Hydrologic Monitoring of Urban Stormwater BMPs at Chicago Public Schools (2016-2017)

James Duncker (USGS), Clint Bailey (USGS), John Watson (MWRD),

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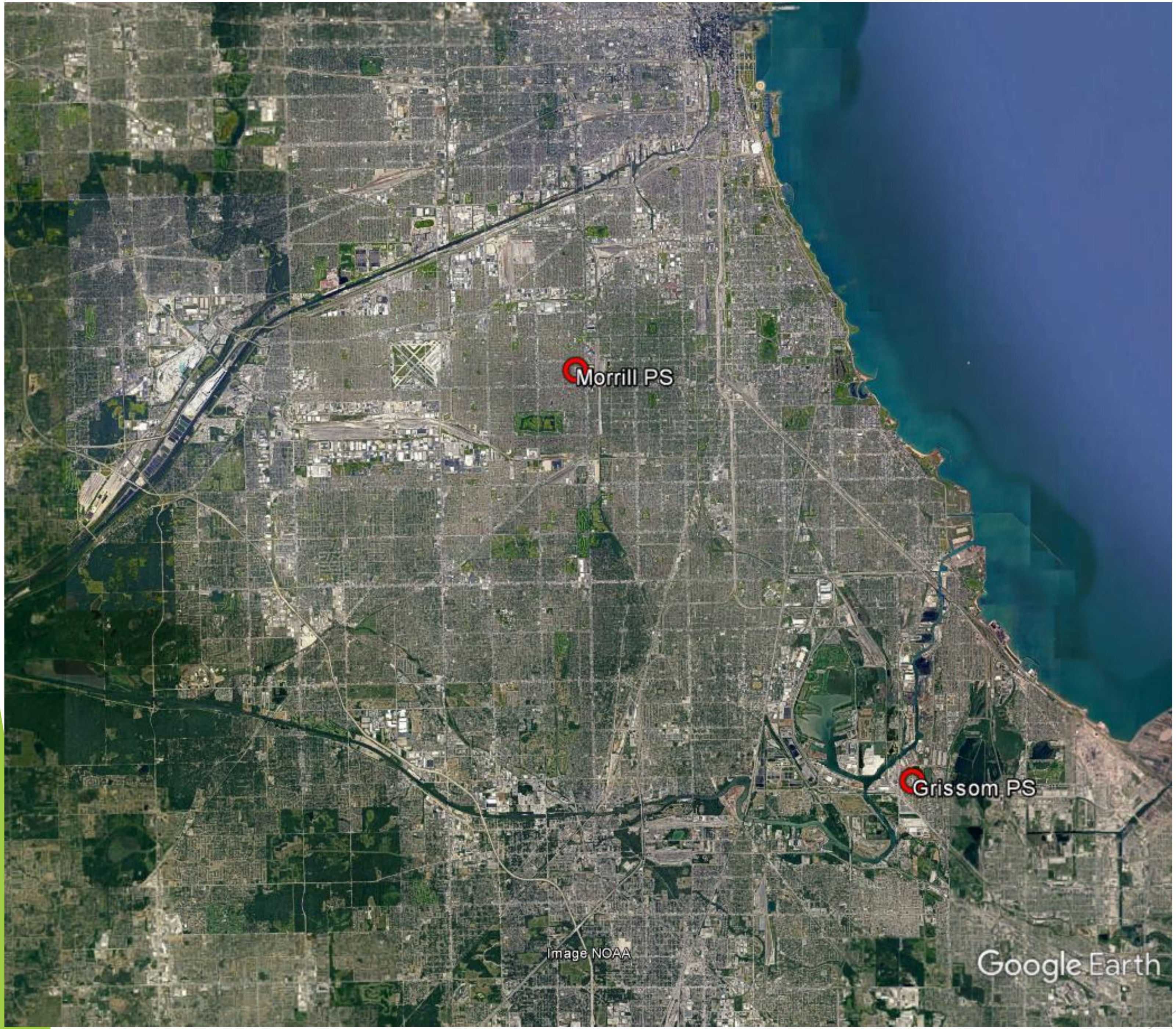
3 Partners for Better Schoolyard and Less Basement flooding

- Rebuilding schoolyards in a sustainable way, including stormwater storage
- 3 main partners:
  - Metropolitan Water Reclamation District of Greater Chicago (MWRD)
  - City of Chicago Department of Water Management (CDWM)
  - Chicago Public Schools (CPS)
- MWRD and CDWM each dedicated up to $500,000 per school towards GI measures (basically splitting the projects in even thirds, overages to CPS)

Metropolitan Water Reclamation District of Greater Chicago



Monitored School Locations

(2 of the 14 schools constructed or currently in design)

