California Polytechnic State University, San Luis Obispo

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Designing for a Driverless Future in Downtown San Luis Obispo

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CRP 512 Students

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Designing for a Driverless Future in Downtown San Luis Obispo

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CRP 512 students, MCRP Class, Fall 2018

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The graduate class CRP 512 Introduction to Visual Communication and GIS, focuses on skill development in visual communications and GIS through a planning exercise. In the Winter quarter of 2018, the class was assigned the re-design of two blocks in downtown San Luis Obispo. The students focused on developing visions and design ideas for a future with autonomous vehicles.

Offered for first-year MCRP students, the CRP 512 class focuses in developing fundamental skills in graphic representation and visual communications, from freehand to technical drawing to computer-assisted programs, and geographic information systems (GIS). For the winter 2018 class, students were asked rethink and design the streetscape at the intersection of Higuera and Nipomo Streets in Downtown San Luis Obispo, California. They had to plan it for 30 years into the future, when autonomous vehicles will be the norm.

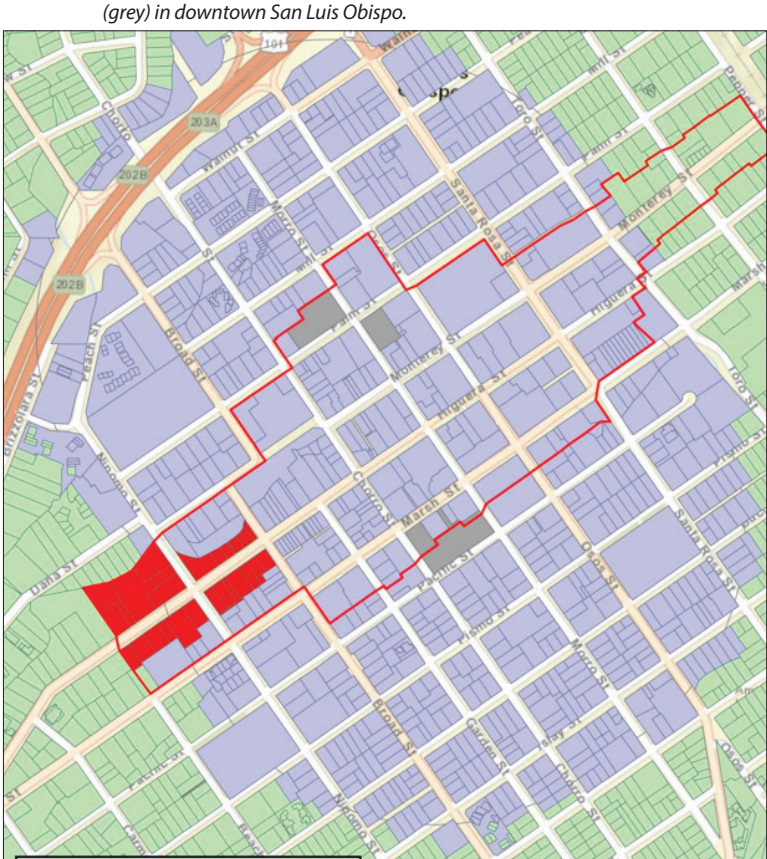
The focus was on changes in circulation that are expected to emerge in the era of autonomous vehicles. Circulation adjustments, such as designing loading zones, changing the flow of traffic, adding bio barriers between lanes, are proposed for the downtown SLO. In this academic practice, it was essential to balance the new mode of transportation with the unique SLO lifestyle. It was crucial to design places that facilitate art, culture and active lifestyles for the community since these characteristics are why people are proud to call San Luis Obispo home.

In order to gain an understanding of what a driverless future looks like, the project began with a research and literature phase, where students delved into the different impacts of autonomous vehicles (AVs) on the future of the built environment. Each team focused their literature review on different aspects of AVs, including:

- Policies and actions for autonomous vehicles;
- Impact on other modes of transport: cyclists, pedestrians and transit;
- Streetscape, circulation, signalization and related infrastructure;
- Autonomous cars and parking;
- Land use and redevelopment opportunities.

