*Stepping into a new future*

# Safe Routes to Kihei High School: *Pedestrian Route Study*

Kihei, Maui, 2014


*Prepared for Group 70 and Hawaii Department of Education*
*Prepared by Walkable and Livable Communities Institute*

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# A MESSAGE From Dan Burden

I have dedicated the bulk of my life to helping North America get back on its feet by working with communities to improve their built forms to be more walkable, livable and welcoming of people of all ages and abilities, while still preserving the need to move people and goods by motor vehicle. As the Director of Innovation and Inspiration and Co-Founder of the Walkable and Livable Communities Institute, I am pleased to have the opportunity to assist communities like Kihei as they strive to ensure the most vulnerable amongst us—our children—have safe access to their schools, their sport fields, their homes, their lives.

Having met with and seen the commitment of the Hawaii Department of Education, school officials, elected leaders, county staff, parents, landowners, and community members who took part in this report, I am a believer in your future. The right people are coming together to make safe routes and complete streets a reality and model on Maui.

There is no doubt, though: Kihei has its fair share of challenges to achieving safe routes, such as policy oversights, siting of the school in today what still is a remote area, streets that encourage too-fast vehicle speeds, a street network that lacks connectivity, and more. The good news is that all of these challenges are opportunities that can be overcome and this report provides the guidance for beginning to do just that.

We are in a major shift in how we design communities. For more than 60 years travel by automobile became the dominant mode of transportation for most communities in the United States. During the past decades, significant resources have been invested and advanced engineering have been applied to move more cars and to move them faster. The result is streets that accommodate cars and deter people from active transportation. It has also influenced local, regional and state land settlement practices—strip centers, cul-de-sacs, poorly sited schools and single-use zoning—that compound the problem, producing auto dependency. These decisions have affected economies, community and environmental health, and overall quality of life. Today we are being asked to solve a new problem: how to re-imagine the public realm that honors people and place, while continuing to move people and goods in motor vehicles. I worked in Florida State Department of Transportation (DOT) for 35 years, I know the challenge we face first hand. The task is immense, and work on it must begin now.

State leaders, including governors, legislators and DOT officials, have the ability to transform the transportation system by changing policies and priorities to ensure streets become the hallmarks of diverse, vibrant and thriving cities and towns. Hawaii has passed a Complete Streets Policy, and the counties have followed suit. We now need to move towards implementation and creating the model projects. Choose places where the community is ready, supportive and there is a high priority destination, such as a school. The future Kihei High School is a project waiting to showcase collaboration and the new proven safety countermeasures that help to include all modes—pedestrians, bicyclists, transit, trucks, emergency vehicles, and automobiles—in the design of our streets. Until we have healthy communities, we cannot have healthy people. In addition to supporting improved health, safe routes and complete streets to school help to boost students' academic performance, broaden their social networks and help them learn important self-reliance skills that will last them a lifetime.

This report provides guidance to support the Hawaii DOT and Kihei community in energetically changing the built environment by planning, engineering and re-working streets that build the communities as whole, livable places. It is my observation that once people come together and agree to work upon a common vision and develop a plan, the desired outcomes come quite fast. As you read this report, consider the main goal of the entire study: to provide safe routes to and from school for people—children—who do not drive and who have much to gain from commuting under their own power. Envision the recommended changes and you will see how they will help each driver who comes to or passes a school to be more alert, yielding, caring and considerate when in the vicinity of children. May the winds of change bring much good to you, and through you.

Sincerely,

Dan Burden
Director of Inspiration and Innovations
Walkable and Livable Communities Institute

Creating an environment that supports active modes of transportation requires scaling our streets. While this photo shows a "Walk" signal, the street is not conducive to walking. It is out of scale for active transportation. Successful and sustainable communities include a range of distinct places—from quiet residential streets to bustling village centers. Following a long period of auto-centric street development and the unintended and negative effects this has had on the health, economic vitality, connectedness and well-being of entire communities, many organizations, agencies and advocates are working together to make towns healthy and sustainable again. This major shift requires that the community approach transportation planning with a focus on integrating all modes: pedestrians, bicyclists, transit, freight and motorists.

# INTRODUCTION: Toward A More Prosperous Future

Many of us can still remember when walking and bicycling to school was a part of everyday life. Our stories recount experiences of independence, self-discovery, accessibility, and overall freedom. Today, however, the story is very different. Many children today have less independence than their parents did, negatively impacting their social development.[1] For example, driving a child from home to school limits the child's opportunities to interact with their neighborhood and peers, creating an environment where children lose relatively "safe" opportunities to make decisions independently.[2] In addition, a growing body of evidence has shown that children who lead sedentary lifestyles are at risk for a variety of health problems such as obesity, diabetes and cardiovascular disease. Seventy percent of Hawaii school children get inadequate physical activity and 30 percent are overweight/obese. Walking and bicycling positively impact childhood physical activity. However, safety concerns prevail; Hawaii is ranked first in pedestrian and third in bicycle fatalities.[3]

As communities have turned their focus away from ensuring children can walk or bike safely to school, communities also have allowed their streets to become designed only for vehicle speed and capacity, and not for people. Level of Service focuses on vehicle mobility at the expense of all other modes. Up until recently, Levels of Service for pedestrians, bicyclists and transit users has not been considered acceptable.

National trends show the share of automobile miles driven by Americans in their twenties has dropped from 21 percent in the late nineties to just 14 percent today. The number of nineteen year-olds who have chosen not to earn driver licenses has almost tripled since the late seventies, from 8 percent to 23 percent.[4] According to Wilson Okamoto's Traffic Impact Report, historical traffic count data obtained from the Hawaii Department of Transportation, Highway Division survey stations in the vicinity of the future Kihei High School indicates that traffic volumes have remained relatively stable [over the last several years]. These statistics are particularly meaningful when one reflects on how the U.S. landscape has changed since the seventies when most American teens could, and did, walk to school, to the store, to the sports field, to the beach, a stark contrast from today.

Walking and bicycling contribute to the developmental health of children.

There are many benefits of physical activity for youth including[1]:

- Weight and blood pressure control
- Bone, muscle and joint health
- Reduction in the risk of diabetes
- Improved psychological welfare
- Better academic performance[2]

1 American Heart Association. Exercise (Physical Activity and Children). Available: www.americanheart.org/presenter.jhtml?identifier=4596.

2 California Department of Education. A study of the relationship between physical fitness and academic achievement in California using 2004 test results. Available: http://www.cde.ca.gov/ta/tg/pf/documents/2004pftresults.doc.

1 Huttenmoser M. Children and Their Living Surroundings: Empirical Investigations into the Significance of Living Surroundings for the Everyday Life and Development of Children. Children's Environments 1995 December; 12(4), Available:http://www.colorado.edu/journals/cye/CYE_BackIssues/.

2 Hillman M. The Impact of Transport Policy on Children's Development. Presentation at the Canterbury Safe Routes to Schools Project Seminar, London U.K. May 29, 1999. Available:http://www.spokeseastkent.org.uk/mayer.htm.

3 2007 Hawaii Physical Activity and Nutrition (PAN) Plan http://activelivingresearch.org/comprehensive-multi-level-approach-passing-safe-routes-school-and-complete-streets-policies-hawaii

4 Jack Neff, "Is Digital Revolution Driving Decline in U.S. Car Culture?"

The last sixty-plus years have focused on applying advanced engineering to move more cars and to move them faster. Most roadways have been designed primarily for automobile and truck travel, which in many cases has made streets less safe for pedestrians, older adults, children, people with disabilities, and bicyclists. The overall result is streets that accommodate cars and that deter people from active transportation. Land settlement practices—strip centers, cul-de-sacs, poorly sited schools, and single-use zoning—compound the problem, producing auto dependency. Our auto dependency is furthered by development patterns that have changed the form of communities from walkable, transit oriented, street grid systems to strip and single-family development accessed by regional automobile corridors. Emphasis on only one mode and not fully integrating other users into the design of roadways has severely impeded the safety of pedestrians and the overall connectivity for non-motor vehicle users.

Various trends are changing the projections for future travel demands; that is, they are changing our understanding of the type of transportation systems people will want and need in the future. Aging population, a millennial generation who is choosing not to drive, rising fuel prices, growing traffic problems, increasing safety, health and environmental concerns, and changing consumer preferences are all increasing demand for walking, cycling and transit. When we restore streets as places that are safe for children, we will also be supporting communities that are vibrant and safe for all.

The State Land Use Commission and Maui County Council condition, in part, reads:

"[Department of Education] shall complete a pedestrian route study for Phase 1 of the Project which includes ingress and egress of pedestrians through defined location(s) approved by DOT and shall analyze compliance with proposed warrants in FHWA/RD-84/082 (July 1984) to the satisfaction of DOT. The pedestrian route study and analysis shall be completed and approved prior to [Department of Education] executing a contract for the design of Phase I of the Project."

## Taking the steps to include pedestrians and bicyclists in street design

Kihei High School, projected to open in 2018, will be located mauka (mountainside) of Pi'ilani Highway at Kulanihako'i Street between the Kulanihakoi and Waipuilani gulches. Today, the majority of the population of Kihei is concentrated on the makai (seaside) of the Pi'ilani Highway. Students and community members will be traveling along and across the highway to access the school. Because the Kihei High School campus is envisioned as a place for the community to gather, the main issue facing the community of Kihei is how students will cross Pi'ilani Highway on foot or bike. The State Land Use Commission and Maui County Council have imposed zoning conditions requiring a Pedestrian Route Study (regarding FHWA/RD-84/082, see Supporting Documents page 66) and require an overpass or underpass be provided, as well as at-grade improvements. This report was created to address the above conditions and is intended for the Department of Transportation's approval.

The report recommends that the Department of Transportation approve an at-grade crossing that includes all roadway users at Pi'ilani Highway and Kulanihako'i Street, a location where pedestrians need to be included first and foremost at-grade. Pedestrian overpasses and underpasses allow for pedestrian movement separate from vehicle traffic. However, they are usually considered as a last resort measure. It is more appropriate to install safe crossings that are accessible to all pedestrians and bicyclists at-grade. Due to the local topography and community in-

put this report also recommends an underpass, although this will take partnership with state and county government agencies, private landowners and the community of Kihei to complete the pedestrian network so that the underpass is used.

The safety of all street users, especially the most vulnerable users (children, elderly, and disabled) and modes (pedestrians and bicyclists) should be paramount in any design of the roadway. The safety of streets can be dramatically improved through appropriate geometric design and operations. A Federal Highway Administration safety review found that streets designed with sidewalks, raised medians, better bus stop placement, and traffic calming, such as roundabouts and raised medians, improves pedestrian safety while still allowing it to move efficiently and effectively: a virtuous cycle.[5]

Hawaii State Complete Streets Act 54 (2009), focuses on a multi-modal transportation system:

*"to accommodate convenient access and mobility for all users of the public highway, including pedestrians, bicyclists, transit users, motorists, and persons of all ages and abilities."*

## Ensuring people are included in the design of our streets

As Dr. Richard Jackson, author of *Designing Healthy Communities* states, "The metric needs to be people. The purpose of transportation is not to move cars and other vehicles; it's to move people; it's to move people using automobiles, buses, bicycle and their own feet. If you make people the benchmark you end up making better decisions."

The overarching principle of this report is: all streets and intersections should be studied and designed with the expectation that pedestrians and bicyclists will use them, along with motor vehicles. Designs should create an environment that is conducive to walking and bicycling, encourages people to walk and bike, and where the street becomes a place people want to be. This is reinforced in Hawaii State Complete Streets Policy, Maui County Complete Streets Resolution, Maui County General Plan and Hawaii's State Pedestrian Plan, which states the following vision: "Hawaii's integrated and multi-modal transportation system provides a safe and well-connected pedestrian network that encourages walking among all ages and abilities. The system promotes a positive pedestrian experience; promotes environmental, economic and social sustainability; fosters healthy lifestyles; and conserves energy. More people in Hawaii choose to walk for both transportation and recreation as a result of enhanced walking environments, mobility, accessibility, safety, and connectivity throughout the transportation system." A new opportunity exists for the Department of Transportation to put these policies and plans into action by including people—especially youth—on foot and bicycle in the design of the intersection at Pi'ilani Highway at Kulanihako'i Street.

5 B.J. Campbell, et al. (2004). A Review of Pedestrian Safety Research in the United States and Abroad, Federal Highway Administration.

Furthermore, the Department of Transportation, State Department of Education, County of Maui and community of Kihei are encouraged to work together and focuses on the following:

- Design for people of all ages and physical abilities whether they walk, bicycle, use a wheel chair, ride transit, deliver freight or drive. A well-designed road provides appropriate space for all street users to coexist.
- Integrate connectivity and traffic calming with pedestrian-oriented site and building design to create safe and inviting places.
- Involve local residents, land, property and business owners, elected officials and technical staff to share responsibility for designing Pi'ilani Highway.
- Create inviting places with interesting architecture, street furniture, landscaping, and public art that reflect the diversity and cultures of Kihei.
- Strengthen and enhance neighborhoods as envisioned by community members without displacing current property owners.
- Encourage active and healthy lifestyles.
- Integrate environmental stewardship through green streets, building and site design.

The Department of Transportation, working with other state and Maui County departments and the Kihei community, has the opportunity to strike a delicate balance between providing for motorists while also delivering a safe, comfortable and accommodating environment for pedestrians and bicyclists. This report outlines the community engagement process, key findings, best practices and built environment recommendations. This report doesn't constitute a traffic study. It is based on observations at key locations and traffic projections from Wilson Okamoto's Traffic Impact Report (TIR) (2012), and assumes that as sites next to the high school are developed, supporting road networks will be built to spread out the traffic flow and not concentrate it all in a single hot-spot to the detriment of other users. The report lays out important recommendations and conceptual designs for leaders to consider as they strive to improve safety, health, and access to the future Kihei High School through a more walkable and livable built environment.

*The recommendations on the following pages incorporate best practices from cities, towns and suburbs nationwide. They're based upon tools and strategies aimed at improving neighborhood quality of life; supporting local economic development; and providing a safe, efficient transportation system that gives choice, convenience and accessibility for all.*

The Report is organized into the following sections:

**1. Process: Setting the Vision & Documenting Existing Conditions** for Pi'ilani Highway and Kihei High School shares observations about the corridor's existing conditions, and documents the community's shared vision for the corridor.

**2. Best Practices & Recommendations** addresses the State Land Use Commission and Maui County Council conditions and consideration of a overpass or underpass, at-grade improvements. This section also includes additional street treatments that further enhance and promote Complete Streets and safe routes to school.

**3. Next Steps** addresses the need for partnerships, funding ideas and short- to long- term next steps.

# Key Concepts

**Active Transportation:** Also known as non-motorized transportation, this includes walking, bicycling, using a wheelchair or using "small-wheeled transport" such as skates, a skateboard or scooter. Active modes of transportation offer a combination of commuting options, recreation, exercise and transportation. (See Victoria Transport Policy Institute, www.vtpi.org.)

**Aging in Place:** Also called "living in place," this is the ability to live in one's home safely, independently and comfortably, regardless of age, income or abilities, in a familiar environment, with opportunities to participate in family and other community activities. (See National Aging in Place Council, www.ageinplace.org.)

**Charrette:** [pronounced, "shuh-RET"] A collaborative session to solve urban-design problems that usually involves a group of designers working directly with stakeholders to identify issues and solutions. It can be more successful than traditional public processes because it focuses on building "informed consent." (See www.walklive.org.)

**Complete Streets:** Roads that are designed for everyone, including people of all ages and abilities. They are accessible, are comfortable for walking and biking, and include sidewalks, street trees and other amenities that make them feel "complete." (See National Complete Streets Coalition, www.completestreets.org.)

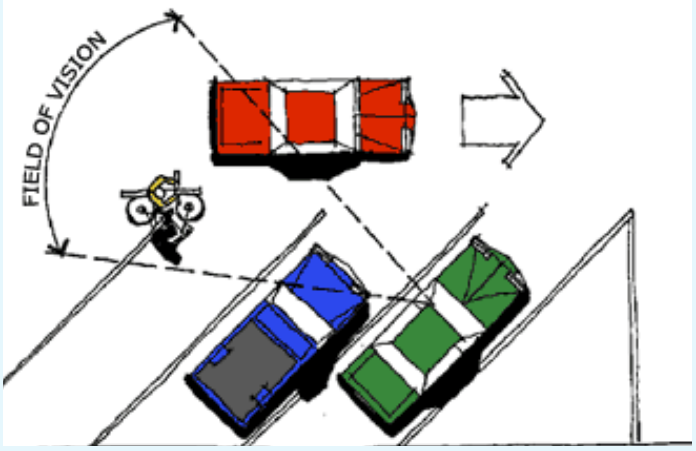
**Head-Out Angled Parking:** Also called "back-in" or "reverse" angled parking, this is arguably the safest form of on-street parking. It offers multiple benefits, including creating a sight line between the driver and other road users when "un-parking." Additionally, head-out parking allows the driver to load their trunk from the curb, instead of adjacent to the travel lane. And for drivers with young children, seniors or others who need extra help, the open car doors direct passengers to the safety of the sidewalk behind the car, not into traffic. Getting into a head-out angled spot is simple—a driver signals their intention, slows, pulls past the spot and then backs into it, which is roughly equivalent to making only the first maneuver of parallel parking. (Watch a brief video about head-out angled parking at www.walklive.org.)

**Livability:** In the context of community, livability refers to the factors that add up to quality of life, including the built and natural environments, economic prosperity, social stability and equity, educational opportunity, and culture, entertainment and recreation possibilities. (See Partners for Livable Communities, www.livable.org.)

**Median Crossing Island:** A short island in the center of the road that calms traffic and provides pedestrian refuge. They can be six to 12 feet wide and 20 to 80 feet long. They should be landscaped with low, slow-growth ground cover, and tall trees without branches or leaves at ground height that help motorists see the islands well in advance but don't obstruct sight lines.

**Sharrows:** A "shared roadway marking"—usually paint—placed in the center of a travel lane to alert motorists and bicyclists alike to the shared use of the lane. They help position bicyclists away from the opening doors of cars parked on the street, encourage safety when vehicles pass bicyclists and reduce the incidence of wrong-way bicycling.

**Safe Routes to School:** A national program to improve safety and encourage more children, including children with disabilities, to walk, bike and roll to school. The program focuses on improvements through the five E's: engineering, education, enforcement, encouragement and evaluation. (See National Center for Safe Routes to School, www.saferoutesinfo.org.)




*Above: This diagram from the City of Northampton, MA illustrates one of the benefits of head-out angled parking: a driver's ability to see oncoming traffic as they pull into the travel lane from their parking spot.*

**Road Diet:** On an overly wide road that has too many vehicle travel lanes to be safe, lanes can be removed and converted to bike lanes, sidewalks, a buffer between the travel lanes and sidewalks, on-street parking, a landscaped median or some combination thereof. A common road diet transforms a four-lane road without bike lanes into a three-lane road (one travel lane in each direction with a center turn lane or median) with bike lanes and street trees. (See Project for Public Spaces, www.pps.org/reference/rightsizing/.)

**Sidewalks:** With some exceptions, sidewalks, trails, walkways and ramps should be on both sides of streets. Where gaps exist or ramps are missing, fix them on a priority basis, working out block-by-block from schools, medical facilities, town centers, and other areas where people should be supported in walking and biking. Sidewalks in people-rich areas should be at least eight feet wide and separated from the curb by a zone that can accommodate planter strips, tree wells, hydrants, benches, etc.

**Street Trees:** Street trees not only provide shade and a nice environment, but also help protect people walking and bicycling. When placed within four to six feet of the street, trees create a vertical wall that helps lower vehicle speeds and absorb vehicle emissions. They also provide a physical buffer between moving cars and people. On streets with a narrow space between the sidewalk and curb, trees can be planted in individual tree wells placed between parking stalls, which further reduces travel speeds. Depending on the species, they should be spaced 15 to 25 feet apart.

**Traffic Calming:** Using traffic engineering and other tools designed to control traffic speeds and encourage driving behavior appropriate to the environment. Examples include street trees, bulb outs, medians, curb extensions, signage, road diets and roundabouts. Traffic calming should encourage mobility for all modes.

