

Minnesota Ground Water Association

April 20, 2016



Saint Paul's CHS Field

- Public-private partnership
- Brownfield redevelopment
- Sustainability focused
- *Rainwater harvesting across properties*



Partnership

Agencies

- Capitol Region WD
- Metropolitan Council
- Metro Transit

Project Team

- St. Paul Saints
- City of Saint Paul Parks and Rec.
- Ryan Companies
 - Schadegg Mechanical
 - Solution Blue, Inc.
 - Rainwater Management Solutions



Site Context

- Oldest part of city (Historic Lowertown)
- Industrial brownfield, 9 acres all impervious
- Destination site: near light rail line and Mississippi River



Ballpark Impact

- 180 events each year
 - 50+ Saints games
 - College partnership
 - Amateur baseball
 - Concerts
 - Community space
 - Rentable conference
 - Reception space
 - Movie nights
- 400,000 annual visitors
- 7,000 seats



Stormwater Regulatory Goals

Desire to exceed minimums

- Watershed District
 - Runoff rate
 - Quality (TSS)
 - Volume reduction
- City of Saint Paul
 - Runoff rate
 - Sustainable stormwater overlay
- Minnesota Sustainable Building Guidelines
 - Zero discharge for 1.25" event
 - Reduce TP
 - Reduce potable water consumption

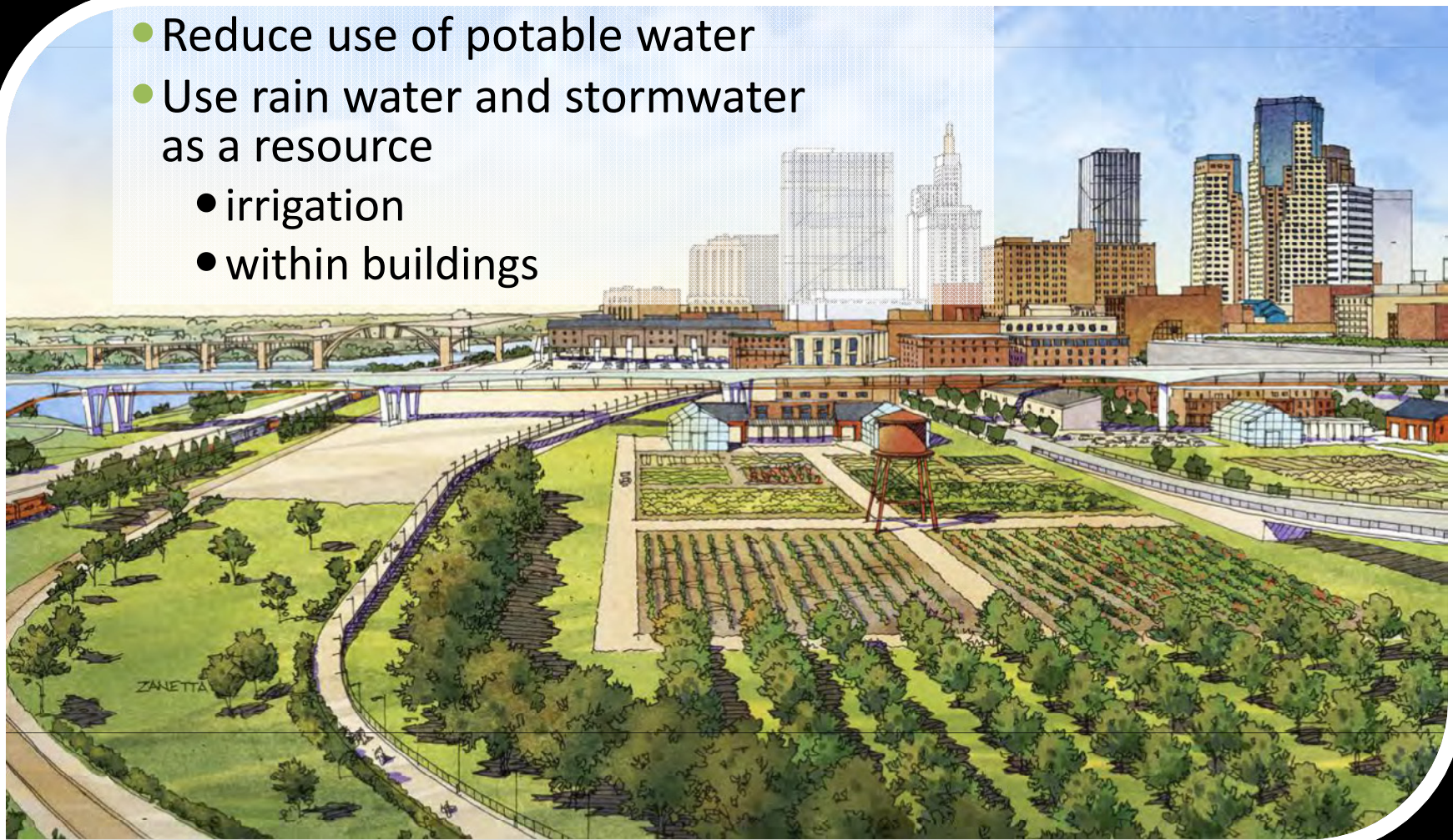
GOAL	Source	BASELINE	ENHANCED
Match existing 2, 10, 100-yr peak flow rates	CRWD	YES	YES
100-yr peak discharge of 1.64 cfs/acre	Saint Paul	YES, 1.64 cfs/acre	YES, less than 1.60 cfs/acre (additional retention provided by selected enhanced stormwater features)
Zero discharge from site for 1.25" event	B3	Most likely not practical because soil contamination - infiltration not allowed for majority of site.	Most likely not practical because soil contamination - infiltration not allowed for majority of site.
Infiltrate 1 inch (or filtrate 1.3 inch) off impervious surfaces	CRWD	YES, 1.3 inches of filtration	YES, 1.9 inches of filtration
90% TSS Reduction	CRWD	YES, analysis shows expected removals between 90-92%	YES, analysis shows expected removals between 92-95%
60% TP Reduction	B3	MAYBE, analysis shows expected removals between 56-62%	YES, analysis shows expected removals between 61-67%
Reduce potable water use for irrigation by 50%	B3	NO	Harvest rain from ballpark and OMF roofs to irrigate field and flush toilets. Potential to reduce water demand by 25-30%.

