Hyperloop as an Innovative Transit Option for an SJC Airport – Diridon Station Connection

Response to RFI 2019-DOT-PPD-4
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A. Respondent Profile

Legal name of the company: Hyperloop Technologies, Inc., D/B/A Virgin Hyperloop One

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High-level description of concept: The Virgin Hyperloop System offers a universally scalable form of transportation. Virgin Hyperloop One ("VHO") is developing a new mode of sustainable transportation that will have the ability to carry passengers quickly, safely, and efficiently. Unlike traditional modes of transport, the Virgin Hyperloop System is capable of efficient transportation from intra-city transit to longer distance applications for commuter and inter-city travel. The combination of the enclosed tube and higher speed vehicles enables a transportation system that makes an entire region reachable like never before – 10km to 100km are effectively reachable within an hour. In addition, the system is designed to be point-to-point and demand responsive so that passengers can request travel when they want to where they want. The proposed route from the Diridon Transit Station to Mineta San José International Airport could take as little as 3 minutes, allowing the two terminals to serve as a single consolidated transit hub and the nucleus for the Virgin Hyperloop System in Northern California.

High-level description of business plan: VHO's business plan is designed to be flexible to accommodate the needs of each specific project. VHO envisions that this project will be best funded and developed under a public-private partnership framework. VHO expects to pull together a consortium of local partners for planning, regulation, and environmental studies, as well as suppliers to provide the construction, and operations and maintenance of the project. We hope the City will assist with obtaining the permitting and land required, as well as participating in the consortium. A more specific delivery strategy will need to be discussed with the City and depend on the needs of the project and its stakeholders.

Virgin hyperloop one

B. Proposed Concept

VHO's concept is to make the Diridon Station and San Jose Mineta Airport function as a single consolidated transit hub. With the Virgin Hyperloop System, a connection between these two destinations would take 3 minutes or less. The Virgin Hyperloop System can thus extend the usefulness of its existing transportation systems, while laying the foundation for hyperloop routes to extend outward from this transit hub to create the next generation transport for San Jose and the surrounding region.

The Virgin Hyperloop System is an enclosed, electric, point-to-point, on-demand transportation system. It utilizes a low-pressure tube that can be built above ground or tunneled. The enclosed tube and low pressure remove air resistance and enables vehicles (called "pods") to travel at far greater speeds with far greater energy efficiency than any technology in the market today. In the current design, pods will be configured to carry between 10-30 passengers. Unlike traditional rail, the Virgin Hyperloop System is designed to enable point-to-point travel and safe autonomous operation of the pods. In particular, the system uses a main trunkline for the guideway, but also includes turnouts using our proprietary high-speed switching technology at hyperloop stations (called "portals"). The turnouts are similar to highway on/off ramps and allow pods to seamlessly exit and enter the main trunkline. This allows every journey to be direct-to-destination, with no stops in-between. Multiple pods will be able to depart from each terminal every few minutes, transporting passengers directly to their end destinations. The Virgin Hyperloop System is completely electrically powered, providing a safe, clean and sustainable travel option. Therefore, as routes are added to the Virgin Hyperloop System, network effects and its fundamental efficiency make the system more beneficial to the region.

C. Physical Elements

a. Describe the guideway.

i. What does it look like for a person walking by, and for a person using the system?

The Virgin Hyperloop System can be elevated or tunneled. An elevated system generally consists of two enclosed tubes made of common construction materials such as steel or concrete. There is one tube for traffic in each direction. The tubes will be made to fit into its environment in a less obtrusive way by choice of paint color, concrete texture, or similar means. The enclosed structure results in less noise pollution to its surrounding areas such that barriers separating the system from neighboring communities, as would be the case with traditional open-air systems, are not needed. There are also columns of various height depending on the terrain that support the tubes, similar to the traditional guideway structure of highways and bridges.