The initial review of these topics served as the foundation for the creativity and logic in the design process, specifically in approaches towards designating road-usage for autonomous vehicles. To gain a foundation of awareness about the site area, students analyzed historical properties, parking structures, speed limits, and other land use and transportation data, using Geographic Information Systems (GIS). For the demographic analysis, students analyzed population and job density, and

Figure 1: Project area (red) and the area within a quarter mile of existing parking structures (grey) in downtown San Luis Obispo.



the percent of workers that drive alone and carpool. These maps offered necessary background information about the project site.

In order to accomplish this project, students completed a series of design tasks. They first developed design skills in freehand renderings of a site plan, a section/elevation, and perspective views, manually. Then, they transitioned to rendering the site plan to 2D and 3D computer-aided representations using AutoCAD, SketchUp, Adobe Illustrator, and Adobe Photoshop. The final phase of visual presentations engaged students in the layout design of the final report in Adobe InDesign.

Managing the Transition: Policies and Actions for Autonomous Vehicles

The National League of Cities, in their 2017 Policy Preparation Guide, urges planners to start integrating autonomous vehicles and related technology into cities long-term transportation plans. As of 2015, only 6% of U.S. cities included autonomous vehicles in their master plans (Nelson et al., 2016). In order to plan for an AV future, all cities need to incorporate plans and policies regarding the issue. Policies can be changed in four major categories to help support this transition: zoning, building code, ordinances, and fiscal policy. The uncertainty surrounding the timing and scenario outcomes of the future of autonomous vehicles complicates the job of policymakers. Different future scenarios require different policies to regulate autonomous vehicles. Several guidelines for policymakers exist to ease the transition. Policies should be conservative and cautious, due to the uncertainty of the future. Besides, plans involving autonomous vehicles need to be continuously updated as it becomes more clear how autonomous vehicles use will manifest. Cities should support investments that are successful in multiple different AV outcomes. Some smaller cities, with fewer staff and resources, may need to rely on regional, state, or federal agencies to develop successful plans.

Implementation of AVs will completely change the way that land use is approached in urban and suburban areas. Advanced communication between AVs, made possible by sensors and modeling systems, will allow these vehicles to occupy less space and be able to travel close to each other in comparison to traditional vehicles (NACTO, 2017, p. 8). Current parking requirements are land-use intensive and focused on providing convenience for individual car owners. As shared AVs become superior to personal car ownership for a variety of reasons, the need for parking related land-use will decrease (WSP, 2016, p.10). Street parking, parking lots, and parking garages may become available for other uses. Also, as large big box parking lots are redesigned and repurposed, a higher emphasis will be placed on curbside space and management (Chapin et al., 2016; Nelson et al., 2016).

These areas offer an opportunity for placemaking and have the potential to become vibrant community centers that encourage mixed-use spaces and density. Dedicated space will also be needed to accommodate AVs that require fuel or maintenance services. Current zoning and land use ordinances must be made flexible to accommodate upcoming changes and conversions of current spaces to fit AV requirements. Ultimately, cities will need to independently decide how they will accommodate and adapt to these types of changes because current land usage and layout varies from city to city.

Early implementation of AVs will require dedicated traffic lanes to minimize interaction with human drivers to reduce collisions and increase transportation efficiencies attributed to AVs. AVs will not require wide buffer areas and medians to ensure safe travel, freeing up extra space for green space, pedestrians, or other means of transit. Intravehicular communication will reduce the variability and uncertainty associated with driver error and distractions (WSP, 2016, p. 15). AVs will move in a harmonized manner making the vehicular movement more predictable and thus, allow for changes in street signage and signals.

