Office Professional 2010 for spreadsheets and descriptive statistics. I have identified one dependent variable, property values, based over time, the independent variable. I have repeated this scenario four times to represent distances from the brownfield site location. The research tested the following null hypothesis: There is not a statistically significant relationship between single-family residential home values over time (from before and after Rainier Court redevelopment commenced) among the multiple distances.

Residential home values increased over the trajectory of 14 years within each distance data set. Distance from the Rainier Court redevelopment may have had influenced this relationship. The statistical technique selected revealed that home values may have increased from a result of the Rainier Court redevelopment, however, more detail is needed to make this assumption. An

increase in residential home values indicated closest to the Rainier Court redevelopment at a 300 ft. radius over time ($p < .0001$, $R^2 = .4786$). See figure 10. The explanatory power of this analysis shows a greater explanation of variance to the two closer data sets, 300 ft., 500 ft. respectively ($R^2 = .4786$, $R^2 = .522$). See figures 10 & 11. The further distances, 1320 ft. and 2640 ft., from Rainier Court show that this model indicates a weaker relationship between home values and time, respectively ($R^2 = .3625$, $R^2 = .086$). See figures 12 & 13.

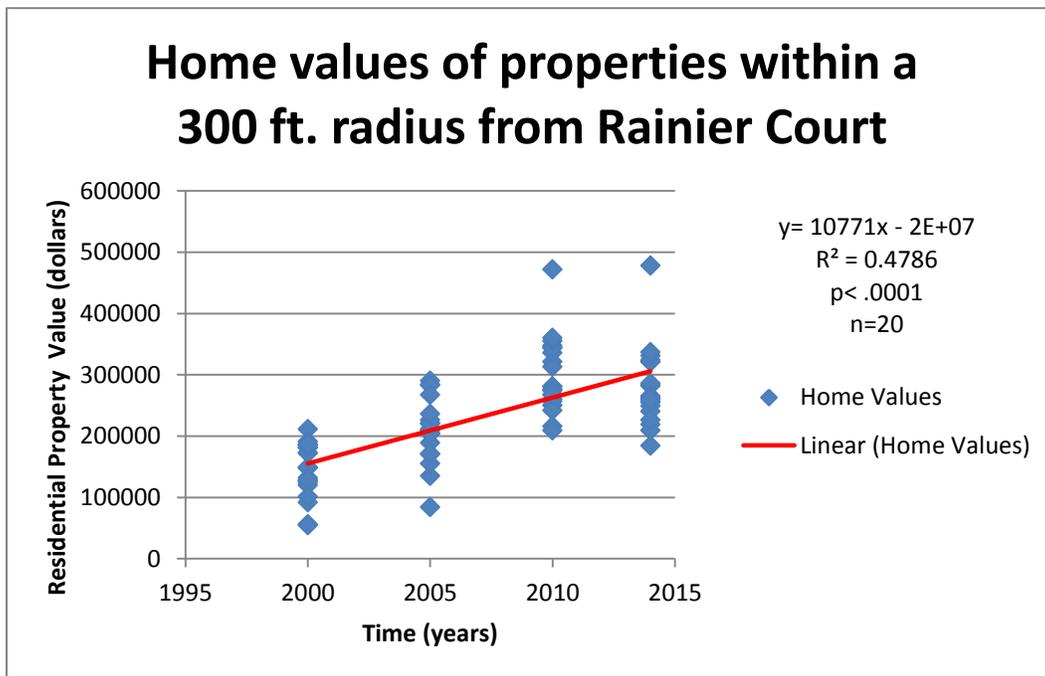


Figure 10: This 14 year trajectory of home values shows an increase over time significantly in regards to 300 foot distance from Rainier Court ($p < .0001$, $R^2 = .4786$).

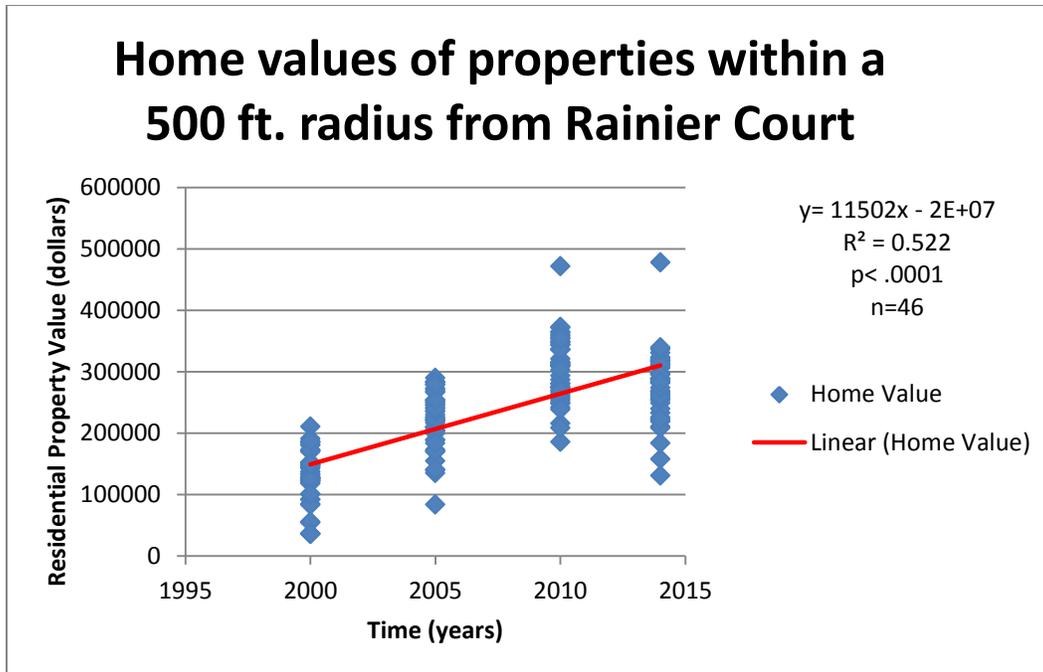


Figure 11: This 14 year trajectory of home values shows an increase over time significantly in regards to 500 foot distance from Rainier Court ($p < .0001$, $R^2 = .522$).

