June 23, 2020 Neighborhood Meeting
Princeton University Geo-exchange Athletics Operations Facility with adjacent water storage tanks

Summary of Questions and Answers

1. **If the Princeton University Traffic impact Study (TIS) projections prove to be too low, and widened roads, traffic lights, and/or other changes need to be made, then who will cover the full cost of this? Will any of these costs be covered by our municipality?**

   The University cannot make changes to the roads without the municipality’s review and approval. Princeton University would bear the costs of any changes needed as a result of University Development. One example of the University installing traffic controls devices would be the hawk light at Broadmead and Faculty Road.

2. **We know that some neighbors have expressed concerns about drilling noise under the ball fields. We would greatly appreciate hearing about what constructive changes have been made so far to the recent and multi-month drilling noise to reduce this. Are any other adjustments yet to be made?**

   The University understands that this has been a challenging time for many in the neighborhood. We acknowledge that many of you have been home, have children at home, and the drilling work on the East Campus has been disruptive. There are several noise attenuation techniques the contractors have started to utilize. Additional methods will continue to be used and tested as the drilling continues. At this time, noise attenuation blankets have been placed on the fence, which has resulted in some reduction in noise. Additional fencing and blankets will be installed to surround the site at 8 feet high. The team is also experimenting with hanging the sound attenuation blankets at different heights and locations as they are trying to find the “sweet spot” to provide the most effect method.

   While the surface drilling along FitzRandolph is expected to be the most obtrusive, it will be completed within a month. The next phase of drilling along FitzRandolph will be performed in an excavated area beneath the ground level. The team anticipates this below surface drilling will be less disruptive to the neighborhood.

3. **To avoid destroying the woods at the corner of FitzRandolph and Faculty, and avoid industrializing that corner, why not move the tanks to west of the parking structure by moving the soccer practice field westward in what the concept plan shows as non-built space. Or alternatively, relocate the tanks to within a redesigned parking structure?**
The configuration of the East Campus projects has been studied extensively in the East Campus Master Plan. The team reviewed dozens of different ways to organize the site and the various programmatic elements, including both of the options suggested here.

Although the site is quite large, the program requirements all have very large footprints with specific dimensions (an NCAA soccer field is not flexible in terms of size, for example). The biggest pinch-point in the current site plan is where the existing Finney/Campbell Fields and the proposed Soccer Practice Field overlap slightly in the north-south direction. The northern and southern boundaries of that site are fixed, and we’ve pushed the Practice Field as far west as it can go and still fit on the site. There is not space to include additional program elements (like the tanks) west of the garage and still accommodate soccer.

To the second question about combining tanks and garage, we looked at this idea in earnest as well. Unfortunately, adding the tanks south of the Garage would cause either a loss of significantly more woodlands along Faculty Road or the reduction in footprint of the Garage, thereby requiring a taller structure to accommodate the same amount of parking. The tanks would also impact safety and security, creating large blind spots for users and limiting daylight and views. There was additional complexity associated with bringing the major utility connections between TIGER and tanks under FitzRandolph Road.

Finally, the concept plan does show the area west of Soccer Practice as an open space. This site will eventually become an important link between the existing campus and the Lake Campus, whenever the Flyover is realized in the future. We have identified this as an "opportunity site" for program that supports this area as a gateway space.

It is true that some trees will need to be removed to facilitate construction of the tanks. However, we have taken great care to preserve as many existing trees – particularly mature trees – as possible, through the location of the tanks and underground utilities as well as construction techniques to limit horizontal disturbance. Princeton also has a long tradition of planting many more trees than are required for new construction, adding thousands of trees over the past few decades. We would continue that tradition here, and plan to add back more trees than are otherwise required.

In our prior campus plan, between 2011 and 2018, we removed 1,492 existing trees and planted 4,700 new trees, resulting in a net add of 3,208 trees.

4. **How much are the tanks sunk below ground?**

The depth of the tanks vary along the site as the natural grade is sloping from FitzRandolph to Broadmead. With that said, the bottom of the tanks will be at the same elevation just above the ground water level as determined from geotechnical test bores. The east tank will be buried approximately 13′-3″ below average grade, and the west tank will be buried approximately 16′-3″ below average grade.
5. **Can multiple full-size trees please be planted and maintained on the FitzRandolph Road side of the tanks to visually hide them? This wasn’t shown on the screen display.**

There are a lot of proposed utilities running between the TIGER facility and TES tanks, as well as to the rest of the campus. While existing and proposed landscape has been coordinated with the proposed utilities, the team has worked hard to preserve the mature trees already on site. These trees have a critical root zone for which the proposed design is minimizing disturbance, thus precluding the addition of new trees in the immediate vicinity.