The Virgin Hyperloop System is intended to provide an upgraded passenger experience compared to what is currently expected in transit. This design intention is based on the use of relatively smaller pods, i.e., designed for carrying 10-30 passengers, and innovative, modern interiors. In portals, or stations, passengers would be routed to their pods in a similar fashion to a small airport or rail station, with guidance provided via their mobile device and/or electronic signage. Conceptual renderings of the pod and the terminal are provided in this response.

ii. How is it grade-separated?

In order to facilitate operation in a low-pressure environment, the Virgin Hyperloop System is enclosed in a tube and inherently grade-separated. The tube would either be elevated above grade or tunneled.

iii. What are its right-of-way needs?

The Virgin Hyperloop System requires less right-of-way than traditional rail and can follow tighter turns at higher speeds due to banking. The System is also unique in that it can easily follow existing right-of-ways like those of highways, allowing VHO to deliver its service at a higher speed and for less cost. While specific right-of-way needs will need to be further evaluated on this specific corridor, a two-tube system generally requires a corridor width of approximately 11 meters or 36 feet. For purposes of planning, we suggest evaluating corridor widths of between 30-60 feet.

b. Describe the stations/passenger access points

i. What do they look like for a person walking by, and for a person using the system?

Our portals are designed to be flexible, allowing high-throughput terminals to fit into dense urban areas and be integrated with existing transit hubs. A passenger will enter into a portal, which might be located on a lower level of Diridon Transit Station, be directed to his or her pod bay – a platform used to load and unload several pods simultaneously – and enter into the next pod that leaves for his or her destination. Upon arrival, the passenger will exit the pod via an "airdock" (similar in nature to a plane) and then to a portal, which is connected to the terminal or station. Similar to airports and train stations that take on the feel of their local environments, Virgin Hyperloop System portals may look different from region to region and depending on their setting, e.g., urban or rural.

We have worked with several world-renowned architecture firms to design various concepts for the Virgin Hyperloop System in location such as Mumbai, Pune, Dubai, and others.

ii. What are the right-of-way and land needs of a station/access point?

The right-of-way and land requirements for portals differ greatly from location to location and route to route. The Virgin Hyperloop System portals are sized to meet demand, and thus the size of the portal depends on how many passengers depart hourly and the total capacity of the line. In general, due to the on-demand nature of the system, where passengers can request pods at their convenience rather than wait for the next scheduled train, the Virgin Hyperloop System requires less waiting area for passengers. The Virgin Hyperloop System also does not require the large stabling areas typical in rail systems. These two factors lend portals to be smaller than train stations of similar capacity.

iii. How will the system integrate with existing transit systems?

The Virgin Hyperloop System can be integrated with BART and other rail and transit services within a unified station. The Virgin Hyperloop System will intersect the station in a way that provides quick and convenient transfers to/from other transit systems and serve as a high-speed passenger link to urban transit systems readily based on the flexible and accommodating designs of its portals. Integration with other modes is essential to improving the complete passenger experience such as schedule coordination and integrated fare collection, ultimately moving people out of their cars and back to mass transportation.

iv. How will the proposed system connect with rail platforms (either BART or other heavy rail) at Diridon Station?

The Virgin Hyperloop System portal layout is flexible and can meet the needs of a unified Diridon Station. If the guideway is tunneled, a portal may be located below ground, or beneath BART or other heavy rail platforms. If the guideway is elevated, a portal may be located above existing platforms. Typically, in a detailed study phase, VHO evaluates the configuration of the portal based on the terrain, alignment constraints and on accessibility of and integration with other existing modes (such as metro, bus and bikeshare stations). In other project proposals, we have envisioned tunnels and aerial pedestrian walkways to facilitate access to existing structures.

v. How will the proposed system connect with airport facilities and parking and SJC?