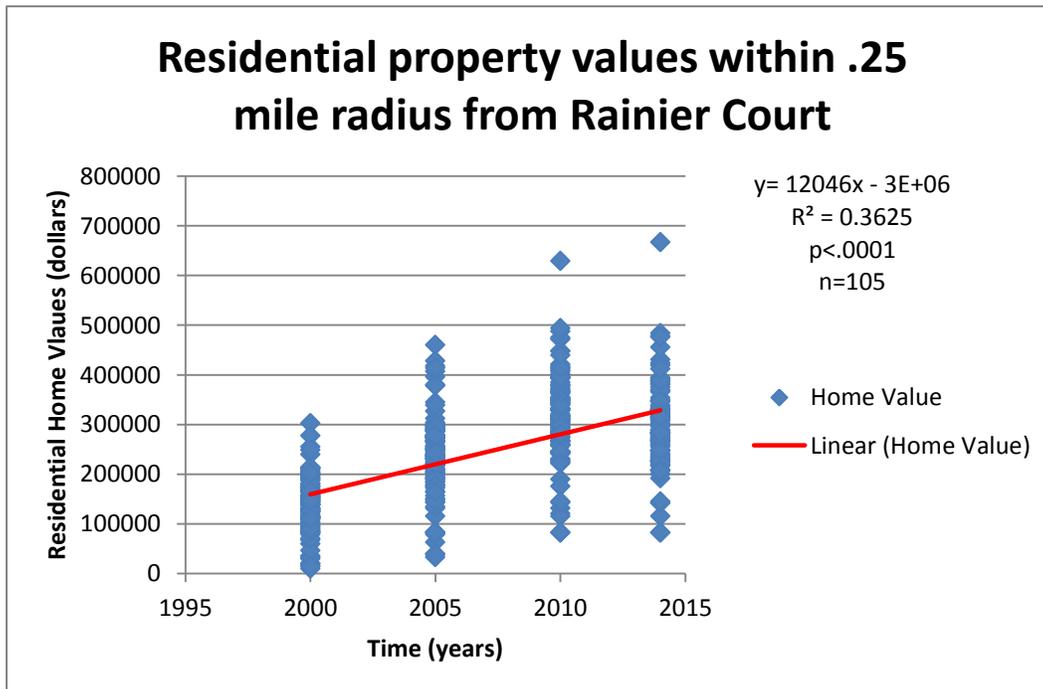


Figure 12: This 14-year trajectory of home values shows an increase over time significantly in regards to 1320 foot distance from Rainier Court ($p < .0001$). The further distance from Rainier court show that this model indicates a weaker relationship between home values and time ($R^2 = .3625$).

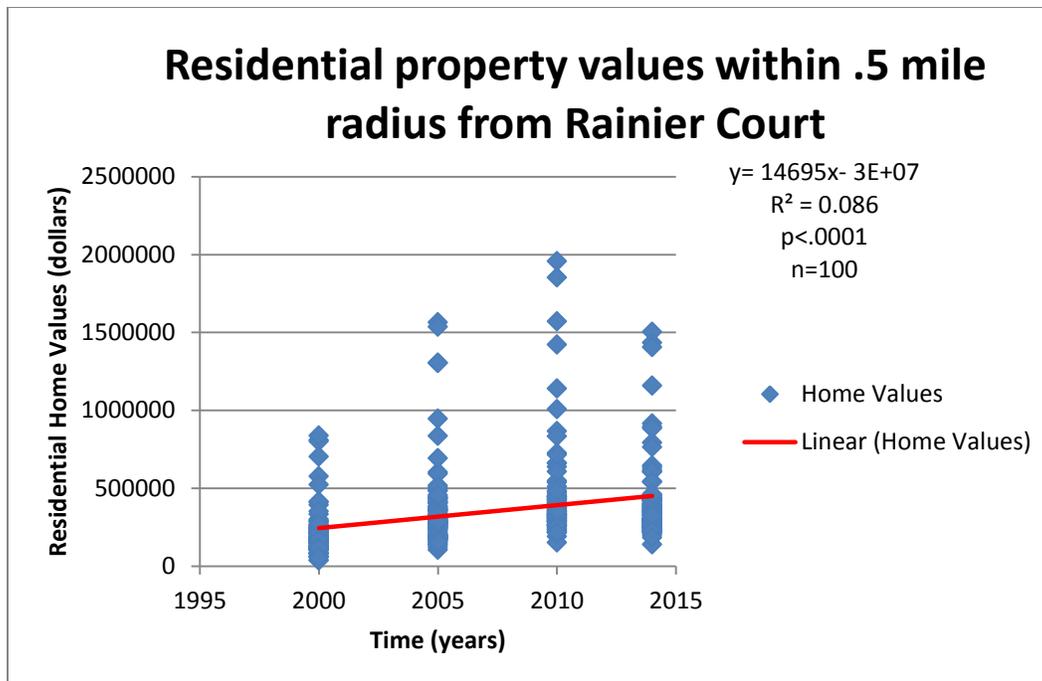


Figure 13: This 14 year trajectory of home values shows an increase over time significantly in regards to 2640 foot distance from Rainier Court ($p < .0001$). The further distance from Rainier court show that this model indicates a weaker relationship between home values and time ($R^2 = .086$).