Exceeding Standards

- 27,000 gallon rainwater harvesting cistern
- Tree trenches with Stockholm Soil
- Vegetated swale
- Rain garden in parking lot
- Underground filtration

Greater Lowertown Master Plan

- Reduce use of potable water
- Use rain water and stormwater as a resource
 - irrigation
 - within buildings



State Rules and Agencies

MN Rule Chapter 4715

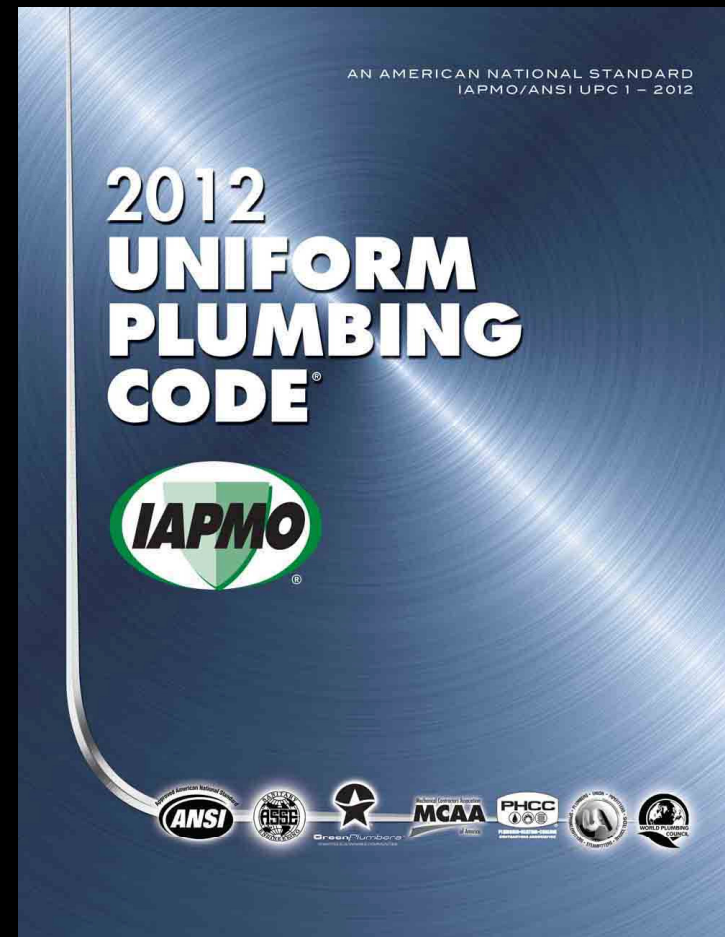
- Plumbing Code
- Department of Labor and Industry (DLI)

