Quick Study:
City of Lakewood connects commuter rail station to downtown

RDI technology helps connect pedestrians and bicycles to transit

The City of Lakewood, Washington, a community of 60,000 residents and 1,100 businesses in the Puget Sound Region, is actively implementing emerging regional, state and federal policies on greenhouse gas emission reduction, multi-modal transportation and transit-oriented development. In 2009, Lakewood released the Lakewood Non-Motorized Transportation Plan, a comprehensive plan to enhance the Lakewood urban area pedestrian and bicycle system and effectively apply these policy principles. The Plan was conducted through coordination with Sound Transit, Pierce Transit and the Puget Sound Regional Council.

Figure 1. Conceptual rendering of Sounder station in Lakewood.

Lakewood's plan highlights the city's priorities on filling critical system gaps, including connecting pedestrians and cyclists to a recently-constructed Sound Transit "Sounder" commuter rail station (Figure 1). ViaCity's RDI technology helped identify and evaluate station area planning improvement options supporting the city's plan.

The Station: So Close, But So Far Away

The Sounder station is straddled by barriers to pedestrian and bike access: it is located between the rail tracks and Highway 99, and immediately to the south is Interstate 5. Pedestrians and cyclists today have no direct way to cross the tracks or I-5 to access the Sounder station, so over-crossings are needed. Additional access improvements are also needed to fully connect Lakewood's central business district to the Sounder Station (Figures 2 and 3).

Figure 2. Sounder station in Lakewood. Lakewood's plan identifies over-crossings for I-5 and rail lines – major impediments to bicycle and pedestrian travel and access to the station – and other options for bikes and pedestrians.

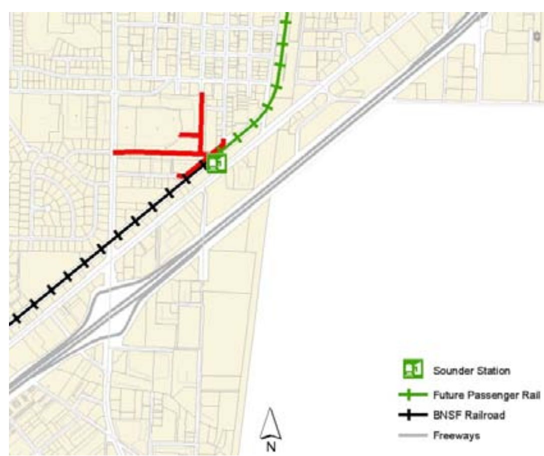

Figure 3. Non-motorized connection across the rail tracks, with supporting pathways. The proposed commuter rail station is shown as a green icon.

RDI Measures the Impact of New Connections

RDI technology helps to quantify the impact of Lakewood's planned connections to the Sounder station. Analysis of Before and After scenarios begins with baseline GIS data including the Sounder station as the destination, the rail line as a pedestrian and bicycle barrier, the street centerline file data, and parcel data for studying both connectivity and the connectivity/land use relationship. The initial study area is a 1 mile radius around the rail station. The included parcels, for the most part residential properties, are weighted by the number of residents per parcel.

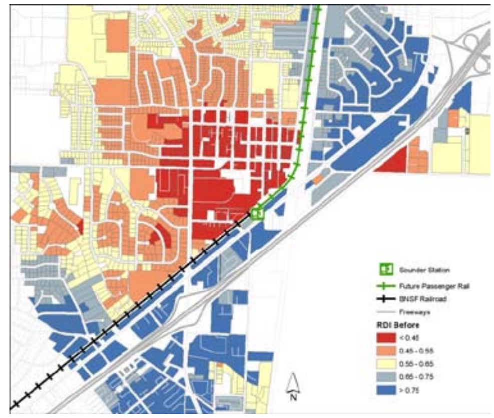

Figure 4. Lakewood's average RDI connectivity to the Sounder station before improvements = 0.63. Parcels that are poorly connected to the Sounder station are shown in shades of red, better connected parcels are in deeper shades of blue.

Figure 4 shows a ViaCity map of the Sounder station's existing connectivity to the Lakewood study area, without pedestrian and bicycle improvements. The ViaCity software scores each parcel's connectivity to the station. This map highlights areas to target for improvement – the parcels in red, while close in crow-flight distance to the station, have poor connectivity because pedestrians have to walk out of direction to reach the closest rail crossings. While the average RDI connectivity score for the study area is an adequate 0.63, much of the core area of Lakewood scores very poorly with RDI scores under 0.45.

In Figure 5, the planned rail crossing and bike/ped connections have been added, and new RDI results show a big connectivity boost for the core area of Lakewood. The average RDI connectivity score for the entire study area jumps to 0.77, an increase of 22%.

Figure 5. Lakewood's average RDI connectivity to the station after planned improvements = 0.77. The core area of Lakewood is now very well connected to the Sounder station.

Change is Good

In the study, 2,803 parcels – nearly 50% of all parcels analyzed – receive at least a minor connectivity benefit (RDI change >0.05) from the planned improvements. 2,300 parcels – 40% of the study – receive a major connectivity benefit (RDI change >0.20). Figure 6 is a ViaCity map of the RDI connectivity change results, with lighter shades of blue representing minor gains and deeper shades representing significant gains.

Figure 6. Relative connectivity in the Lakewood core area greatly improves after the addition of new paths and rail crossing. Parcels that benefit the most are shaded in deepest blue.