Qualitative Data

Qualitative data was collected during professional interviews with stakeholders from local governments, technical advisors, non-profits and state program managers. Open and closed ended question relating to the brownfield redevelopment at Rainier Court as well as brownfield impacts in general on surrounding property values were discussed. Examining stakeholder opinions about the impact of brownfield redevelopment on surrounding communities provides insights to intangible variables such as civic pride, sense of place and perceived safety effects to the community as well as to the environment, i.e. cleanup. Interviewee's experience with brownfield redevelopment projects ranged in involvement from 7-32 projects.

Professional Surveys

Three themes were identified from the results from conducted professional interview. Three themes are identified below.

1. Brownfields impact on residential property values
2. Gentrification is a concern when property values increase
3. Size and location and of brownfield have influence on perception of environmental or human health risks

An interview with a Brownfield Program Manager who works with financial aspects of brownfield funding, highlighted the power of perception when it comes to contaminated properties. For example, there is a 900-acre parcel in Spokane, WA, an old rail yard used for industrial purposes for decades. 500 acres are obvious industrial areas, 140 acres have confirmed contamination and 120 acres is the intensive railroad usage with the heaviest of contaminations. Therefore, 140 acres remain stagnated that is safe, buildable land of which no one wants due to the perception of contamination associated with the location. The underuse site furthers blight in the area and may be deflating surrounding property values and referred to the Harding et al. (2009), study on foreclosures' effects of home values. The program manager expressed that the sight would be perfect for industry or high intensity land use similar to that of the past, of at least 20 jobs per acre. Unfortunately, the larger the site results in a greater perceived contamination.

An interview participant from a brownfield program planning perspective agreed with the consensus of the literature and respondents in that residential property values may be lower nearby brownfield sites. The

participant estimated an impact could extend to a few miles or as small as a neighborhood depending on context of the site itself. The place-based influence within the community was highlighted as a driver of positive outcomes regarding reuse options for brownfield sites. Sprawl, gentrification and changes in land use zoning were a concern with changes in property values if raised too quickly. Therefore, a disproportionate burden would be reflected more on low-income communities, forcing those to seek housing elsewhere.

An interview respondent associated with a localized brownfield program agrees with the consensus that blighted or underutilized brownfield sites can depress the value of surrounding residential property. The impacts are not known and no before and after studies have been conducted by the County's brownfield program. Reuse options for redevelopment weigh heavily on the potential outcomes of a project. For example, commercial reuse options may have differing impacts than if it were a small neighborhood site.

The three themes lined up with the consensus in the literature supporting that residential property values are hindered by the perception of contamination, i.e. brownfields and blight. The reuse and scale also support that mentioned by interviewees and the literature. The context of the redevelopment is crucial to the success of a redevelopment project for the community. When addressing social issues such as affordable housing, governments must take care not to help create conditions not suitable for the community needs. Increased tax revenue from

brownfield redevelopment projects can be beneficial in generating dollars to be used publicly elsewhere (De Sousa et al, 2012). However, there is a careful balance in expected outcomes versus unforeseen or unwanted outcomes in the field of urban planning.

Discussion

Phases One and Two of the Rainier Court redevelopment project were initiated in 2003 and completed by 2005. Phases Three and Four are not measured due to the completeness of the projects. The quantitative data collected for this research was specific to 2000, 2005, 2010, and 2014. Due to the relatively short timeline to project completion, the limited temporal analysis it is difficult to make the assumption that property values were hindered by the blight of the Rainier Court site before remediation and redevelopment commenced. The data collected in this research does not support this claim. Considering 35 years of illegal dumping and other area wide social factors including other crimes, a more detailed study could measure other possible factors influencing home values. A more detailed study, such as mentioned, could provide fact driven statements that brownfield redevelopments are indeed vital influences in altering the local landscapes regardless of other changes are occurring in the area. More case studies addressing these factors in regions less populated might show a stronger relationship between distance from a brownfield and residential home values.

Small-scale projects would provide additional insights in that larger projects may occur around larger populations, often not as vulnerable to change. Considering the property values in the Seattle metropolitan area rank in the top five, this may have skewed the data analysis findings. A comparative analysis

including smaller towns with smaller scale projects, and potentially smaller funding, may provide better insights to the relationship between brownfield sites and residential property values.

CONCLUSION

Environmental, economic and equitable concerns remain a focus in a systems thinking approach. These concerns are peppered throughout brownfield redevelopment projects. Imminent population growth, habitat vulnerability, ecosystem services and limited resources of the future can be better understood and therefore protected from implementing a multilateral approach to future land use design with sustainability goals. While contamination threats to human health remain a priority, many other disciplines determine project outcomes. From examining these other disciplines and their relationships to each other, I reveal larger system dynamics and power structures influence brownfield redevelopment projects.