MN Rule Chapter 4720

- Public Water Supplies
- Department of Health

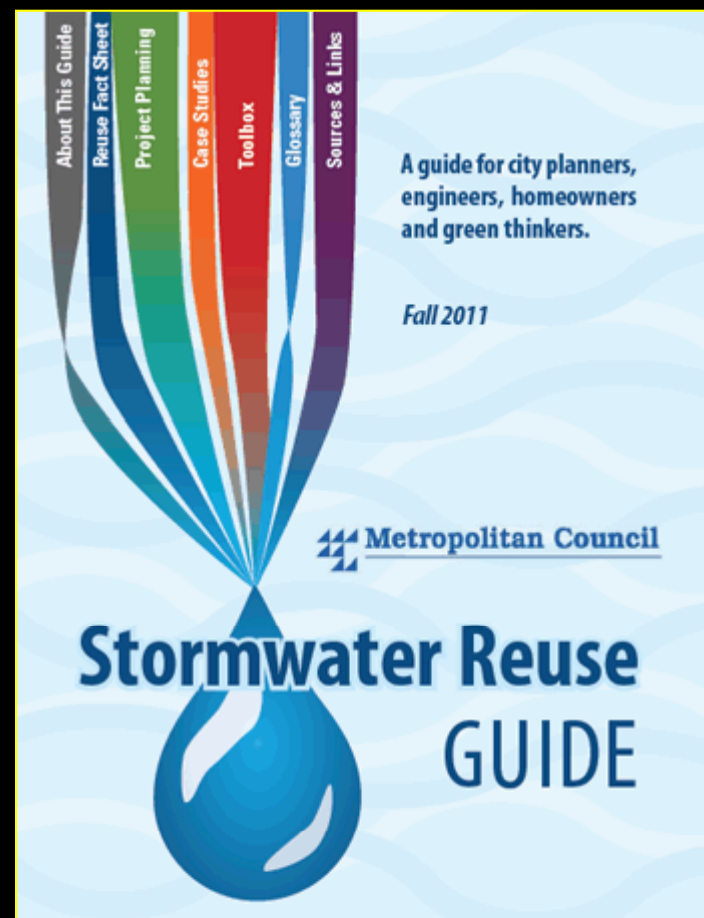
Code Considerations

- Plumbing Code
 - Silent on rainwater harvesting
 - Allows for Alternative Methods review
 - Provisions for First Class cities
- Public Water Supply
 - Treatment
 - Review



Challenges

- Lack of standards
- Multiple jurisdictions
- No defined process
- Limited agency capacity
 - Duties; authority
- Operation and maintenance oversight
- Water economics



Stormwater “Double Play”



Design Charrette

- Facilitated by outside reuse expert (Stark Rainwater / RMS)
- Develop possible alternatives
- Schematic design and prelim cost estimates