A Virgin Hyperloop System airport connection could have several stops at the airport terminal to connect terminals, airport parking facilities, rental car facilities, etc. As noted above, VHO's concept is to create SJC and Diridon into a single transit hub. An airside-airside connection between the SJC and Diridon Station could allow Diridon Station to effectively serve as an extended terminal of the airport. For example, passengers could check-in at Diridon Station before entering into the Virgin Hyperloop

System portal and travel seamlessly to their desired terminal. In this concept by VHO, parking, security, and other needs for airport facilities could be mitigated because passengers now have multiple options for reaching the airport.

vi. How do the system's vehicles operate within the network?

The Virgin Hyperloop System employs autonomous pods. The system design includes a Network Operating Center (NOC) that autonomously controls and navigates all pods through the network and provides fleet management services. Our system will dynamically size available fleet to match demand.

A pod is a passenger or cargo vehicle that travels using magnetic levitation technology. Pods will come in multiple configurations, comfortably seating 10-30 passengers and carrying light luggage. Some may also be altered to carry fewer passengers and more luggage. Small pods provide on demand, direct to destination journeys at high frequency. Alternatively, the system may employ larger pods, if necessary.

vii. Is there level boarding?

Yes, the Virgin Hyperloop System is entirely level boarding to promote accessibility for all passengers.

viii. How will the system be designed to be compatible with "complete streets" if the system is aerial?

The Virgin Hyperloop System is intended to be fully compatible with a complete street. The system is fully enclosed and will be tunneled or above grade. Thus, it will not interfere with "complete streets" because it has no at-grade crossings. In addition, the Virgin Hyperloop System, requires a small footprint compared to traditional or high-speed rail, enabling better integration around "complete streets" by maintaining accessibility around the infrastructure.

ix. **If the main guideway is aerial of underground, how do passengers get to grade level?**

In cases where the main guideway is underground, passengers would simply come up to grade level in a similar manner to existing transit stations using a mixture of elevators, stairs, and escalators as appropriate.

c. Describe the vehicles

i. What do they look like for a person walking by, and for a person using the system?

A Virgin Hyperloop One pod is similar to a large bus or a small aircraft that seats 10-30 passengers. A comfortable interior with plush seating, soothing lighting, and access to entertainment and media are all possible interior configurations of the pod.

Figure 1. An example of a Virgin Hyperloop One pod interior that was unveiled in partnership with the Roads and Transport Authority in Dubai.

ii. How many passengers and how much baggage can fit in a vehicle?

Pods are designed to comfortable seat 10-30 passengers carrying light luggage. For airport connections, the number of passengers may be on the low end of that range in order to accommodate additional baggage. Accessibility and mobility needs are also accommodated in the design. The interior space can be adjusted to accommodate other needs.

iii. How do passengers board and alight from the vehicle? How long does it take?

Passengers simply walk into the pod, sit down, and within minutes, the door closes and the pod leaves the portal en route to its destination. The system is purposefully designed to facilitate quick boarding and disembarking from the vehicle, such that passengers' total travel time is minimized as much as possible. It is expected that the entire unloading, boarding and leaving the station of a single pod will take approximately 6-10 minutes.

iv. What is the top speed, and how quickly is it achieved?

The top speed of the Virgin Hyperloop System is 670 mph. Passengers are accelerated and decelerated at a gentle 0.20 Gs in our system, which feels similar to a train ride. For the short route between SJC and Diridon Airport, initial analysis suggests a maximum speed of 130 miles per hour can be reached, resulting in approximately 3 minutes of travel time.

v. Are vehicles autonomously operated?