Although there is speculation about the specifics, street and road networks will be redesigned. The end goal will be to increase safety and minimize traffic bottlenecks. Overall, AVs have the potential to influence extensive changes in the built environment. Like any other transportation issue, benefits from the implementation of this technology will be maximized through thoughtful and people-focused planning. Strong policies need to be created in a manner that ensure benefits are directed towards the public rather than the profits of large corporations (Nelson 2016). Besides, the ability of cities and communities to successfully integrate and adapt to AVs will be directly correlated to the quality of the planning. Thus, it is important for planners to consider these needs and engage the community and all AV-related stakeholders to begin conversations sooner rather than later.

Design and Visualization

Students were able to initiate the design process by hand-drafting individual visions of the site-plan, whereby each person had an opportunity to freely draft their ideas about what the driverless future may look. The teams of 2 students each worked to merge their ideas into a single, hand-draft design. Then, students scanned and uploaded the hand-draft design into AutoCAD, and that led the way into the remainder of the design process in the digital format.

In AutoCAD, students first digitized the hand-drawn site plans into 2D models. In preparation for the next phase of the digital-design, students created 3D models in AutoCAD. While the focus of the work in AutoCAD was on preparing the streets, these

3D models served as the foundation for the design process using Google SketchUp software, where students expanded the work in a 3D environment. Through SketchUp, students adjusted the building types, mainly using the 3D Warehouse. Many teams used this opportunity to refine their streetscape design in SketchUp. Students selected three specific scenes to focus. These scenes evolved into the finalized perspective views.

Upon finalizing the three scenes, students exported them for the next phase of work in Adobe Photoshop. In Photoshop, students added more realistic features to the urban environment, including people, trees, benches, vehicles, buses, and more. Each team rendered one of their scenes as a night scene, in Photoshop. Transitioning then to Adobe Illustrator, each team created their street section, circulation site analysis, and site-plan rendering. Then, each of the final products was compiled through Adobe InDesign into a final portfolio. The final portfolio presented seven unique visions for a driverless future in downtown San Luis Obispo.

Selected Design Alternatives

This section depicts three scenarios and various design alternatives for the Higuera and Nipomo Streets intersecction at downtown San Luis Obispo considering a future with autonomous vehicles. This impressive collection of work demonstrates some of the critical thinking and skills that the students were able to develop throughout the quarter.

Alternative 1: Bio-Swales and Community Spaces (by Cara Meche and Leeza Segal)

The first unique design element aims to convert every parking lot into fun community spaces. Parking will not be needed in the project area with the convenience of large drop off zones on Nipomo and two drop-off zones designated for deliveries and handicapped-use only on Higuera. The three converted lots will hold a park that expands south of the creek, an area that hosts multiple small food vendors and lastly a community event space that includes a small stage for concerts, booths for pop-up shops, a covered lounge area, and an open-air cafe.

The second design element includes two bio-swales with multiple functional uses. In addition to their environmental benefits, they will also act as buffers to encourage a safe boundary between pedestrians, bicyclists and autonomous vehicles. The larger bio-swale is twelve feet in width, providing spaces for bike racks and seating.

This alternative focuses on creating a social and retail center on Higuera Street. Existing parking lots are removed and converted into plaza space, new building construction, and a park located adjacent to the creek. The park includes a dog park and plaza suitable for temporary exhibits and pop-up events. The two plaza spaces located northwest of the intersection is open to outdoor vendor use. Overall, building density is increased, with several new constructions and average building height increased to 2 or 3 stories.

Higuera will be a two-lane street with one designated lane for traffic in each direction. These lanes are flanked by bio-swales on each side, the south side bio-swale will be expanded for park use and bicycle parking. Pedestrian sidewalks are wid-