As far as full-sized trees, our arborist recommends that we plant younger trees that will stay healthy which can mature to achieve heights that we need. Full size trees are much less likely to survive.

6. **The tanks will sit very close to the existing trees. Will the construction process protect the roots?**

We are trying to preserve every possible tree we can – we are working with the tank manufacturer to establish the minimum disturbance around the footprint of the tanks. As indicated above, the team has identified a critical root zone and minimized disturbance to that zone as much as possible. While some tree root balls may be affected, Princeton University will continue to replant more trees than are needed to be removed.

7. **How can ambient noise levels on location 5 be LOWER than current ambient noise levels?**

As noted on the slide in the presentation, in areas where the predicted mechanical equipment noise level is below the ambient noise (such as location 5), the ambient noise levels will dominate in the location, and one would not be able to hear the mechanical equipment noise.

8. **Are predicted TIGER noise levels daytime, nighttime, or 24-hrs?**

The predicted noise levels are cumulative and assume that all equipment is operating simultaneously (i.e. a worst-case scenario for noise levels). These predicted noise levels do not assume a time of day. While the TIGER facility will run 24 hours per day, not all the equipment will be operating simultaneously. Therefore, the noise levels would be lower than the predictions indicated in the presentation.

9. **Will TIGER’s operation be heard from Broadmead or the daycare facility? What about its 65dBA after 10pm? If the sound level exceeds the predictions, what will be done?**

The noise levels are going to vary within the TIGER facility. As previously indicated, these noise levels are cumulative and assume that all equipment is operating simultaneously. Even with all equipment running simultaneously, the predicted noise levels at locations 2, 3, and 4 (the childcare facility and Broadmead) equal or are below the existing site ambient noise levels
previously measured during the acoustical engineer’s site visit. Therefore, the TIGER equipment would not be heard from these locations.

If positioned at location 1 (directly adjacent to the TIGER facility), one might experience the 65 dBA equipment noise level, if all of the equipment were running simultaneously - this is not a likely scenario. While the NJ noise code does stipulate a maximum noise level of 50 dBA from 10:00pm – 7:00am, it is as measured from a neighboring property line. The studies show that noise levels would be below the maximum allowed amount once located at a neighboring property line.

If the predicted noise levels are found to be in violation of the New Jersey Noise Code, the University will make the necessary upgrades to the building envelope to reduce the equipment noise to acceptable levels.

10. Could the TES tanks and the Ath Ops/TIGER building be flipped along the FitzRandolph Road axis. I.e. the TES tanks are between the soccer stadium and Location #2. Presumably within the building, Ath Ops and TIGER would exchange places so Ath Ops is next to Faculty Rd and TIGER is next to TES tanks and across from road running between garage and soccer stadium. I assume the school kids care less about the esthetics of the tanks than the neighbors who live on Faculty across Broadmeade. The TES tanks could either stay in same “horizontal” position (as it appears on the slide) or moved 90 degrees so that the 2 tanks lie along FitzRandolph Rd.

As noted previously, the configuration of the East Campus projects has been studied extensively in the East Campus Master Plan. Following the Master Plan phase, the design team for the TIGER and Athletics Operations facility continued to study numerous configurations on the building site to help limit the impact of the tanks on the area.

Ultimately, the current configuration was decided on as the tanks were positioned to provide the most efficient operation while still being sited among several mature trees with the opportunity to plant new, native tree species to help to screen the tanks.

Along with the various studies on the positioning of the tanks and building, the size of the tanks themselves was scrutinized heavily by the University and design team. The tanks have been reduced in size as the Facilities Engineering team will aim to operate the tanks in a more efficient manner. The tanks will also be buried below grade down to the level of the ground water to further reduce the height. The tanks will be clad with an architectural façade to further enhance the aesthetics. Had the tanks been located further north along FitzRandolph, they would be far more visible to the neighborhood as there are less mature trees in that vicinity.

11. Which campus buildings are served by the geothermal energy?

Eventually, we will convert the entire campus to a heating hot water system. This full campus conversion will help to drive down Princeton University’s carbon footprint. In addition to the
TIGER facility, the West Plant will be converted to heating hot water and both facilities will be interconnected with the ability to back-up one another. The TIGER facility is needed to provide additional heating and cooling capacity associated with the new Environmental Studies & School of Engineering and Applied Sciences project as well as other construction. The TIGER facility and existing West Plant will both be able to provide cooling to all buildings that are on the existing chilled water loop as well as new construction. As new campus buildings are built, or existing buildings are transitioned from steam to hot water heating, the TIGER facility will provide an increased amount of heat for campus. This will allow us to use more electricity as our input energy and less natural gas. We plan to provide an increasing amount of that electricity from renewable sources such as on-campus and off-campus solar PV.