MEP contractor not on project team yet

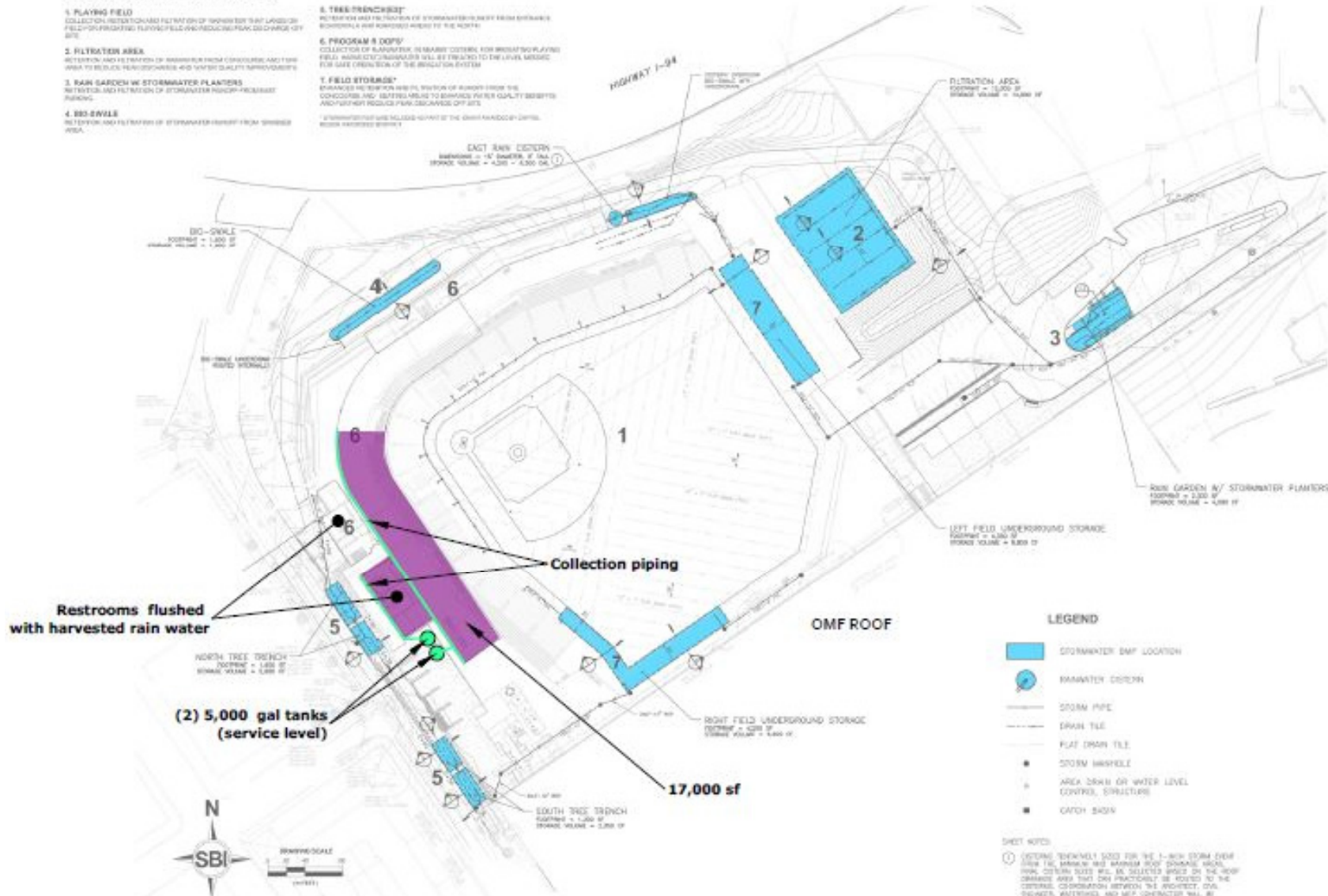
Pricing and Options

LOWERTOWN BALLPARK STORMWATER MANAGEMENT PLAN

RAIN HARVESTING OPTION A TOILET FLUSHING FROM BALLPARK ROOFS

STORMWATER MANAGEMENT FEATURES

- PLAYING FIELD**
COLLECTION AREA TOWARD FILTRATION OF RUNOFF FROM PLAYING FIELD TO REDUCE FLOODING AND REDUCE PEAK DISCHARGE OF SITE.
- FILTRATION AREA**
RETENTION AND FILTRATION OF RUNOFF FROM CONCOURSE AND PARK AREA TO REDUCE FLOODING AND IMPROVE WATER QUALITY IMPROVEMENTS.
- RAIN GARDEN W/ STORMWATER PLANTERS**
RETENTION AND FILTRATION OF STORMWATER FROM CONCOURSE PARKING.
- BIO-SWALE**
RETENTION AND FILTRATION OF STORMWATER FROM CONCOURSE PARKING AREA.
- TREE TRENCHES**
RETENTION AND FILTRATION OF STORMWATER FROM CONCOURSE CONCOURSE AND CONCOURSE AREAS TO THE NORTH.
- PROGRAM # DOPS**
COLLECTOR OF RUNOFF FROM CONCOURSE AREAS TO PLAYING FIELD. RUNOFF FROM CONCOURSE AREAS WILL BE TRACKED TO THE LEVEL NEEDED FOR SAFE CREATION OF THE REGULATION SYSTEM.
- FIELD STORAGE**
ENHANCES THE STORAGE CAPACITY OF RUNOFF FROM THE CONCOURSE AND PLAYING FIELD TO IMPROVE WATER QUALITY BENEFITS AND FURTHER REDUCE PEAK DISCHARGE OF SITE.
- STORMWATER USE**
USE AS A SOURCE OF WATER FOR THE GOLF COURSE AND OTHER AREAS.



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Suite 200, St. Paul, MN 55101
612-224-0808
www.solutionblue.com

Project Name
LOWERTOWN BALLPARK

Location
ST. PAUL, MN

REVISIONS	