**Walking Audit:** Also called a "walking workshop," this is a review of walking conditions along specified streets conducted with a diverse group of community members. Participants experience firsthand the conditions that either support or create barriers to walking and biking. (See more about walking audits, see the Walkable 101 series of resources at www.walklive.org.)

## Roundabouts, Mini Circles and Rotaries

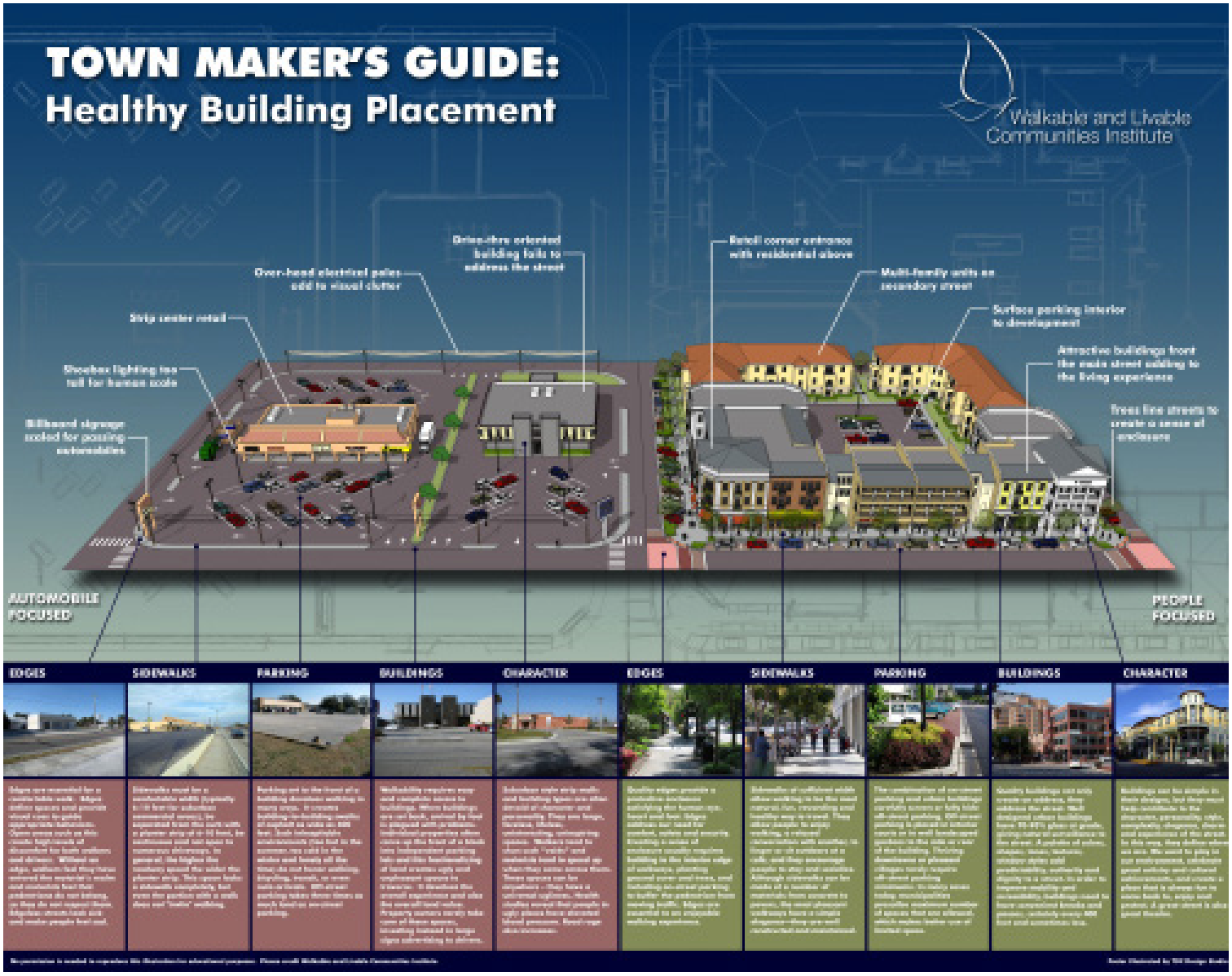
**Roundabouts:** Modern roundabouts navigate cars around a circulating island, usually 50 to 135 feet in diameter. They are ideal for collector and arterial roads, on Main Streets, and at freeway on-off ramps. They eliminate the need for cars to make left turns, which are particularly dangerous for pedestrians and bicyclists. Properly designed, roundabouts hold vehicles speeds to 15 to 20 mph and reduce injury crashes by 76 percent and reduce fatal crashes by 90 percent compared to signalized intersections. (See http://www.iihs.org/research/topics/roundabouts.html.) Roundabouts also can increase capacity by 30 percent by keeping vehicles moving. When installing roundabouts in a community for the first time, take care to make roadway users comfortable with the new traffic pattern and to educate them about how use roundabouts properly. (See the educational video at http://bit.ly/fhwasafetyvideo.)

*A modern, single-lane roundabout in San Diego, CA calms traffic, improves safety, and supports people walking and biking, all while carrying about 25,000 vehicles per day.*

**Mini Circles:** Often used in neighborhoods, these intersections navigate vehicles around a small island—eight to 15 feet in diameter—that can be either lightly domed or raised. If raised, they should be visible from hundreds of feet away, creating the feeling of a small park in the neighborhood. They should be designed to reduce speeds to 15 to 18 mph at each intersection.

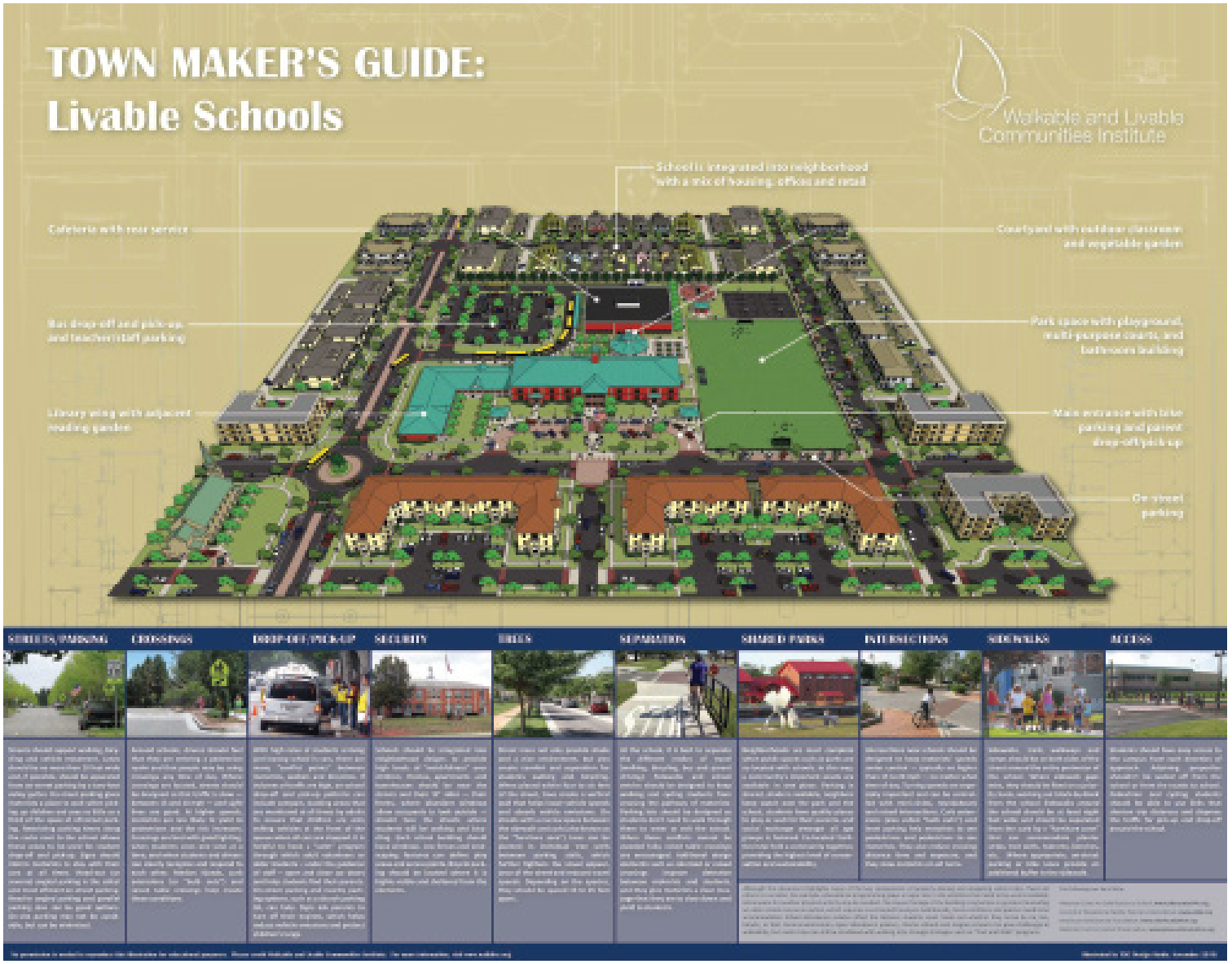
**Rotaries and Traffic Circles:** These can be as big as football fields and might include stop signs and signals. Rotaries can be cumbersome and complicated and often induce higher speeds and crash rates. Many rotaries in North America and Europe are being removed and replaced with modern roundabouts.

# Key Concepts




In the past, cities were weakened as land-use experts did what they did best and transportation experts did what they did best. The failure to integrate transportation with land use led to a devalued or compromised set of land uses and roadways. For instance, with roads designed for high speeds, developers cannot develop a village that is enjoyable. This, then, increases the number of miles people drive, so more roads are built to handle the resulting traffic to more distant places. The opposite effect is also true. If the developer builds too many land uses with driveways, roadway capacity and safety degenerates, roads and intersections are widened, and land is further devalued. As roads are widened, people drive farther to distant shopping, and central town parcels are abandoned. By working together, traffic is better handled and balanced, land use goes up in value, people have better places to live and town economies heal and eventually thrive. Additionally, when we place a person at the center of the design scale, we end up with land that retains its value, less costly infrastructure and safer conditions for all users. The graphic above shows the different forms that are generated by using an automobile as the design vehicle (left) versus placing a person at the center of the design scale (right). For a full-resolution copy of the Town Maker's Guide to Healthy Building Placement, visit the Resources section of www.walklive.org.

# Key Concepts




A school's physical relationship with its surrounding affects whether students can easily —and safely—walk, bike or roll to school. Thus, school siting issues should be considered in developing any program to promote active transportation of getting to and from school. The Town Maker's Guide to Livable Schools illustrates many of the important components that help make a school supportive of active living, walkability and livability. For a full-resolution copy visit the Resources section of www.walklive.org.

# Key Concepts: Livable Schools

***Streets and Parking***

Streets should support walking, bicycling and vehicle movement. Vehicle travel lanes should be no more than 10 feet wide and, when possible, should be separated from on-street parking by a two-foot valley gutter. There should be no more lanes on a road section than needed to safely carry out its mission. Signs should inform motorists to remain in their cars at all times. Head-out (or reverse) angled parking is a safe and efficient way to provide on-street parking.

***Security***

Schools should be integrated into neighborhood designs to provide high levels of "watchfulness" over children. Homes, apartments and townhouses should be near the streets and their "A" sides — their fronts, where abundant windows allow occupants to look outside — should face the streets where students will be walking and bicycling. This orientation provides "eyes on the street." Each school building should have windows. Low fences and landscaping features can define play areas and access points. Bicycle parking should be located where it is highly visible and protected from the elements.

***Separation***

It is best to separate the different modes of travel (walking, bicycling, bus and parent driving) at schools. Sidewalks and school entries should be designed to keep walking and cycling students from crossing the pathway of motorists. Parking lots should be designed so students do not need to walk through them to enter or exit the school. Where sidewalks and driveways must cross each other, a level sidewalk should continue. Additional design elements such as colorized or raised crossings should give motorists a clear message that they are to slow down and yield to students.

***Trees***

Street trees not only provide shade and a nice environment, but also help protect students walking and bicycling. When placed within four to six feet of the street, trees create a vertical wall that helps lower vehicle speeds and absorb vehicle emissions. They also provide a physical buffer between cars and children. On streets with narrow space between the sidewalk and curb (also known as the "furniture zone"), trees can be planted in individual tree wells placed between parking stalls, which further reduces travel speeds. Depending on the species, they should be spaced 15 to 25 feet apart.

***Dropping Off and Picking Up***

With high rates of students arriving and leaving school in cars, many "conflict points" arise between motorists and walkers/bicyclists. If volumes of traffic are high, on-school drop-off and pick-up patterns can include compact stacking areas that are monitored at all times by adults to ensure that children are only exiting vehicles at the front of the queue when all cars are stopped. It is helpful to have a "valet" program through which adult volunteers or older students (under guidance of staff) open and close car doors and help students find their parents. On-street parking and nearby parking options, such as church parking lots, can help. Signs ask parents to turn off their engines, which helps reduce vehicle emissions and protect children's lungs.

***Sidewalks***

Sidewalks, trails, walkways and ramps should be on both sides of streets around the entire perimeter of the school. Where sidewalk gaps exist or ramps are missing, they should be fixed on priority basis, working out block-by-block from the school. Sidewalks around the school should be at least eight feet wide and separated from the curb by a "furniture zone" that can accommodate planter strips, tree wells, hydrants, benches, etc. Where appropriate, on-street parking or bike lanes can provide an additional buffer to sidewalks.

***Access***

Students should have easy access to their campus from every direction. Adjoining properties should not be walled off from the school or from the routes to school. Walking and bicycling students should be able to use links that shorten trip distances and disperse drop-off/pick-up traffic.

***Shared Parks***

Neighborhoods are most complete when public spaces such as parks are co-located with schools. In this way, a

community's important assets are available in one place. Parking is shared; shade is available; neighbors keep watch over parks and schools; students have quality places to play or wait for their parents, and social exchange amongst all age groups is fostered. Co-located facilities help hold a community together, providing the highest level of conservation and sustainability while building cooperation, collaboration and social capital.

***Intersections***

Intersections near schools should be designed to keep motorists' speeds under control — typically no higher than 15 to 20 mph (at most) — no matter what time of day. Turning speeds are especially important and can be controlled with mini-circles, roundabouts and raised intersections. Additionally, curb extensions (also called "bulb outs") and inset parking make it easier for drivers and walking students to see each other and slow motorists down.

***Crossings***

Around schools, drivers should feel that they are entering the pedestrian realm and that people may be using crossings any time of day. Where crossings are located, streets should be designed so that traffic is slow — between 15 and 20 mph — and sight lines are good. At higher speeds, motorists are less likely to yield to pedestrians and risks increase. Crossings are best with good lighting, where one lane can be crossed at a time, and where students and drivers can clearly recognize each other. Median islands, curb extensions (or "bulb outs") and raised crossings help create these conditions.

# DEFINING THE VISION

In the Hawaii State Pedestrian Plan the following vision is stated:

*Hawaii's integrated and multi-modal transportation system provides a safe and well-connected pedestrian network that encourages walking among all ages and abilities. The system promotes a positive pedestrian experience; promotes environmental, economic and social sustainability; fosters healthy lifestyles; and conserves energy. More people in Hawaii choose to walk for both transportation and recreation as a result of enhanced walking environments, mobility, accessibility, safety, and connectivity throughout the transportation system.*

*Above: Nick Nichols, Department of Education, stands just above the intersection of Pi'ilani Highway and Kulanihako'i Street, gazing at the vacant site that will soon be Kihei High School.*

The site of the future High School is priming the land and the greater community for a new future, creating an opportunity to demonstrate how transportation and land-use planning can coexist; where future development supports active-living; and where the existing built environment—streets and buildings—transforms to honor people and place. Over time, Pi'ilani Highway can become an attractive and bustling corridor that connects residents to education, jobs, shopping and recreation options, all in an environment where it's just as appealing to ride a bike or walk as it is to drive a car. It's a place where the third, fifth or ninth-grader can safely walk home from school to one of the residential neighborhoods that lie just beyond the highway, as his/her older brother/sister rides a bike to his/her job at a restaurant half a mile away. If Kihei can build a school that integrates and connects to the town for children, then the school and town is built for all people.

The future Kihei High School will serve the growing population in the Kihei region. The Directed Growth Plan (Chapter 8) of the Maui Island General Plan (December 2009) identifies the need for a high school for South Maui. The surrounding area to the future high school site also includes the "Kihei Mauka" planned growth area. Kihei Mauka is approximately 500 acres of existing undeveloped ranch land planned for mixed use development, including approximately 1,500 single-family and multi-family residential units. Maui Research and Technology Park is located adjacent to the school site, across the Waipuilani Gulch, and is actively planning a mixed-use devlopment. The future high school and planned mixed-use community are demanding that policies and practices, such as formed-base code— where buildings honor and are built-to the street versus set-back—and the right-size streets designed for pedestrians, bicyclist and automobile, create compact and walkable environments that do not induce vehicle traffic.

The Maui Island General Plan advocates for smart growth and walkable neighborhood design, identifying that accessibility issues on Maui can be addressed by *"expanding transportation alternatives, including public transit, biking, and pedestrian movement."* Supporting this vision is the State's Complete Streets Act 54 (2009), which focuses on a multi-modal transportation system: *"to accommodate convenient access and mobility for all users of the public highway, including pedestrians, bicyclists, transit users, motorists, and persons of all ages and abilities."* Although the remaining federal Safe Routes to School funding cannot be applied to high school safe routes projects, the philosophy and tools of the program should still help guide the process to ensure that the streets transform to support youth on foot and bike. Schools create priority areas within communities, meaning schools should be some of the first spots where communities come together to lead planning and implementation projects that will reduce vehicular travel and congestion, encourage walking and bicycling, and promote health and safety. This vision is further supported nationally with the Federal Highway Administration's (FHWA)

guide: *Flexibility in Highway Design,* which emphasizes that community values and surrounding land-use need to be taken into consideration when designing highways in order to incorporate creative solutions to enhance the safety, efficiency, and effectiveness of the roadway "for the movement of people and goods."[1]

Measuring only level of service of motor vehicles, overlooking the flexibility of national and state standards and guidebooks, and not taking into full consideration community values can cause a road to be out of context with its surroundings. FHWA's Flexibility in Highway Design is a guide that encourages highway designers to expand their consideration in applying the Geometric Design of Highways and Streets (Green Book) criteria*. "The setting and character of the area, the values of the community, the needs of the highway users, and the challenges and opportunities are unique factors that designers must consider with each highway project. It shows that having a process that is open, includes public involvement, and fosters creative thinking is an essential part of achieving good design." An important concept in highway design is that every project is unique, and there are new guides such as National Association of City Transportation Officials (NACTO) that U.S. DOT has endorsed to further guide states and counties in the new traffic-calming and street treatments that have been proven as safety countermeasures.

Pi'ilani Highway is unique; today it is a barrier for pedestrians and bicyclists, dividing the existing community of Kihei from the high school site and the future development because vehicle speeds are high and crossing distances are overly wide to support people, especially our youngest, who choose to use active transportation. The Highway also acts as the main route into Kihei; the future land use—school, signal family, multi-family and commercial buildings—demand that the highway starts to transition into a road that creates safe routes at grade, for pedestrians and bicyclists, while continuing to move vehicles at a safer speed and efficiently.

The section of Pi'ilani Highway between Kulanihakoi and Waipuilani Gulches provides an excellent opportunity to implement the State Complete Streets Policy and goals and policies from the Hawaii Pedestrian Plan along to support active transportation— children walking and biking to school. It will take partnerships, many which will be new, to achieve this vision. Maui County should continue to right-size the other streets in Kihei, while completing many important street networks. The State Land Use and Maui County Council should re-envision the outdated zoning condition of an overpass or underpass. The opportunity for an underpass is present with the gulches, however will take more community support and commitment from all the state departments and Kihei community to properly build a trail system that connects the community mauka-makai, a very important undertaking and opportunity that should be pursued.

The main goal of this Pedestrian Route Study is to provide safe routes to and from school for people—children—who do not drive and who have much to gain from commuting under their own power. The best practices and recommended changes on the pages to follow will help each driver who comes to or passes a school be more alert, yielding, caring and considerate when in the vicinity of children; envision this opportunity.

