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A California Non-Profit Tax Exempt 501c3 Corporation

To the RTC Commissioners and Staff, November 8, 2017

Responding to requests of the of the Santa Cruz County Regional Transportation Commission for public input about its Draft UCS study, Santa Cruz PRT, Inc. submits the following comments and proposal.

We believe that Personal Rapid Transit (PRT) is rail transit. PRT is uniquely suited to meet commute needs in the corridor under study. We bring this proposal which also contains a comprehensive treatment of the nature of PRT and of existing PRT systems worldwide.

We have participated in many SCRTC workshops and meetings over the past several years. We have learned that the RTC staff is reluctant to consider this technology wanting it first to be adopted by larger jurisdictions in California. We hope to persuade staff and commission members that this is not the best approach. We suggest that the issue of climate change and resulting severe weather inflicted on virtually every part of our planet is telling us that this is an imperative that ought not to be ignored.

Furthermore, the lack of assurance that our trips *on our own highways* will be safe leads us to say that we want our elected officials to take action promptly to remedy that situation. There is no reason that the RTC should not take a very serious look at a form of transportation that has a record 100% free of fatal accidents or serious injuries. Failing to do so would hint of an acceptance of the horrible safety record on US and California highways.

The theory of the RTC staff in the past is that we are too small and that we should leave innovation to other, larger jurisdictions. Perhaps, with time, quality innovated technology *will* be adopted by other Regional Transportation Planning agencies. But that may not happen. Our region in Santa Cruz County delivers a very high level of participation in our RTC proceedings. Our residents are highly educated and motivated and believe that *we* should be leaders in addressing global warming and seeking safer transportation. And if *we* do not act, perhaps we are courting disaster by waiting for someone else to lead.

We believe we understand why our RTC staff has taken the positions it has. Accordingly, we have prepared this proposal with a modest, low-risk concept of implementing the PRT technology. It's a minimal system on the campus of Cabrillo College. We have their interest and support in seeking study of this concept. (Letter attached). At this time, we ask is that it be studied as a possible rail project serving the future transportation in the rail corridor.

We expect that this idea will garner favorable reviews. But, other similar PRT plans are possible and might even come first before the development of this Cabrillo plan. For example, a similar, very small PRT system might be first needed to serve the rail corridor itself. Or, that plus the Cabrillo system might be developed simultaneously.

We made the decision to focus on just one, simple installation. We trust this will merit careful evaluation and consideration by the RTC staff and then by the full Commission.

We thank you for taking the time to read this introduction.

Sincerely,

Ed Porter, President
Santa Cruz PRT, Inc.
105 Lighthouse Avenue
Santa Cruz, CA 95060
(831) 427-0836
Email EPorter95@aol.com

Subject: Re: transportation between the rail link & Cabrillo campus
Date: 11/6/2017 5:33:20 P.M. Pacific Standard Time
From: sugochis@cabrillo.edu
To: info@sccrtc.org
Cc: EPorter95@aol.com

November 5, 2017

To:
Santa Cruz County Regional Transportation Commission
Ginger Dykarr
Cory Caletti
Unified Corridor Study Staff
Email: info at sccrtc.org
1523 Pacific Avenue
Santa Cruz, CA 95060

Our office has been apprised of a proposal prepared by Santa Cruz PRT, Inc. In that proposal, Santa Cruz PRT asks that a PRT transportation link be considered to connect possible transportation in the rail corridor with the central campus of Cabrillo College.

While Cabrillo does not take a position pro or con about such a link at this time, we see the potential value of it if rail transportation is developed that could serve the Cabrillo campus. The proposed link would complete the connection to the rail line and enable the conversion of some current automobile trips to our location to a green and convenient form of transportation. Obviously this would be very helpful to our students, a safety enhancement, and a step in reduction of greenhouse gas emissions from the automobiles currently driven to Cabrillo.

We send this letter as a comment to Phase 1 of the RTC's UCS study process and with the thought that the study of this proposed PRT link would probably benefit Cabrillo, the RTC and our community.

Sincerely,

Sue Gochis

Sue Gochis
Vice President of Student Services
Cabrillo College

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A Proposal Submitted by Santa Cruz PRT, Inc
to the
Santa Cruz County Regional Transportation Commission
Phase 2, Unified Corridor Investment Study (UCS)
Submitted November 8, 2017
Proposal for Personal Rapid Transit in the Rail Corridor

Proposal Statement:

Santa Cruz PRT, Inc. requests that the RTC include the following proposal in its Phase 2 study of options within the Unified Corridor Study. We propose that a PRT transportation link be considered that would connect transportation in the rail corridor with the central campus of Cabrillo College. This proposal suggests that a Personal Rapid Transit (PRT) guideway be built between Cabrillo College and the Railway Corridor. This PRT service would pass through the college campus, and proceed to the Railway Corridor. We propose that this project be included as one of the projects to be studied in the Unified Corridors Investment Study.

Introduction:

We strongly urge the community, under the auspices of the Santa Cruz Regional Transportation Commission (RTC), to continue the development of a transportation system in this critical rail corridor. Given that the corridor will be used for transportation, we suggest ways in which that route can be intelligently linked to destinations along the corridor.

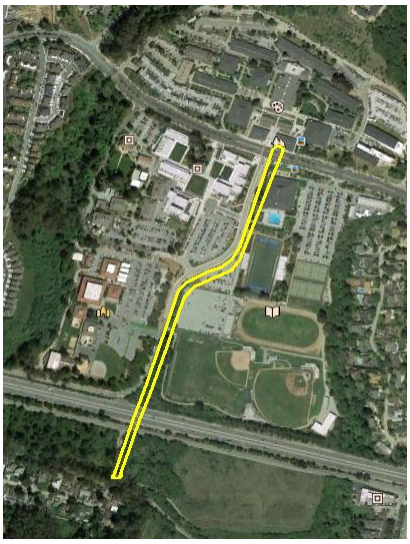
Many different such “last-mile” links will ultimately transform the confined rail corridor into a highly useful network serving all our County. We recommend one particular such link at this time. This proposed Project, the “Cabrillo College Connection,” is a relatively small PRT system which would connect Cabrillo College to the rail corridor. Cabrillo College is one of the top trip destinations of the corridor under study. This PRT service would proceed through the campus, then either cross over Highway 1 to meet the railway corridor directly south of Cabrillo, or alternatively, head east on Soquel Drive to meet the rail corridor north of where it crosses Highway 1. The latter is a longer, more costly option.