NO.	DESCRIPTION
1	ISSUED FOR PERMIT
2	ISSUED FOR PERMIT
3	ISSUED FOR PERMIT
4	ISSUED FOR PERMIT
5	ISSUED FOR PERMIT
6	ISSUED FOR PERMIT
7	ISSUED FOR PERMIT
8	ISSUED FOR PERMIT
9	ISSUED FOR PERMIT
10	ISSUED FOR PERMIT

DRAFT - NOT FOR CONSTRUCTION

DESIGNED BY SBI
Checked by: _____
Reviewed by: _____
Date: _____

PROJECT NO.
DATE

PROJECT NAME
STORMWATER MANAGEMENT PLAN

SHEET NO.
C550
DATE: 01/20/2016

NOTES
1. ORDER TRENCHES FOR THE 1-INCH STORM PIPING WITH THE MINIMUM 180° BENDS. STORM PIPING SHALL BE INSTALLED UNDER THE CONCOURSE AREAS THAT CAN PRACTICALLY BE ROUTED TO THE CONCOURSE. COORDINATION BETWEEN THE ARCHITECT, CIVIL ENGINEER, ELECTRICAL, AND MECHANICAL CONTRACTORS WILL BE REQUIRED.

Pricing and Options

LOWERTOWN BALLPARK STORMWATER MANAGEMENT PLAN

RAIN HARVESTING OPTION B BALLFIELD IRRIGATION FROM 1/6 THE OMF ROOF

STORMWATER MANAGEMENT FEATURES

1. PLAYING FIELD

COLLECT ON, RETENTION AND FILTRATION OF STORMWATER THAT LANDS ON THE PLAYING FIELD. PLANTING TREES AND VEGETATION TO REDUCE CITY SITE.

2. FILTRATION AREA

RETENTION AND FILTRATION OF STORMWATER FROM CONCOURSE AND TERRACE AREA TO REDUCE PHOSPHORUS AND OTHER QUALITY IMPROVEMENTS.

3. PARK GARDEN W/ STORMWATER PLANTERS

RETENTION AND FILTRATION OF STORMWATER FROM PREMIER BOXES.

4. BIO-SWALE

RETENTION AND FILTRATION OF STORMWATER FROM GARAGE AREA.

5. TREE TRENCHES

RETENTION AND FILTRATION OF STORMWATER FROM ENTRANCE CONCOURSE AND GARAGE AREAS TO THE NORTH.