Yes, vehicles in the Virgin Hyperloop System are autonomously operated.

vi. **What do vehicles do when they are not operating?**

When vehicles are not in operation, they are parked in a stabling area or a maintenance depot.

vii. **Do the vehicles require space off the guideway for storage?**

Vehicle storage is part of the portal (station) infrastructure.

viii. **How are vehicles powered (e.g. battery, catenary, third rail, etc.)?**

Vehicles are battery powered.

ix. **Do the vehicles require a maintenance facility? If so, describe the facility requirements (e.g. number of facilities, connection to the system, size of facility, etc.).**

The maintenance facility will be part of the portal infrastructure. There will be two facilities that will perform maintenance on the pod. Light maintenance (cleaning the pod, replacing lights, etc.) will be done at the portal area. Heavy maintenance (such as replacing a chair, annual inspection, etc.) will be performed at a maintenance depot. The facility size will vary depending on the expected throughput of the system and thus the number of pods required to service this throughput.

x. **Do the vehicles need to move or be moved in order to be redistributed to meet demand on a regular basis? Describe how this is performed (by operator, autonomously, by user, etc.) and how often.**

Vehicles will be autonomously controlled, so if they need to be redistributed to accommodate unexpected or uneven demand, they can do so with a direction from the control center. Re-distribution of the vehicles is done autonomously and through dynamic demand monitoring. Pods will be moved out of stabling areas, which are mainly located at portals.

d. Provide pictures or renderings of all physical elements of the system

The Virgin Hyperloop System consists of a main trunkline for the guideway turnouts using our proprietary high-speed switching technology at portals, similar to a highway on/off ramp. This allows every journey to be direct-to-destination, with no stops in-between.

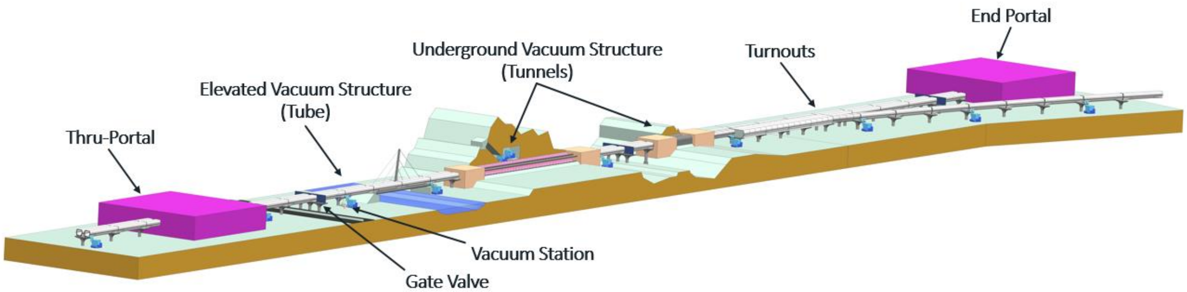

Figure 2: Cross-section of Virgin Hyperloop System guideway and supporting infrastructure.

D. Operational Elements

a. Describe the operational model.

i. Can the vehicle travel outside the grade-separated guideway (e.g. provide point-to-point service utilizing city streets?)

No, the pod cannot travel outside of the Virgin Hyperloop System.

ii. What is the potential travel time from SJC to Diridon?

It would take approximately 3 mins to travel between SJC and Diridon. This may be adjusted to be optimized for energy efficiency as well.

iii. **What is the potential frequency of the service?**

The Virgin Hyperloop System is designed such that pods leave the station multiple times per minute. During peak hours, pods can be convoyed – or virtually coupled together – to meet higher demand. During off-peak hours, pods can depart at less than maximum capacity to meet acceptable service levels.

iv. What is the potential passenger carrying capacity?

The Virgin Hyperloop System is designed to carry 16,000 pphpd (passengers per hour per direction). If required, the system can also use convoying technology to accommodate higher capacities.

v. **How can capacity scale up if demand exceeds initial supply?**

The Virgin Hyperloop System is designed to be future-proof and accommodate growth in demand. First, capacity can be increased by adding more pods into the system in various ways: (1) by decreasing the headways (the time gap between the vehicles); and (2) by convoying – or virtually coupling – several pods together, allowing multiple pods to leave the portal simultaneously. Second, pod seating can also be reconfigured to fit more passengers per pod.

vi. What is the dwell time of a vehicle at a station?