12. Could this new system pose a risk of explosion or could the water inside the tanks escape in a deluge-like way?

There is no risk of explosion. There will not be any combustion in this plant. This facility does not have boilers. There’s nothing in the facility that can explode. The tanks are constructed of concrete and have steel bands imbedded in the concrete. These would prevent catastrophic failures. This type of tank rarely has leaks. If there are leaks, they tend to be just that; small, manageable leaks, not major failures. There has been an existing tank by the West Plant for over 10 years, and we have had no problems with it.

13. Considering Hartley Ave/Faculty Road are a (the) major entrance to Princeton University, has any consideration been given to the impression that visitors will receive when they encounter these two “Elizabeth/Linden NJ petro-chemical size tanks? They will stand out like a sore thumb, amongst the beautiful wooded campus entrance. How were the noise levels for facility predicted or estimated? Has consideration been given to concealing these tanks in some type of building?

The issue of the noise level has been addressed in previous responses. The Princeton University team visited the tanks at Stanford University which is a state-of-the-art facility also driving their campus towards carbon neutrality. Aesthetic judgement can vary, but the Stanford tanks are very beautiful, they are wrapped with a similar material to what is proposed with the TIGER tanks. The setting at Stanford has become so successful with these tanks that the grounds have been requested for wedding receptions and wedding ceremonies. The University hired an architect that has a lot of skill in this. This is not going to connote an industrial setting, but rather the woodland setting will be restored. The team has been very careful about the design of the material and color of the tanks, incorporating techniques to address the scale and appearance. Historically, industrial buildings such as boiler houses or generation plants were incorporated into the of urban fabric of cities quite successfully. They had a civic quality. With good architecture, we can make today’s generation of buildings to be really good partners in the neighborhood and the campus. The gateway aspect of it along FitzRandolph as a learning opportunity for the community and the University to meet very aggressive sustainability goals, tells a good story. We are confident that this is a plus, both in terms of sustainability and aesthetics.
14. Why are the tanks built so close to paths? This would not allow for tree barriers?

There is an adequate barrier here for thickened woodlands. I think that the distance to the pathways is adequate here. The distance from FitzRandolph curb to the tank is 60’. We have a greater distance between Faculty and the tanks. With the distance between the tanks and the roads and paths, there is more opportunity to shield these than we’ve had with the older buildings, such as, Jadwin, which presses pretty close to Faculty Road, and doesn’t have a very big tree buffer.

We will restore the woodlands and enhance the planting all around the tanks as much as possible by interplanting new trees where possible, along with new shrubs and ground cover. The only exception to this is as discussed in response to one of the earlier questions – where there are utilities running underground near the site.

15. Is there going to be solar on top of the parking garage?

The University does not expect to have solar on the parking garage at the time is opens for parking day, but the garage is designed to accommodate a solar array. This is a great site for solar. Perhaps not on day one, but we will get there.

16. So utilities trump trees?

Utilities certainly do not trump trees. Utilities can coexist with trees. These projects require quite a bit of underground infrastructure and there is an important balance in the design of both the utilities as well as the landscape. While it is true that utilities can coexist with trees, there are very real challenges to siting trees directly over major below-grade utilities. This particular area of the plan along FitzRandolph is the most complicated below-grade, and there just is not space to include trees above. Elsewhere – where utilities are less of an issue – the team has worked hard to preserve existing trees and provide new trees to screen the facilities.

17. Will the noise study be shared with the neighbors?

Yes, the noise study will be posted on the website.

18. Could you please compare ambient noise levels at NIGHT, so we can compare those to the predicted noise levels?

At this time, there are no existing site ambient noise level measurements during night time hours. As noted previously, the studies show that the total cumulative noise levels would be below the maximum allowed amount once located at a neighboring property line, day or night. As one begins to get further away from the TIGER facility (and further away from the locations noted in the study), the noise will continue to dissipate. Without taking site factors into account (trees, buildings, topography, etc.), sound or noise will dissipate according to the
“inverse square law”: at a point twice the distance from the source, the noise will be \(\frac{1}{4}\) the intensity.