*Above: The Walkable and Livable Communities (WALC) Institute team lead a walking audit with Department of Education, Group 70, and Munekiyo & Hiraga Planning, walking gulch to gulch to discover opportunities to ensure safe routes for youth both at grade and through separated paths.*

1 Federal Highway Administration: http://www.fhwa.dot.gov/environment/publications/flexibility/flexibility.pdf

* The Green Book, published by the American Association of State Highway and Transportation Officials (AASHTO), contains the basic geometric design criteria that establish the physical features of a roadway.

# STAKEHOLDER MEETINGS

During public meetings in Dec. 2013, community members set the following vision for Kihei High School and Pi'ilani Highway:

> "The school will be a hub on the mauka side of the highway from which spokes will radiate to adjacent neighborhoods. Connections will be multi-modal, innovative, shaded and inviting setting the standard for all future development, a corner-stone for change, reinventing Pi'ilani Highway from a high-speed arterial into an asset that honors the community and promotes walking, biking and driving—overall, active living."

The findings of this report are informed by the input received from the community stakeholders. Through focus group meetings, personal interviews, walking audits, and a public meeting, the WALC Institute team gained insights and understanding of Kihei's preferences for the new high school. Maui County's General Plan 2035 states the community's long-term vision is to unite land use and transportation planning. "Land use patterns and transportation have a very close relationship—land use decisions affect transportation planning, and transportation planning affects land use patterns. Coordination must exist between transportation and land use planning decisions so they are complimentary rather than contradictory. When designing new communities, expanding current communities, or increasing density in existing communities, ensuring mobility and circulation must be a top priority. Providing for efficient movement of all levels of transportation – pedestrian, bicycle, public transit and automobile—is essential to assuring the livability of a community."

## FOCUS GROUP MEETINGS

On December 18, 2013 the WALC Institute team facilitated focus group meetings with the following stakeholder groups:

- Maui County Departments of Planning, Public Works, Parks and Recreation, and Police. Maui County Department of Fire and Safety, Hawaii State Department of Land and Natural Resources, and Hawaii State Department of Transportation were invited but no representation was present.
- Landowners representing Haleakala Ranch, Kaonoulu Ranch, Maui Research and Technology Park, and elected officials, including and Senator Roz Baker and Representative Kaniela Ing.
- Community Advocates, including Public Access Trails Hawaii (PATH)-Maui Director Joe Bertram, Kihei Community Association (KCA) President Mike Moran and several other KCA members and resident advocates.
- School leaders, including the principals from Kihei elementary schools.

The attendees commented on the high vehicle speeds along Pi'ilani Highway and expressed a desire for an at-grade crossing to create a safer and consistent pedestrian experience. They were enthusiastic about ideas that would slow down vehicles, such as roundabouts and medians, while preserving traffic efficiency, making the area more walkable. Additionally, many expressed the need for better street connectivity.

## PUBLIC MEETING

The project's main public meeting was held on December 19, 2013, and included a presentation and discussion in the evening. About 30 people attended the evening meeting. County staff, members of Kihei Community Association, and Representative Kaniela Ing were present, among others.









Participants shared their vision, ideas, and objectives to ensuring future students and residents can access the high school by foot or bike:

1. Rowena Dagdag-Andaya, Deputy Director of Maui County Department of Public Works identifies the need to slow motorists and include all users along Pi'ilani Highway near the school.
2. Sgt. Lawrence Pagaduan, Maui Police Officer, reinforces the need for good design, along with education and enforcement.
3. A resident advocate addresses the need for pedestrian and bicycle greenways that create mauka-makai connections, linking the future school and development to existing homes, businesses, schools, beach parks, and other destinations.
4. Local elementary school principal notes her school's barriers to Safe Routes to School stating, "it is time to get Safe Routes to School right."
5. Joe Bertram, founding member of PATH-Maui, shares members vision to "reestablish walking as a culturally fundamental transportation mode by creating a walkable Kihei, connecting existing paths, building new ones, and making Kihei a safer and more enjoyable place in which to travel on foot, increasing health, environmental and cultural benefits for all."
6. "Our community both youth and adults will look for the path of least resistance," stated Senator Baker, understanding human behavior. She wants to create routes of the least resistance for youth at-grade.
7. Father-daughter landowners, Henry Rice and Wendy Peterson want to continue to support the transformation of the school site into a place that supports the safety of youth.
8. Jonathan Starr shares his vision as Rep. Ing looks on, "Traffic calmed with roundabouts and other grade level devices with fun paths for biking and walking from all directions, promoting safety."

# WALKING AUDIT

The WALC Institute led a walking audit with Department of Education, Group 70, and Munekiyo & Hiraga Planning to identify conditions that affect active living, social connectivity, safe routes to school, and access to daily needs at the new high school site along Piʻilani Highway between the Kulanihakoi and Waipuilani gulches.

Today, the majority of the Kihei community lives makai (seaside) of the highway, with future development planned mauka (mountainside). Students will be traveling across the highway to access the school. Because the Kihei High School campus is envisioned as a place for the community to gather, the main issue facing the community is how people will get across the highway safely and efficiently. The State Land Use Commission and Maui County Council are requiring an overpass or underpass be constructed, as well as at-grade improvements.

In addition, the WALC Institute led a second walking audit along Liloa Drive with elected leaders and Kihei stakeholders to look at best practices that are built in Kihei, such as the roundabout on Piikea Avenue and Liloa Drive and the pedestrian/bicycle greenway. These projects are examples of the County of Maui working with the community to address the design of the built environment. The County of Maui and Kihei community leaders will continue to be instrumental partners in ensuring Safe Routes to School and complete streets are created to and from Kihei High School.

These efforts should address the following:
1. High Vehicle Speeds & Incomplete Streets
2. Complex Intersections
3. Missing Connections
4. Zoning Condition for an Overpass or Underpass

*Above: Council Member Don Couch joins in walking audit.*


1. High Vehicle Speeds. DESIGN FOR TARGET SPEED & RIGHT-SIZE STREETS
2. Complex Intersections. BUILD SAFER INTERSECTIONS
3. Address Off-Street Pedestrian and Bicycle Crossings and Networks OVERPASS OR UNDERPASS
4. Missing Connections. IMPROVE CONNECTIVITY


High Vehicle Speeds. Destinations—places where people wish to gather—require low, safe vehicle speeds. Like many places on the Hawaiian Islands and throughout the country, vehicle speeds in Kihei have crept up over time. This has been the result of focusing public investments and built environment designs on vehicle flow and efficiency, to the exclusion of people walking, biking or using other active modes of transportation. The State of Hawaii's Complete Streets Policy, Act 54 (2009), which focuses on a multi-modal transportation system, supports the need to accommodate all users along Pi'ilani Highway. By utilizing different design treatments, transportation engineers can move traffic more efficiently, and at lower and safer speeds that include all users, and support children getting to school safely by foot and bike.


Incomplete Streets. Pi'ilani Highway and Kulanihako'i Street are not "complete." A dedicated right-turn lane with overly wide turning radii allows vehicles to exit the highway onto Kulanihako'i Street at fast speeds. As the new intersection is redesigned to support all users this section of Kulanihako'i Street should be considered for a road diet. A road diet involves road conversion measures to right-size travel lanes and to remove excess lanes from streets primarily by moving paint. The remaining space is used for bike lanes, transit-stop bays, sidewalks or on-street parking. A road diet can improve the performance and safety of the corridor and encourage active transportation and economic vitality. This would be an important partnership with the County of Maui in tandem with the intersection improvements.


Complex Intersections. The school entrance and exit will convert the existing t-intersection at Pi'ilani Highway and Kulanihako'i Street into a four-way intersection. It is critical that this location support all users—pedestrians, bicyclists, transit users, and vehicles. The intersection will have an increased amount of turning movements. The future intersection at Pi'ilani Highway and Kulanihako'i Street will become more complex due to the future high school and mixed use development. To ensure intersection safety for all users, especially the most vulnerable users pedestrians, children and seniors intersection treatments, either a signal or roundabout need to be applied. A signalized intersection helps control significant turning volumes, however signals do not reduce vehicle-to-vehicle or vehicle-to-pedestrian conflicts. A roundabout should be considered first. The modern roundabout is an intersection treatment that reduces vehicle speeds, enhances the efficiency of the road, reduces conflicts between users, overall better supports all roadway users, and creates place as it acts as a gateway treatment.

Waipuilani Gulch


Kulanihakoi Gulch


Natural Opportunity for Underpass. The gulches on either side of the school provide the natural topography for a underpass. During the focus group meetings landowners and Maui's Public Access Trails Hawaii (PATH) agreed that the gulches were ideal candidates for an underpass and pedestrian/bicycle trail. Maui Research and Technology Park shared that they have concept plans to create a trail that would connect their campus to the future high school campus over the Waipuilani Gulch, making this gulch the ideal place to start. The underpass connection to the school would be a pedestrian and bicycle path, creating another safe route to school for future high school students and Kihei residents. The underpass would also help reconnect the community to the cultural, spiritual, communal and physical importance of paths and walking. Over time, it would connect to the greenway path that will be on the North-South Collector Road, providing easy and safe connections between homes, schools, businesses, shopping and other destinations. A major element that needs to be taken into consideration is flooding. This can be managed with early detection systems, enforcement, and designing with native species and materials that can handle extreme weather conditions.

Missing Connections. Complete the street network. The County of Maui is in the process of working towards completing Liloa Drive or the North-South Collector Road (incomplete section pictured on left) that runs parallel to Pi'ilani Highway and South Kihei Road. Once complete this will greatly improve overall traffic circulation in Kihei. The North-South Collector Road will also extend the greenway, a separated pedestrian and bicycle path. A prime opportunity is to further link and enhance the pedestrian and bicycle connection to the school from the residential areas and town-center.

# Pi‘ilani Highway Today

Today, Pi‘ilani Highway has no pedestrian environment and is an overly wide road that encourages motorists to travel at speeds higher then posted speeds. High speeds kill people and place. The surrounding land use mauka of Pi‘ilani Highway is transforming from ranch land to Kihei’s new upper community with the new high school and future mixed-use developments. Overtime, Pi‘ilani Highway will need to transform to honor the urbanizing community of Kihei and not remain a barrier. A catalyst area will be Pi‘ilani Highway and Kulanihako‘i Street where the future Kihei High School will be located.

Pi‘ilani Highway and Kulanihako‘i Street form a t-intersection. The Northbound approach of Pi‘ilani Highway, heading towards Kulanihako‘i Street, has an exclusive eleven foot left-turn lane that starts over 580 feet back from the intersection, two through lanes (11 to 12 feet), and a six to seven foot shoulder. The Southbound approach of Pi‘ilani Highway, heading towards Kulanihako‘i Street, has two through travel lanes, an exclusive twelve foot right-turn lane that starts over 440 feet from the intersection, a five foot bike lane marked periodically within the right-turn lane, and a shoulder that varies in width from six to twelve feet. Kulanihako‘i Street is a stop sign controlled left-only turn lane, and exclusive right-only turn lane. The splitter islands, or pork-chop islands are painted. There is no marked crossing on any of the legs of the intersection. The existing geometric design is to move cars fast, and excludes pedestrians in the design. The existing peak traffic volumes at Pi‘ilani Highway and Kulanihako‘i Street, according to Wilson Okomoto Traffic Impact Report (TIR) are:

- 1,344 vehicles Northbound on Pi‘ilani Highway at peak AM; 1,633 at peak PM
- 1,677 vehicles Southbound on Pi‘ilani Highway at peak AM; 1,654 at peak PM
- The more used turning movement is the left-hand turn from Kulanihako‘i Street onto Pi‘ilani Highway at 207 and 121 vehicles during AM and PM peak, respectively
- Average Daily Traffic (ADT): 18,000 vehicles per day

One travel lane can move 1,800 vehicles per hour uninterrupted. It is at the intersections where additional turning movements interrupt a single through travel lane. As new developments change an area, existing roads take on new responsibilities for moving people on foot, bicycle, transit and automobile. It is at intersections where all these users meet, creating a space that has many conflict points. The good news is that there are new tools, such as roundabouts and raised medians that are recognized by the Federal Highway Administration (FHWA) as “proven safety countermeasures,” that when applied provide safer crossings for pedestrians,

bicyclists and drivers, while continuing to maintain vehicle efficiency and flow.

Given that this intersection is in front of a future high school, building a pedestrian-friendly environment is critical. Traditional traffic engineering practices orders that an intersection must be built for the busiest 15 to 20 minutes of the day, and uses biased language such as the intersection "fails" when delay reaches an arbitrarily chosen threshold. This report is not looking for this intersection, or any intersection, to literally "fail" but rather to "thrive" economically, environmentally, aesthetically, and from the transportation perspective of safety and people-moving capacity through the intersection.

The Traffic Impact Report (TIR), April 2012, produced by Wilson Okamoto, for Kihei High School states that: "historical traffic count data obtained from the State Department of Transportation, Highway Division survey stations in the vicinity of the project, indicates traffic volumes have remained relatively stable [over the last several years]." The siting of the new high school in Kihei along Piʻilani Highway and the future mixed-use development demands that new tools be applied to Piʻilani Highway to transform the road into a place that safely moves and connects all people and all modes, while not growing traffic.

The new school will alleviate long travel distance for families driving their children back and forth to school in Central Maui and for students who ride the bus to and from Central Maui. The TIR reassigned the current high school students trips along Piʻilani Highway to get to/from school in Central Maui to the school site. The TIR states that "upon [the school] opening traffic operations are expected to remain similar to today's existing volume." The Wilson Okamoto TIR assumes that for the years leading to the year 2025, there will be a steady one percent growth in traffic every year. By 2025 traffic operations are expected to deteriorate slightly due to ambient growth. This report makes the assumption that any growth, on top of site generated growth, will be minimal, and therefore instead uses the 2015 volumes in the TIR and assumes that the 2015 volumes will stay relatively steady through the year 2025.

As communities continue to grow, transportation planning can no longer continue to induce traffic by only measuring and planning for a single mode—the automobile. An integrated system needs to be the focus and the measure needs to be moving people and goods on foot, bicycle, and automobile. This means the built environment, specifically roads—existing and new—need to be designed first for pedestrians, especially around schools. Intersections need to be compact and have safe crossings that promote better stopping behavior of motorists and create safe routes for people, especially students, to walk. This shift will help alleviate capacity pressure from the current roadway system because, overtime, people shift their behavior and walk or bike instead of drive for more trips or choose to travel slightly outside of the peak travel hours.

This report utilizes more progressive traffic engineering principles which acknowledge that an excessively wide intersection will induce more trips. More trips lead to more congestion, leading to widening roads again, and the vicious cycle will continue if new tools are not used. By the same token, a more compact street design will lead to a "virtuous cycle" where when capacity is limited drivers will be encouraged to arrive at school or work 20 minutes earlier, leading to a spreading out of the peak hour flow, less congestion, and an intersection that works for all modes of travel. Furthermore, this report assumes that as sites next to the High School are developed, a parallel road behind the High School will be built to spread out the traffic. The following best practices and recommendations strike a delicate balance between providing for motorists while also delivering a safe, comfortable, and accommodating environment for pedestrians and bicyclists.

# MOVING FROM VISION TO IMPLEMENTATION

The following section further identifies best practices, recommendations and next-steps on design treatments that, when included, help maximize the capacity of the street for all users:

1. DESIGN FOR TARGET SPEED: RIGHT-SIZE STREETS
2. BUILD SAFER INTERSECTIONS
3. ADDRESS OFF-STREET PEDESTRIAN AND BICYCLE CROSSINGS & NETWORKS
4. IMPROVE CONNECTIVITY


ROAD X-ING


NO
MOTOR
VEHICLES


AHEAD

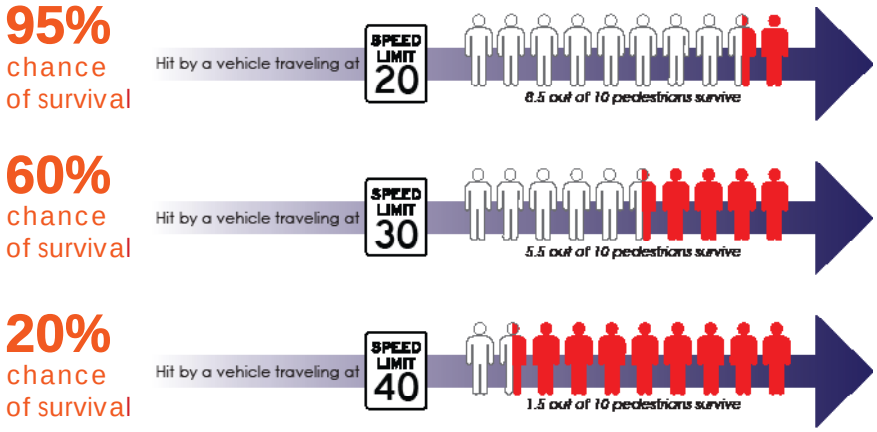
# 1 Design for Target Speed

The foundation to designing streets that honor communities—people and places—begins with addressing the appropriate target speed. Also known as the "desired operating speed" of a street, "target speed" is the speed desired on the roadway to ensure that all modes (vehicular traffic, transit, freight/delivery, pedestrians and bicyclists) can operate efficiently, effectively, safely and with enjoyment. Designing to a target speed means including only those design elements that best reflect the function of the roadway and its land uses.

Traditional street design practice in the transportation profession has been to set design speed and posted speed limit on 85th percentile speeds—how fast drivers are actually driving—rather than how fast drivers ought to drive. It is now recognized that such actions tend to induce greater speeds, which can cause a significant rise in crashes, especially to the most vulnerable roadway users. Design speeds should match the desired target speed. A lower target speed is a key characteristic of streets in walkable, mixed use, urban areas and school zones. Major arterials have the poorest walking condition, due to higher traffic volumes, high traffic speeds, wider streets, and complex intersections. Fewer than one-third of drivers go the speed limit on urban and suburban arterials. Therefore, the design of our roadways must be consistent with the target speed desired.

## Target Speed = Design Speed = Posted Speed

Lower design speeds reduce observed speeding behavior, providing a safer place for people to walk, bicycle, use transit and drive. Speed plays a critical role in the cause and severity of crashes. The graphic below shows a pedestrian's likely survival rate if hit by a vehicle traveling 20, 30, 40 miles per hour.




Source: *Killing Speed and Saving Lives*, UK Dept. of Transportation, London, England. Also see: Limpert, Rudolph. Motor Vehicle Accident Reconstruction and Cause Analysis. Fourth Edition. Charlottesville, VA. The Michie Company, 1994, p.663.

# Safety in Numbers

Visibility is impacted by the design and operating speed of a roadway. Designers need to proactively lower speeds near conflict points—intersections, mid-block crossings, for example—to ensure that sight-lines are adequate and movements are predictable for all users. As a driver's speed increases, his/her peripheral vision narrows severely, illustrated below.


Source: National Association of City Transportation Officials (NACTO) Urban Streets Design Guide

# 1 Design for Target Speed: Right-Size Streets

The following design features that have been found to affect operating speeds:

***Horizontal and Vertical Curvature*** — A tight curve radius has a greater impact on operating speed than any cross-section or roadside element.

***Sight Distance*** — As sight distance decreases, so do operating speeds.

***Street Trees*** — Street trees in planting strips have a traffic calming benefit.

***Lane Widths*** — Narrower lane widths are associated with lower speeds.

***Total Roadway Widths*** — Narrower roadway widths are associated with lower operating speeds.

***Access Density*** — Higher density of access points is associated with lower operating speeds.

***Median*** — Roadways without medians have higher speeds than roadways with medians.

***On-Street Parking*** — On-street parking leads to lower speeds, due to side friction between moving and passing vehicles.