Vehicles in operation sit at the portal for approximately 6-10 minutes or until pods fill up, which keeps passengers moving to their destination quickly and efficiently. Dwell time will be determined by passenger demand at a station. It can be similar to other traditional transit systems, or a longer time for passengers with luggage and additional assistance.

vii. What is the reliability of the service?

The Virgin Hyperloop System is designed to be highly reliable. Each element of the system is tested at the subsystem level for performance and reliability before full-scale, full-system testing, and there are a number of redundancies built into the system. Additionally, a number of reliability analyses are performed to determine potential failure modes and preventions.

viii. Can the service be ticketless? If so, how will fares be collected?

The Virgin Hyperloop One service has the ability to accommodate modern technologies such as mobile payment and services. The fare collection process will be finalized pending discussions with the transportation authority.

E. Current Status of Concept Technology

a. Provide a description of the current development status of your concept (e.g. conceptual, design, development, pre-production testing, or production)

Virgin Hyperloop One completed a full-scale test on our prototype system in May of 2017 at our Las Vegas test site, Devloop. Since then, the company has been refining our design for commercial release and working with regulatory agencies and safety authorities to define the requirements for hyperloop operations and safety procedures around the world. We are also working on commercial partnerships with suppliers and vendors to deliver the Virgin Hyperloop System.

b. Include a schedule for development of a fully deployable system, if applicable. Identify key assumptions for this schedule.

Virgin Hyperloop One is now leading the charge for a hyperloop certification center, which is a critical step to take hyperloop from a technology innovation to a transportation innovation. There are multiple states in the U.S. who are interested in this certification track and we plan to break ground within the next 12 months. The Virgin Hyperloop System will be ready for deployment in 5-7 years, assuming current efforts to obtain regulatory and safety approvals continue to hit key milestones.

We are encouraged by the support we are seeing at the federal level. Earlier this year, U.S. Secretary of Transportation Elaine Chao created the Non-Traditional and Emerging Transportation Technology (NETT) Council to explore the regulation and permitting of hyperloop technology to bring this new form of mass transportation to the United States.

c. Include examples of successful similar implementations if available.

The VHO DevLoop System was the first full-scale test of a functional hyperloop system in the world. The VHO team built that system in 10 months, including not only the construction of the linear infrastructure and installment of vacuum pumps, but also the integration with the pod (vehicle), the autonomous control system, and as well as emergency and safety access points. We believe this is a testament to the skills and capabilities of the team to build and deploy rapidly and successfully.

d. Identify areas of notable risk that would be investigated further.

Virgin Hyperloop One prides itself on putting safety first – this includes the safety of our employees as well as future passengers and customers. As such, we are working closely with government authorities to develop a regulatory path forward that would allow the deployment of commercial hyperloop systems to be done safely and promptly. The NETT Council – the Non-Traditional and Emerging Transportation Technologies Council – that was set-up by U.S. Transportation Secretary Elaine Chao earlier this year is evidence that the federal government is interested in the commercialization of hyperloop technologies, and Virgin Hyperloop One is actively working with the NETT Council to develop the path to obtain approval for safe operations of the Virgin Hyperloop System. There is much work yet to be done, but the progress made to date, as well as the speed at which it has been made, is very encouraging.

F. Concept Requirements

a. Describe key requirements for implementation of the system (e.g., infrastructure, utilities, regulatory and/or policy) and estimated length of time required to implement the system.

Corridor Assessment: Depending on whether any existing environmental assessments that can be leveraged and expanded on for a hyperloop system, and an evaluation of the environmental impacts will need to be performed prior to construction.

Demand Analysis: A detailed demand analysis for this corridor will need to be conducted to develop an operational strategy.

Obtaining Right-of-Way: Depending on the route alignment, right-of-way will need to be obtained from the appropriate owners and authorities.