19. Why do athletics operations vehicles need to be serviced in this area? Could they not be serviced elsewhere?

The functions of the Athletic support staff are separate and distinct from the University Grounds and Buildings operations. The Athletics staff does at times perform similar functions like snow shoveling or mowing but the primary function is to prepare and maintain both indoor and outdoor venues for practice and competition. The Athletic Department performs minor servicing of its vehicles including blade sharpening, lubricating, filter changes, tire repairs, belt replacements, and equipment cleaning. Equipment requiring major repairs and annual winter services are sent out to other campus facilities or outside vendors. Occasionally, onsite service is required from the University Maintenance Garage or outside vendor service. The minor vehicular servicing that would occur at the proposed facility, similar to the servicing done now at the current facility at Building 29 located across FitzRandolph on Lot 21, would occur within the enclosed area of the new facility and out of view from the neighborhood. If the Athletics Operations facility were to not be located adjacent to the athletic venues the Athletics support staff support, there is a fair amount of equipment that is not road worthy so it would then need to be put onto the trucks and taken from destination A and destination B and then unloaded from those trucks and trailers to then do the grounds work. For efficient and personnel safety reasons, it is best to keep the Athletics support staff proximate to athletic sites and campus so they don’t have to travel on public roads.

20. How many non-University people are attending this meeting?

It’s a little difficult to determine how many people were attending the meeting tonight because there could be more than 1 person sitting at home looking at the same computer. There are some logged in from the University planning team, and approximately twenty-one logins from individuals who are not on a planning team.

21. Can you say more about the schedule, both for this and also for the ultimate demolition of Ferris Thompson and 87 Prospect?

Early work is underway with the geo-exchange drilling that is occurring now. The TIGER facility itself will start construction when the approvals process concludes – this should start in early 2021 with completion in late 2022. Abatement and demolition of Ferris-Thompson is scheduled to start December 2020, and will last several months into early 2021. Demolition of 87 Prospect is scheduled to begin mid-2021.

22. Can you show us photos of the Stanford tanks?
23. Could you give some more detail about the building process itself - given how incredibly disruptive the current drilling is, would be very helpful to have a sense of 1. how long the construction will be, 2. how loud it will be? and 3. how will traffic on fitzrandolph be affected. Finally, what will be done to attenuate these issues. Thank you.
The early geo-exchange bore drilling has been performed from the ground surface and directly adjacent to FitzRandolph - this is the worst-case scenario for sound transmission and will continue for the next 3 weeks. The next phase of geo-exchange bore drilling will be performed below surface level after excavation is completed. Drilling within the excavation will decrease the sound transmission significantly as the earth will provide a natural attenuation.

We continue to experiment with methods of reducing the sound transmission during the surface drilling. We have added sound attenuation blankets to the fencing and have turned the drill rigs so the direction of the noise is away from the residents north of the drilling area. We are currently experimenting with hanging the blankets near the drill rig at various heights and widths in an effort to maximize the effectiveness of the blankets. As the geo-exchange bore drilling will be ongoing through Spring 2021, we are hiring a sound attenuation consultant to review other options for addressing and minimizing the drilling noise.

We expect to have approvals in place to proceed with the drilling below grade in the very near future. We are proceeding with site logistics required as a precursor to this work now and expect to begin excavation by mid-July. We will excavate and haul approximately 150,000 cubic yards of soils from the site(s) and expect this will be ongoing for 2 months (assume through August, 2020). The truck route from the site will take the dump trucks south on FitzRandolph, then east on Faculty to Harrison Street. The trucks will head south to Route 1.

As previously stated, the geo-exchange bore drilling will proceed from mid-August 2020 through the Spring 2021.

24. Are there drawings showing which existing trees will be removed and where new trees will be placed?

Yes. Included in the site plan submission to the municipality there will be plans showing the trees to be removed as well as the trees to be planted. Once the submission has been made, the plans can be posted to the project website.

25. So it will be probably louder than the ambient noise at night - it is misleading to state that ambient noise is louder.

The ambient noise indicated in the presentation and the acoustical report is as measured during the hours of 12:30pm – 4:00pm. As previously noted, the existing site ambient noise was not measured during the evening. The statement in regards to ambient noise being louder was predicated on the timing of the site testing. With that said, the predicted noise levels represent an unlikely worst-case scenario where all equipment is running at the same time. These predicted cumulative noise levels would still be below the maximum allowed amount once located at a neighboring property line, day or night.
The University will work with the acoustical engineer to provide a diagram that extends the boundaries of the drawing and indicate what the predicted sound levels would be a block away based on distance alone. Any additional elements such as trees or buildings would only further reduce experienced noise levels.

26. I appreciate the detailed explanation of the noise levels from the TIGER bldg. I don’t completely understand the decibel levels, so can Ron compare the predicted noise to that of the (very noisy) chemistry bldg?