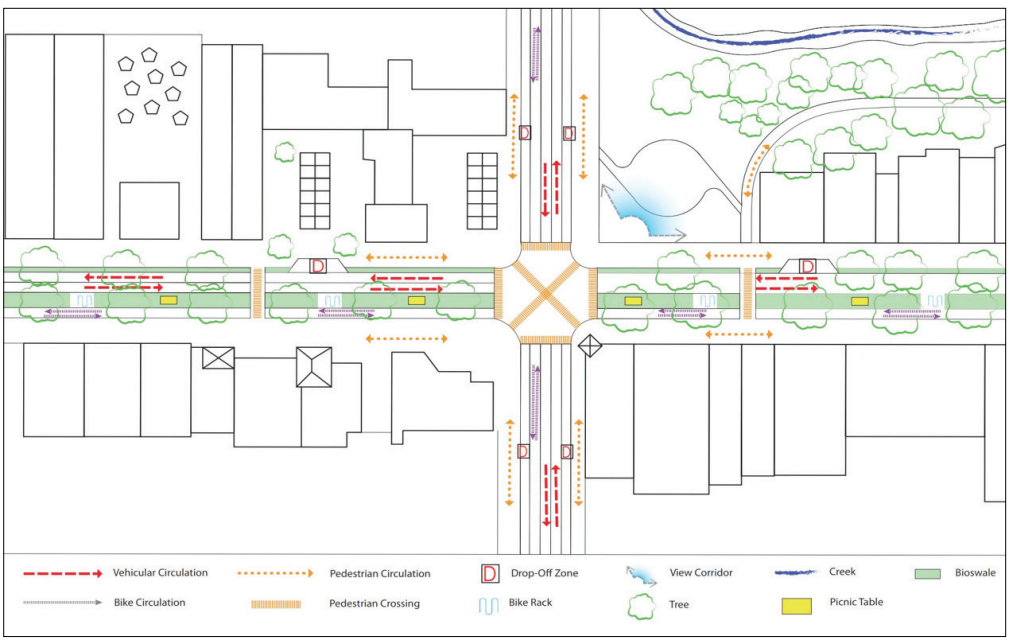
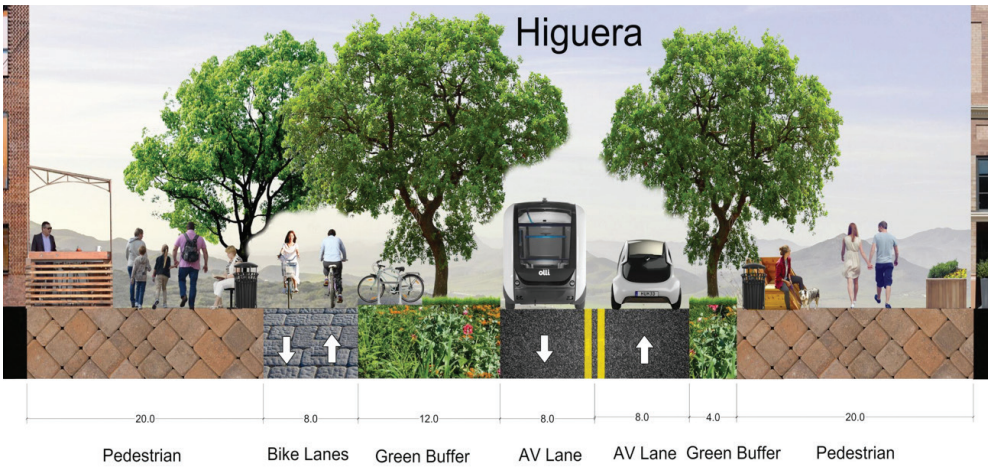


Figure 2: Alternative 1 Circulation.



Figures 3 & 4: Alternative 1 - Higuera Street; street section and view of pocket park and intersection looking east.



ened to 20 feet on both sides to accommodate for increased sociability with the addition of benches, restaurant seating, and planters. Designated bike lanes are located between the-south side sidewalk and bio-swale to place a buffer between bikers and traffic. Higuera will be an active scene, highlighting-pedestrian use.

Alternative 2: Shared-Street
(by Qijun Zeng and Dustin Stiffler

This design is based on the concept of shared-street. The autonomous transit is located in Higuera Street where transit shelters on Higuera Street provide a place for passengers to transfer and pedestrian or cyclist to rest. The implementation of the shared street design on Higuera Street will allow for all street users to utilize the street in coexistence.