Options for a PRT connection to the rail line: illustrated by the photographs below
In this overview, we depict three levels of development of a PRT system at Cabrillo.

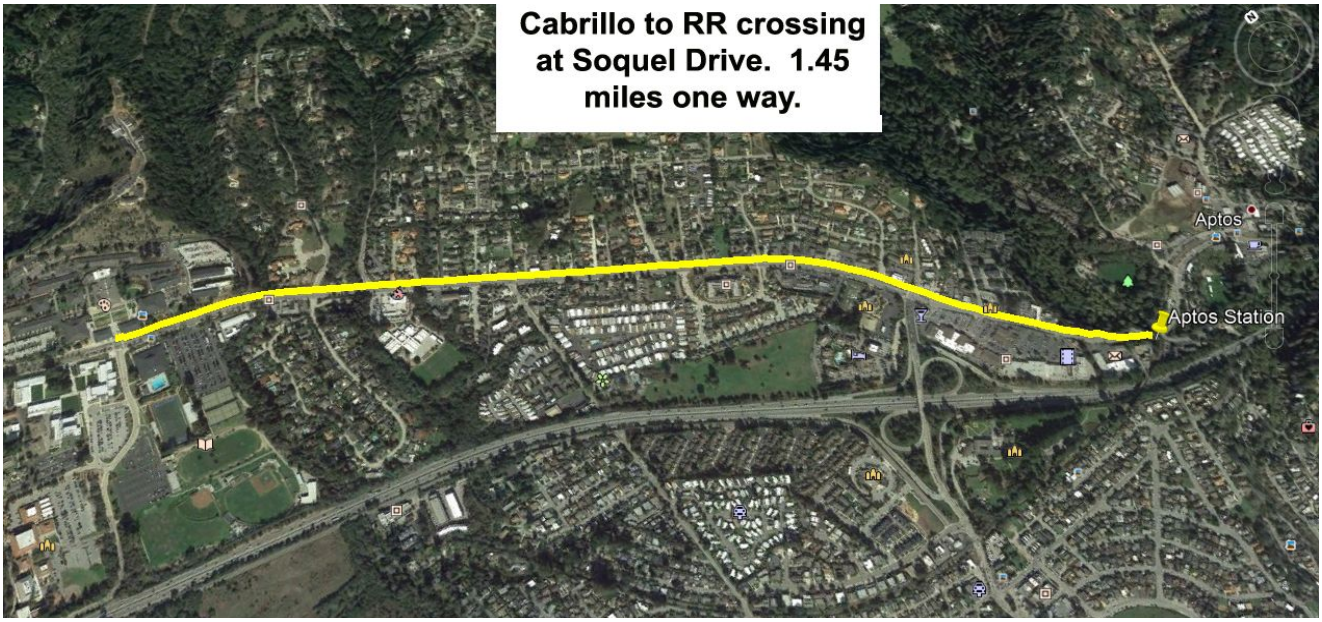
1. The first is a full and robust system that serves the entire campus.
2. Second is a slightly reduced plan that serves the South Campus and delivers passengers to the Bookstore area.
3. Third is what we have called the “Frugal” version that only delivers passengers to the Bookstore area and sacrifices many advantages of true PRT.

The routes shown below are for illustration purposes and are not intended to represent actual engineering. The first image is a full page illustration of what we have termed “A full and robust system”. The image depicts service of the full campus with sufficient stations to make the system useful for intra-campus movements in addition to trips to and from the rail corridor.
(image follows on next page)

The South Campus PRT loop has from 2 to 4 stations to serve the campus. More are possible on the upper campus (as shown above) if funding is available and needs justify that cost.



This “frugal” link to the rail line omits several important PRT features. However, It is the simplest possible PRT loop at the lowest cost. It does eliminate serving other important parts of the campus. In this option everyone using the system would arrive at and depart from the vicinity of the Bookstore.



To avoid crossing Highway 1 south of the Cabrillo campus, the rail link to Cabrillo could be tied to the north side of the Highway 1 rail overpass 1.6 miles East of Cabrillo.. It is shown here because an RTC rail corridor study shows a pedestrian crossing to serve Mar Vista School and also Cabrillo at Mar Vista Avenue. Here, a station would be created on the West side of the rail line and south of Soquel Drive. This option would involve about 3 miles of guideway placed in parallel segments adjacent to Soquel Drive. Unfortunately it removes the use of offline stations and use of the loop architecture. It would cost about $15 million more than the previous on-campus plans and, without adding features to serve the neighborhood along the route, it can’t be considered a high-ranking option.

Some design considerations for the proposed system:

At the onset of any transportation system planning effort, a requirements team is selected and is tasked to identify the system requirements. Considerations include the needs of the area served, compliance with budgetary constraints, and identification of local transit needs. Once the requirements have been generated and documented, then the PRT system is designed to satisfy these system requirements.

In order to get maximum capacity from a PRT system, the best performance specifications are used. While better maximum performance is expected as further developments take place, the following specifications are widely accepted as being feasible at the present time. This system can move 7200 people per hour by using 2 second headways (time between cars) and 4 person cars. This high rate of passengers per hour will move 72,000 passengers in a 10 hour day. But Cabrillo, at present, would probably be completely satisfied with 10,000 trips per day. Perhaps when planning for the usage of the next 10 years, it is worthwhile to plan for 15,000 per day. So, the system designed for Cabrillo only needs to provide about 20% of the high capacity we just described.