***Curbs*** — Speeds appear to be lower on streets with curbs than streets without curbs.

***Pedestrian Activity*** — Speeds are lower on roadways with higher pedestrian activity.

***Roadside Development*** — Building setbacks also influence speed.

# 1 Design for Target Speed: Right-Size Streets

## Narrow Travel Lanes; Add Landscaped Medians; Buffered Sidewalks

A person's decision to walk is influenced by many factors, including distance, perceived safety and comfort, convenience, and visual interest of the route. Pedestrians feel exposed and vulnerable when walking directly adjacent to a high-speed travel roads. Vehicle noise, exhaust and the sensation of passing vehicles reduce pedestrian comfort. Factors that improve pedestrian comfort include a separation from moving traffic and a reduction in speed, improving safety for all roadway users. Applying the following design treatments to Pi'ilani Highway will design the road for the appropriate target speed (25 to 30 mph in the school zone), creating safe paths of travel for all modes.

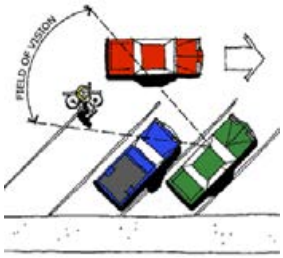
***Narrow Travel Lanes.*** The wider a roadway, the faster cars tend to travel. Wide roadways also make for wide pedestrian crossings, increasing the amount of time a person is exposed to the threat of being hit by a car and the amount of time that cars are held back. The same is true with auto-to-auto crashes and bicycling crashes. Reduce vehicle lanes to 10 feet wide, 11 feet wide maximum. This should be the default lane width. In addition to lowering vehicle speeds, this practice saves on materials, reduces environmental impacts, adds to vehicular efficiency and performance, and provides physical space for wider sidewalks, or bike lanes, or wider buffers between sidewalks and passing vehicles. Studies by the Transportation Research Board reveal that there is slight improvement in safety when narrower lanes are applied. The AASHTO Green Book provides guidance that states, counties, and cities often unnecessarily treat as standards. The Green Book encourages flexibility in design within certain parameters, as evidenced by AASHTO publication: A Guide to Achieving Flexibility in Highway Design. For example, 10-foot lanes, which many states often shun out of concern of deviating from standards, are well within AASHTO guidelines. Nine-foot lanes have even been permitted for lower speed environments. Thus a 10 or 11 foot (maximum width) for this lower speed area falls well into the normal range for both a travel lane or turn lane. There is no reason for any travel lane to exceed 11 feet. The center turn lane should be at maximum 10 feet because the lane's primary function is to store cars waiting to make a left hand turn. In many areas, the narrower lanes also make intersections more compact and efficient. When it comes to the width of vehicle lanes, less can be more.

***Landscape the Median.*** A landscaped median with street trees will create a buffer, green the street and further act as a traffic calming tool, creating a boulevard effect.


***Build Buffered Sidewalks or Multi-Use Trail.*** On the school side along the highway wide sidewalks or multi-use trail should be built at a minimum of 12 feet wide. A landscaped buffer with shade trees should be included to protect pedestrians and bicyclist from moving vehicles. A model example is the greenway on Liloa Drive in Kihei.

# 1 Design for Target Speed: Right-Size Streets with On-Street Parking

Off-street parking takes up three times more space than on-street parking. On-street parking visually narrows streets and helps to bring down vehicle speeds, while providing the most sustainable and affordable parking. Speeds are brought down even more when tree wells are used to provide a canopy to the street. Tree wells can be placed every three to five parking spaces to create a beautiful green edge. The primary reason for maximizing parking on-street is to help civilize the street that was overbuilt for speed. On-street parking belongs on center city streets, near schools, employment centers, and residential neighborhoods, acting as a buffer between pedestrians and moving cars—a natural traffic calming tool —and one that honors the surrounding land. The majority, if not all, of the 955 parking spots needed at the high school can be moved on-street, helping to calm traffic, save costs, and provide more green space on the school campus.




The diagram (above) from the City of Northampton, MA illustrates one of the benefits of head-out angled parking: a driver's ability to see oncoming traffic as they pull into the travel lane from their parking spot.

Head-Out Angled Parking, also called "back-in" or "reverse" angled parking, is arguably the safest form of on-street parking. It offers multiple benefits, including creating a sight line between the driver and other road users when "un-parking." Additionally, head-out parking allows the driver to load their trunk from the curb, instead of adjacent to the travel lane. And for drivers with young children, seniors or others who need extra help, the open car doors direct passengers to the safety of the sidewalk behind the car, not into traffic. Getting into a head-out angled spot is simple—a driver signals their intention, slows, pulls past the spot and then backs into it, which is roughly equivalent to making only the first maneuver of parallel parking. (Watch a brief video about head-out angled parking at www.walklive.org.)

*Left: The illustration was created for Solana Beach, CA, offering inspiration for how Kihei High School's access road could be designed.*

# 1 Design for Target Speed: Right-Size Streets with On-Street Parking

*Above: La Jolla Boulevard in Bird Rock California converted 5-lanes to 2-lanes. One of the greatest challenges of the design team was to drop to the two travel lanes and include angled parking on one side. A "transition lane" was created, allowing parking and un-parking to occur without interrupting the flow of traffic. This same tool can be applied for head-out angled parking on the street of the new high school.*

*Above: Head-out angled parking in Seattle, WA improves motorists sight lines as the are looking directly out at on-coming traffic--vehicles or bicyclists.*

***Convert Off-Street Parking to On-Street Parking.*** The Department of Education has the opportunity to improve Kihei High School campus design by moving the majority, if not all, of the off-street parking to on-street parking. This will help calm the school streets, provide for more street connectivity and thus better traffic circulation on campus. On-street parking is a key ingredient to creating a vibrant and pedestrian-friendly street. Using the curbside for parking saves considerable amounts of land from life as an off-street surface parking lot, making a better land use decision. On-street parking also increases safety. Motorists tend to drive at slower speeds in the presence of features such as on-street parking. Slower vehicle speeds provide pedestrians, cyclists and drivers more time to react, and if a crash were to occur, the chance of it being life-threatening is greatly reduced. On-street parking helps to create a safer environment and honor the community.

The new high school and future development have the greatest potential to be a model of walkability and livability for the town of Kiehi. In order to achieve this the design of the street needs to be integrated with the surrounding land use, and a new way of thinking about the design of our built environment needs to happen, shifting from building for the movement of cars (inducing traffic) to a focus on moving people. Failing to install on-street parking may contribute to the speeding of motorists, while removing an important physical buffer between people on the sidewalks and people passing them. Change policies to set a maximum for off-street parking when a new development goes in, instead of requiring a minimum; even better work towards not having a minimum or maximum. Kihei High School has already been successful in reducing the current parking requirements. The opportunity is right to move most, if not all, of the parking onto the street by using the most efficient for of parking—head-out angled parking.


*Above: Ulune Street in Aiea Heights, Honolulu, transformed through the use of paint as the City and County of Honolulu's first Complete Streets demonstration project. The island's first head-out angled parking was done on Ulune Street and in front of Aiea Heights High School.*

# 2 BUILD SAFER INTERSECTIONS
## Through Compact Design

"All transportation projects need to consider pedestrians' needs, including limited access freeways and highways that pedestrians cross or that intersect with streets that serve pedestrians. Because in Hawaii, highways are often the 'main streets' of villages and towns, pedestrians often walk along and cross highways." - Hawaii Pedestrian Toolbox

Most conflicts between roadway users occur at intersections, where travelers cross each other's path. Good intersection design indicates to those approaching the intersection what they must do and who has to yield or stop. Conflicts for pedestrians and bicyclists are exacerbated due to their greater vulnerability, lesser size, and reduced visibility to other users.

Kihei, Maui is considered one of Maui's urban centers according to the Hawaii Pedestrian Plan, 2011. Intersections, particularly in urban or village areas, have a significant placemaking function as well as transportation function. Pi'ilani Highway and Kulanihako'i Street will become a multi-modal intersection filled with pedestrians, bicycles, cars, trucks and buses with the future high school and mixed-use residential development. The diverse use of intersection users creates a high level of activity and need to share space.

Intersections with high motor vehicle volume, high vehicle speed, and multi-lane intersections with complex signal phasing or without any traffic control at all are the most hazardous types of intersections for pedestrians. Pedestrians are even at risk at simple STOP-or YIELD-sign intersections because of the common disregard of traffic control devices by both motorists and pedestrians. [1] People on foot may avoid difficult crossings or subject themselves or their children to considerable risks while crossing a street at a poorly designed intersection.

1 Institute of Transportation Engineers (ITE). Issue Briefs 9: Pedestrian Safety at Intersections. 2004. http://www.ite.org/technical/IntersectionSafety/Pedestrians.pdf

The new intersection that will be created at Pi‘ilani Highway and Kulanihako‘i Street for Kihei high school needs to address an at-grade intersection design that accommodates the needs of all road users. Intersection design should promote eye contact between users, creating a streetscape in which pedestrians, bicyclists and drivers are aware of one another and can effectively share space. The following are guiding principles to ensuring that the intersection is built to function for everyone, regardless or age or mode choice.

The following principles apply to all users of intersections:

- Good intersection designs are compact.
- Design should account for existing and future land uses.
- Conflicts should be avoided by applying treatments such as the Federal highway Administration (FHWA) proven safety countermeasures, which include roundabouts and medians and pedestrian crossing islands.
- Simple right-angle intersections are best for all users since many intersection problems are worsened at skewed and multi-legged intersections.
- Signal timing should consider the safety and convenience of all users and should not hinder bicycle or foot traffic with overly long waits or insufficient crossing times.

Intersection geometry is a critical element of intersection design, regardless of the type of traffic control treatment used. Geometry sets the basis of how all users traverse intersections and interact with each other. Taking into consideration the existing conditions—multi-lane road, high vehicle speeds and overly-wide corner radii—of the intersection at Pi‘ilani Highway and Kulanihako‘i Street, current traffic data and the changing land use with a school and future development the design of the intersection needs to ensure a compact, multi-modal intersection is implemented. The following pages outline the benefits, disadvantages and next steps for intersection treatments that create a safe and connected multi-modal transportation system to the future Kihei High School through best practices and conceptual design drawings.

# *Modern Roundabout: A Safer Choice.*

Some people think roundabouts can't be constructed on state roads, but that is not true. This is why the Federal Highway Administration strongly encourages state and local leaders to first look at roundabouts as an alternate to conventional intersection design.

# 2 BUILD SAFER INTERSECTIONS
## Through Compact Design: Modern Roundabouts

Modern roundabouts are proven safer than signals. The Federal Highway Administration (FHWA) strongly encourages state and local leader to look at roundabouts as an alternate to conventional intersection design.

Every day in the U.S., about 20 people are killed at conventional intersections, and many more are seriously injured.[1] Roundabouts can help reduce these deaths and injuries: they are calmer and safer, and in recent years have been deemed a "proven safety counter-measure" by the U. S. Department of Transportation.[2]

Modern roundabouts increase safety, reduce delays at intersections, reduce crashes, traffic delays, fuel consumption, air pollution, construction costs and maintenance costs. Roundabouts enhance the beauty of intersections and effectively control speeds. Compared to signzalized intersections, studies show that roundabouts provide a:

- 90-percent reduction in fatal crashes
- 75-percent reduction in injury crashes
- 30- to 40-percent reduction in crashes involving pedestrians

When designed properly, roundabouts result in safe vehicle speeds—between 15 and 25 mph, depending on the size and objective of the roundabout—which increases drivers' ability to judge and react to other vehicles and pedestrians. The slower vehicle speeds also are one of the keys that make roundabouts work for pedestrians: drivers are more inclined to yield as required when they're already going slowly. Conditions are easier for older and novice drivers. All modes are safer and integrate better. Despite the slower speeds, roundabouts tend to increase traffic efficiency—sometimes by as much as 50 percent—because they keep traffic flowing. In some places, including the Bird Rock neighborhood of San Diego, CA, single-lane roundabouts successfully carry 25,000 vehicle trips per day. Today, roundabouts grace about 2,000 intersections in the U.S., with more planned.[3]

Roundabouts also reduce environmental and noise impacts, and require much less maintenance and repair than signalized intersections. Roundabouts improve the visual quality and character through landscaping, sculptures and other gateway features that celebrate place while providing traffic calming benefits.

1 Modern Roundabouts: A Safer Choice, U.S. DOT's Federal Highway Administration (FHWA), http://safety.fhwa.dot.gov/intersection/roundabout/fhwasa10023/transcript/audio_no_speaker/
2 Proven Safety Countermeasures, FHWA, http://safety.fhwa.dot.gov/provencountermeasures/fhwa_sa_12_005.htm
3 Modern Roundabouts. http://roundabout.kittelson.com/Roundabouts/Search

# 2 BUILD SAFER INTERSECTIONS
## Through Compact Design: Modern Roundabouts

Roundabouts provide:

**90%**
reduction in fatal crashes

**75%**
reduction in injury crashes

**30-40%**
reduction in pedestrian crashes

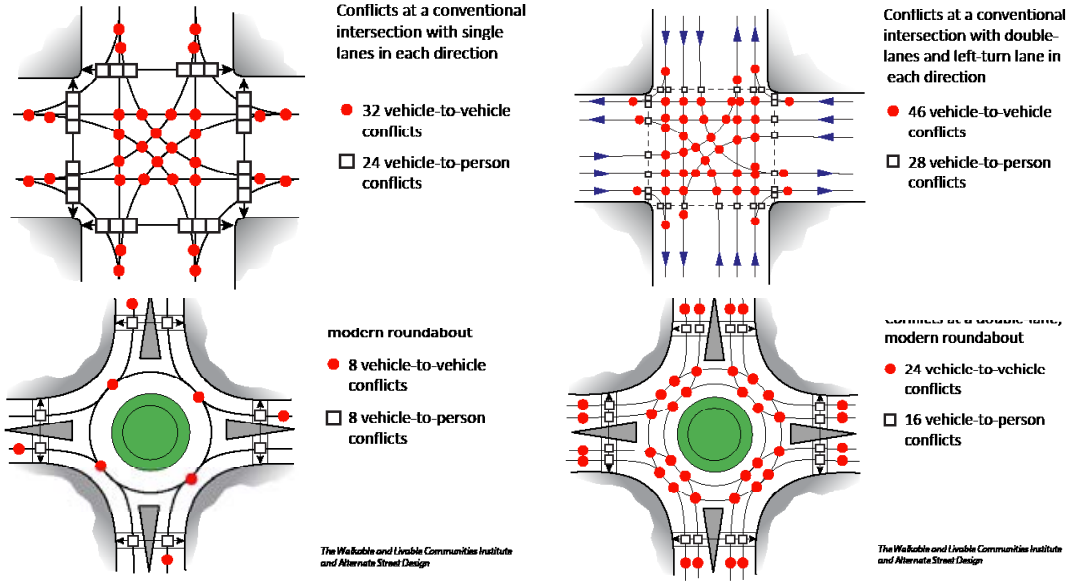
**10%**
reduction in bicycle crashes

**30-50%**
increase in traffic capacity

Lower maintenance costs with no signal equipment to install, repair and rebuild, which has a saving of

**$13,000 to $20,000**
per year for every signalized intersection

Roundabouts are inherently safer because they reduce the number of points of conflict within the intersection, as shown in the illustration below.




Roundabouts are circular intersections that move traffic counterclockwise around central islands, but not like large, high-speed 'rotaries' or 'traffic circles.' Rather modern roundabouts range from mini-roundabouts that fit on neighborhood streets that span up to 80 feet in diameter and handle 10,000 or more vehicles per day, to double-lane roundabouts 200 feet in diameter that handle 45,000 vehicles a day.[1]

Roundabouts are typically more efficient than traffic signals. At traffic signals there is "lost time" where vehicles on all approaches are stopped simultaneously between phases when the signal changes from green on one approach and turns to green on another. At roundabouts, vehicles can enter the circulating roadway whenever there is a suitable gap, most often without coming to a full stop. Additionally, vehicles can enter from multiple approaches simultaneously. These factors mean that roundabouts can process more vehicles in a given time with less delay than traffic signals. During off-peak traffic periods (the majority of the day) roundabouts excel, as there is no need to be stopped waiting for a green light.

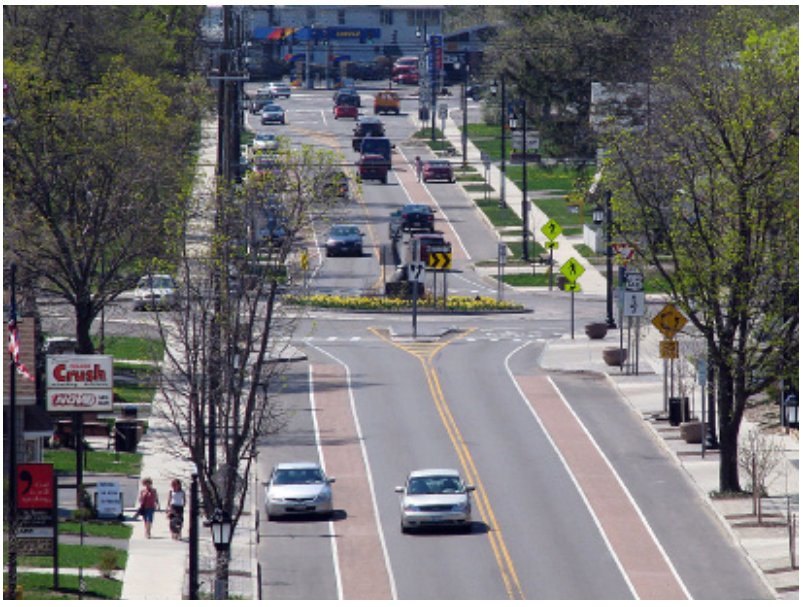
Many people oppose change, especially of new things that aren't yet understood. For example, before two 2-lane roundabouts were first installed in Bellingham, Washington, only 34% of people surveyed by the Insurance Institute for Highway Safety said that they were supportive of a roundabout. Once they went in, however, the numbers reversed, and 70% became supportive. In another study conducted by the Institute, support for 6 different roundabouts, went from a low of 22% at first to a high of 87% up to five years after installation.

1 Roundabouts: An Informal Guide, FHWA, hhttp://www.fhwa.dot.gov/publications/research/safety/00067/000674.pdf

*Above: The Clearwater Beach, FL roundabout is one of the busiest in the nation, handling 58,500 motorists daily at peak season, along with 8,500 pedestrians.*

*Above (Left): Speeds on Grandview Drive in University Place, WA were once as high as 50 mph. After the installation of the roundabout motorized crashes went from one every nine months, to zero for the past 14 years.*

*Above (Right): The roundabout on La Jolla Blvd in San Diego, CA has reduced crossing distances from 64 feet to 14 feet. Pedestrians no longer have to cross multiple high-speed lanes at once.*



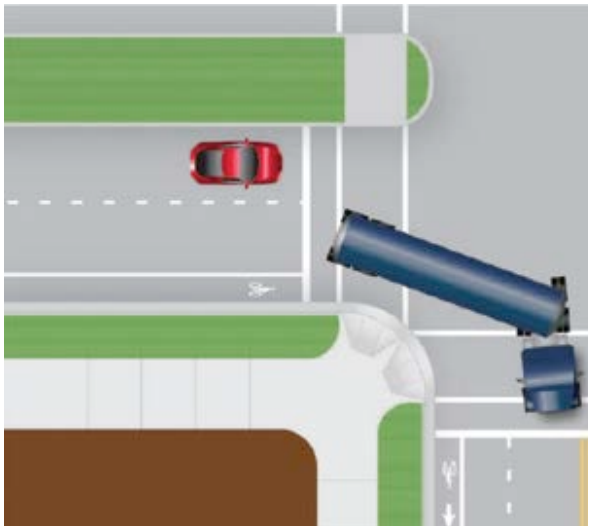

*Left: By the 1990s, business had declined along Route 62 in Hamburg, New York's commercial district. Empty storefronts pushed shoppers out to malls and big box stores. The road was often congested and presented hazards for bicyclists and pedestrians. A state plan emphasized wider roads and signalized intersections. But a group of residents banded together as the "Route 62 Committee" and created a new vision for Route 62 based on walkability and calmer traffic. Roundabouts have reduced the number and severity of crashes, congestion has been eased and emissions from idling cars have been reduced.*

# 2 BUILD SAFER INTERSECTIONS
## Through Compact Design: Signalized Intersection

Today the Federal Highway Administration (FHWA) strongly encourages State and local leaders to first look at roundabouts as an alternate to conventional intersection design, as roundabouts are one of the U.S. Department of Transportation's proven safety countermeasures.
This is due to the roundabout's proven ability to move motorists efficiently, effectively and more safely while creating an inclusive environment that supports all other modes of transportation and people of all ages over traditional signalized intersections.