Measuring residential property value effects from the Rainier Court brownfield redevelopment project is the focus of this research. From my analysis, I conclude more temporal data collection is needed to better explain a change in property values from brownfield redevelopment efforts. While many factors influence changes in property values, more data would be necessary to fully account for any relationship between before and after effects of brownfields redevelopment projects.

Analysis of the themes from interviews and the data collected suggest relationships to distance from brownfields exist. To examine and better understand the relationships more case studies focused on communities may highlight missing linkages to overall perceptions of brownfields to communities. The data analysis suggests and highlights the importance of an interdisciplinary

focus to measuring brownfields influences. Social factors would include community input and data collection of characteristics of the surrounding area before and after projects begin. The spatial relationship of brownfield influences on nearby communities and shape landscapes in a multitude of ways. The economic driven data suggests that complexities exist in and are difficult to measure when socio economic environments are present.

The pragmatic worldview is focused on problem centered real world situations fulfill research questions, and are aligned with environmental protection and economic motivations. The limitations of such an approach can obfuscate the subjectivity and uniqueness of brownfield redevelopments. As shown in this research, further examination of data may reveal the common assumption that brownfields effect residential property values nearby. Use of additional worldviews in addressing brownfield success should include systematics including sustainability theory, social constructivism to address assumptions about the world around us.

Externalities of brownfield redevelopments are complex and difficult to measure. Understanding spillover effects on surrounding a community, such as home values, can highlight subjectivity and desirable outcomes of brownfield projects. Additional case studies in the field of risky brownfield redevelopments may provide insights in regard to brownfield project size and various end use options can provide an opportunity to measure impacts to surrounding areas and support public funding. Several studies do so in a large-scale analysis (De Sousa et al, 2012 & Harding, 2009). My findings suggest more small-scale case study

research may be beneficial in addressing brownfields influences to a community through and data driven context, supporting a localized visions of sustainability as well as local government needs. Without measurements of the pieces, how can we measure the success of the whole? The central research questions addressed in this case study ask: Is the Rainier Court redevelopment in line with existing smart growth policies? Is there data to support claims that brownfield redevelopments increase residential property values? How can improvements be made to reach sustainability goals?

This research suggests that Rainier Court is in line with existing smart growth policies. The mixed-use design accommodating, senior and affordable housing solutions are in line with other community goals such as transportation upgrades. The data does support claims that brownfield redevelopment increase property values however, more data is needed to confirm that property values had actually decreased as a result of the contaminated properties. Other efforts in the community may have also had an accumulative influence on the market values. Additionally tax assessors' evaluation processes were not examined in this study and may provide insights to how properties were assessed for their taxable value.

Phases One and Two of the Rainier Court redevelopment project may be seen as an exemplary case as it has received the EPA Phoenix Award in 2005. Phases Three and Four were not specifically accounted for in the award criteria. Due to the ongoing project development of Phase Three and Four the project is not complete in totality. Seattle needs affordable housing for seniors and families.

To meet the needs of the public, the Seattle housing authority was already planning for development for housing.

Seven acres of land was idle, vacant and attracting crime. There was a large blight in the area due to a number of confounding factors including the brownfield. Additionally, federal assistance from the TBA and the BRLF may have been the differentiating factors in this brownfield redevelopment project and its success. Areas of this redevelopment project remain undeveloped (Phase Four). Federal funding frameworks allowed the local governments to utilize opportunities to include participation, accommodate for population growth, curb sprawl, and other smart growth objectives as required in Washington State. Thus, qualifying as measures of sustainable redevelopment success in the 3P framework.

Lastly, Washington Research Council concluded in 2002 on the subject, “For goals to have meaning in state law, it must be attached to a plan.” Sustainability is an ongoing process of evaluation and adaptation. Therefore, planning is an ongoing process that includes environmental consideration, social needs and economic development. From this research, I conclude that Rainier Court has met the fundamental achievements of sustainability as discussed. The time involved with measuring a brownfield success can take generations to uncover. Measurements should not be allocated in just dollars as in this research. By supplementing economic data, a focus on intangible outcomes would support claims to measuring success, and sustainability of brownfield redevelopment

projects overall. With a communicating interdisciplinary approach, this can be achieved.

Appendix A

Smart growth Principles:

- Compact Building Design
- Create Range of Housing Opportunities and Choices
- Create Walkable Neighborhoods
- Encourage Community and Stakeholder Collaboration
- Foster Distinctive, Attractive Communities with a Strong Sense of Place
- Make Development Decisions Predictable, Fair and Cost Effective
- Mix Land Uses
- Preserve Open Space, Farmland, Natural Beauty and Critical Environmental Areas
- Provide a Variety of Transportation Choices
- Strengthen and Direct Development Towards Existing Communities

Source: Adapted from the PDF "This is Smart Growth," published by ICMA and EPA in 2006. <http://www.smartgrowth.org/why.php>

Appendix B

1990-1991 Growth Management Act

The following goals are adopted to guide the development and adoption of comprehensive plans and development regulations of those counties and cities that are required or choose to plan under RCW 36.70A.040. The following goals are not listed in order of priority and shall be used exclusively for the purpose of guiding the development of comprehensive plans and development regulations:

- (1) Urban growth. Encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner.
- (2) Reduce sprawl. Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development.
- (3) Transportation. Encourage efficient multimodal transportation systems that are based on regional priorities and coordinated with county and city comprehensive plans.
- (4) Housing. Encourage the availability of affordable housing to all economic segments of the population of this state, promote a variety of residential densities and housing types, and encourage preservation of existing housing stock.
- (5) Economic development. Encourage economic development throughout the state that is consistent with adopted comprehensive plans, promote economic opportunity for all citizens of this state, especially for unemployed and for disadvantaged persons, promote the retention and expansion of existing businesses and recruitment of new businesses, recognize regional differences impacting economic development opportunities, and encourage growth in areas experiencing insufficient economic growth, all within the capacities of the state's natural resources, public services, and public facilities.
- (6) Property rights. Private property shall not be taken for public use without just compensation having been made. The property rights of landowners shall be protected from arbitrary and discriminatory actions.
- (7) Permits. Applications for both state and local government permits should be processed in a timely and fair manner to ensure predictability.
- (8) Natural resource industries. Maintain and enhance natural resource-based

industries, including productive timber, agricultural, and fisheries industries. Encourage the conservation of productive forest lands and productive agricultural lands, and discourage incompatible uses.

(9) Open space and recreation. Retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks and recreation facilities.

(10) Environment. Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.

(11) Citizen participation and coordination. Encourage the involvement of citizens in the planning process and ensure coordination between communities and jurisdictions to reconcile conflicts.

(12) Public facilities and services. Ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards.

(13) Historic preservation. Identify and encourage the preservation of lands, sites, and structures, that have historical or archaeological significance.

Source: Washington State Legislature, 2002

<http://apps.leg.wa.gov/RCW/default.aspx?cite=36.70A&full=true#36.70A>.

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Appendix C

SITE-SPECIFIC COMMUNITY INVOLVEMENT PLAN FOR RAINIER COURT DEVELOPMENT- Draft

Washington Coalition Brownfields Cleanup Revolving Loan Fund

1. Overview of the Community Involvement Plan

This Site-Specific Community Involvement (CI) Plan has been prepared in accordance with the Washington Coalition Brownfields Cleanup Revolving Loan Fund (BCRLF) Program Implementation Manual. The purpose of the CI Plan is to provide background and environmental information on the Rainier Court Project Phase I, and to indicate how the project proponents, including the Washington Coalition, King County and SouthEast Effective Development (SEED) will involve the community and solicit input into the project.

2. Site Background

Site Location The site is located at 3500 - 3700 Rainier Avenue South, Seattle, WA, 98118. The site consists of two parcels, which will be Phase 1 of a multi-phase development project.

Site/Facility History Since the 1940's the project site has been used for commercial purposes. Commercial uses included vehicle storage, welding, office space and a mortuary. There are three structures on the site, two of which are still being used for commercial purposes.

The site is part of a larger, 7-acre site that has been blighted for the past 30 years and has been used for illegal dumping and criminal activity. In 1997, the City assisted neighborhood volunteers in removing tons of garbage, including furniture, cars, baby diapers, tires and drug paraphernalia from the entire site. SEED, a nonprofit community development corporation that has purchased the site for cleanup and redevelopment, secured the site when it purchased the land, but the incidents of illegal dumping continue. Cleanup and redevelopment of the site will result in new housing and jobs and serve as a catalyst for additional investment in the area.

3. Site Investigation

Summary of Environmental Risks EPA has completed sampling on the site under its Targeted Brownfields Assessment Program. This included obtaining soil and groundwater samples on the site (Parcels B and C). Contaminants exceeding screening levels in the soil were not found beneath Parcel C. However, on Parcel

B, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), tetrachloroethene (PCE) and metals were detected above screening levels. In general, the magnitude of the contaminant concentrations and number of contaminants decrease with depth beneath the site. Groundwater contaminants detected beneath portions of the site include petroleum hydrocarbons, arsenic, manganese, lead, iron, PCE, trichloroethene (TCE) and vinyl chloride (VC). SEED intends to perform a remedial action that is protective of human health and the environment and meets cleanup standards in compliance with the Washington State Department of Ecology Model Toxics Control Act (MTCA) (WAC 173-340) dated February 12, 2001.

Analysis of Cleanup Alternatives for the Site A Remedial Investigation and Feasibility Study (RI/FS) and Cleanup Action Plan (CAP) have been prepared for this project. The Washington Coalition Brownfields Cleanup Revolving Loan Fund (BCRLF) Program and EPA Region 10 have determined that this RI/FS and CAP meet the requirements of an analysis of cleanup alternatives required for cleanups performed using BCRLF funds. The RI/FS CAP is available for review at the information repository and administrative record identified later in this document.

The following cleanup action alternatives were evaluated for the site:

Alternative 1: No action. Alternative 2: Isolation of the contaminants and implementation of institutional controls. Alternative 3: Design, installation and operation of in-situ remedial stabilization systems. Alternative 4: Excavation of contaminated soil with on-site treatment and reuse of the excavated soil. Alternative 5: Excavation of contaminated soil with off-site treatment disposal of the excavated soil at a permitted facility.

Preferred Remedial Action The preferred remedial alternative is a combination of excavation of contaminated soil with off-site treatment and disposal of the excavated soil at a permitted facility (Alternative 5), and on-site isolation of the contaminants and implementation of institutional controls (Alternative 2). In addition, a groundwater monitoring plan will be prepared and implemented for monitoring groundwater quality beneath the site after the remedial action.