Any PRT system must be designed to satisfy the transportation needs of its intended users. It would be a serious mistake to overbuild or underbuild it. For this Cabrillo link, there is no need to design the system for 72,000 passengers per day when the likely ridership will probably not exceed 15,000 per day for the foreseeable future. The system should be designed for 15,000 trips a day but with the same travel time. Headway times (time between cars) should be increased, vehicle speeds be reduced, and car sizes also reduced. These economies, particularly in car size would result in cost savings and have a favorable effect in making the system less costly and more likely to be implemented.

Overhead guideways vary in elevation depending on the location. There are generally agreed upon clearances: above pedestrians 12 feet over a walkway. A seven foot tall basketball player should not be able to touch the PRT car. Over a roadway clearance is 16 feet or more. Above a railway clearance must be 24 feet. Passenger stations are located to the side of the main guideway route. The access possibilities include: by elevator, stairs or ramp and when access is at ground level, by walking directly from the station platform. A typical PRT car might be from 8 to 12 feet long, 5 to 6 feet wide and 5 to 8 feet high. The door openings are about 5 feet wide and match the height of the car.

For Cabrillo's needs, the average speed could be 20 to 25 miles per hour. At 30 mph, the circuit of the entire campus would require less than 3.5 minutes. The requirements committee would determine that an average speed of less than 30 mph is quite adequate. In other applications, where the very maximum ridership is required, speeds up to 40 mph would be common.

The primary initial purpose of this PRT system is to transport passengers from the rail corridor to the central Cabrillo campus near the Bookstore, and back. Stations at the Bookstore and at the rail line are absolutely necessary to serve this need. Additional stations would expand the usefulness for other reasons. Seniors and persons with disabilities who find it challenging to climb Cabrillo's hills would find it useful to get to various campus destinations, including the Stroke and Disability Learning Center. Finally, there is the additional benefit in making the relatively long trek between the

sports fields on the lower campus and the classrooms on the upper campus. All of these uses might point toward planning additional stations.

We consider the correct number of stations to be from a minimum of two to a maximum of six. More stations than six in the relatively small system is probably not sensible. Three or four stations is probably the most likely number but the requirements committee would set the number and locations based on Cabrillo's needs.

The footprint width of the guideway will be about six feet, and where guideways run parallel such as at the freeway crossing and on New Brighton Road approaching the rail line, two guideways can have a one foot separation and require a total width for both of 13 feet. Nominally, a station would require an off-ramp of 75 to 100 feet, and vehicle stopping spaces (berths). Ramp lengths vary according to vehicle speed, likely between 25 and 100 feet, and will be determined when the system requirements are finalized.

Project Management - A Preliminary Look:

SCOPE OF WORK: This proposal asks that the work of studying and evaluating the Cabrillo PRT system be included in the existing work plan for Phase 2 of the Santa Cruz County Regional Transportation Commission Unified Corridor Investment Study (UCS). The work would be performed by the consultants already hired by the RTC.

BUDGET: The budget for the the consultant work to evaluate the above described system has already been determined by the RTC staff. The budget to build such a proposed PRT system is considered to be approximately $15,000,000 per mile of guideway. This, of course, is subject to determination of system requirements and system complexity.

SCHEDULE: The Unified Corridor Investment Study (UCS) will continue throughout the remainder of 2017 and into 2018. The final report will be issued in December, 2018. The schedule for actual deployment of a PRT system includes at least 3 months for project team selection and mobilization, 6 months for requirements definition, 6 to 9 months construction, and 12 months for system testing and reliability verification.

Project Team Organizational development:

Santa Cruz PRT Inc. (SCPRT) is a California Corporation with an IRS approved 501c3 tax exemption. Incorporation took place in 2008. Before that the organization existed as Citizens for Personal Rapid Transit (CPRT) under the umbrella of the CPRT in Minneapolis, MN. Santa Cruz CPRT began meeting in the 1990's. The membership consists of community individuals who advocate PRT for transportation applications in the Santa Cruz community.

In 2017, SCPRT Inc. formed a proposal team to serve several purposes. One is to provide comprehensive comment on the County's Unified Corridor Study via the Regional Transportation Commission (RTC) and its staff. A second purpose and activity is to formulate and write a proposal recommending several uses of PRT in our County's transportation planning. A third is to identify funding sources and apply for such funding that will facilitate the detailed planning and evaluation of such PRT proposals.

At present, the proposal team is preparing a comprehensive PRT proposal intended to connect the Cabrillo College Campus with presumed transportation utilizing the Santa Cruz Branch Rail Line railroad and corridor which the RTC has acquired from its former owner, Union Pacific Railroad.

The project team Is a group of individuals performing the following functions:

Project Manager	Organizes and coordinates the activity of all partners
Construction	A construction contractor with a history of successful comparable projects.
Finance Manager	Develops, secures, and manages the securing of project financing & spending.
Banking Representative	Provides bridge financing for elements of the project as needed.
Technology Supplier	Brings the technology and technical details to the team product.
Engineering	Provides engineering expertise and execution as components are developed and built. Addresses architecture, system power and communications
Legal partner	An individual lawyer or legal firm that evaluates, approves, and manages project contracts. Provides related legal guidance and direction.
Public Outreach	Manages and conducts internal and external project communications
Interface Coordinator	Facilitates communications between team members and updates documentation accordingly.

More definition of the partnership structure will be developed as incremental acceptance of this or other proposals occurs, and requirements are refined.

A massive newly contracted PRT/GRT system: **NEWS**

July 5,2017

Written by Adam Frost

Ultra Fairwood to build the world's largest autonomous vehicle transportation system in the UAE with over 47 miles of guideway and 115 stations.

http://www.traffictechnologytoday.com/news.php?NewsID=86282

Images of existing PRT systems and vehicles Worldwide

.Also, see links to noteworthy PRT videos of existing systems, page 18 and footnotes starting with number 4 on page 19.

The Suncheon, So. Korea "SkyCube" car at a station (wider view)

The Suncheon "SkyCube" car at a station

The Suncheon "SkyCube" car on guideway

Modutram car in station with passengers entering, Guadalajara Mexico.

