Cost

Question #3

The general answer is no.

Maintenance - clogs:
The pavement needs to be clean so it function and won't fail.
sweeping and vacuuming - cost, storage, what kind of machines, how often.
Maintenance cycle can be 7 years. first installation is 3 years old. we did not calculate full maintenance cycle yet.
monitoring filters is hard.

LLC:
How long the pavement last.
Never ending cycle - need more research, more experience.

Database:
There is a national database (WORF) but it voluntary.
More agencies should build test patched, track and publish the information. share database.
There is a need in obligatory pilot projects, and obligatory to track maintenance.
There is no uniform form to write costs. Need to define parameters.
Maximo system: developing maintenance plan, tracking costs, developing management.

Question #2

we don't have what to compare to, because there are no much existing projects.
some municipalities did great job with pavement condition and survives, but not in SF.
Pavement management it is a local level work.
Must be a database that is possible to compare, and it should be written by municipalities agencies.
Project Level Design Issues

Question #29

<u>Problems:</u>
Geotech like to keep the soil dry based on traditional design, and permeable pavement changes the rules. Saturated soil cause loss of strength, but possible. It will spread the loads like a traditional design. When road is wet and soil is saturated the pavement is weak.

Saturation can be designed all year long or just part of the time. Easier to assume it is all the time saturated, but in CA it can be saturated only for about 6 month in a year.

This system is new and contractors don't know this field yet. It costs much more than a traditional pavement. We try to balance costs, or cover some cost to make it competitive.

Conflict with existing utilities. Traditional pavement section is 18" thickness or less, no meeting newer utilities and most of the old ones. When pavement is thicker, like in permeable pavement, 32", getting to utilities. Need to optimize pavement thickness and utilities depth.

Solutions:
Main effect is increasing the pavement thickness.

Maybe the sand will take water away before influence on clay. Putting a layer of sand acts as a filter. Rock reservoir might be helpful to slow down the water.

Geocells are under pavement and helps strength when have poor soils, has a downside of losing tension.

Question #35

Good tests available to characterize fatigue and more.
Watershed and Flood Control Design Issues

Question #41

There is no guidelines manual. We need to be ready for the 100 years waterstorm.

Capital flood guidelines needs to acknowledge permeable, what is the big impact on regularly small fall events and what is the tiny impact in a big rare fall event.

Private sector is dealing with this type of questions, like decomposed granite.

Pavement is like soil but not exactly the same.

Question #45

What is the right ratio between permeable and impermeable in a section.
Zero to one. One to one.

Sweepers. Lots of organic debris.

Asset Management

Question #61

There is no pavement management system for traditional ones, based on complains only in most cities.

MS4/combined system - stormwater and sewage is in the same system in most of SF.
Permeable pavement management should capture the stormwater system too, and sometimes also the sewage system.

Question #64

Grinding top layer will make fine dust that clog the underlayer.
Is it possible to bond a new top layer to an existing base layer.

Can permeable asphalt be rehabilitated by simple grind and overlay?

Porous concrete - need hug vacuums connected to trucks with water jets and a huge vacuum head to vacuum fine debris while grinding. “Banyan Bird”.

Precast porous concrete company developed their own cleaning machine.
Free

Question #69

We (RCFC) trying to do all monitoring stormwater that need to be captured, but that doesn’t meet the permit obligations. It is hard to get dedicated resources, and we miss a lot of storms. We have a lab and we can’t run it, and we would like to have students.

Questions #70

Hard to be city accepted material. Replacement in pavement material, after utility cut for an instance,can be done only with accepted material. SF will not accept pervious concrete or porous asphalt. SF accepts only permeable pavers and porous pavers. Mostly because it is new and SF afraids of new materials.

Utilities cuts - cities can’t trust the contractors to do a good job about putting back permeable pavement patches.

Performances specs - hard to answer it in small patches.