We do not have a comparison between the Chemistry Building and proposed TIGER facility. However, as an example of noise levels, a normal conversation is typically around 60 decibels.

27. Ron said the pump is nearer 5 than 2, so why is the noise prediction higher for 2 than for 5?

The predicted noise levels at location 2 are higher than location 5 due to the varying site conditions. The two TES tanks screen location 5 from the TIGER facility and therefore screen the equipment noise from the TIGER.

28. Where do the weddings take place at the Standard geothermal facility?

We have been told during visits to the Stanford facility that weddings have been held there, but we did not attend, so we can’t confirm the location where the event(s) were held.

29. Here’s current Google Earth image of the Stanford facility. It’s at the northern edge of the campus and does not look like a wedding venue.

The aerial photo probably doesn’t do the project justice. If you go to the ZGF architect’s website, or Google Stanford Energy ZGF, you’ll see photographs within the facility, no one experiences a site from aerial photographs, we experience the buildings on the ground or within the space.

30. The Stanford tanks are screened and read as part of a larger building. Here’s a Google Earth street view looking north at the facility

They are screened.

31. To be more precise: when would *demolition* likely start (assuming planning board approval, etc.)? Thanks!

For the demolition schedule, Princeton University has received approval and are proceeding with preparation to demolish Building 29, the Garage adjacent to the observatory, and Biodigester (located behind Observatory). The Observatory demolition applications is under review by the municipality.
32. Are there any plans for disability parking on Ivy Lane once the parking lots ae demolished? Taplin is used for concerts and the physics building is used for lectures.

Currently there are parking spaces for persons with disabilities at Jadwin Physics and arrangements can always be made with Transportation and Parking Services for parking near Taplin. Additionally, all the TigerTransit buses are ADA compliant offering service in the evenings.

33. Is there any possibility of TIGER sound being reflected off of the parking structure or tanks?

Yes, sound will be refracted from the surfaces that it hits, but it will be absorbed and then the distance will dissipate the sound, so that any refracted sound leaving the site will be less that the sound directly surrounding the site. Meaning reflected sound will diminish the same way as projected sound, and by the time it gets back to the neighboring buildings east of the TIGER facility, it would be below the predicted noise levels at the perimeter of the site.

34. How will Location 1 meet the NJ 10pm to 7pm level requirements?

The State mandated noise level requirements are taken at the property line of the neighboring site. Location 1 is within the property line, as are the other four locations with predicted noise levels. The State regulations would be out farther away from the TIGER facility at the neighboring property lines.

35. The University Capital plan was cut in 2008 and construction postponed. Is there a plan B for the projects being discussed (if the endowment gets hurt)?

While outside the scope of this meeting, it’s true that the University capital plan was cut as a consequence of the 2008 recession, but it also recovered as the endowment recovered. By the end of what we call Capital Plan 1, the Capital Plan ended up at the same level that had been anticipated prior to the recession. These things are all functions of the depth and duration of economic disruption, the health and success of the endowment. The University is always exploring scenarios and running multiple scenarios to anticipate future events, and you can be sure that the University is engaged in scenario planning right now. The level of scenario planning is positioning the University so that it can respond as best it can.

36. Here’s the Stanford architect’s website and its images of the geothermal facility. People may want to be married inside the geothermal facility at Stanford, but residents and visitors to the Princeton campus will be looking at and experiencing it from Faculty Road and Fitzrandolph Road, not from the inside, and the University’s proposal is not to have a facility that is totally screened from the public.

Princeton University has a history of always doing high quality work. There’s history of civic buildings that are industrial buildings, and we are confident that this is a building of our time, that is a good campus partner, a good partner neighborhood, and is very well designed.
37. Is it possible that once the tank installation begins that you discover that they can be sunk even more? Can this please be done?

There has been significant geotechnical testing done on the site to understand the rock strata that is below the site. With the information available, Princeton University does not expect to find sinking the tanks farther would be practical.

38. Can Princeton University seriously consider installing a tall screen to fully shield both of the tanks as Stanford has nicely done? If so, then does that make sense to do all around or primarily on the Fitzrandolph side that wouldn't be covered by trees? If sound is a problem, then could these screens include appropriate sound deadening materials?

Multiple studies have been conducted during the course of design. Providing a screen for the tanks was considered. Through the study, it was determined that a single tall screen to conceal the tanks increased the visual mass, and by providing an architectural façade on the separate tanks, the visual mass and scale of the tanks is reduced. Installing a screen would also require the removal of more trees, and prohibit the planting of new trees in certain areas.