A smaller car by Modutram.

Electricity from solar panels is the primary power source. This will be a major contribution to reducing greenhouse gas emissions..

An Ultra Heathrow car entering a station.

Passengers in an Ultra Heathrow car with the person on the right pressing the “Start” button.

Masdar City UAE PRT Car

https://www.youtube.com/watch?v=q7XQlEKoSZw

Masdar PRT: A comfortable seat, a nice computer, and the driving done for you. Quality time.

Masdar, UAE Interior of PRT Car

Background:

Now that automation technology is coming of age, PRT is having an international renaissance. The numerous new projects functioning worldwide are demonstrating the promise as envisioned years ago. The current tools available to improve urban mobility – light-rail, bus rapid transit, bike lanes (dangerously located alongside traffic), and even autonomous at-grade cars or shuttles – all sidestep the issue of snowballing deficiencies of transportation systems that are competing for space in the modern urban landscape.

PRT developers are emerging here in California (Spartan Superway in San Jose and SkyTran in Mountain View), as well as in the Netherlands, the UK, France, Sweden, Russia, Mexico, South Africa, Australia, India, Singapore, the United Arab Emirates, and South Korea. Most visibly, large projects are under consideration in several Indian cities. The largest committed project to date (offered by Indian developers with UK's ULTra technology) is in Ajman, United Arab Emirates, with a 76-km route (partly double track achieving a gross length of 120 km), 115 stations, 1,745 vehicles (some PRT with 6 passengers, some GRT of 30 passengers), with a capacity of 1.64 million trips per day, and a total investment of US$1.6 billion.

The failing transportation engineering algorithm in California is "*more*" -- if 3 lanes don't work, add a fourth. If four lanes don't work, convert one lane to bus rapid transit ("BRT") on the unquestioned assumption that more people can be accommodated with larger vehicles (a variation on the theme that "*more*" is better). These scenarios ignore the reality that, in both cases, the next traffic interchange will continue to be congested. The at-grade light rail, the bus, the BRT, or the automated shuttle van will still be stuck in the same traffic as the cars when it reaches the next interchange where all modes compete for limited space unless pre-established with a dedicated grade-separated corridor. Autonomous cars may seem like a solution but these are still cars interrupting quality of life for urban living.

What is PRT?

PRT stands for Personal Rapid Transit. It is a system of small, automated, computer controlled cars traveling on a fixed guideway or rail. Passengers select their destinations and gain entrance to the car with currency, ticket, student i.d., credit card or cell phone. Destinations are selected by the passengers and travel automatically from origin to destination non-stop. If those in the car have the same destination, then the trip is non-stop.

PRT or ATN (Automated Transportation Network) has many similarities to "self-driving" or "robo-cars". However, The major difference involves safety. PRT cars travel on their own dedicated guideway. Thus, there is practically no risk of collisions with other cars, trucks, trains, or pedestrians, when using PRT. In fact, the PRT systems in Morgantown West Virginia and at Heathrow Airport in London, United Kingdom, have now accomplished literally millions of passenger miles without a single fatality or even serious injury of any kind. It is this high degree of safety that makes PRT remarkably superior to other transit modes. In the USA every year, more than 30,000 people are killed in automobile accidents. More than ten times that number are seriously injured or maimed. The safety of PRT offers a stunning contrast and a moral imperative.

Equally important, PRT is green! Energy requirements to operate the system are so low that we advocate placing a canopy of solar panels over the guideway allowing the electricity required for this system to come entirely from renewable sources, with no need for net consumption of fossil fuels. Because it's automated like an elevator and can be solar powered, PRT technology offers the lowest cost per passenger mile of all known transportation modalities.

The Santa Cruz PRT website at http://www.santacruzprt.com/ offers extensive current background information about Personal Rapid Transit. In addition, the PRTreport on Facebook provides world news involving PRT dating back seven years.

Why PRT in Santa Cruz County?

Personal Rapid Transit can solve many transportation problems, big and small, within Santa Cruz County. This suggested UCS Project solve small problems such as navigating in and out of Cabrillo College and, later, around downtown Santa Cruz as well. A larger PRT implementation would provide a true alternative for those who are stuck daily in rush-hour traffic. It would be essential for new car-free communities which may help address our housing crisis. Our PRT system could also enhance tourism, providing a convenient way for visitors to explore our community without creating traffic jams.

Santa Cruz is an environmentally conscious community. In Santa Cruz, PRT powered by solar panels can create an unprecedented demonstration of a community facing the challenge to mitigate the effects of excessive carbon emissions of past and present by helping us to do our fair share in reducing greenhouse gas emissions. PRT gives us a chance to lead!

The cost of adding any new transportation capacity is high. But, in a comparison of all of the possible options, PRT offers an installation cost ranging from one quarter to one tenth that of the other possible options.

Funding Possibilities of this system

We recognize that it will cost money to include Personal Rapid Transit in the Unified Corridors Investment Study. We encourage the RTC to apply for Caltrans Planning Grants for the study we are requesting. PRT is a resilient transportation system with low or no carbon emissions, making this research an ideal candidate for both the Sustainable Communities grants and the Adaptation Planning grants. For more information, visit:
http://www.dot.ca.gov/hq/tpp/grants.html

Traditional funding of transportation systems has often been with Federal money along with State and local matching shares. However, funding of that kind has dwindled considerably in recent years. In addition, with the widening recognition of the adverse effects of carbon emissions, government agencies are scrambling to identify ways of implementing new transportation modes that are carbon neutral or better. California's SB 862 has introduced new opportunities to fund low-carbon or carbon-neutral transportation, including the Transit and Intercity Rail Capital Program (TIRCP) and Low Carbon Transit Operations Program (LCTOP)

The most commonly discussed method of financing a PRT system is a Public - Private partnership

where the municipal agency provides rights-of-way using a franchise agreement and also oversight of engineering and legal contract development. The private portion of the project is expected to come from PRT developers and investors. Assuming that level of public commitment, several PRT developers have offered to build an entire PRT system using their own capital investment resources and operate the new system to obtain return on investment.