4. Community Background

The Rainier Valley in Southeast Seattle has been the city's most diverse neighborhood for the past 40 years, with 60 different ethnic and cultural groups reported in the 2000 census. When compared with the rest of Seattle, the Rainier Valley has the greatest concentrations of low- and moderate-income people in the city, and many pockets of people in poverty. Seattle's two largest public housing

projects are located in this neighborhood, and 15%-20% of residents receive food stamps.

In recent years, there has been significant redevelopment in Southeast Seattle. The successful Rainier Valley Square shopping center opened, with 104,000 square feet of new commercial space and successful retail outlets. Since then QFC, Lowe's Hardware and Starbucks have opened successful stores in the area. The two public housing projects are being redeveloped into mixed-income neighborhoods with increased density and quality design, through HUD Hope VI Grants. In addition, the Sound Transit Link light rail project, the largest capital investment in the region, will be located along Martin Luther King Way South, less than a mile from the Rainier Court site.

The Seattle-King County Public Health Department reports that indicators of community health are weaker for this population than for other areas of the City and County. Key indicators include: unavoidable hospitalizations, which are 2-3 times higher than for the rest of the County; low birth weight; lack of prenatal care and teenage pregnancies, which are significantly higher than in the rest of the County; high early death rates; and lower life expectancy at birth, which is 75 years for Southeast Seattle as compared to 80 for other areas.

In recent years, there has been significant redevelopment in Southeast Seattle. The successful Rainier Valley Square shopping center opened, with 104,000 square feet of new commercial space and successful retail outlets. Since then QFC, Lowe's Hardware and Starbucks have opened successful stores in the area. The two public housing projects are being redeveloped into mixed-income neighborhoods with increased density and quality design, through HUD Hope VI Grants. In addition, the Sound Transit Link light rail project, the largest capital investment in the region, will be located along Martin Luther King Way South, less than a mile from the Rainier Court site.

Past Community Involvement with the Site SEED began planning the overall development project in 1995 and has involved community groups in the project from the beginning. The project was identified in two City of Seattle Department of Neighborhood Plans (Columbia City and I-90), and as such was subject to public review during the neighborhood planning process.

In addition, starting in 2002, SEED has met monthly with local community groups to describe project plans and progress and address concerns. These groups include the Courtland Action Team (comprised of local residents), the Mt. Baker Community Council, the Genesee Merchants Association and neighborhood Block Watch groups.

In 2003, SEED began the process of applying for a City of Seattle Master Use Permit (MUP), which requires SEED to conduct public meetings about this particular phase of the project. To-date, five design review meetings have been held for the general public, and SEED has continued to attend community group meetings as mentioned above.

Key Community Issues and Concerns- Concerns identified through a series of community interviews include the following: • Traffic impacts, • Adequacy of street and landscaping improvements, • Owner occupied units in addition to rentals, • Need for ongoing environmental monitoring, • Concern that the project be completed, • That the cleanup be done adequately, • That the project is too big in scale for the neighborhood.

To address these concerns, SEED is conducting the following activities: the developer of Rainier Court is working with the City of Seattle Department of Transportation on street improvements to reduce the traffic impacts of the project overall. The clean-up activity will be done according to a plan that is approved by the State Department of Ecology (DOE) and will be conducted by trained personnel with procedures that meet State and Federal regulatory requirements.

The project has also gone through the City's Design Review process, which includes public comment. The project was scaled-down in this process and specific amenities, including street and landscaping improvements have been developed and will become conditions of the building permit. The Washington State Housing Finance Commission has awarded the Rainier Court project tax credit financing which requires that the project be constructed and occupied by December 2004. SEED is working with the City and the State Department of Ecology to assure that necessary reviews and approvals are done in a timely manner so that the building can be constructed by that deadline.

Continued Community Involvement Plans Throughout the planning and cleanup process, monthly updates will be given in person and in writing to the groups listed in Attachment 2 and will also be placed in the information repository at the SEED offices for interested community members to review. In addition, there will be a 30-day public comment period on the draft RI/FS and CAP and that the comment period will be announced by publishing a notice in the Seattle Times and by notifying the community groups listed in Attachment 2. Comments submitted during the comment period will be considered by the Washington Coalition, Ecology, and the project owners before the final remedial plan is adopted. In addition, an Action Memorandum or equivalent document will be produced that documents the final plan and how any significant comments

received were addressed. Final project reports will be placed in the information repository and the administrative record after the remedial action is complete.

The project documents may be reviewed at the information repository located at the SEED offices, at 5117 Rainier Avenue South, Seattle, Washington, 98118, or at the administrative record located at the Washington State Department of Community, Trade and Economic Development (CTED), located at 128 – 10th Avenue SW, Olympia, WA, 98504-2525.

5. Schedule and Timeline

Rainier Court: Phase 1 City of Seattle issue grading permits September - October 2003

Dept. of Ecology approve cleanup plan September - October 2003

Clean up conducted October – December 2003

Construction begun December 2003

Completion and Occupancy December 2004

Attachments

Attachment 1: Locations of Information Repository and Administrative Record.

The Information Repository is located at SouthEast Effective Development (SEED) at 5117 Rainier Avenue South, Seattle, Washington, 98118. The Administrative Record is located at the Washington State Department of Community, Trade and Economic Development (CTED) at 128 – 10th Avenue SW, Olympia, WA, 98504-2525.