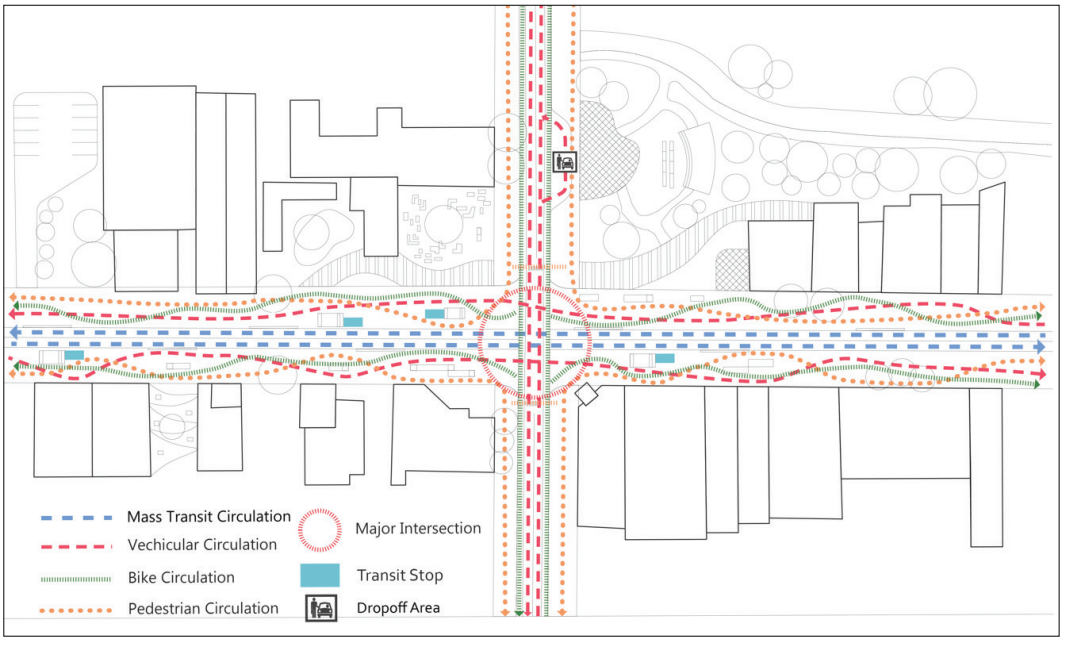


Figure 5: Alternative 2 Circulation.





Figures 6 & 7: Alternative 2 - Higuera Street; street section and view of pocket park and perspective view.

This alternative strives to incorporate the natural environment into the city by allowing the lifestyles and transportation systems of the future to coexist seamlessly. This is an environmentally-conscious design that employs natural recycled materials, such as wood, that connects the the natural and built environments and decreases the environmental impacts.

Alternative 3: Roundabout and Urban Parks
(by Elizabeth Yee and Erik Anderson)

This team envisions a comfortable, safe, and active downtown and its design maintains the scenic views of the surrounding hillsides while promoting higher density with mixed uses. This involves the use of wide, activated sidewalks with ample outdoor seating.

In this alternative, the downtown supports multimodal transportation options, two-way streets for autonomous vehicles, dedicated bicycle lanes on Higuera with shared bike paths on Nipomo, and pedestrian-friendly mid-street crossing points with a large multidirectional crosswalk at the intersection. A pick-up/drop-off lane runs the length of Higuera to accommodate circulation for AV passengers, service vehicles, and transit.