PRT improves the quality of transportation. Two overarching qualities lead the list of many PRT benefits..

One of these is **safety**. All of the operating PRT systems have a record of zero fatalities and zero serious injuries throughout their **entire** history. For Morgantown, West Virginia, that is over 40 years! They also are 100% free of serious injuries. This is in stark contrast to the bleak record of highway safety in the USA. In the year 2015, **35,092** fatalities occurred on US highways.[*1] In 2016, the death rate is reportedly up 10.4% in the first six months of 2016 compared to the same period in 2015[*3]. California led the nation with 2,925 traffic deaths. The number of people with serious injuries is about 10 times the number of fatalities. The California Highway Patrol reports that 230,904 Persons suffered serious injuries in automobile collisions in 2014. [*2] Many significant groups are now saying loudly that “This rate of carnage in our transportation is unacceptable!” If we have a choice between our horrible highway safety record, and the 100% fatality and serious injury free PRT systems, we have an obligation to consider PRT.

The second overarching quality is the **excellent green quality of PRT**. We propose a PRT system that is entirely powered with solar energy. The solar panels will be a canopy above the guideway or adjacent to it. With this amount of transportation being free of greenhouse gas emissions, this project will be a *leader* in Santa Cruz County in elimination of greenhouse gas emissions. By luring people out of fossil fuel burning personal automobiles with this attractive transportation option, the existing levels of transportation generated greenhouse gas emissions will be reduced.This will provide valuable progress in our region’s Greenhouse Gas Emission Reduction programs.

PRT has many other attractive qualities:

Little or no waiting: When you arrive at the PRT stop, a car may be already waiting for you or it will come within a minute or 2 of your pushing a button (like an elevator). There is no need to consult a bus schedule.

Little or no stopping: Unlike conventional transit, there’s no need to stop at every station on the way to where you’re going. PRT stations are “offline” in the sense that one car can drop off or collect passengers on the side, while other cars sail on by.

No transfers within network: The car can take you directly from any PRT stop to any other PRT stop. The only time you would need to transfer is if you’re taking a bus or other transit to or from a location beyond the PRT network.

Comfortable, quiet car: The cars travel smoothly and quietly, and in general there is no need to share a car unless you choose to share (although a private PRT car may be priced higher than a shared ride).

Safe and secure: PRT achieves a high level of safety and security. No cross collisions are possible; autos, trains, buses at grade will inevitably crash. If bikes are introduced into a PRT car corridor, no crashes will occur.

Efficient: PRT can provide easy, secure, direct access to hospitals and schools in an expanded network.

Solar power means zero emissions: The system is installed with enough solar panels to power the vehicles with surplus. Overhead PRT cars are at least 40% more efficient than typical electric car, and the light-weight infrastructure is easy on the environment. Furthermore, PRT improves climate adaptation (resilience), because a solar-powered elevated system can continue to function even during a flood, fuel shortage, or grid outage.

PRT is a Win-Win for both Transit Activists and Trail-only Activists: Personal Rapid Transit exceeds the goals of public transportation activists, but it does not depend on the railroad tracks. An elevated transit system in the corridor is the key to enabling our community's diverse groups of strong-willed transportation advocates to reach consensus.

PRT cars are self-driving cars (autonomous):

There is a great deal of interest right now in "Autonomous cars"**,** "Robo cars" or "Self-driving cars." With this large-scale, worldwide interest, it's often not noticed that a PRT car already IS an Autonomous car. So, the autonomy is not a new idea for a transport vehicle. The idea has been around for 70 years and in operation for over 40 years. But PRT uses dedicated fixed guideways and avoids conflicts and collisions with other cars, trucks, buses, trains, pedestrians, and bicycles. In contrast, it is important to remember that the robo cars, running on our streets without guideways, still must travel in our existing traffic jams and compete for the same surface space with existing cars and buses. PRT avoids these problems. In that situation, traffic jams are not resolved.

A combination of the PRT idea with fixed guideways in all congested areas and a robo car in uncongested areas is called "Dual Mode" PRT. In Dual Mode, the PRT car can leave the guideway and proceed the last quarter mile or so, on surface streets to the destination and to the passenger's front doorstep.

PRT Frequently Asked Questions:

This section frequently addresses PRT concepts and systems larger than that proposed at Cabrillo College..

Aesthetics and design issues:

1. **Aesthetics:** Compared to the visual impact of auto or rail infrastructure (i.e., pavement, street light posts, etc.), the appearance of PRT guideways will blend into the surroundings. Noise levels will be much lower, pollution less than with autos, trains or buses. It is not proposed to place these routes in residential areas. Aesthetic considerations are major and will be subject to community consensus. The cars and lines wIll be aesthetically pleasing.
   Safety and security