Attachment 2: List of Interested Groups and Contacts

The Rainier Court project has strong, broad-based support from the community, and SEED has involved community groups in the project from the beginning. SEED meets monthly with community groups to describe plans and progress and address concerns. These groups include the Courtland Action Team (comprised of local residents), the Mt. Baker Community Council, the Genesee Merchants Association and the Rainier Chamber of Commerce. Contact information for these groups is listed below.

Courtland Action Team Diana Vibh 3618 Courtland Place S Seattle, WA 98144
(206) 383-1716

Kevin Dour 3637 - 36th Ave. S Seattle, WA 98144 (206) 725-2753

Genesee Merchants Assoc. Grover Haynes 5217 S. Alaska Seattle, WA 98118
(206) 722-6947

Rainier Chamber of Commerce Susi Burdick Burdick's Security 4728 Rainier
Avenue S. Seattle, WA 98118 (206) 723-0773

Mt. Baker Community Club Kim Burroughs 3450 Cascadia Ave. S Seattle, WA
98144 (206) 722-5078

List of Figures

Figure 1: Site Location Map

Figure 2: Site Diagram

Bibliography

- Adams, D., De Sousa, C., & Tiesdell, S. (2010). Brownfield Development: A Comparison of North American and British Approaches. *Urban Studies*, 47(1), 75–104. doi:10.1177/0042098009346868
- Anthony, J. (2004). Do state growth management regulations reduce sprawl? *Urban Affairs Review* 39: 376-397, doi:10.1177/1078087403257798, Retrieved from: <http://uar.sagepub.com/content/39/3/376.abstract>
- Au-Yeung, B., Yigitcanlar, & T. Mayere, S. (2009). Brisbane urban growth model: integrated sustainable urban and infrastructure management in Brisbane. In *Infrastructure Research Theme Postgraduate Student Conference 2009*, 26 March 2009, Queensland University of Technology, Brisbane. p.5, Retrieved from: <http://eprints.qut.edu.au/20707/1/20707.pdf>
- Boyd, J., & Banzhaf, S. (2006) What are ecosystem services? The need for standardized environmental accounting units. *Ecological Economics*, 63, 616-626. Retrieved May 1, 2014, from <http://www.sciencedirect.com.bay.evergreen.edu/science/article/pii/S0921800907000341>
- Brill, C. W. (2009). Using GIS to contrast perceived versus preferred priorities for brownfield redevelopment in Worcester, Massachusetts. *Journal of the Urban & Regional Information Systems Association*, 21(2), 49-57.
- Bryson, J. (2012). Brownfields gentrification: redevelopment planning and environmental justice in Spokane, Washington. *Environmental Justice*, 5(1), doi: 10.1089/env.2010.0045
- Chakrapani C. & Hernandez, T. (2008). Brownfield Redevelopment and the Triple Bottom Line Approach. Centre for the Study of Commercial Activity. Retrieved October 24, 2012, from <http://www.mah.gov.on.ca/Page9933.aspx>
- Cullen, J. B. & Levitt, S.D. (1999) “Crime, urban flight, and the consequences for cities,” *Review of Economics and Statistics*, 81, 159-169
- Davis, T. (2002). Brownfields a comprehensive guide to redeveloping contaminated property. (2nd ed.). United States of America: American Bar Association.
- DeSousa, C. A., Wu, C., & Westfal, L. M. (2009). Assessing the effect of publicly assisted brownfield redevelopment on surrounding property values. *Economic Development Quarterly*, 23(2), 95-110. doi: 10.1177/089124208328379

- Durning, A. T. (1996). *The car and the city, 24 steps to safe streets and healthy communities*. Seattle: Northwest Environment Watch.
- Eisen, J. (1999). Brownfields policies for sustainable cities. *Duke Environmental Law & Policy Forum*, Vol. 9, p. 187-229, Retrieved from: <http://ssrn.com/abstract=1921766>
- Eisen, J. (2007). Brownfields at 20: A critical reevaluation. *Fordham Urban Law Journal*, 34, 721-756 Retrieved from <http://law2.fordham.edu/publications/articles/400flspub8507.pdf>
- Gibbs, J. P. & Erickson, M. L. (1976). "Crime Rates of American Cities in an Ecological Context," *American Journal of Sociology*, 82(3), 605-620.
- Great Lakes Commission (2001). Linking brownfield redevelopment and greenfields protection for sustainable development. Bridges, Retrieved from: <http://www.glc.org/bridges/9-01BridgesI.pdf>
- Greenberg, M., Mayer, H., Miller, K. T., Hordon, R., & Knee, D. (2003). Reestablishing Public Health and Land Use Planning to Protect Public Water Supplies. *American Journal of Public Health*, 93(9), 1522-1526. doi:10.2105/AJPH.93.9.1522
- Gute, D. M., & Taylor, M. (2006). Revitalizing neighbourhoods through sustainable brownfields redevelopment: principles put into practice in Bridgeport, CT. *Local Environment*, 11(5), 537-558. doi: 10.1080/13549830600853452
- Harding, J. P., Roseblatt, E., & Yao, V. W. The Contagion Effect of Foreclosed Properties. *Journal of Urban Economics*, 66, 164-178. Retrieved May 1, 2014, from: http://papers.ssrn.com/sol3/apers.cfm?abstract_id=1160354
- Hayek, M., Arku, G., & Gilliland, J. (2010). Assessing London, Ontario's brownfield redevelopment effort to promote urban intensification. *Local Environment*, 15(4), 389-402. doi: 10.1080/13549831003677712
- Heberle, L. (2006). Connecting smart growth and Brownfield's redevelopment, *School of Urban and Public Affairs*, University of Louisville. Retrieved on June 6, 2011 from: http://cepm.louisville.edu/publications/PDF_docs/smart%20growth%20and%20brownfields%20for%20website.pdf
- Hoole, J. City of Seattle Department of Neighborhoods, Historic Preservation Program (2011). *Public housing in southeast Seattle: 1940- present*.