Balancing greenspace and higher density with mixed-use would both beautify the streetscape and meet commercial, office and housing needs. Sidewalk are made of pervious pavers to assist in stormwater management and water retention., and while they are widened to a minimum of 18 feet to accommodate outdoor seating and active spaces, the vehicular lanes are shrunk to eight foot wide each. A roundabout is proposed for the intersection of Nipomo and Higuera Streets. Pedestrian

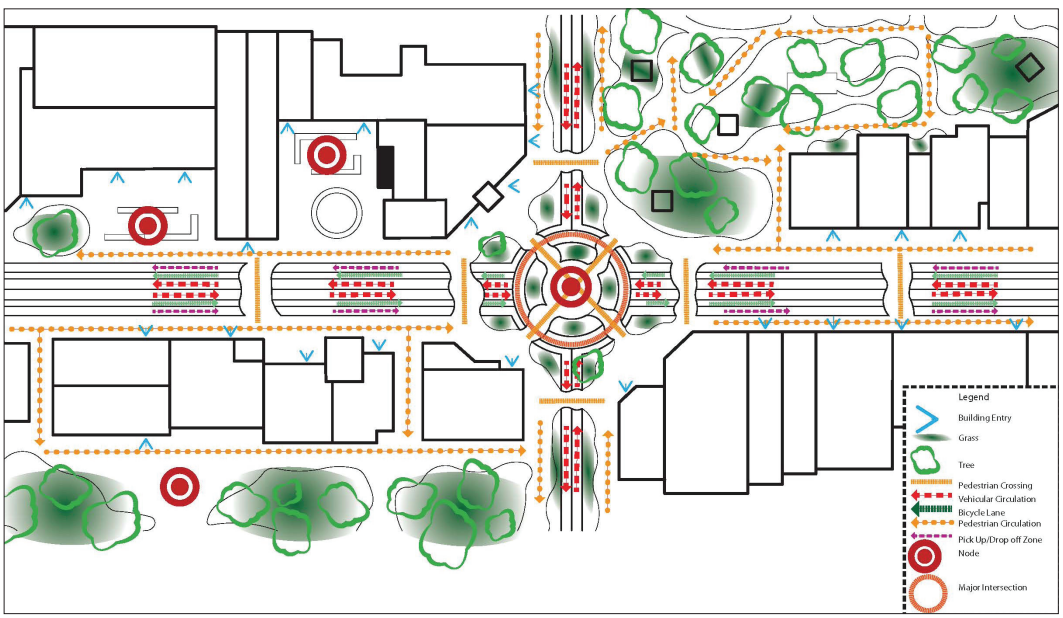


Figure 8: Alternative 3 Circulation.

crossings tie the business district to the adjoining park. As the sidewalks, the crosswalk is made of pervious pavers for beeter stormwater management and to differentiate from the street for pedestrian safety.

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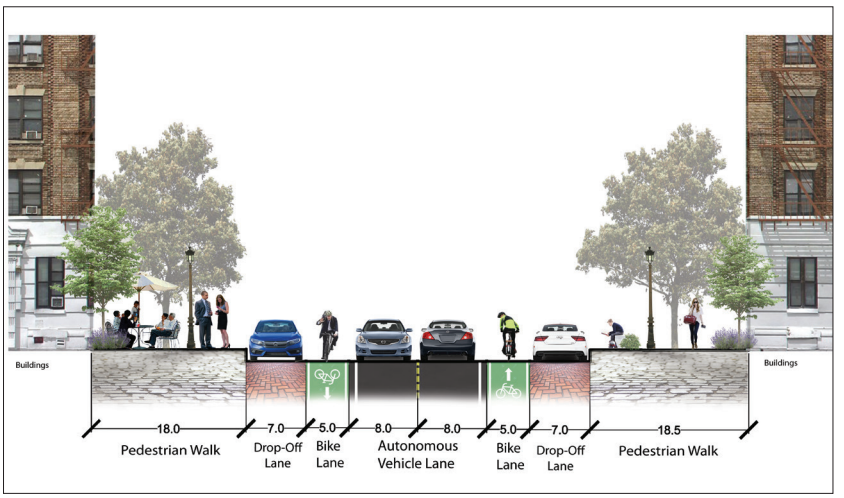
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Figures 9 & 10: Alternative 3 - Street Section and view of park.