2. **Safety of PRT vs. Street Traffic:** Street traffic is mortally dangerous. In 2015 there were 35,092 total fatalities on USA highways[*1] In the first six months of 2016, fatalities reportedly increased by 10.4%, as compared to the same period from 2015[*3]. California led the nation with 2,925 traffic deaths. We reject this **rate of carnage in our transportation as unacceptable!** In contrast, *all* of the operating PRT systems have a record of *zero* fatalities and *zero* serious injuries throughout their *entire* history. For Morgantown, West Virginia, that is over *40 YEARS of impeccable passenger and public safety*!
3. **Safety in occasions of disaster or malfunction:** The system will have auxiliary generators in the event of a general power failure, so that cars can keep moving, at least to the nearest station for passenger unloading. In the rare worst case, the PRT controller will have trucks which can extend hydraulic rescue platforms to disabled cars and quickly remove stranded passengers. Emergency exit walkways will be provided where appropriate. Design requirements will provide prevention of interruption from earthquake as much as is technically possible.
4. **If one car stalls between stations, must the entire system go down?** No. One option is that each car will feature redundant propulsion (as well as redundant duplicates of other key components). In addition, technology permits one car to join with and propel another to a nearby station or maintenance depot. Finally, because of the network nature of the system, traffic will automatically be re-routed to avoid the problematic stretch of guideway, so as to deliver passengers to their chosen destination stations or the nearest alternative stations that can be reached. The system as a whole would remain mostly unaffected, although there could be minor delays.
5. **What happens when there is an obstruction** on the line caused for example by a bird, fallen tree or other obstruction? The answer is similar to that for the stalled car case. In addition, note that guideway maintenance will be performed on a daily basis and as needed. Video monitoring will facilitate dispatch of maintenance vehicles to clear any obstructions. It is also unlikely that a cat or other animal will be able to get onto the guideway except at a station. From train and light rail statistics, this is not a major issue.
6. **What security precautions are in stations and on cars** to prevent or protect against personal violence, or terrorism? PRT doors will be opened only by their passenger(s). They are normally locked and only opened by authorized passengers or system personnel. Closed circuit video surveillance can record all transactions if the community desires it. We are all vulnerable to terrorism, but preventive steps will be implemented as reasonably required.
7. **How does the system prevent getting on a car with a stranger**, especially late at night? Think of PRT as a taxicab with a fixed route. If you are first in the queue, you may or may not opt to permit others going to the same destination to ride with you. cars will be designed to permit exclusive use.
8. **Is there emergency communication from the cars?** Will cell phones work on cars? Yes, an intercom or cell phone system will provide emergency communication. cars will have an emergency button to alert authorities and may divert the car to the nearest station. Cell phones will work on this system and cell stations will be added if needed.

Maintenance issues:

9. **How will graffiti be avoided** in stations and cars? Are cars cleaned regularly? How is the throwing of materials from cars avoided? Video recorders may be placed on every car and at every station. It is a system design decision whether or not to have windows that may be opened. BART and airport people movers do not have such windows. Cleaning will be as with all other public transport systems.
10. **Where will cars be stored when not in use?** Cars park in stations or in maintenance bays when not in use or, travel automatically, without passengers, to other stations when needed.

System lifetime, upgrade potential, end-of-life:

11. **What is the estimated life of the system?** Life expectancy of these systems is the same as it is for other electro-mechanical systems. With good maintenance it is in excess of 35 years and after that time, updated system components will be obtained.
12. **Can the system accommodate changes in technology?** The systems will be updated as needed. As with other transportation systems, good maintenance will provide long life cycles. The system in Morgantown, WV, has been in continuous operation for over 40 years without a serious accident or failure. It is probable that there would be a similar life expectancy for a new, more modern system.
13. **What if the project fails to deliver system requirements? Can the infrastructure be removed, and at what cost?** The entire PRT system is easy to un-bolt and carry away. It's fast to put up (or extend or modify) and equally fast to remove. Removal costs would be borne by the developer. The initial test track portion of the system will demonstrate all requirements. Again at system completion, all requirements will be verified and certified for acceptance.

Being a PRT passenger:

14. **Will there be heating and/or air conditioning in cars**? Will windows open? This is a design issue and would be decided by community consensus. Some form of air circulation is a necessity and most designers conclude that both heating and cooling are required.
15. **How many people and how much baggage** can cars accommodate? Cars can range from 4 (at Heathrow) to 16 (at Morgantown, using standing room). Heathrow also can accommodate either baggage or a bicycle. The smaller the cars, the more efficient and flexible.
16. **Will smoking/eating be permitted in stations or on cars?** Smoking would be prohibited as it currently is on buses and in other similar public spaces. Eating and drinking would probably be prohibited but this too is a matter of community consensus.
17. **What are proposed operating hours?** Services can operate 24 hours a day, 7 days a week, year round. Some stations or areas of guideway may need occasional or scheduled maintenance and all transport systems schedule occasional maintenance time during off hours. It is also possible that some locations will not want PRT riders to access those stations when they are closed at night, evenings, on holidays and on weekends.

18. **How much will it cost to ride?** Since this is an extension of a commute system on the rail line, this trip will be included in whatever that cost is. The existing Cabrillo bus pass will probably provide the entire ride.
19. **How can disabled people access the PRT stations and cars?** Stations and cars will be fully ADA compliant with elevators at stations above grade (or passenger boarding at-grade or via ramp) where needed.

Technical issues:

20. **How much does a PRT car weigh? The car** will weigh about 600 lbs. or more if more amenities are required.
21. **How much energy does a PRT car need?** All-electric PRT cars get an equivalent mileage of about 400 mpg when comparing with contemporary automobiles. The World Wildlife Fund, in advocating PRT, estimates that a single PRT car will require 839 BTUs per passenger mile. In comparison, a motorcycle requires 2,274 BTUs per passenger mile and a personal automobile requires 3,581. Numerous other assessments agree with the low power required by PRT: The cost per passenger is about 25% of other common public transit modes, and that of the personal automobile.
22. **What is the average speed?** How close can cars be to each other? How long will waiting times be for a PRT car? A maximum speed would be about 40 mph. For the Cabrillo College campus, expected line speeds will be about 20 to 25 mph. This system can easily operate at 2 second intervals (headways); however, anticipating Cabrillo's future needs, it's likely that the cars would travel with a separation of 30 seconds or more. There will also be a cap on speed and minimum separation of cars in observance of safety standards. Often, an empty car will be waiting at a station but, if no car is already there, a car would arrive within 90 seconds.
23. **What are the possible propulsion systems?** The most favored propulsion uses a linear induction motor. These electric motors are already in widespread use. Other systems use standard rotary electric motors, powered by power from within the guideway and with supplemental batteries. All are powered when possible by solar voltaic panels.
24. **What percent of power supply can reasonably be provided by solar?** We expect 95% of the required power to be supplied by solar. There are, however, significant installation costs involved. Still, the added cost is paid off by fuel savings in less than five years compared to nine years for a comparable installation on a house.
25. **Does the car move under or over the rail, and how many wheels?** This depends on which design is selected. See our section of other PRT web sites to view the different design possibilities.
26. **How much space do the stations require**? The space required depends upon the number of vehicles and the planned ridership. A minimal station probably needs at least 30 x 15 feet..
27. **Assuming the line is elevated, how far apart are the supports?** It will vary according to design but 60 feet is a currently accepted distance. 90 feet is also specified in some systems. Heavier vehicles require more closely spaced support posts.