Retrieved from website:

<http://www.seattle.gov/neighborhoods/preservation/sotheastseattle>

International City County Management (2010), Putting smart growth to work in rural communities, Smart Growth Network (www.icma.org); at

<http://icma.org/Documents/Document/Document/301483>.

Kubasek, N., & Silverman, G. (2008). Environmental law. Sixth Edition. New Jersey: Pearson Prentice Hall

Kurdila, J., & Rindfleisch, E. (2007). *Funding opportunities for brownfield redevelopment*, 34 B.C. Env'tl. Aff. L. Rev. 479 Retrieved from:

<http://lawdigitalcommons.bc.edu/ealr/vol34/iss3/3>

Mohal, P., & Saha, R. (2007). Racial inequality in the distribution of hazardous waste: A national-level reassessment. *Social Problems*, 54(3), 343-370.

Retrieved from <http://www.jstor.org/stable/10.1525/sp.2007.54.3.343>

Schädler, S. S., Morio, M. M., Bartke, S. S., Rohr-Zänker, R. R., & Finkel, M. M. (2011). Designing sustainable and economically attractive brownfield revitalization options using an integrated assessment model. *Journal Of Environmental Management*, 92(3), 827-837.

doi:10.1016/j.jenvman.2010.10.026

Smartgrowth.org (2011). *Smart growth principles*. Retrieved on June 6, 2011 from Smartgrowth.org website: <http://www.smartgrowth.org/why.php>

Spielman, S., & Thill, J. (2007). Social area analysis, data mining, and GIS. *Computers, Environment and Urban Systems*, 32, 110-122. doi:

10.1016/j.compenvurbsys.2007.11.004

Synder, K. & Bird, L. (1998). Paying The costs of sprawl: using fair-share costing to control sprawl. Retrieved from:

<http://www.smartcommunities/articles/sprawl.shtml>

United States Environmental Protection Agency, Brownfields and Land Revitalization (2009). *Brownfields Definition*. Retrieved June 6, 2011,

from The United States Environmental Protection Agency website:

<http://epa.gov/brownfields/overview/glossary.htm>

United States Environmental Protection Agency, Brownfields and Land Revitalization (2011) Rural revitalization: EPA's Brownfield program working with small and rural communities. *Factsheet*. Retrieved June 6, 2011, from United State Environmental Protection Agency website:

<http://epa.gov/brownfields/policy/bf-Ag-FactSheet-4-5-11.pdf>

Washington Research Council. (2002) Economic development growth management's missing link. *Policy Briefs*, PB 02-1. Retrieved on June 6,

- 2011 from Washington Research Council website:
<http://www.researchcouncil.org/docs/PDF/WRCGrowthLandUse/EconDevelGrowthMgmtMissingLink.pdf>
- Washington State Department of Commerce. (2009). Smart growth. Retrieved from: <http://www.smartgrowth.org/why.php>
- Washington State Department of Ecology. (2011) Washington State Brownfield Policy Recommendations; Redeveloping Brownfield/ Revitalizing Our Communities. (2011, September). Retrieved from www.ecy.wa.gov/biblio/1109051.html
- Washington State Legislature (2002). *Comprehensive plans- Mandatory elements*. Retrieved June 6, 2011, from Washington State Legislature website: <http://apps.leg.wa.gov/RCW/default.aspx?cite=36.70A.070>
- Washington State Legislature (2002). *Growth management — planning by selected counties and cities*. Retrieved June 6, 2011, from Washington State Legislature website: <http://apps.leg.wa.gov/RCW/default.aspx?cite=36.70A&full=true#36.70A.010>
- Wedding, C. G., & Crawford-Brown, D. (2007). Measuring site-level success in brownfield redevelopments: a focus on sustainability and green building. *Journal of Environmental Management*, 85, 483-495.
- Wegmann, J., & Nemirow, A. Institute of Urban and Regional Development, (2011). *Secondary units and urban infill; a literature review (2011-02)*. Berkley: University of California.
- Wernstedt, K., Heberle, L., Alberini, A., & Meyer, P. (2004). *The brownfields phenomenon: Much ado about something or the timing of the shrewd*. Washington, DC: Resources for the Future.
- Wilson, B., & Chakraborty, A. (2013). The environmental impacts of sprawl: emergent themes from the past decade of planning research. *Sustainability*, 2013(5), 3302-3327. doi: 10.3390/su5083302
- Wolfe, C., & Symington, P. (2009) From Barriers to Solutions and best practices: urban centers and TOD in Washington . *The Quality Growth Alliance, The Runstad Center for Real Estate Studies, The College of Built Environments University of Washington*. Retrieved from: <http://www.qualitygrowthalliance.org>
- Yates, J. J. (2012). Abundance on trial: the cultural significance of "sustainability". *The Hedgehog Review*, 14(2), Retrieved from www.iasc-culture.org/THR?THR_article_2012_Summer_Yates.php