Construction of Infrastructure: VHO's current estimate is that infrastructure can be built at a pace of 200-400 meters per week above ground, based on current technology. Tunneling of the route and its pace is subject to surveys and analysis of the site. Accordingly, roughly 1-2 years for build of a 3-4 mile route is VHO's recommended baseline, though this may vary depending on if the infrastructure is constructed above ground or below ground. Depending on the system configuration, underground utilities may also need to be moved.

Pod Order: Depending on the number of pods required to service the system, there may be a lead time for pod delivery.

Testing and Commissioning of Project: The System will require some time for testing and commissioning. Specifics are to be determined with the appropriate regulatory authorities.

Approvals for Safe Operations: VHO is actively working with state and federal regulatory authorities to develop a pathway to approval for safe operations. This will need to be evaluated in the context of this project as well.

b. Could the system function in either an aerial or underground configuration? Could it transition between aerial and underground? What are the maximum allowable grades for the system to ascend/descend?

The Virgin Hyperloop System can be either above ground, elevated on columns, or below ground in a tunneled form. Many of our proposed routes include both sections which are elevated and sections which are tunneled, and a transition between the two is a well-understood part of our design. Our system tolerates tighter curves and steeper grades than any other track-based transportation at the same speed.

c. Could the system be extended in the future?

Yes, the system could be extended in the future.

d. Could stations be added to the system in the future?

Yes, stations – or portals – could be added to the system in the future.

e. What are the maintenance requirements for the guideway, vehicles, stations, etc.?

The Virgin Hyperloop System has no wheel-on-rail wear and tear due to proprietary next-generation magnetic levitation technology. Track elements are also located in enclosed environment. Both factors reduce operation and maintenance costs compared to existing rail systems.

The system is designed to minimize maintenance activities on the guideway; instead, VHO has created sensors to proactively detect maintenance needs on the guideway and are developing methods to replace or fix parts without human intervention when possible. Most maintenance activities occur on the pod, and regular pod maintenance to be easily performed in a maintenance bay which may be connected to the portals or is in a separate maintenance depot.

G. Costs

a. What is the cost per mile to deliver the fixed infrastructure needed to operate the system, not including stations and land acquisition costs?

The cost per mile is highly dependent on the particular route. In one study, it was shown that the linear infrastructure costs for the Virgin Hyperloop System are 30-40% lower than those of high-speed rail. The percentage of the route that is tunneled will also have a great impact on costs. Further cost details can be determined during a feasibility study or a more detailed assessment of the corridor.

b. What is the incremental cost of a station and/or access point?

The cost of a station depends on many factors, including size, throughput, location, etc. Further cost details can be determined during a feasibility study.

c. What is the cost of the vehicle fleet needed to begin operations?

Fleet size is customized for each route based on throughput and ridership. Further cost details can be determined during a feasibility study.

d. Summarize the capital costs for delivering the full system for each potential project, Airport Connector and Stevens Creek Line. Assume six stations on the Stevens Creek Line and three stations on Airport Connector, plus Diridon station for both routes.

We do not have enough information at this time to provide an accurate cost estimate for the potential projects. Further cost details can be determined during a feasibility study.

e. Provide a high-level estimate of the ongoing operations and maintenance costs, as well as equipment replacements costs and schedules.

Ongoing operations and maintenance costs vary from route to route. Further cost details can be determined during a feasibility study.

H. Business Plan

a. Describe the business plan to deliver and operate the proposed project. The City is looking for innovative ways to fund and operate new transit systems.

Virgin Hyperloop One has the capability to develop innovative funding and operational strategies. At a high level, VHO envisions that the project will be best funded and developed under a public-private partnership framework. VHO expects to pull together a consortium of local partners for planning, regulation, and environmental studies, as well as suppliers to provide the construction, and operations and maintenance of the project. We hope the City will assist with obtaining the permitting and land required, as well as participating in the consortium. A more specific delivery strategy and detailed business plan will need to be discussed with the City and depend on the needs of the project and its stakeholders.

b. Who will operate the system once constructed (VTA, the builder, PPP, other)?