Operational implications for surroundings:

28. **What is the expected noise level?** The PRT sound level is equivalent to that of an electric car. There is only minor surface noise. Ambient noise should be minimal. It is probable that one would not hear a car approaching. While at least one PRT design features steel wheels on steel tracks, we hope to have something as quiet as rubber or urethane wheels on steel guideways, for the lowest possible sound propagation.
29. **Would the route go through or impinge upon either residential or natural areas?** There would be virtually no impact on residential areas.

Costs and financing:

30. **What is probable cost per mile for construction?** We believe that a reasonable figure for this project is $15 million per mile of one-way guideway.
31. **What is the probable cost of stations, and can they be community spaces?** Station cost is factored into the cost per mile: however it is generally accepted that an additional station costs about $400 per foot (for additional guideway) plus whatever amenities are desired.
32. **What are anticipated costs and provisions for operations, insurance, liability and maintenance?** Operating costs are low; these are autonomous vehicles. The destination is selected by the passengers' choice. There will be operations workers but the number per passenger mile is lower as a result of automation. Costs should be appreciably less than similar costs for light or heavy rail or bus operations. Liability and maintenance is similar to all other transit modalities. The accident-free records of Morgantown PRT and London's Heathrow cars indicate a low cost for liability insurance.
33. **What are the financing probabilities?** Funding for PRT will come from State or Federal government programs, venture capital, investment of PRT developers, or a combination of any of those sources. This is largely a community decision.. Construction costs and operating costs are much lower than other forms of public transport, specifically the cost of highway construction and maintenance operations. Currently, a popular approach to building public infrastructure projects like this is known as Design, Build, Own, Operate, Transfer or DBOMT. In this concept, the developer takes on much of the initial risk, develops, owns, and operates the system, but is party to a binding option contract where the local transit agency acquires the system.

The process: Realizing a local PRT system:

34. **What is the procedure? i.e. how to we get started with a system?** Simultaneously, Requests for Qualifications (RFQ) may be sent to known PRT developers and vendors. After that, a Request for Proposals (RFP) may be sent to those who responded to the RFP and are found to be qualified. The top two or three proposals may be invited to participate in a design competition. The winning design could then be used in a test facility of about a quarter mile. Upon certification of the test system, that designer would be invited to prepare a proposal for the a Pilot System. When that design is accepted, installation would begin. It will require a year to 18 months to develop the test facility and another 30 months to design and build the full system.

35. **What is the public process?** All of the usual public discussion venues will be required. Any full PRT system or pilot will require an Environmental Impact Report (EIR) and require approval of Cabrillo College, the RTC, METRO, Caltrans, and the Coastal Commission.

Side-effects and implications of PRT?

36. **Are there ecological advantages of PRT?** Considering the likely effects of global warming, changing to solar powered vehicles such as PRT is prudent for human society. PRT designs have the goal of making the “prudent” thing also the comfortable, convenient, safe, efficient, affordable, cost-effective thing, People will benefit in ways that will lead them to choose PRT over other forms of transportation.

37. **Could PRT have a positive impact on the local economy?** PRT offers the opportunity for local fabrication and construction jobs as well as operations and maintenance positions. A Cabrillo College training program for needed PRT skills would provide educational and job opportunities for Cabrillo students. There will be future retail development along the rail corridor and PRT will enhance and hasten such development.

Where to find PRT systems and more information:

38. Are there other PRT projects in operation or, in the mill, world-wide? Where and what designs? Yes, there are several PRT systems in operation and many more PRT projects are continuing to emerge. The following links are to Wikipedia and other objective articles about these projects:

- The PRT system at Morgantown, West Virginia has been in full operation for more than forty years with almost no downtime and a virtually flawless safety record. After an extensive evaluation of the cost-effectiveness of the system, a retrofit and upgrade, costing around $130 million, was approved, because no other transit mode could address the transportation needs of the city and university as cost-effectively as Morgantown PRT.

- About 30 other cities worldwide are seriously considering PRT at present.

- ULTra PRT at London Heathrow Airport has been in public use since May 2011 after a year of testing. Previous to that, the demonstration system had been in operated periodically at Cardiff, Wales for many years.

- A subsidiary of the Korean steel company Posco, the Vectus prototype PRT system in Uppsala, Sweden began operation in the Spring of 2006. After its Suncheon system became operational, the Uppsala demonstration was concluded.

- In April 2013 Vectus began test trials of a fully operational passenger-serving PRT in Suncheon Bay, South Korea. Based on the Vectus design and a new car design developed in partnership with TDI and the Italian design house Pininfarina, the new PRT system emerged in Suncheon. Just before its opening to the public, Vectus partnered with Ecotrans to operate and maintain the system. Ecotrans named the new system "SkyCube". It opened to the public about

April 30, 2014 and has been operating since then.

• Masdar City in the United Arab Emirates has built and tested a small PRT system. It has been in operation since 2010 and was built by the Dutch company 2GetThere, formerly known as Frog.

• In Guadalajara, Mexico, the Modutram PRT has a test track and system. Modutram is a consortium of Mexican companies, funded by the Mexican government, implementing PRT, which they call a "Lean Intelligent Transportation Network", or LINT. It's a small system intended to prove concepts for larger systems but also provides passenger rides. (A portable system, has been providing sample rides to attendees at transportation conferences and other publicity events for several years.)