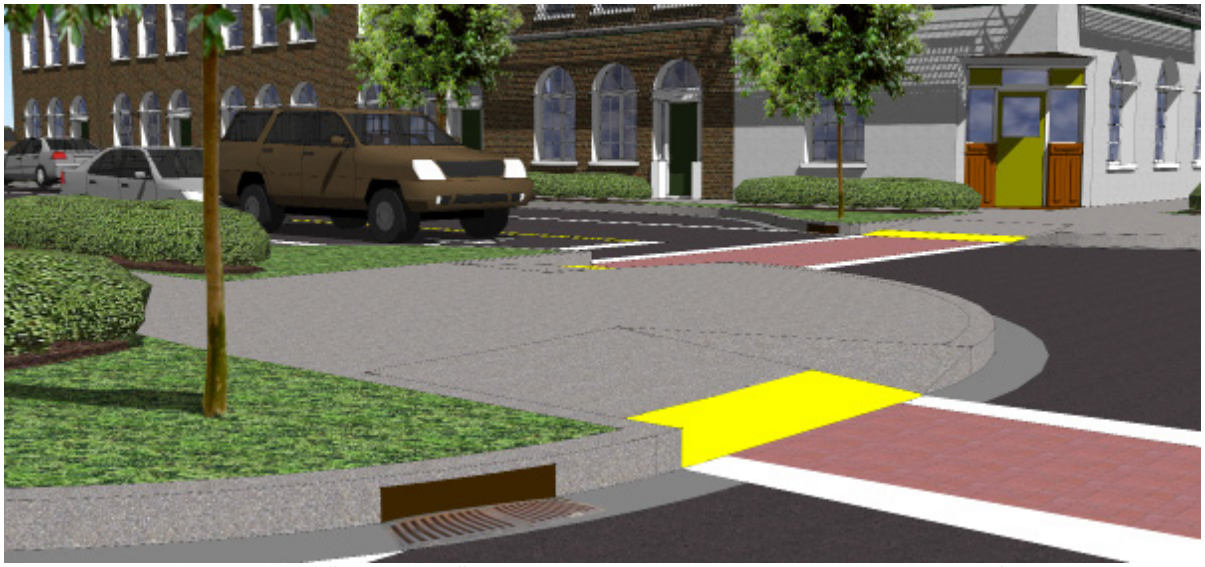
The vision of the community is to continue to enhance Kihei's walkability and access to community destinations. This also aligns with the State's vision (per the Hawaii Pedestrian Plan) to create a more integrated system that promotes a positive pedestrian experience while still moving motorists. Although, the report recommends a roundabout first, a signalized intersection would also be feasible, as long as it is designed to be compact and the design honors people and place. The following are best practices for creating compact signalized intersections, which apply to the new intersection being created at Pi'ilani Highway and Kulanihako'i Street.

A compact signalized intersection means that design treatments are used such as curb extensions, or "bulb-outs," that create a more compact curb radii and low-speed right-hand turns, which eliminates high-speed right-hand turns. The addition of bike lanes also creates a greater effective turning radius at corners and driveways, allowing large vehicles to turn without off-tracking onto the curb. Other treatments should include medians and median noses or pedestrian island crossings helping to minimize and brake-up the crossing distance for pedestrians. This will also help minimize the waiting time of motorists as the crossing distance determines how long the motorist is held back to allow a person on foot to cross.



*Left: Crossings are improved by tightening the curb radius and building raised medians with pedestrian refuges. Bike lanes support the effective corner radius , which controls turning speeds and the ability of large vehicles to turn. Note crosswalks can be enhanced with high visibility lateral striping.*

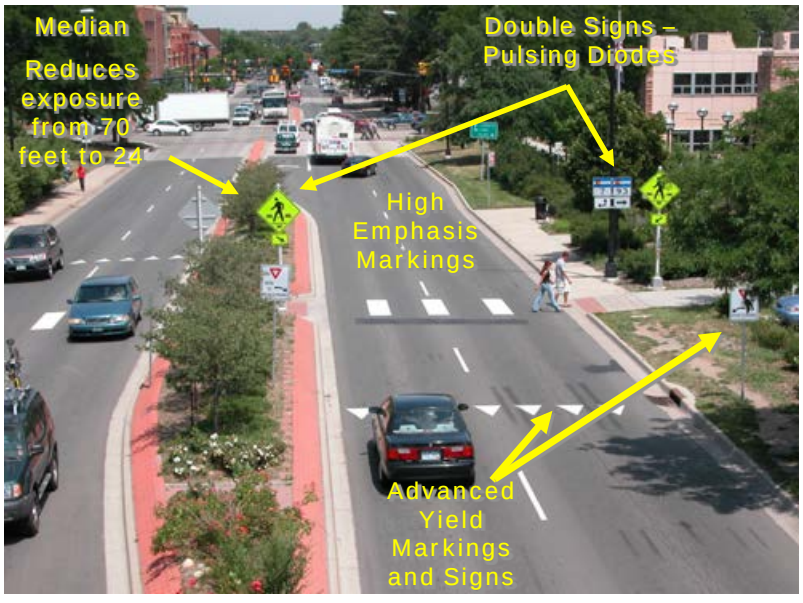
*Illustration by Michele Weisbart; source: LA County's Model Design Manual for Living Streets*



*Above: Curb extensions, of "bulb-outs," reduce the crossing distance and exposure of a person on foot, as well as, greatly improve ADA compliance. Helping children cross the street safely also benefits elders, people with disabilities and parents with strollers.*

*Above (Left): This intersection in West Sacramento, CA has two ADA ramps per corner with high visibility marked crossings, helping to communicate that pedestrians are expected here.*

*Above (Right): Lincoln Highway in West Sacramento, CA is transforming. Today, a tree lined and landscaped median has been implemented, including a median nose at a signalized intersection to help pedestrians more safely cross six travel lanes.*



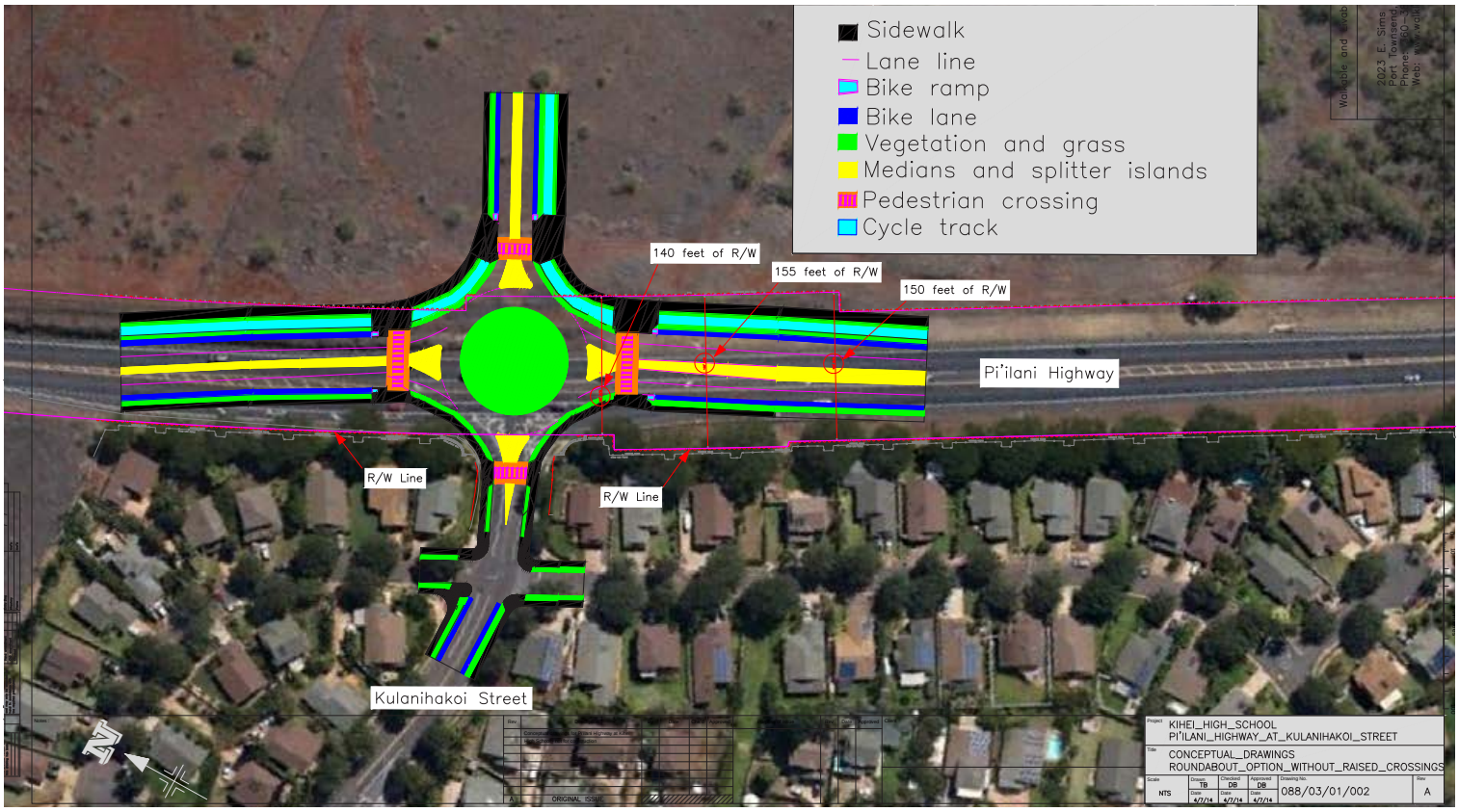

*Left: A landscaped median and marked midblock crossing in Boulder, CO. Note, Hawaii is a STOP for pedestrian state so the marking would be a solid bar instead of the triangular yield marking shown in this photograph. It is also important to note that the advanced yield or stop bar is placed, at minimum, 30 feet back from the crossing to reduce multiple threat crashes. A multiple threat crash is when a motorists stops to let a person cross too close to the marked crossing, and sets up a blind for an approaching motorist in the adjacent travel lane.*

# Vision: Before

**The photo-vision illustrates how a modern roundabout at the of Kihei High School creates a gateway for the school and community, honoring place and quieting the street. It reduces the crossing distance (exposure) for students on foot by providing space to pause on the 'splitter island,' and pedestrians only need to consider one direction of traffic at a time, simplifying the task of crossing the street. The low vehicle speeds through a roundabout increase driver vigilance, allowing more time for drivers and pedestrians to react to one another. Bicyclists are given the option of riding in the lane of slow moving traffic, or riding on the shared pedestrian path.**

# Vision: After

# 2 BUILD SAFER INTERSECTIONS
## Through Compact Design




Choose a Roundabout. Many roundabouts have been installed near schools in the United States, including Montpelier, Vermont; Howard, Wisconsin; University Place, Washington; and Kennewick, Washington. The low speed and safety aspects for both drivers and pedestrians at the intersection, along with the traffic calming effects seen several hundred feet from the intersection, make roundabouts an ideal choice near schools. The conceptual design (above) illustrates a double-lane roundabout along the Pi'ilani Highway leg and a single-lane on the Kulanihako'i Street and school street leg. Double-lane roundabouts typically are 200 feet in diameter can have a large right-of-way requirement, however this is not an issue given the sufficient right-of-way along this section of Pi'ilani Highway. The conceptual design factored in the nearby intersections of Pikea Avenue, Kaonoulu Street and Ohukai Road to ensure that traffic at these intersections would not backup into the proposed intersection. The findings prove that there will be no backup; Pikea Avenue is 3,900 feet away and Ohukai Road is 5,000 feet away. Kaonoulu Street currently is unsignalized creating no queue length. Design details are important; ensure it is done by an engineer experienced with modern, double-lane roundabouts that are traffic-calming, include the pedestrian and bicyclist, and act as placemaking tools.

To manage peak twenty-minute school traffic a metering signal can be installed. The reason why a roundabout can become congested is because the traffic flow within the roundabout circulation prevents motorists from other legs entering due to a lack of gaps. A metering signal is similar to a ramp metering where the approaching vehicle queue is metered and a part time signal is used to stop the conflicting vehicle flow to allow the congested approach to enter the roundabout.[1] To better signal to drivers a pedestrian is present a Rectangular Rapid Flash Beacon can also be installed, in a way that is similar to a half signal so only one direction of traffic is stopped at a time.

1 Clearwater Beach, Florida Roundabout. http://www.sidrasolutions.com/Documents/KenSIDESClearwaterROUPaperITE.pdf

# 2 BUILD SAFER INTERSECTIONS
## Through Compact Design

When driving through a roundabout:

1. Slow down.

2. When there is more than one lane, use the left lane to turn left or make a u-turn, the right lane to turn right, and all lanes to go through.

3. Yield to pedestrians and bicyclists.

4. Yield to circulating motorists.

5. Stay in the same lane within the roundabout and use the right-turn signal to indicate intention to exit.

6. Always assume trucks need all available space - don't pass them.

7. Clear the roundabout to allow emergency vehicles to pass.

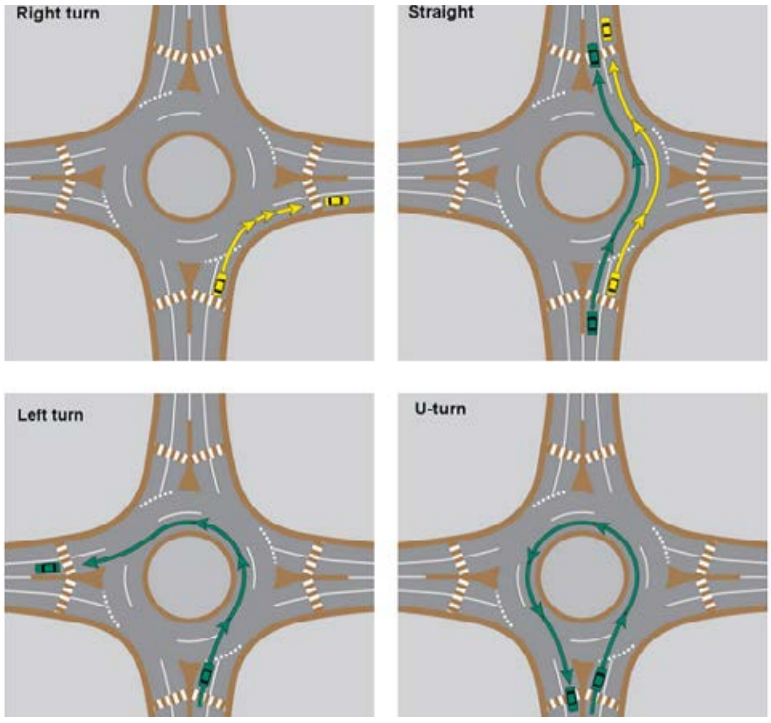
Watch a video demonstration Carmel, Indiana: http://www.carmel.in.gov/modules/showdocument.aspx?documentid=911

To further support a roundabout as the viable intersection treatment:

***Adopt a Roundabout-First Policy.*** Whenever a project includes reconstructing or constructing an intersection, analyze the feasibility of using a roundabout instead. This approach is recommended by the U.S. Department of Transportation's Federal Highway Administration and backed by the Insurance Institute for Highway Safety.[1] HDOT in 2008 adopted a " Modern Roundabout Policy Guideline" which notes roundabouts should be considered by transportation professionals and communities (http://goo.gl/lfmpTK).

***Promote the Design Through Education and Awareness.*** People may be concerned with driving in a multi-lane roundabout. Many may ask questions, such as *how do I choose which lane to enter and exit?* Education is vital to the acceptance and success of a roundabout. Navigating a roundabout is easy, but because people are apprehensive about new things, it's important to educate the public about roundabout use. In general, multi-lane roundabouts should be approached the same way as any other intersection. If the motorist wants to turn left, use the left-most lane and signal the intention to turn left. If the motorist wants to turn right, use the right-most lane and signal the intention to turn right. In all cases, motorists circulate counterclockwise around the central island. Motorists entering the roundabout always need to yield to people crossing and motorists that are currently circulating in the roundabout.

1 Smart Transportation Guide, Planning and Designing Highways and Streets that Support Sustainable and Livable Communities. Chapter 6. http://www.state.nj.us/transportation/community/mobility/pdf/smarttransportationguidebook2008.pdf




*Above: The graphic, from Washington State DOT, shows what turns can be made in multi-lane roundabouts. The arrows in yellow show the movements that can be made from the right lane, and the arrows in green show the movements that can be made from the left lane.*



*Top (right): A graphic illustrating a roundabouts main characteristics. Bottom (right): A graphic illustrating walking and biking through a roundabout. Learn more here: http://safety.fhwa.dot.gov/intersection/roundabouts/fhwasa08006/*

Although a roundabout is the recommended first choice for creating an inclusive environment that supports all modes of transportation and people of all ages, the report conceptually illustrates a signalized intersection. The most important point is that the intersection needs to honor the future land use and set the tone for safe and convenient at-grade routes for all people and all modes of travel.

If a signal is implemented the intersection should be built compactly to reduce turning speeds and minimize conflict points between motorists and pedestrians. Design treatments such as curb extensions to eliminate high-speed right-hand turns and medians with median noses should be applied, helping to minimize and brake-up the crossing distance. This will also help minimize the waiting time of motorists as the crossing distance determines how long the motorist is held back to allow a person on foot to cross. Signal timing also needs to be addressed to ensure that it allows time for pedestrians on foot and minimizes conflicts due to turning movements. The following street treatments are recommended to ensure a compact intersection designed to safely and conveniently allow all modes an at-grade crossing:

- Install curb extensions.
- Paint high-visibility ladder-style marked crossings.
- Enhance visual clues to motorist by installing landscaped medians.
- Include median noses at intersections to reduce crossing distance for people on foot.
- Set signal timing not just for the movement of motorists, but also for pedestrians, bicyclists and public transit users to create a safer environment that supports everyone.

# 2 BUILD SAFER INTERSECTIONS
## Through Compact Design

*Install curb extensions.* Reduce high speed right-hand turning radii and crossing widths by installing curb extensions. To still allow for truck turning movements stop bars can be set further back from the crosswalk marking, and the addition of bicycle lanes provides the additional benefit of increasing the effective turning radius. Any new design should include American with Disabilities Act (ADA) Requirements. This is a federal law. ADA compliance is improved through the use of curb extensions. Not only is it easier to position the ramps where they need to be the pedestrian is positioned where they can see traffic, and where drivers can see them. Curb extensions help improve motorists yielding behavior, and sight lines are better protected for both motorists and pedestrians.

*Paint high-visibility ladder-style marked crossings.* Ladder-style crosswalk markings provide the highest visibility to a driver from afar because there is more surface area to be seen. They also provide added support for people with visual limitations. The color contrast shown in El Cajon, CA (left) is not required in uniform traffic standards, but can be adopted by communities to better support active transportation. Raised crossings also help create a more enhanced crosswalk marking and slow motorists.

*Enhance visual clues to motorist by installing landscaped medians.* Medians reduce the number of conflicts and conflict points, decreasing vehicle crashes, providing pedestrians with a refuge as they cross the road, and space for landscaping, lighting and utilities. These medians are usually raised and curbed. Landscaped medians enhance the street, or help to create a gateway entrance into the community. Medians with trees planted in them create a sense of enclosure, helping to improve driver vigilance.

*Include median noses at intersections to reduce crossing distance for people on foot.* Median noses, similar to pedestrian crossing islands that are used for mid-block crossing locations, are often placed near schools, trail crossings, high pedestrian flow zones, transit stations, work centers and shopping districts. The minimum width of a crossing island or median nose is six feet in width. A pedestrian activated signal should be placed in the median nose to allow pedestrians waiting to activate the signal cycle. Creating a refuge helps people of all ages cross a multi-lane road, by creating an environment where people are not stranded if they are unable to make the full signal length.