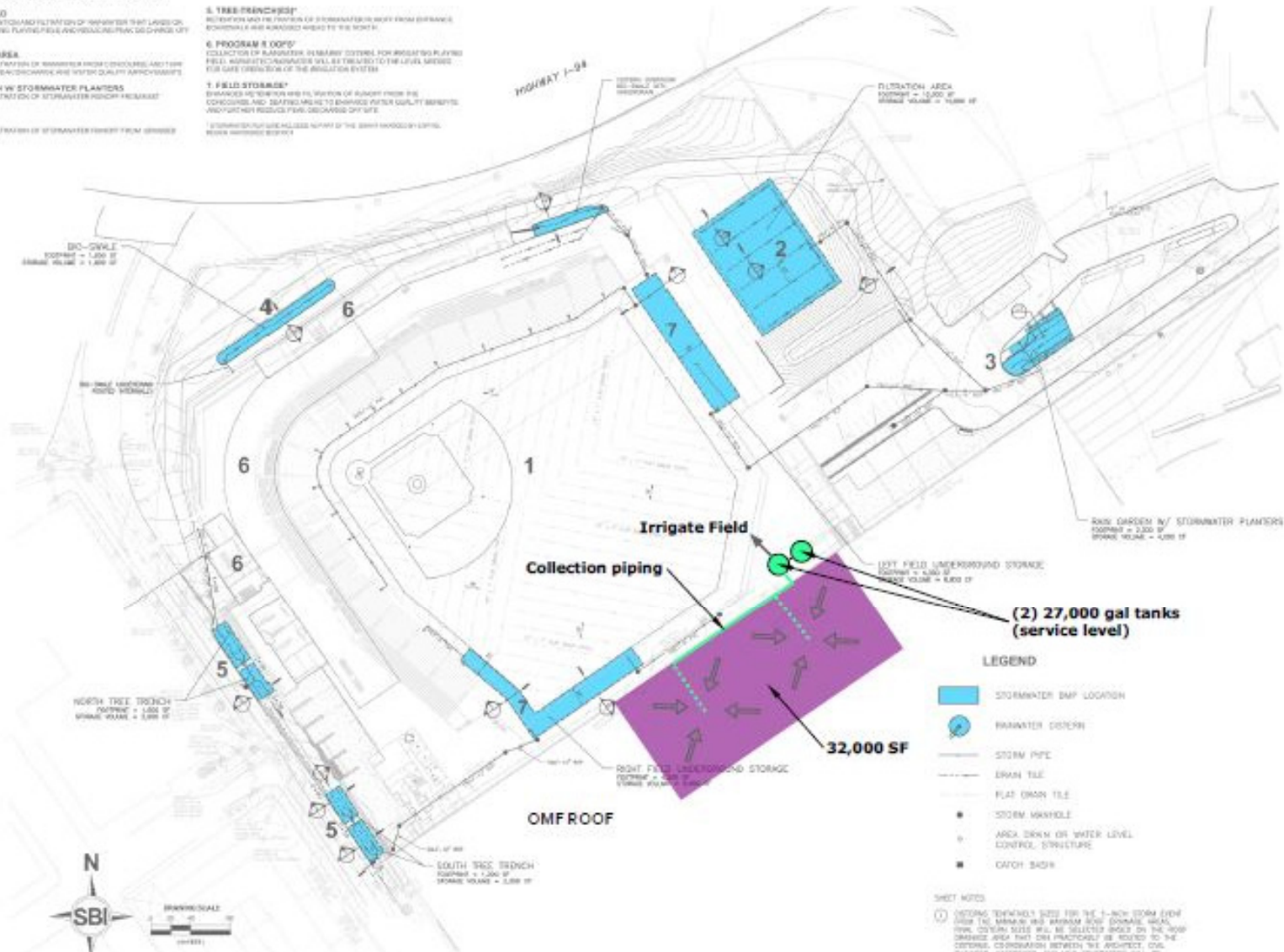
6. PROGRAM R OOPS

COLLECTION OF RAINWATER TO BE USED FOR IRRIGATION IN PLAYING FIELD. RAINWATER COLLECTORS WILL BE TIED TO THE LEVEL SERVICE FOR SAFE DRAINAGE OF THE REGULATION SYSTEM.