• PRT systems have been or are being considered in San Jose, CA, Mountain View CA, Orange County CA, Austin TX, Arlington TX, Wichita KS, Greenville SC, Cincinnati OH, Ithaca NY, Minneapolis MN, Seattle WA, Daventry England, UK, and Bangalore, India, just to name a few. Literally hundreds of other cities worldwide are considering PRT and watching the leading developments closely to see if they turn out to be as good as expected. For more information, see the Wikipedia website on Personal Rapid Transit, or the Santa Cruz PRT Facebook page[*6], which have far more detail than we can display here.

39. **Why hasn't PRT been installed in the United States in the last 30 years?** This is largely a local policy decision. We live in a car culture in the United States. In recent years, motor vehicle transportation has dominated in local agency consideration of transport choices; engineers tended to develop only modalities that were already in use. In recent times, several PRT systems *have* been installed elsewhere in the world, and have been pleasing passengers for many years. PRT is a good idea, even a great one, but every region and community has its own unique needs. The question examined by Santa Cruz PRT, is whether PRT is right for Santa Cruz County, and if so, what kind of PRT system would be best?

40. **What websites are there where additional information can be obtained?** Please see our full Santa Cruz PRT web site: http://www.santacruzprt.com/. Numerous other links to other pages about PRT are furnished on this page. In addition, Santa Cruz PRT Inc publishes a PRT journal on Facebook. This journal has been in operation for 7 years and has covered most PRT news stories worldwide during that timespan. Most of the postings have links to other websites expanding the PRT related story. A majority of the postings link directly to the source of the article's story. The web-address is **https://www.facebook.com/pg/PRTreport/posts/** . Or, you will find our Facebook page at the top of the search list, if you simply search for "Santa Cruz PRT" from your Facebook home page.

Existing and Operating PRT systems:

In the following table, PRT is "Personal Rapid Transit" for 1 to 6 passengers. GRT is for "Group Rapid Transit" with larger vehicles and up to 12 passengers or more. All use elevated guideways except number 8. These links will allow you to view video of these PRT systems in operation.

	System Name & location	GRT	Opening Date
1.	**Morgantown West VA, USA** **Video:** https://www.youtube.com/watch?v=iaSaWfw07Sw		1975
2.	**ULTra Heathrow, UK** **Video:** https://www.youtube.com/watch?v=4Ujd4wutddE	PRT	Apr 2011
3.	**Masdar, UAE** **Video:** https://www.youtube.com/watch?v=5G9X0voSi2Y	PRT	Nov 2010
4.	**SkyCube, Suncheon, South Korea** **Video:** https://www.youtube.com/watch?v=LSlFwHk21xY **Video:** https://www.youtube.com/watch?v=lgTxQuL5xMQ	PRT	Apr 2013
5.	**H-Bahn, Dortmund campus site, Düsseldorf Germany** **Video:** https://www.youtube.com/watch?v=uglsZ3QgNK8	GRT	May 1984
6.	**H-Bahn SkyTrain Airport site, Düsseldorf Germany** **Video:** https://www.youtube.com/watch?v=oAYyphyOKvo	GRT	Jul 2002
7.	**Modutram, Guadalajara México.** **Video:** https://www.youtube.com/watch?v=ULgRrG_3MN0	PRT	2014
8.	**Parkshuttle Rivium, Netherlands, an example of automated, Robocar, (not PRT or GRT) uses only existing streets and some dedicated guideway.** **Video:** https://www.youtube.com/watch?v=itmmLr8Fp0M	Ground	*1999*

Conclusion:

We have gone to some length in this proposal to convey a relatively thorough impression of what PRT could be and, particularly, at Cabrillo College. The focussed purpose of this document on November 8th, 2017 is to demonstrate that PRT is rail transit, that it should be studied within the scope of the Regional Transportation Commission's Phase 2 effort over the next 14 months. We have provided an excellent example of where and how PRT could serve a very significant need and, in doing so, provide a major piece of the ridership that is required to have *any* transit in the rail corridor. Without significant ridership, any new transit effort would be scored a failure. But with Cabrillo's population of about 14,000, with so many of them using personal automobiles to travel to and from the campus, this becomes a golden opportunity to change transportation choices to something much more green, enhance safety in dramatic measure, and demonstrate how this technology can be applied in countless other ways in Santa Cruz County.

Now, a political debate has arisen suggesting that there should not be transit on the existing rails or within the rail corridor. But the corridor and its rail line were purchased under the assumption that Santa Cruz County WOULD, in fact, implement some form of rail transportation in the rail corridor.

Enter consideration of PRT. PRT would, in fact, provide the compromise needed in this situation. Grade separated PRT could provide the green transportation that would assure 100% safety for all including pedestrians, bicyclists, and transit riders. The 100% fatality and serious accident-**free** record of PRT since 1973 supports that contention. And if PRT is solar powered, it delivers a huge component in our efforts to reduce transportation caused greenhouse gas emissions in our County

By studying this very modest proposed link on the Cabrillo campus, the RTC can develop the needed information for the Cabrillo project, gain the needed foundation and background to consider PRT in our county and provide a step for its early implementation and demonstration.

Footnotes and Recommended Websites:

1* USA Highway safety accident and fatality statistics
http://www.iihs.org/iihs/topics/t/general-statistics/fatalityfacts/state-by-state-overview)

2* California CHP automobile fatalities and serious injuries in the year 2014

https://www.chp.ca.gov/programs-services/services-information/switrs-internet-statewide-integrated-traffic-records-system/switrs-2014-report

3* USA Automobile fatality rise 2016
https://www.autoblog.com/2016/10/07/us-traffic-fatalities-rise-10-percent-2016

4 Washington State University on PRT
http://faculty.washington.edu/jbs/itrans/prtquick.htm

5 Santa Cruz PRT Inc. Website: http://www.santacruzprt.com/

6*. Facebook PRTreport: https://www.facebook.com/pg/PRTreport/posts/

7. A Korean youngster looks at SkyCube PRT https://www.youtube.com/watch?v=bq3Q6CIkoYM

London, UK Suncheon, South Korea Morgantown W VA, USA Masdar, UAE Guadalajara, México

The above autonomous PRTs operate every day in five cities worldwide.