Equally important to the allocation of space for the design of the intersection, is the allocation of time performed by traffic signals. In combination, space and time govern how streets operate and how well they provide mobility, safety and access. Signal timing is an essential tool, not just for the movement of traffic, but also for a safer environment that supports walking, bicycling public transit use and surrounding land use.

*Set signal timing not just for the movement of motorists, but also for pedestrians, bicyclists and public transit users to create a safer environment that supports everyone*. Basic pedestrian signal timing principles should be combined with innovative pedestrian signal timing techniques to enhance pedestrian safety and convenience, especially near a school. To improve livability and pedestrian safety, signalized intersections should:

- Provide signal progression at speeds that support the target speed of a corridor;
- Provide short signal cycle lengths, which allow frequent opportunities to cross major roadways, improving the usability, accessibility and livability of the surrounding area for all modes;
- Ensure that signals detect bicycles;
- Place pedestrian signal heads in locations where they are visible;
- Set the signal timing to automatic recall, so pedestrians don't have to seek and push a pushbutton. If this is not included, place pedestrian pushbuttons in convenient locations, using separate post that are accessible.

To ensure pedestrian signal phasing is included to increases safety and convenience for pedestrians refer to the *LA County's Model Design Manual for Living Streets here: http://www.modelstreetdesignmanual.com/ or National Association of City Transportation Officials (NACTO) here: http://nacto.org/usdg/intersection-design-elements/traffic-signals/*

# 2 BUILD SAFER INTERSECTIONS
## Through Compact Design

In addition to at-grade intersection improvements for all users at Pi'ilani Highway and Kulanihako'i Street the County of Maui should compliment improvements by addressing the crossing distances on many of the residential streets along Kulanihako'i Street, which today are overly-wide due to the overly-wide right-hand turn radii, encouraging high speed turns. Walkable low-volume neighborhood streets should have a crossing distance of 28 feet maximum (includes two travel lanes and turning radius).

*Install curb extensions*. The County of Maui should add curb extensions to fix overly-wide street crossings on Kulanihako'i Street.

*Above: Residential, cul-de-sac, streets are overly-wide with the crossings over 40 feet, on some streets crossings are close to 70 feet. The maximum width of low-volume neighborhood streets should be 28 feet.*

# 3 ADDRESS OFF-STREET PEDESTRIAN & BICYCLE CROSSINGS & NETWORKS

## Underpass or Overpass

The State Land Use Commission and Maui County Council have imposed a zoning condition that an overpass or underpass be considered (see supporting documents, page 66), as well as at grade improvements, the following section will address this condition.

Pedestrian overpasses and underpasses allow for pedestrian movement separate from vehicle traffic. However, they are usually considered as a last resort measure. It is more appropriate to install safe crossings that are accessible to all pedestrians and bicyclists at grade. Separated facilities are extremely high-cost and create other problems. "Eyes on users" and ADA compliance are two very common problems associated with over/underpasses. For example, to meet ADA extensive ramping typically is needed to accommodate wheelchairs and bicyclists at grade changes, resulting in long crossing distances and routes, which discourage use. Studies have shown that many pedestrians will not use an overpass or underpass if they can cross at street level in about the same amount of time or less. Keeping in mind that students will be using this feature, peer pressure to "race for it" and cross at grade may also be likely.

Careful consideration should be given to potential negative impacts on the pedestrian environment.

- Use sparingly and as a measure of last resort. An overpass or underpass is most appropriate over high-volume, high-speed highways, railroad tracks, or natural barriers.
- People will not use the structure if a more direct route is available.
- Lighting, drainage and security are also major concerns with underpasses.
- Must be ADA accessible, which generally results in long ramps on either end of the overpass or underpass, depending on topography.[1]
- Decreased on-street vibrancy due to a reduction in movement and activity by pedestrians.
- Increased construction expenses.

Costs for pedestrian and bicycle overpass or underpasses vary greatly from state to state and city to city. Costs will vary greatly based on site conditions, materials and other contexts. Underpasses (excluding bridges) range from slightly over $1 million to over $15 million in total or around $120 per square foot. Overpasses (excluding bridges) have a range from $150 to $250 per square foot, depending on site conditions. More detailed cost information can be found here: http://www.pedbikeinfo.org/data/library/casestudies_details.cfm?id=4876.

1 Pedestrian and Bicycle Information Center. Overpass/Underpass. http://www.pedbikeinfo.org/planning/faciliites_crossings_over-underpass.cfm

# 3 ADDRESS OFF-STREET PEDESTRIAN & BICYCLE CROSSINGS & NETWORKS

## Underpass or Overpass

Taking these factors into consideration, an overpass should not be considered due to the areas topography, costs, and understanding of pedestrian behavior. During the focus group sessions the majority of participants agreed that due to the contexts of the surrounding area of the new school site an overpass is not an appropriate treatment.

If this condition is to be met, an underpass is the most viable option given the gulches on either side of the school, which provide the natural topography for an underpass. However, additional measures need to be taken into account for the planning and design of an underpass due to concerns regarding flash flooding in Maui County. An underpass is the more widely accepted and supported treatment within the community.

*Choose an underpass.* The first priority is to address at-grade crossings for pedestrians and bicyclists. A mid- to long-term treatment is an underpass due to the natural topography of the area with the gulches: the most viable option for an additional pedestrian and bicycle-only travel-way. This however will require additional engineering studies and multi-government agency and public-private relationships. Of the two gulches, the Waipuilani gulch would be the best gulch to start with. Maui Research and Tech Park has already shared their interest and conceptual designs for a non-motorized trail connecting their campus to the school campus along the Waipauilani gulch.

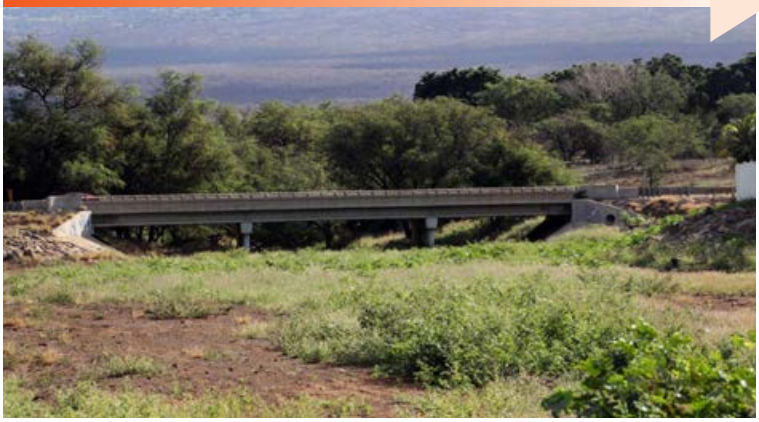
*Left: The Hendrix College Tunnel in Conway, AR provides a tunnel with a musical fugue and light show to make the passage more interesting and to encourage use.*

## Envision: From this... To this.

*Above (Left): Existing conditions at Waipuilani Gulch.*

*Above (Right): The Tunnel Underpass in Boulder, CO*

## Envision: From this... To this.



*Above (Left): Existing conditions at Waipuilani Gulch.*

*Above (Right): An underpass trail in Davis, CA.*

# 4 IMPROVE CONNECTIVITY
## Complete the Street Network

Maui County General Plan 2035:
Objective: 6.8.2 Provide a more expansive network of safe and convenient pedestrian-friendly streets, trails, pathways, and bikeways between neighborhoods and schools where appropriate.

Policies: 6.8.2.a Encourage the State to build new school facilities in appropriate locations that minimize time and distance for students to travel to and from school.

6.8.2.b Encourage the State to implement the Safe Routes to School initiative with funding commitments to help the County plan and fund projects that ensure safe access routes to school

Implementation Actions:
6.8.2-Action 1 Conduct an inventory to determine safety obstacles along school access routes and work with the State to address safety concerns for students who are unable to utilize school bus transport.

6.8.2-Action 2 Work with the State to coordinate the siting and development of future school facilities, bikeways, pedestrian paths, and greenways to encourage mobility.

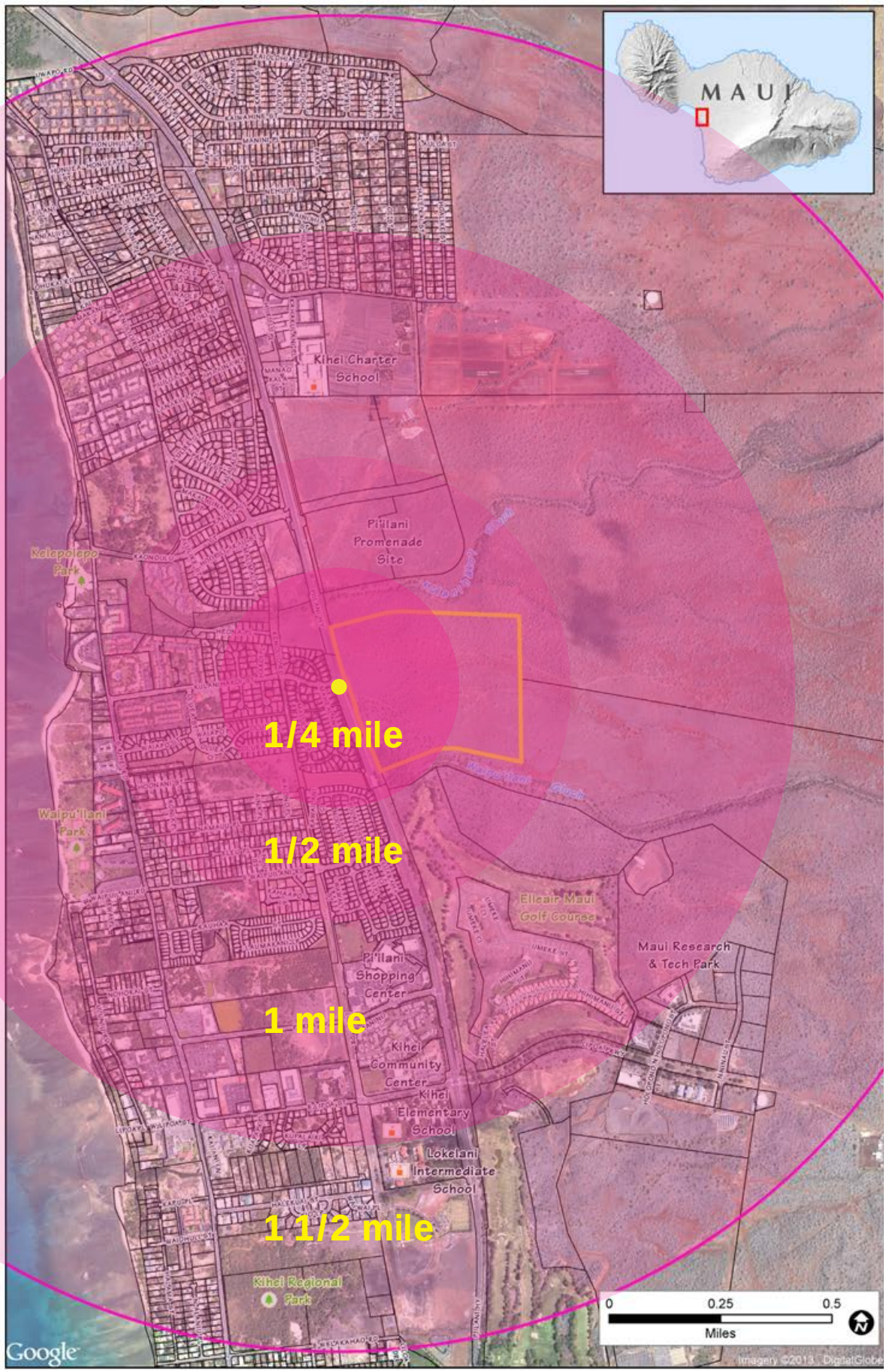
6.8.2-Action 3 Amend County zoning and subdivision regulations to require development within the vicinity of schools, libraries, community centers, and other public facilities to provide bike-and pedestrian-friendly infrastructure and traffic calming features.

The location of the high school is within walking distance to existing and future residential areas, thereby encouraging students to walk and bike to and from school. However current conditions of the streets are hostile to someone on foot, especially for youth. Pi'ilani Highway needs to transition, other street networks need to be completed, such as the North-South Collector road, as well as, new pedestrian and bicycle networks need to be created. All of these are opportunities in which partnerships are needed. This work cannot be done alone.

Creating a walkable and bikeable community starts with the built environment: having destinations close to each other; siting schools, parks, and public spaces appropriately; allowing mixed-use developments; having sufficient densities to support transit; creating commercial districts that people can access by bicycle, foot, wheelchair and motor vehicle. Most walking trips are less than a-half mi, so having a compact environment is essential. Similarly, while half of all household trips are three miles or less, fewer than two percent of those trips are made by bicycle, allowing for the opportunity for more people to shift to bicycling if there is the infrastructure to make it feel safe and comfortable.

The design of the built environment greatly influences the sustainability of all communities and the overall quality of life for all residents. Land use patterns and transportation have a very close relationship – land use decisions affect transportation planning, and transportation planning affects land use patterns. Coordination must exist between transportation and land use planning decisions so they are complimentary rather than contradictory. When designing new communities, expanding current communities, or increasing density in existing communities, ensuring mobility and circulation for all modes of transportation must be a top priority; it is essential to assuring the livability of a community.

The County of Maui, Hawaii State Department of Education, Hawaii State Department of Transportation, elected leaders, and the greater community need to work together to continue prioritizing built environment improvements starting at the new high school site and working outwards. Maui County General Plan 2035 outlines this goal in more detail. Local community plans should be honored and followed.

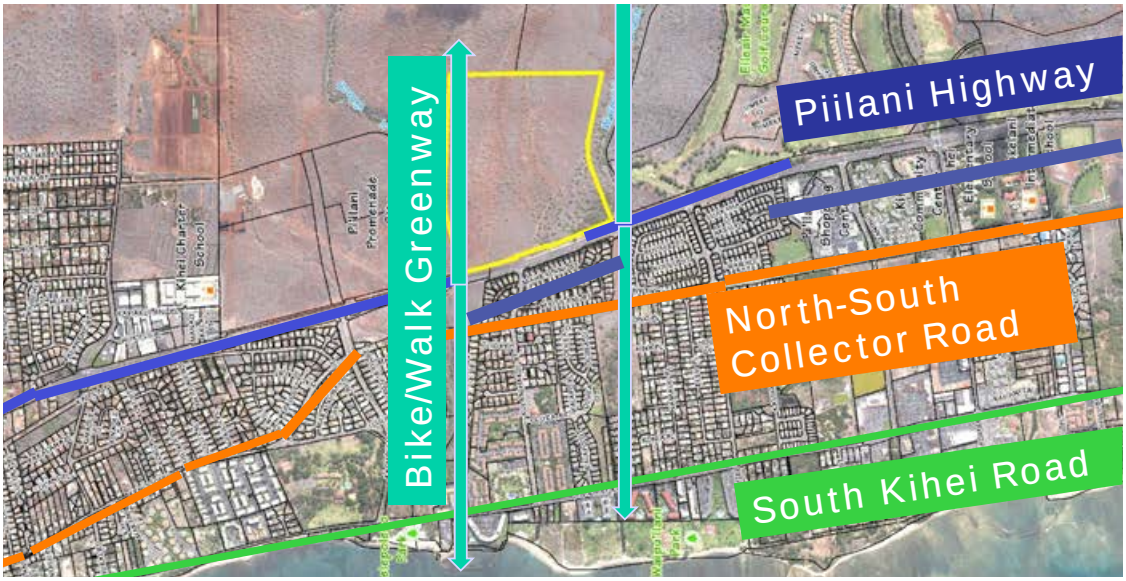



This map illustrates the walk/bike shed, or the area encompassed by walking and bicycling distances from adjacent neighborhoods that could be taken to/ from Kihei High School.

Although the new high school will be located centrally within Kihei, a major barrier exists-- Pi'ilani Highway. The good news is that the school, it's access road and the highway can transition to reduce congestion and road maintenance costs, reduce busing demand and cost, increase safety, restore the youth's freedom, and help make the school truly a center of the community.

# 4 IMPROVE CONNECTIVITY
## Complete the Street Network

***Complete the Street Network.*** The County of Maui and the Kihei community should continue prioritizing completing the street network with a traffic circulation study. The completion of the North-South Collector Road should remain a top priority. Completing this road will help create better traffic circulation in Kihei as it will alleviate pressures from the highway and South Kihei Road. Any new road design should incorporate people, specifically people on foot and bike. Make pedestrians at the top of the transportation planning hierarchy. Create an action plan for a pedestrian and bicycle trail network and look to create new connections mauka to makai; the gulches provide a natural opportunity for greenways. As new development continues to occur in Kihei ensure that codes are updated, new design standards are adopted such as LA County Living Streets Design Manual or National Association of City Transportation Officials (NACTO) to ensure that streets are not over-built for one mode, the automobile, and are built to accommodate all users. Kauai County has adopted the LA County Living Streets Manual and are in the process of rewriting portions to more specifically address local conditions.




*Left: When University Place, WA incorporated in 1995 there were zero sidewalks, today they have installed over 23 miles of sidewalks, in addition to the first roundabout in the State of Washington located at the High School. Today high school students walking home is a daily scene.*

***Create More Connectivity within the School Site.*** It is important to consider a school's physical relationship to its surroundings. For example, at the site plan scale, it is key to evaluate how a sidewalk connects to the school's entrance and how it relates to driveways and parking lots. On a larger scale, it is important to evaluate how a school relates to the neighborhood around it, particularly people's homes, as well as, take into account future development. This is critical because the proximity of homes and schools has been found to be the most important influence of walking and bicycling to school (Active Living Research 2009).

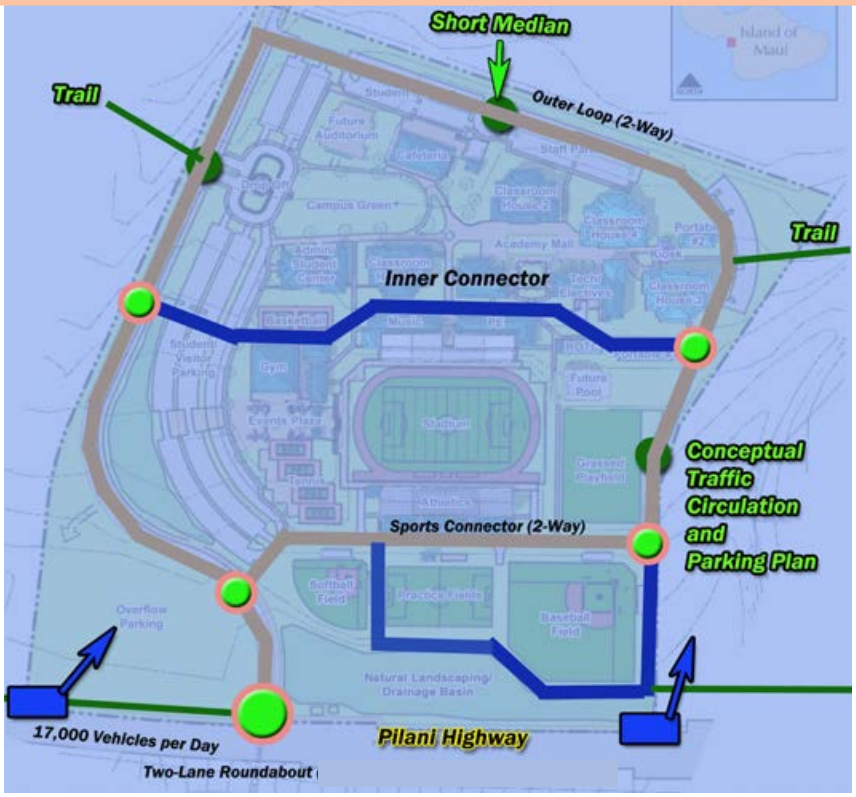
It is important to note that billions of dollars of taxpayer money are used for school construction on an annual basis. Given this investment, it is important for communities to have school buildings and sites that are meaningful, lasting and are able to serve a community that changes through time.

The school siting process can be very complicated, with many factors that districts have to consider, including educational programming and safety. The ability of youth to walk and bicycle to school is a as critical component. When a new school is planned, a collaborative and open planning process that brings together policy-makers and staff, county representatives, residents and parents leads to schools that are cherished and respected by the community.