7. FIELD STORAGE

ENHANCED RETENTION AND FILTRATION OF RUNOFF FROM THE CONCOURSE AND TERRACE AREAS TO ENHANCE WATER QUALITY BENEFITS AND FURTHER REDUCE PAVEMENT DEGRADATION.

7 STORMWATER STORAGE CAPACITY OF THE BALLPARK IS LIMITED BY THE CITY'S REGULATIONS.



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383 Cedar Street
Suite 1000, MN 55401
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www.solutionblue.com

PROJECT NAME
**LOWERTOWN
BALLPARK**

LOCATION
ST. PAUL, MN

DATE	REVISION	DESCRIPTION

**DRAFT - NOT FOR
CONSTRUCTION**

DESIGNER'S DECLARATION
I hereby certify that the plans, specifications, and reports prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

ENGINEER'S NAME

DATE

PROJECT
**STORMWATER
MANAGEMENT
PLAN**

PROJECT NO.
C550

DATE
01/20/11

LEGEND

- STORMWATER BMP LOCATION
- RAINWATER COLLECTOR
- STORM PIPE
- DRAIN TILE
- FLAT DRAIN TILE
- STORM MANHOLE
- AREA DRAIN OR WATER LEVEL CONTROL STRUCTURE
- CATCH BASIN

NOTES
1. NOTING SPECIFICALLY SIZES FOR THE 1-1/2" INCH STORM EVENT OVER THE MINIMUM 100 YEAR RETURN PERIOD. OTHER DRAINAGE SIZES WILL BE SELECTED BASED ON THE DESIGNER'S AREA THAT IS PRACTICALLY BE REQUIRED TO BE COORDINATED BETWEEN THE ARCHITECT, CIVIL ENGINEER, AND OTHER PROFESSIONALS INVOLVED.