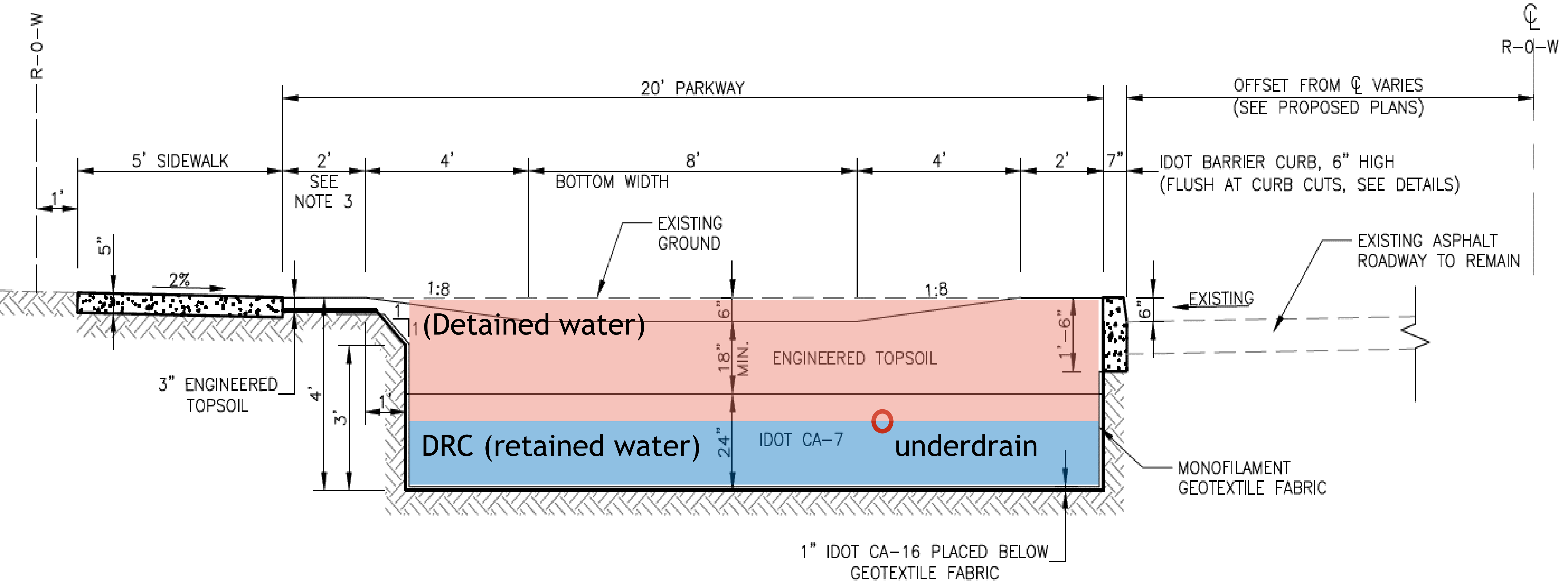
Stormwater Design Criteria (MWRD, DWM)

- 9 schools constructed in 2014-16, 5 schools in 2017,
  - up to 19 more by 2020
  - With those 9 constructed, already 1.48 million gallons of stormwater retained
- Meet and exceed Chicago and MWRD Ordinance Requirements
  - City of Chicago Flow Vortex
  - Bulletin 70 Rainfall Data
- Any stormwater release to be of high water quality
- Projects to positively impact thousands of local residents by providing:
  - A safe place for their children to play
  - Educating all to the benefits of GI, visible stormwater elements and signage
  - Providing much needed relief to localized flooding
- The main objective is to reduce local flooding and the amount of rainwater entering the local combined sewer system, and to maximize Design Retention Capacity

Design Retention Capacity

- Defined by USEPA as “the maximum available retention capacity of a project in any individual storm event”
- Detention: all stormwater drains to local sewer, but at a much-reduced rate. This helps reduce the peak flows, which are problematic for CSOs, flooding, basement backups, etc,
  - However, the entire volume still has to be held in TARP, then treated, and with small projects, the small lag time and tempered release rate may not have much of an impact in a larger sewer system with long travel times
- Retention: all stormwater is retained on-site and is never released to local sewers, and instead, stormwater infiltrates and evapo-transpirates. This helps solve the problems with detention listed above, replenishes the shallow groundwater table, and overall, makes for a more natural method of stormwater management.