To better compliment the recommendation to move parking on-street, the school with community partners has the opportunity to enhance the campus by addressing traffic circulation, by adding street connectivity through the campus. Current conceptual designs of the school create what is called a super-block that will negatively contribute to the walkability of the future development of this area of Kihei. Set the target speed for 15-20 mph. Make two travel lanes, 10 foot each. Work together to refine the conceptual site plan to apply traffic calming tools, such as short medians, raised crossings, mini-circles, bike lanes or a "sharrow" park/unpark lane, and on-street parking, to prime the area for future walkable developments, which will bring more "eyes to the street" and ensure a strong street network is created on the mauka side of Kihei. Consider an inner connector street that allows for some teacher parking and deliveries, but during school hours is closed to vehicular traffic, creating a flexible and festival street. Adding street connectivity will set the stage for a walkable, livable mauka community.

Kihei High School Conceptual Site Plan


**Conceptual School Campus Traffic Circulation and Parking Plan**



# STRENGTHEN PARTNERSHIPS

The Kihei community is preparing itself to build on successful Smart Growth planning and complete street engineering efforts, as noted in Maui County Comprehensive Plan. To fully achieve this the new school site is a fresh canvas to capitalize on the energies of a team that are able to collaborate effectively and foster change. Collaboration between the Department of Education, Department of Transportation, and county can lead outcomes with far-reaching benefits. Communities with a high degree of collaboration have been able to build and maintain facilities that would not have been possible otherwise, utilize each other's data to better plan for future needs, and create vibrant real-world life-long learning opportunities.

Collaborative projects have higher-quality outcomes, are easier to implement, face fewer legal challenges, better serve the public and make better use of available resources. Keys to success include recognizing there is common ground and interest in working together, that there are distinct planning needs and regulations for each group involved and the importance of regular communication.

The future high school brings forward the opportunity to continue to work with the community to overcome any past history to create safe routes to school; working partnership to gather information and identify issues; create a framework for community outreach and education that looks at incentives and encouragement for improving walking, biking and enforcement; and expands the safe routes to school partnership school by school.

To achieve this level of collaboration there needs to be a designated point person or program coordinator to help unite and focus on the engineering, education, enforcement, encouragement and evaluation (Five E's) that various partners are leading. The good news is that each county of Hawaii will be able to hire a Safe Routes to School County Coordinator to be the central person to assist with safe routes to school-related projects, like the high school. The Hawaii Safe Routes to School special fund established by HB 2626 in 2012 consists entirely of State funds collected from traffic violations in school zones. The State Department of Transportation (DOT) is currently finalizing Administrative Rules necessary to distribute to counties for county-level programs. The DOT should share their status to confirm whether or not this future position will be filled within a time-line that works for the new high school project.

The following potential partners should be engaged in creating safe routes and complete streets to the new high school:

### Education

Department of Education, Department of Health: Healthy Hawaii Initiative Maui County, Maui PATH, local elected leaders, PTA, teachers, students, and principals.

Tasks: Getting everyone on the same page to understand what works best for the high school to do outreach within the schools and the community to educate everyone on the benefits of creating a new school campus that honors the community by creating safe streets for all.

### Encouragement

Principals, teachers, Maui PATH, Department of Health: Healthy Hawaii Initiative Maui County, parents, PTA, local elected leaders, other grass roots non-profits, and business community.

Tasks: Locating and providing incentives, finding the fun and tailoring the program to suit the needs of the high school.

### Engineering

County departments such as planning, public works, and parks and recreation, Maui MPO, fire, police, Hawaii DOT, and Department of Education

Tasks: Prioritizing and completing the recommended engineering improvements at or near the school.

### Enforcement

Police/Sheriff, parents, students, principals, teachers, Department of Education

Tasks: Regular and random police presence during pick-up/drop-off to encourage good motorist behavior. Enforcement of traffic laws around schools to ensure safety, reducing parental concerns about traffic congestion and “stranger danger.”

### Evaluation

PTA, principals, teachers, parents, students, Department of Education, Hawaii DOT, Maui County

Tasks: Collecting baseline data to evaluate how implemented solutions and tools are providing safe routes to school.

Additional avenues to partner for achieving the engineering, education and engagement and enforcement may include partnering with local before- and after- school programs for students to walk or bike to or from, or involve residents, landowners, and business owners who might be interested in creating or maintaining a safe route such as a trail.

The following are next steps related to the built environment recommendations made in this report. To implement many of the recommendations, a strong working partnership between government agencies, leaders and the greater community may be needed.

# NEXT STEPS

## Short-term

- **Set the target speed within the School Zone to 30-35 mph.**
  State Department of Transportation, Department of Education and Maui County officials need to agree on setting an appropriate target speed for the new section of Piʻilani Highway which will transform into a school zone due to the siting of the new Kihei High School. Design the road and intersection along Piʻilani Highway at the school site so that motorists behave and drive the target speed. Fast-moving vehicles kill people and divide places. A pedestrian hit by a vehicle at 20 mph has a 90 percent chance of survival while the odds of surviving a 40 mph impact are only 10 percent.

- **Prioritize an at-grade crossing, first and foremost.**
  Creating a built environment that honors the community means that all modes of transportation should first be included, and at-grade crossings for pedestrians and bicyclist should be a top priority in the design of intersections and at other street crossings especially near schools.

- **Update HDOT 2008 roundabout guideline policy and adopt a roundabout-first policy.**
  To support the Department of Transportation in effectively analyzing and implement Federal Highway Administration proven safety countermeasures elected leaders can adopt a roundabout-first policy. Whenever a project includes reconstructing or constructing an intersection, such is the case for the new Kihei High School, analyze the feasibility of using a roundabout. This approach is recommended by the U.S. Department of Transportation's Federal Highway Administration and backed by the Insurance Institute for Highway Safety. This report has conceptually analyzed the feasibility of a roundabout at the intersection of Piʻilani Highway and Kulanihakoʻi Street, showing that a roundabout is a viable option, and through good design ensures that drivers slow down to 20 mph, while maintaining traffic flow. A roundabout protects pedestrians, reduces pollution and noise, and creates a more pleasant gateway into the community and school. The following are next steps to move from the report's conceptual engineering recommendation for a roundabout toward implementation.

- **Share the report findings with the State Land Use Commission and Maui County Council, specifically highlighting the section on overpasses and underpasses.**
  Due to the topography of the surrounding area of the high school site and the community's

preference for an underpass, the commission and county should evaluate if an overpass can come off the table. Either way, building an overpass or underpass can have high costs and involves many government agencies, departments, and the greater community to effectively implement. If the commission and council still want the zoning condition of an overpass or underpass to be met, the Department of Education should work with these agencies to recieve an extended time-line to achieve this goal, as long as, an inclusive and accessible at-grade intersection for all users is implemented first.

- **Build support.**
  Since roundabouts and other traffic calming tools can be a new idea, support elected leaders and agency staff by continuing to build community support. Public support first will help inspire the approval and navigate implementation. Share the report with stakeholders who participated in the focus group meetings, walking audit, and public workshop along with others who were not able to make these events. This also recognizes the individuals who participated and whose input helped form the recommendations in this report. For example, community advocates can print this document and/or the photo vision, talk to neighbors, build community support, and then meet with decision makers, news outlets, experts and others to discuss the benefits of roundabouts, underpasses and other traffic calming tools recommended. Agency staff can engage the public in meaningful process, hosting charrettes or interactive design workshops to continue building public acceptance and understanding.

- **Department of Education should address traffic calming and additional street network recommendations into the school campus conceptual designs.**
  This includes treatments like on-street parking, tree lines streets that buffer sidewalks, bike lanes, and ten foot travel lanes.

## Mid-term

- **Design a compact at-grade intersection that supports and includes all modes of travel—people on foot, bicycle and motor vehicle**
  A modern roundabout should be the first choice for the at-grade intersection of Pi‘ilani Highway and Kulanihako‘i Street. It has been proven to be an intersection treatment that provides for the safest movement for all modes at an intersection, while keeping traffic moving and creating an environment that is attractive and encourages people of all ages to walk or bike. If the next steps for designing a roundabout are not followed, then the intersection should be a compact signalized intersection to help control the many new turning movements by motorists and an increase in people on foot or bike in this location. A signalized intersection has more vehicle-to-vehicle and vehicle-to-pedestrian conflicts when compared to a modern roundabout, however applying curb extensions, landscaped medians, median noses for pedestrian’s to take refuge, bicycle lanes, and signal timing that accounts for people on foot and bicycle improves drivers’ vigilance and operations for all modes becomes more inclusive. Department of Transportation and Department of Education need to work together with the greater community to implement a compact multi-modal intersection.

- **Right-size Piʻilani Highway**
  To ensure that motorist behave and vehicle speeds meet the target speed (30 to 35 mph) the following tools should be implemented:
  - **Narrow Travel Lanes:** Ensure that travel lanes are not wider then 11 feet, 10 feet is the recommended width.
  - **Install a Landscaped Median:** Create a sense of enclosure, slowing motor vehicle speeds and increasing driver vigilance by creating landscaped medians with street trees. This also will create a gateway element to the school area.
  - **Build a Sidewalk or Multi-Use Trail:** Sidewalks should be prioritized on both sides of the highway, and should be added on all sides of the intersection, then as future land use evolves sidewalks can be extended and connected. If one side has to be chosen to be implemented first, it should be the school side. A sidewalk or multi-use path should be implemented along the school edge, and leading up the school road. The sidewalk should be a minimum of 6 feet wide and a multi-use trail should be a minimum of 12 feet wide. Use the Hawaii Pedestrian Toolbox to guide in the design of the sidewalk or trail. Use the Hawaii Pedestrian Toolbox.
  - **Place the Proper School Zone Signage Along the Corridor:** Remind motorists to obey posted speeds with the right school zone signage per MUTCD guides. The addtion of signs and designing the road to achieve the desired target speed makes motorists more vigilant and aware. Further back with enforcement.
  - **Colorize Bike Lanes:** Colorized bike lanes further communicate to motorists that bicyclists use the roadway too, by sending visual cues to the motorist. Bike lanes also provide an additional benefit by further creating a buffer between moving vehicles and pedestrians on the sidewalks and increase the effective turning radius for oversized vehicles.

- **Right-size Kulanihakoʻi Street**
  Maui County should work towards reducing overly wide right-hand turn radii by installing curb extensions, remove obstacles from sidewalks, reduce travel lanes to ten feet, and add bike lanes and on-street parking along Kulanihakoʻi Street.

## Long-term

- **Improve Street Connectivity and Network, Including Pedestrians and Bicycles.**
  Maui County should continue working towards completing parallel street networks to Piʻilani Highway to provide additional routes for motorists, further helping the community's overall traffic circulation. A traffic circulation study should be completed. These connections should prioritize pedestrians as the top of the design hierarchy. These networks can continue to be prioritized and supported through a community-wide pedestrian and bicycle master plan. Ensuring strong street connectivity should be reinforced by updating County codes to insure that any new development helps to build in street connectivity.

- **Transform Gulches into Pedestrian and Bicycle-Only Trails.** Overtime, as new street networks are completed, such as the North/South Collector Road additional mauka-makai links should be made to better connect the community to the high school and future neighborhoods that will be developed on the mauka side of Kihei. The gulches create a natural

geographic feature that would allow for trails. Trails have less of an impact environmentally and can withstand the occasional flood. To implement this vision it will take many partners, including state agencies.

- **Address Other Intersections Along Pi'ilani Highway.** Working with the community, the Department of Transportation should study other intersections along the highway to apply proven safety countermeasures, such as roundabouts and raised medians and other traffic-calming treatments, to make all the intersections more compact and safer for all roadway users.

# FUNDING

Unique funding opportunities can be discovered when partners around the table pool resources to complete projects. Funding opportunities can be identified once the partnership know what the task is, how much it will cost, and what it will take to implement. Knowing what is needed is much of the effort.

Funding for engineering improvements can come from various sources such as:

- Private foundations with missions seeking to reduce childhood obesity fund improvements that change the built environment to create opportunity for physical activity such as Robert Wood Johnson, Kellogg, General Mills, Aetna, Heinz and others.
- State and federal government grant options include Community Development Block Grants, HUD grants, and DOT Transportation Alternatives funding through MAP-21, although this federal funding cycle ends in the Fall of 2014.
- Non-traditional government sources including air-pollution and water-quality agencies.
- The development community, which should be required to create projects that support the vision of the Comprehensive Plan, but also may contribute funding to improve children's access to school as a show of good faith and to help build goodwill toward their work.

Safe Routes and school coordinators can approach membership clubs, Wal-Mart, Target, Home Depot; and local health foundations to provide in-kind donations such as giveaways for encouragement events, bike racks, signage, crosswalk striping and staff time to help build awareness. The State Department of Health could be a key partner in education initiatives to create and encourage safe routes to school is this is a key goal and objective in their statewide Nutrition and Physical Activity Plan. The National Highway Traffic Safety Administration is a source that provides funding to train police and crossing guards for school traffic safety.

# Concluding Thoughts

## This report has laid out a path to creating safer routes to Kihei High School. Now the difficult—but rewarding—work begins. Towards implementation:

The future Kihei High School brings an opportunity to the Department of Transportation, and the greater community, to showcase new proven safety countermeasures, such as a modern roundabout and raised medians, to improve the operation and accessibility of Pi'ilani Highway for all users in the section adjacent to the future school. The changes will be incremental, first addressing the section of Pi'ilani Highway that lies between the gulches. This report serves as a good start for heading down that path.

The report is intended to be a guide for the Department of Transportation, as much as it is a guide for other agencies and the greater community. It is critical to remember that our communities are incredibly dynamic and ever changing, so this work takes patience, collaboration and vision.

Today, there are new tools and approaches to transportation planning to ensure our communities are desirable places to live, learn, work, and play. The Department of Transportation, in partnership and support from the Department of Education, the State Land Use Commission, County of Maui, elected leaders and community members, should address the engineering improvements identified, starting with the intersection of Pi'ilani Highway and Kulanihako'i Street. Current conditions are hostile to a person on foot, especially the most vulnerable children and elderly. It is also important to note that up until today the current intersection design has, for the most part, served its need: moving people in cars. The future high school is creating a destination that will attract people on foot, bicycle and motor vehicle.

The Kihei community's vision is for Kihei to continue to transform into a walkable, more livable community. The school should be viewed as a catalyst project that demonstrates how land-use and transportation decisions can be in sync with each other. It is an opportunity for the Department of Transportation to implement it's well crafted Complete Streets Policy, and Pedestrian Plan and Toolbox. Residents and stakeholders of Kihei recognize that integrating transportation and land use planning improves safety, protects resources, improves health, encourages living in place, and provides opportunities for residents to interact.

Attention also should be focused on fixing incompatible policies and setting up a working group that engages the many potential partners identified in this document as possible to continue building support and education.

The energy, passion and leadership is there. It is time to act; to take charge in forging new understandings and relationships that will propel Kihei into a key destination for livability within the Island of Maui and the state of Hawaii.

# Additional Resources

**Healthy Development Checklist, from Walkable Communities:**
*http://www.walkable.org/assets/downloads/healthy_development_checklist.pdf*

**Active School Neighborhood Checklist, from the Arizona Department of Transportation:**
*http://www.azdot.gov/Highways/swprojmgmt/Enhancement_Scenic/saferoutes/SafeRoutes_Common/Apply_Active_School_Neighborhood_Checklist.asp*

**Healthy, Active & Vibrant Community 2009 Toolkit, from Trailnet:**
*http://www.trailnet.org/HAVC_Toolkit.php*

## Safe Routes to School Guides:

**Why Johnny Can't Walk to School**
*http://www.saferoutesinfo.org/program-tools/why-johnny-cant-walk-school*

**Media and Visibility**
*http://www.saferoutesinfo.org/guide/media/index.cfm*

*Education*
*http://www.saferoutesinfo.org/guide/pdf/SRTS-Guide_Education.pdf*

**Enforcement**
*http://www.saferoutesinfo.org/guide/pdf/SRTS-Guide_Enforcement.pdf*

**Evaluation Guide for Community Safe Routes to School Programs**
*http://www.saferoutesinfo.org/guide/pdf/SRTS-Guide_Evaluation.pdf*

*Many more guides and tools are available at www.saferoutesinfo.org.*

# *Supporting Documents*

1. **State Land Use Commission (LUC) and Maui County Condition**
2. **Hawaii State Complete Streets Policy**
3. **Hawaii State Safe Routes to School (SRTS) Policy**
4. **Conceptual Drawing: Roundabout Intersection Treatment**
5. **Conceptual Drawing: Signalized Intersection Treatment**
6. **Photo Vision**

# 1. State LUC and Maui County Council Condition

Introduction
In granting the land use approvals for development of a high school at this location, the State Land Use Commission and the Maui County Council placed conditions concerning a number of transportation and non-transportation items. The condition relevant to this Pedestrian Route Study reads, in part:

"Petitioner shall complete a pedestrian route study for Phase I of the Project which includes ingress and egress of pedestrians through defined location(s) approved by DOT and shall analyze compliance with the proposed warrants in FHWA/RD-84/082 (July 1984) to the satisfaction of DOT. The pedestrian route study and analysis shall be completed and approved prior to Petitioner executing a contract for the design of Phase I of the Project. Petitioner shall cause to be constructed, or ensure that there is an available above or below ground pedestrian crossing and implement such mitigation or improvements as may be required or recommended by the study and analysis to the satisfaction of DOT prior to opening Phase I of the Project...Petitioner shall submit copies of the studies and analyses to the State of Hawai`i DOT for review and approval, and to the County of Maui Department of Public Works for review and comment."

The research document cited by the condition, FHWA/RD-84/082 (July 1984) "Warrants for Pedestrian Over and Underpasses", was prepared for the Federal Highways Administration (FHWA) and studied factors that make a grade separated pedestrian crossing (GSPC) such as an overpass or underpass well-utilized or, conversely, not well-utilized. The objective of the research document was "to develop and validate warrants which can provide a basis for determining when a grade separated pedestrian crossing (GSPC) would most likely be successful and well-utilized by pedestrians."

Based on the research, the study's authors presented the following proposed warrants in FHWA/RD-84/082 (July 1984):

1. Pedestrian volume should be a total of over 300 in the 4 highest continuous hour period if vehicle speed is over 40 mph and the proposed sites are in urban areas and not over or under the freeway. Otherwise, pedestrian volume should be a total of over 100 pedestrians in the 4 highest continuous hour period.

2. Vehicle volume should be over 10,000 in the same 4 hour period used for the pedestrian volume warrant or ADT over 35,000 if both vehicle speed is over 40 mph and the proposed sites are in urban areas. If the two conditions are met, vehicle volume should be over 7,500 in 4 hours or ADT over 25,000.

3. A proposed site should be at least 600 feet from the nearest alternative "safe" crossing. A "safe" crossing is where a traffic control device stops vehicles to create adequate gaps for pedestrians to cross. Another "safe" crossing is an existing over or underpass near the proposed one.

4. A physical barrier to prohibit at-grade crossing of the roadway is desirable as part of overpass or underpass design plan.

5. Artificial lighting should be provided to reduce potential crime against users of underpasses and overpasses. It may be required to light underpasses 24 hours a day and overpasses all night.

6. Topography of the proposed site should be such that elevation changes are minimal to users of overpasses

and underpasses and construction costs are not excessive. Elevation changes is a factor effecting the convenience of the users.

7. A specific need should exist or be projected for a GSPC based on existing or proposed land use(s) adjoining the proposed site which generate pedestrian trips. These land use(s) should have direct access to the GSPC.

8. Funding for construction of the pedestrian overpass or underpass must be available prior to construction commitments.

Response to FHWA/RD-84/082 Report
FHWA/RD-84/082, published in 1984, is now 30 years old and has never been adopted as policy or standards by the FHWA. The Notice fronting the document states "The contents do not necessarily reflect the official policy of the Department of Transportation" and "This report does not constitute a standard, specification, or regulation."