Land Use Analysis Highlights Density

Because ViaCity quantifies connectivity at the parcel level, RDI scores can be integrated into other geospatial analyses measuring land density, land use mix, and the quality of the network.

The 3D views in Figures 7 through 9 show the previous RDI data with land use density plotted as the parcel height. Denser parcels in the core of Lakewood receive higher connectivity benefit from the rail crossing and other improvements. Serving the higher density areas with better connections to transit, bicycle, and pedestrian facilities will contribute to residents driving less, reducing vehicle miles traveled and directly impacting greenhouse gas emissions.

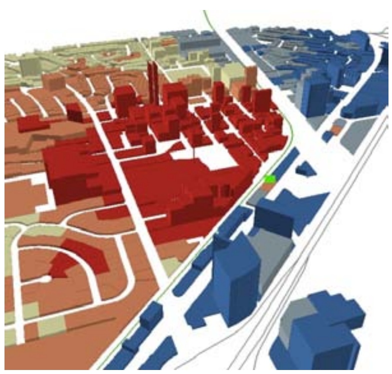

Figure 7. RDI scores connectivity at the parcel level, allowing scores to be related to land use information and other GIS data. In these images, "taller" parcels reflect higher land use density (address points per acre). This image shows Lakewood station area land use density and RDI before improvements. The Sounder station is shown as a green square.

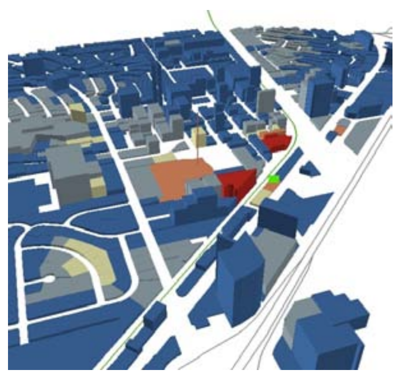

Figure 8. Lakewood station area land use density and RDI after improvements. Many of the higher density residential parcels receive a significant increase in connectivity as a result of the improvements.

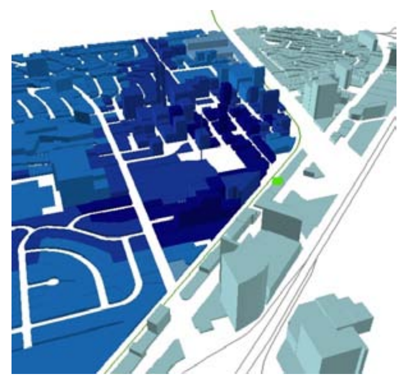

Figure 9. Lakewood station area land use density and RDI relative change.

In Lakewood, Other Measures Don't Measure Up

The Lakewood Sounder station also serves as a reference point for RDI as a connectivity measurement versus other techniques.

Intersection Density (ID) and Link-Node Ratio (LNR) are common measures in practice, but the Lakewood area study indicated neither measure could effectively quantify the benefits of new key connections. Figure 10 shows an ID map of Lakewood after improvements, a map that is nearly identical to the "before" map. The analysis showed ID changed only 1.4% after improvements; LNR changed less than 1%.

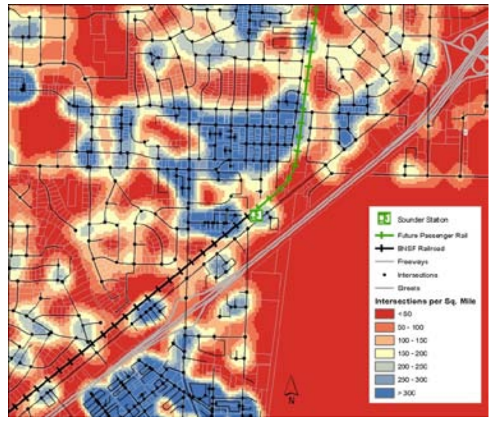

Figure 10. "Before" and "After" Intersection Density maps show nearly identical results in the Lakewood station area, and do not help assess the impact of connectivity changes.

It was realized after this analysis that RDI reflects a more intuitively realistic connectivity change of 22%, as shown in Table 1.

While ID and LNR maps may help planners and decision-makers see the density of development and number of cul-de-sacs, neither factors specific route distances nor is tied to parcels. So as quantitative tools, they only approximate connectivity, are not able to incorporate parcel-level results, and lack flexibility for additional geospatial analysis when compared to RDI.

Lakewood Station Area Results	Before	After	Change
Intersection Density (intersections / square mile)	144	146	1.4%
Link-Node Ratio	1.29	1.30	< 1%
Walkscore (1 = poor, 100 = good)	89	--	--
Average RDI	0.63	0.77	22%

Table 1. Evaluating Lakewood connectivity by ID, LNR, Walkscore, and RDI

Some consumers look to Walkscore.com as a quick easy way to gauge pedestrian walkability. But Walkscore's measures are also poor proxies for connectivity – they also don't factor routes, but measure distance as straight lines across a landscape that is assumed to be barrier-free. For example in Lakewood, despite the formidable pedestrian barriers of I-5 and the rail line sandwiching the station, the Lakewood Sounder station receives a Walkscore of 89 of 100, an incredibly high score. The Lakewood analysis shows Walkscore can provide approximate distances, but the simplistic nature of the tool also leads to inaccuracies that, when combined with lack of features for assessing change in a transportation system, severely limits its effectiveness for professional planning purposes.

Data courtesy City of Lakewood

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