Design Retention Capacity Example

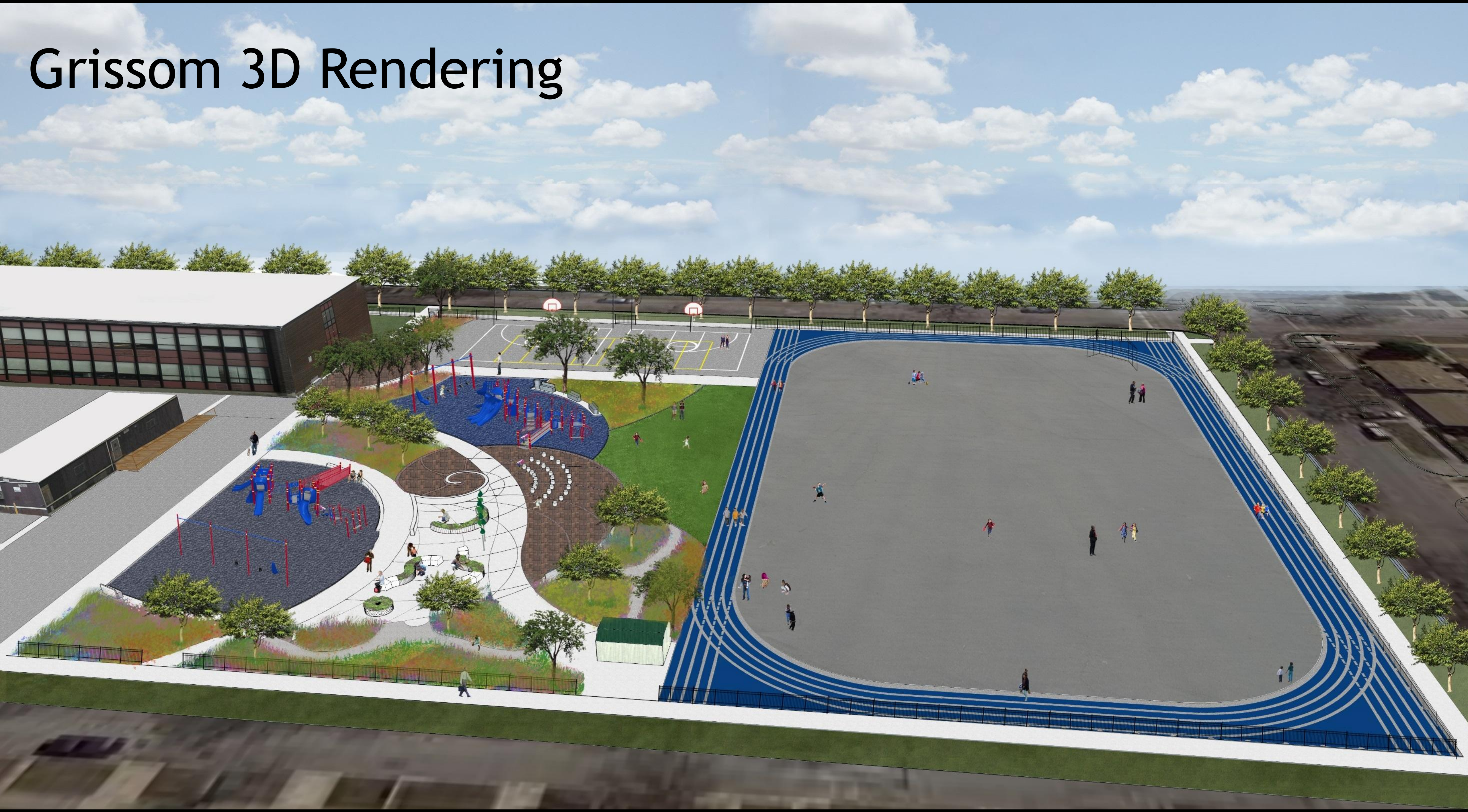


PROPOSED RAIN GARDEN TYPE A TYPICAL SECTION
N.T.S.

Design Retention Capacity (continued)

- These projects have a combination of both retention and detention, but the design efforts are mostly towards retention volume (DRC)
- Currently being physically monitored to calibrate and/or verify calculations (USGS-monitored projects)

Grissom 3D Rendering




Grissom Before Construction
Example school, accelerated construction
Source: Google Earth Pro

Grissom After Construction

Source: Google Earth Pro

Student and Community Enjoyment, all on top of a stormwater feature!

Source: *MWRD, DW*

What we've observed and learned so far

- As a result of our projects, playgrounds have been used much more by students and their families
- Due to increased use and visibility, playground areas are much safer than before
- Good publicity for the MWRD and CDWM
- Public Education about Stormwater, Sustainability, and Green Infrastructure

- Some studies seem to indicate improved learning with greenspace access
  - Ref: Dr. William Sullivan's research at UIUC (2017, 2015, 2014, etc)
- We have a better handle on which technologies lead to the most DRC,
  - and how designs can be adapted for more DRC
- Agencies working together to solve a problem have yielded better results than working alone,
  - Each agency's contributions go farther
- Beneficial example projects can lead to adaptation around the US, possibly world someday

Image: Data Conversion Laboratory

Time-Lapse Video of Wadsworth Construction, 3 min

https://www.youtube.com/watch?v=s5Hx3f2CkzM&feature=youtu.be

(embed video if time allows, if not, just click link)

Future Monitoring Plans at CPS schools

- One school monitored long-term (likely Morrill, side-by-side)
- 2 new schools per year:
    - one before & after construction (1-2 water years)
        - + easy for public to see reduction in runoff
        - - have to adjust for different storms
    - another side by side (1 water year, and rotating)
        - + same storms, don't have to adjust for rainfall depth or distribution
        - - More difficult for the general population to directly see the reduction in the *same underlying utility system*
- Compile and analyze data, compare with H&H models
- Write and publish a report, and do presentations, sharing data with environmental science and engineering professions, which can be used to:
    - improve projects
    - improve calculations for runoff reduction
    - demonstrate effectiveness of Green Infrastructure

USGS
science for a changing world

Thank you!

Questions?

Image: *MWRD Public Affairs*

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