VHO has partnerships with several prominent transport operators that could operate the system with appropriate training and support from VHO. VHO is also open to VTA playing a role in the operations.

c. What is the passenger fares strategy?

The Virgin Hyperloop System is a mode of mass transit, and thus fares are set according to what most residents in the region are willing to pay. Mobile payment service will be offered to enable a fast and convenient fare collection process. During an in-depth study, consumers' travel patterns and willingness-to-pay will be evaluated, alongside competing modes and alternatives, and an appropriate fare strategy will be set in conjunction with the project owner/sponsor.

d. What are the expected fares for passengers to use the system?

Expected fares will be competitive with the cost of other modes on the same route. Fares will be determined during a future study.

e. What is the strategy to maximize ridership?

We believe that ridership will be maximized on a Virgin Hyperloop System by the design of the system itself: 1) The system is designed to offer quick transfer to/from airport, short, consistent wait times, and easy level boarding for passengers with luggage; 2) the Virgin Hyperloop System will be integrated into the unified station at the Diridon Station, connecting seamlessly with other transit services in the Bay Area; and 3) the system has flexible and dynamic capacity that can be scaled with demand in both reactive and proactive ways. As the passenger demand increases, the system is designed to react to this demand by reducing headways between vehicles and increasing service frequency to better meet the demand, including the surcharge of demand on specific events (game days, annual events, holidays, etc.).

f. Can capital and operations costs be funded through passenger fares?

The project cost and passenger fare will be studied based on route-specific information. In many situations, capital and operations costs can be funded through passenger fares. This is because the system can offer shorter, consistent wait times and direct, non-stop trips that are quick, as well as multiple levels of quality of service that will enable higher ridership. Also, the cost of operating the system will be lower than other traditional transit systems due to the system's design principles and higher energy efficiency. Accordingly, in almost all situations, we believe that operating expenses can be funded through passenger fares.

g. Describe opportunities or strategies to maximize farebox recovery and/or offset operations and maintenance costs.

The Virgin Hyperloop System is designed to maximize farebox recovery and offset operations and maintenance costs by its very design. Apart from the higher ridership enabled by short travel time and ability to support point-to-point travel, the system is (1) frictionless – due to VHO's proprietary magnetic levitation architecture, leading to no wheel-on-rail wear and tear; (2) enclosed in a tube, leading to minimal chances of derailment or impact by external forces like weather; and (3) automated, ensuring scalability of operations, and mitigating chances of human error to deliver a seamless passenger experience.

I. Impacts

a. What are potential negative impacts during construction?

Virgin Hyperloop One is committed to sustainability in the construction, operations, and maintenance of our system. We challenge ourselves and our partners to minimize our impacts on the environment and surrounding communities in all aspects of the project lifecycle. Prior to construction VHO will conduct an assessment of impact and commit to working with the City of San Jose to develop a construction schedule and process that is considerate of the surroundings.

b. What are potential negative impacts during operations?

The Virgin Hyperloop System is entirely electric with no direct emissions. Because the system is enclosed in a tube, there is also minimal noise pollution on its surroundings, allowing the system to be built in dense urban environments. The environmental impacts can be vastly minimized compared to other forms of transportation, particularly if the system can be supplied with renewable electricity.

c. How can negative impacts be mitigated?

We do not see any specific negative impacts at this time that cannot being mitigated.

d. **What might the community outreach and engagement strategy look like?**

We dedicate time in all of the regions where we have projects to connecting with the local community. At this time, our test vehicle, XP-1, is travelling around the U.S. and stopping in cities and regions that VHO is actively working with. Our team is travelling with the pod to meet local stakeholders and the general public to answer their questions and tell them about our technology. We have participated in numerous town halls and public outreach meetings. Engagement with the youth community is also extremely important to the company. We have set-up several STEM outreach events to educate our youth on this new technology. Additionally, we plan to do more direct outreach to the public as part of each individual project as the projects progress towards construction.