Assessing the report today, the research has low relevance to modern science, human factors and modern traffic engineering. The document was written at a time when the vast majority of transportation planners and engineers were failing to fully accommodate people on foot. Today modern engineering and FHWA policy looks at the much broader context of where a tool is to be placed, appropriate speeds for that context, and a more comprehensive look at circulation systems. If the FHWA/RD-84/082 report is intended as a 'guideline' then a context sensitive approach needs to be accounted for and flexibility to the warrant needs to be applied. This Pedestrian Route Study for Kihei High School cites information from the Pedestrian and Bicycle Information Center (PBIC) literature on the topic of grade separated pedestrian crossings (see Section 3. Address Pedestrian and Bicycle Connections and Networks: Overpass or Underpass, page 49).

Assessment of Project with respect to Proposed Warrants in FHWA/RD-84/082

In compliance with the Hawaii Land Use Commission and Maui County Council conditions, this Pedestrian Route Study includes the following assessment of the Kihei High School project with the FHWA/RD-84/082 proposed warrants.

1. Pedestrian volume should be a total of over 300 in the 4 highest continuous hour period if vehicle speed is over 40 mph and the proposed sites are in urban areas and not over or under the freeway. Otherwise, pedestrian volume should be a total of over 100 pedestrians in the 4 highest continuous hour period.

Response: Currently the posted speed along Piilani Highway is 40 mph, however it is observed that many motorists drive at higher speeds. The proposed use (high school) does not currently exist and there are no recorded pedestrian counts at Piilani Highway and at Kulanihakoi Street intersection. The TIAR study estimates that pedestrian volume may be over 100 in the 4 highest continuous hour period once the high school is construction and open.

Need for a Context Sensitive Approach
The viability and safety of pedestrian travel depends on well-designed roadways and pedestrian facilities. Basic design features can affect the ability of the public right-of-way to accommodate persons on foot, bike or wheelchair. The walking infrastructure—or physical elements on a street segment which serve pedestrians, or which affect the

feeling of safety, security, convenience, or comfort—are missing today along Pi'ilani Hwy and at Kulanihakoi Street intersection.

Land uses, both the type and mix of use in a given area, strongly affect the level of demand for walking as a means of travel by residents and visitors to an area. Some land uses are known to generate relatively high levels of walking: schools, civic institutions like libraries and museums, hospitals, and shopping districts. Mixing of complementary uses (e.g. housing near jobs, schools in residential areas, etc.) in close proximity can increase the demand for walking as a mode of travel. This will be true with the future Kihei High School and mixed-use development. To fully support walking as a mode of travel, pedestrian accessibility needs to be addressed. Pedestrian accessibility must take account of the pedestrian infrastructure available for walking, as well as the likelihood of needing to walk generated by the land uses served by the pedestrian infrastructure. It takes a context sensitive and integrated approach to ensure that roadways are designed for the safety and accessibility of all users, at all times of day. Resource: Wisconsin DOT: http://www.dot.wisconsin.gov/projects/state/docs/ped-guide-chap5.pdf

2. Vehicle volume should be over 10,000 in the same 4 hour period used for the pedestrian volume warrant or ADT over 35,000 if both vehicle speed is over 40 mph and the proposed sites are in urban areas. If the two conditions are met, vehicle volume should be over 7,500 in 4 hours or ADT over 25,000.

The current Average Daily Traffic (ADT) along Pi'ilani Highway near Kulanihakoi Street is less then 25,000 vehicles per day. Currently the ADT is 18,000 vehicles per day.

3. A proposed site should be at least 600 feet from the nearest alternative "safe" crossing. A "safe" crossing is where a traffic control device stops vehicles to create adequate gaps for pedestrians to cross. Another "safe" crossing is an existing over or underpass near the proposed one.

The proposed Piilani Highway and Kulanihakoi Street intersection needs to be developed as a safe crossing for all roadway users—pedestrians, bicyclists, transit users, and motorists. Regarding GSPC, there is a natural opportunity for an underpass in gulches located north and south of the intersection. Both of the gulches are located over 600 feet away from Piilani Hwy and Kulanihakoi Street intersection, making these locations feasible with this warrant. A GSPC located near Kulanihakoi Street would not be located over 600 feet away from the proposed intersection.

4. A physical barrier to prohibit at-grade crossing of the roadway is desirable as part of overpass or underpass design plan.

A physical barrier to prohibit at-grade crossings is not desirable. Some designers will build elaborate fencing, to force use, which forces even more out of route travel.

5. Artificial lighting should be provided to reduce potential crime against users of underpasses and overpasses. It may be required to light underpasses 24 hours a day and overpasses all night.

Lighting and security are major concerns for grade separation—overpass and underpass. Lighting is critical element that needs to be included in the design, taking into account users at all times of the day.

6. Topography of the proposed site should be such that elevation changes are minimal to users of overpasses and underpasses and construction costs are not excessive. Elevation changes is a factor effecting the convenience of

the users.

Due to the topography of the area an overpass would create significant elevations changes, which would lead to high costs due to extensive ramping needed to accommodate people in wheelchairs (meet ADA requirements) and people on bicycles. People will not use an overpass or underpass if they can cross at street level in the same amount of time, or less. The gulches near the site provide a natural opportunity to create a trail system that connects mauka-makai and gives students, other residents and visitors an off-street connection from the existing Kihei village and beach to the high school and future mixed-use development. Ramping will also be required to appropriately connect a gulch trail with the high school site.

7. A specific need should exist or be projected for a GSPC based on existing or proposed land use(s) adjoining the proposed site which generate pedestrian trips. These land use(s) should have direct access to the GSPC.

The proposed new high school is expected to generate pedestrian trips by students and other community members. While establishing this proposed warrant, FHWA/RD-84/082 findings also note that, based on observation and interviews, a predictor for an underutilized GSPC is locations near a junior or senior high school (serving 13-18 year old age group).

Additional pedestrian and bicycle infrastructure, connections and networks are needed within Kihei to affect the level for walking and bicycling. The gulches can provide the foundation for an underpass and trail network that connects existing residential and commercial neighborhoods to a future mixed-use neighborhood and school, which are land uses that will generate more walking.

8. Funding for construction of the pedestrian overpass or underpass must be available prior to construction commitments.

Funding for construction of a grade separated facility near the future site of Kihei High School is not currently appropriated. An overpass is expensive to build, costing an estimated $10 to 15M. A more modest amount of investment is an underpass due to the topography of the site and the bridges that exist today over the gulches. The cost to create an underpass, which includes a wide trail, is estimated at $1 to $10M. Costs vary greatly based on site conditions, materials, etc. so a full analysis would be needed to determine costs on the Island of Maui.
Source: http://www.pedbikeinfo.org/planning/facilities_crossings_over-underpasses.cfm

Summary:

In most cases, the emerging patterns from the analyses in the FHWA/RD-84/082 document confirmed that if it is safe to cross at-grade on the roadway, pedestrians will chose an at grade crossing over a grade separated pedestrian crossing.

The analysis and recommendations are to have an at grade intersection at Piilani & Kulanihakoi with further analysis of whether a roundabout would be a suitable alternative to the warranted signals. The condition requires that the underpass proposals will have to be implemented prior to opening Phase 1. So the necessary connections to the adjacent subdivisions and public trails or paths will need to be in place too for those underpass paths to be functional.

# 2. Hawaii State Complete Streets Policy

GOV. MSG. NO. 671

EXECUTIVE CHAMBERS

HONOLULU

LINDA LINGLE
GOVERNOR

May 6, 2009

The Honorable Colleen Hanabusa, President
and Members of the Senate
Twenty-Fifth State Legislature
State Capitol, Room 409
Honolulu, Hawaii 96813

Dear Madam President and Members of the Senate:

This is to inform you that on May 6, 2009, the following bill was signed into law:

SB718 SD1 HD1

A BILL FOR AN ACT
RELATING TO TRANSPORTATION.
**ACT 054 (09)**

Sincerely,

LINDA LINGLE

Approved by the Governor
on MAY 6 2009

THE SENATE
TWENTY-FIFTH LEGISLATURE, 2009
STATE OF HAWAII

# ACT 054

# S.B. NO. 718 S.D. 1 H.D. 1

# A BILL FOR AN ACT

RELATING TO TRANSPORTATION.

**BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:**

SECTION 1. Chapter 286, Hawaii Revised Statutes, is amended by adding a new section to be appropriately designated and to read as follows:

"**§286- Complete streets.** (a) The department of transportation and the county transportation departments shall adopt a complete streets policy that seeks to reasonably accommodate convenient access and mobility for all users of the public highways within their respective jurisdictions as described under section 264-1, including pedestrians, bicyclists, transit users, motorists, and persons of all ages and abilities.

(b) This section shall apply to new construction, reconstruction, and maintenance of highways, roads, streets, ways, and lanes located within urban, suburban, and rural areas, if appropriate for the application of complete streets.

(c) This section shall not apply if:

(1) Use of a particular highway, road, street, way, or lane by bicyclists or pedestrians is prohibited by law, including within interstate highway corridors;

(2) The costs would be excessively disproportionate to the need or probable use of the particular highway, road, street, way, or lane;

(3) There exists a sparseness of population, or there exists other available means, or similar factors indicating an absence of a future need; or

(4) The safety of vehicular, pedestrian, or bicycle traffic may be placed at unacceptable risk."

SECTION 2. (a) There is established a temporary task force, exempt from section 26-34, Hawaii Revised Statutes, to review existing state and county highway design standards and guidelines, for the purpose of:

(1) Determining standards and guidelines that can be established to apply statewide and within each county to provide consistency for all highway users;

(2) Proposing changes to state and county highway design standards and guidelines; and

(3) Making recommendations for restructuring procedures, rewriting design manuals, and creating new measures to

track success, within one year after implementation of the recommendations under subsection (c).

(b) The members of the task force shall be selected by the director of transportation, and shall include one member representing:

(1) The department of transportation;

(2) The department of health;

(3) Each county's public works department or transportation department;

(4) Hawaii Bicycling League;

(5) Peoples Advocacy for Trails Hawai'i;

(6) AARP Hawaii;

(7) Hawaii Highway Users Alliance;

(8) University of Hawaii's department of urban and regional planning or department of civil and environmental engineering;

(9) Developers;

(10) Federal Highway Administration; and

(11) Other interested parties.

(c) The task force shall submit to the legislature, through the department of transportation, the following:

(1) An interim progress report no later than twenty days prior to the convening of the regular session of 2010; and

(2) A final report, including findings, recommendations, and proposed legislation, no later than twenty days prior to the convening of the regular session of 2011.

(d) The task force shall cease to exist upon filing of its final report.

SECTION 3. New statutory material is underscored.

SECTION 4. This Act shall take effect upon its approval; provided that section 1 shall apply to any development for which planning or design commences on or after January 1, 2010.

APPROVED this 6 day of MAY , 2009

GOVERNOR OF THE STATE OF HAWAII

# 3. Hawaii State Safe Routes to School Policy

http://www.capitol.hawaii.gov/session2009/Bills/HB983_CD1_.htm

H.B. NO. 983

**Report Title:**
Schools; Traffic Safety

**Description:**
Requires the director of transportation to conduct a statewide pupil travel evaluation to study how students get to school and to use that information to award federal grants for school-based workshops and community planning that will reduce traffic congestion, encourage walking and bicycling, and increase health and safety. Requires the director of transportation to streamline the grant application process. Requires annual reports.

HOUSE OF REPRESENTATIVES
TWENTY-FIFTH LEGISLATURE, 2009
STATE OF HAWAII

# H.B. NO. 983

# A BILL FOR AN ACT

RELATING TO EDUCATION.

**BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:**

SECTION 1. The legislature finds that almost every school in Hawaii is plagued by traffic congestion that results from poor planning and increased vehicular traffic. It is estimated that as much as twenty to twenty-five per cent of morning traffic consists of parents driving their children to school. Ironically, safety concerns lead parents to drive their children to school, which increases the traffic and makes it even less safe for others to walk and bike. Unfortunately, fifty per cent of children who are hit by cars near schools are hit by cars driven by parents of other students.

As part of the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, Public Law No. 109-59, Hawaii has been awarded $1,000,000 per year for five years for the Safe Routes to School program. Program funds may be used for both infrastructure-related and behavioral projects designed to reduce traffic, fuel consumption, and air pollution in the vicinity of schools and provide a safe and appealing environment for primary and secondary school children to walk

and bicycle to school. Unfortunately, Hawaii has not made optimum use of its $5,000,000 share of Safe Routes to School grant funding. Implementation of the program and distribution of funds has been slow, and as a result, $3,000,000 remains unused.

Efficient and effective use of Safe Routes to School funding requires planning that includes the full range of community stakeholders so that projects have the support of parents, students, and schools needed to succeed. Planning also needs to deemphasize very expensive engineering changes, like additional traffic lights that can consume one-third of the annual grant budget. Smaller projects involving more stakeholders and more schools are necessary to generate change across a broad spectrum of the State. The process must begin with assembling basic information about transportation issues confronting students, parents, and the community.

The purpose of this Act is to reduce traffic congestion around schools and to make it safe for more students to walk or bicycle to school.

SECTION 2. (a) The director of transportation, through the Safe Routes to School coordinator, shall conduct a statewide pupil travel evaluation to study how students get to school and



use that information to provide Safe Routes to School program funds to each school for school-based workshops and community planning that will reduce vehicular travel and congestion, encourage walking and bicycling, and increase health and safety.

(b) The evaluation required by subsection (a) shall:

(1) Identify the modes of travel used by students to get to each school;

(2) Using direct observation, determine the number of students using each mode of travel;

(3) Survey the parents of each student to gather information regarding the factors involved in the choice of transportation mode for the student and, where the student travels by automobile or bus, what would need to change for the parent to permit the student to walk or ride a bicycle to school;

(4) Identify traffic infrastructure elements in the immediate vicinity of each school, including multi-lane roadways, speed limits, and traffic calming features that, either by their presence or absence, contribute to the use of automobiles to as a student's mode of travel to school; and

(5) Prepare a map of the immediate vicinity of each school that can be used to identify alternate locations for students to be dropped off by automobiles and buses and safe routes for students to walk and ride bicycles to school.

SECTION 3. (a) The director of transportation, through the Safe Routes to School coordinator, shall distribute Safe Routes to School program funds in amounts ranging from $500 to $1,000 for school-based workshops and community-based planning that, based upon the evaluation required by section 2, will develop ways to reduce traffic congestion around schools, including walking and bicycling to school, safety education and traveling in groups, and improving safety for those students who are driven to school by automobile or bus with remote drop-off points and traffic management measures. The planning shall include community stakeholders and engineers, police, school administrators, parents, staff, and safety officials.

(b) The director of transportation shall develop a streamlined application process for federal Safe Routes to School grants that expedites release of funding for the individual projects developed pursuant to subsection (a).



# H.B. NO. 983

SECTION 4. The director of transportation shall submit a report of the results of the statewide pupil travel evaluation required by this Act and the school-based workshops and community-based planning projects funded by the Safe Routes to School program, no later than twenty days prior to the convening of the regular session of 2010.

SECTION 5. This Act shall take effect upon its approval.

INTRODUCED BY:

JAN 26 2009


Walkable and Livable Communities Institute
2023 E. Sims Way #121
Port Townsend, WA 98368
Phone: 360-385-3421
Web: www.walklive.org

Notes :

| Rev | Description | By | Date | Chk'd | Approved |
|---|---|---|---|---|---|
| | Conceptual drawings for Pi'ilani Highway at Kihei High School- not for construction | | | | |
| A | ORIGINAL ISSUE | | | | |

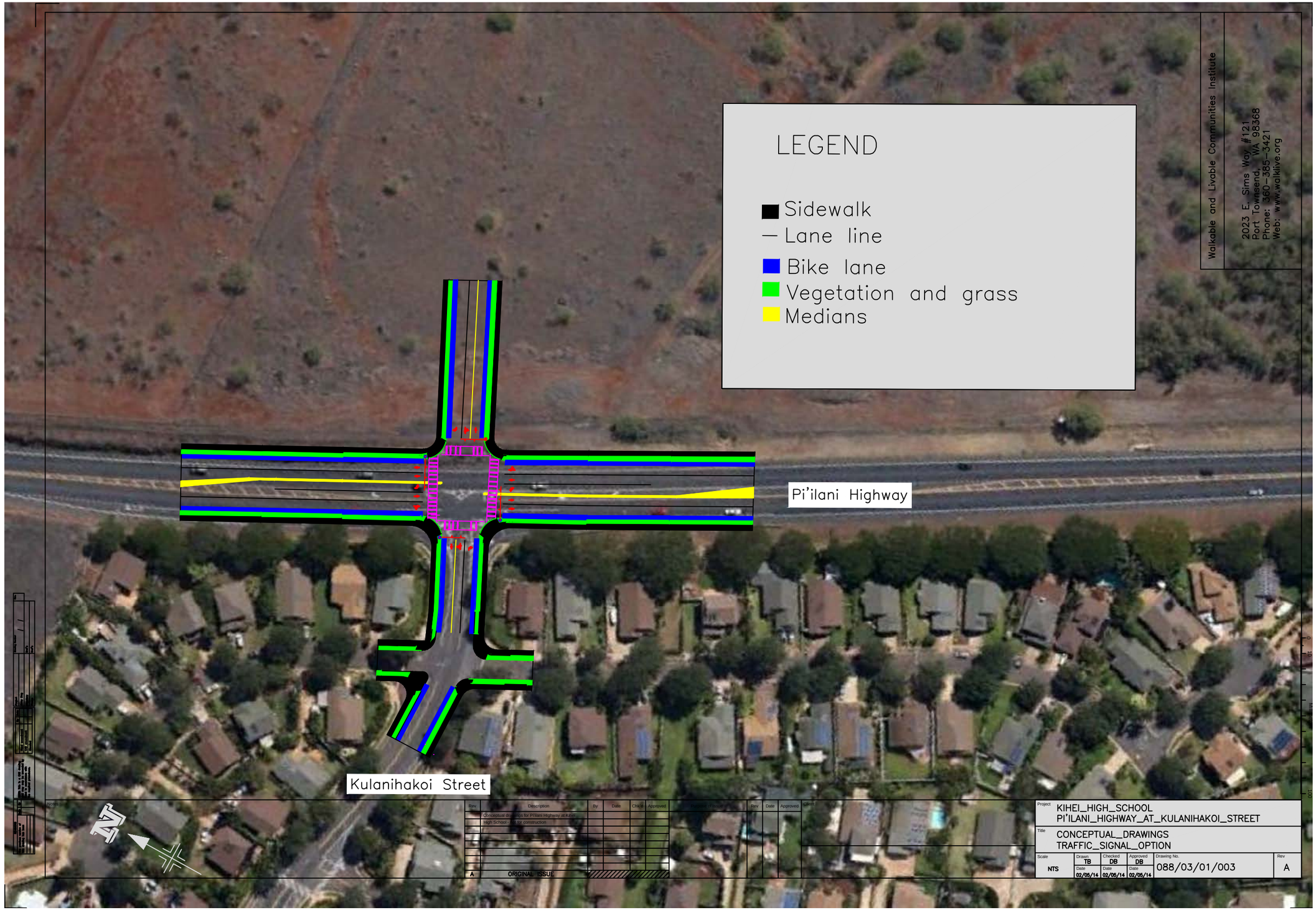
| Rev | Date | Approved |
|---|---|---|

Client

Project: KIHEI_HIGH_SCHOOL
PI'ILANI_HIGHWAY_AT_KULANIHAKOI_STREET

Title: CONCEPTUAL_DRAWINGS
ROUNDABOUT_OPTION_WITHOUT_RAISED_CROSSINGS

| Scale | Drawn | Checked | Approved | Drawing No. | Rev |
|---|---|---|---|---|---|
| NTS | TB | DB | DB | 088/03/01/002 | A |
| | Date 4/7/14 | Date 4/7/14 | Date 4/7/14 | | |

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| Project | KIHEI_HIGH_SCHOOL<br>PI'ILANI_HIGHWAY_AT_KULANIHAKOI_STREET | | | | |
| Title | CONCEPTUAL_DRAWINGS<br>TRAFFIC_SIGNAL_OPTION | | | | |
| Scale | Drawn | Checked | Approved | Drawing No. | Rev |
| NTS | TB<br>Date 02/05/14 | DB<br>Date 02/05/14 | DB<br>Date 02/05/14 | 088/03/01/003 | A |


Kihei High School