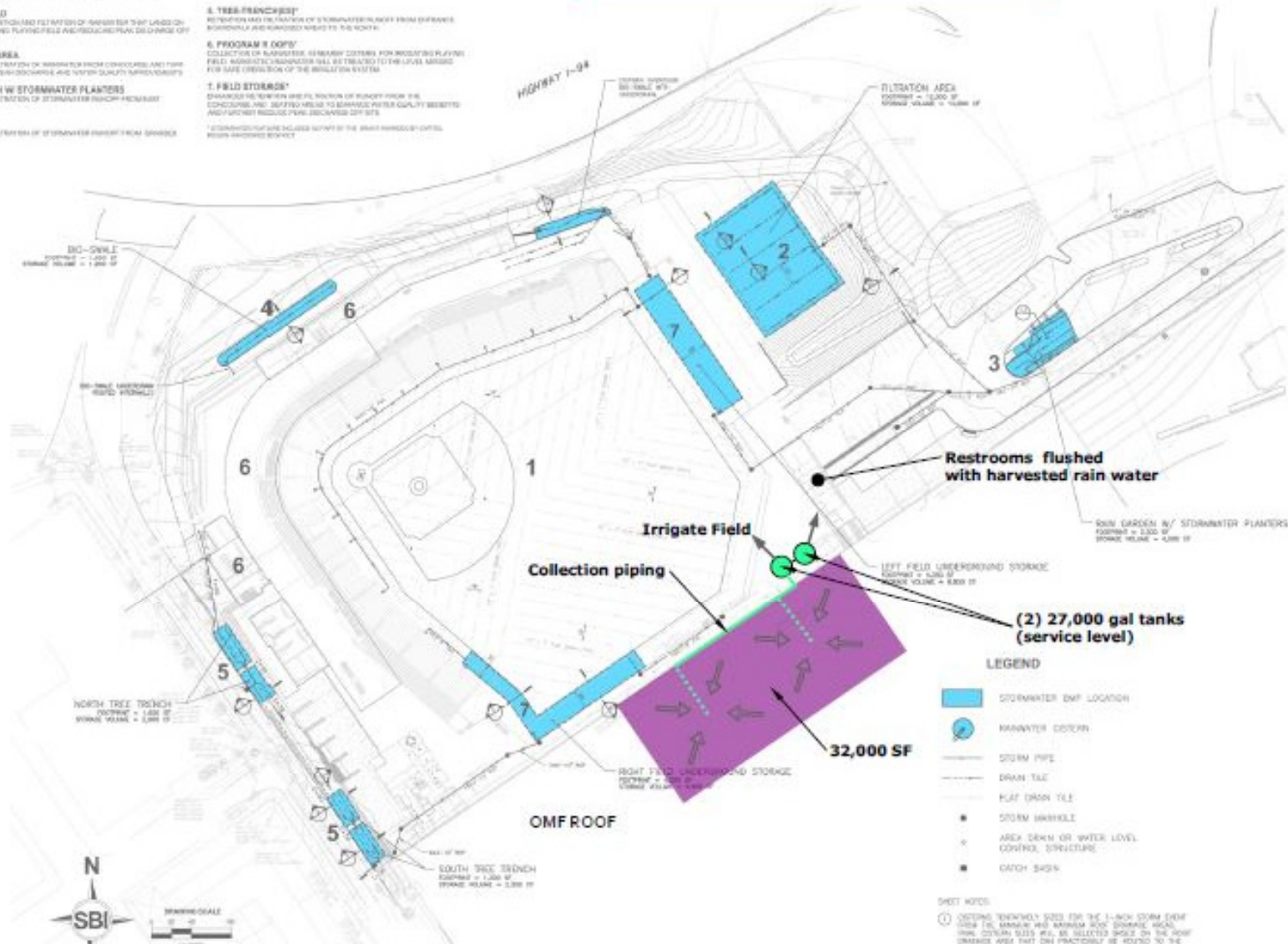
Pricing and Options

LOWERTOWN BALLPARK STORMWATER MANAGEMENT PLAN

STORMWATER MANAGEMENT FEATURES

- 1. PLAYING FIELD**
COLLECTION, RETENTION AND FILLTATION OF RAINWATER TO IMPROVE ON-FIELD OR OFF-FIELD PLAYERS AND REDUCE PEAK DISCHARGE OFF SITE.
- 2. FILTRATION AREA**
RETENTION AND FILLTATION OF RAINWATER FROM CONCOURSE AND PARK AREA TO REDUCE PEAK DISCHARGE AND IMPROVE QUALITY APPROVED/ADMITTED.
- 3. RAIN GARDEN W/ STORMWATER PLANTERS**
RETENTION AND FILLTATION OF STORMWATER FROM PREMIUM PARKING.
- 4. BIO-SWALE**
RETENTION AND FILLTATION OF STORMWATER FROM PREMIUM PARKING.
- 5. TREE TRENCHES***
RETENTION AND FILLTATION OF STORMWATER FROM PREMIUM PARKING AND WALKWAYS NEARBY TO THE NORTH.
- 6. PROGRAM 'X' DOPY***
COLLECTION OF RAINWATER AS NEARBY CONCOURSE FOR REUSING PLAYERS FIELD. HYDROLOGIC RETENTION SHALL BE TREATED TO THE LEVEL REQUIRED FOR SAFE CIRCULATION OF THE BALLPARK VISITORS.
- 7. FIELD STORAGE***
DISCHARGE RETENTION AND FILLTATION OF RAINWATER FROM THE CONCOURSE AND OFF-FIELD WALKWAYS TO IMPROVE WATER QUALITY APPROVED/ADMITTED REDUCE PEAK DISCHARGE OFF SITE.

RAIN HARVESTING OPTION C BALLFIELD IRRIGATION AND TOILET FLUSHING FROM 1/6 THE OMF ROOF



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Office 612.224.0000
www.urbansolutions.com

PROJECT NAME
**LOWERTOWN
BALLPARK**

LOCATION
ST. PAUL, MN

ISSUE RECORD	DATE	DESCRIPTION
1	10/11/11	ISSUE RECORD
2	10/11/11	ISSUE RECORD
3	10/11/11	ISSUE RECORD
4	10/11/11	ISSUE RECORD
5	10/11/11	ISSUE RECORD
6	10/11/11	ISSUE RECORD
7	10/11/11	ISSUE RECORD
8	10/11/11	ISSUE RECORD
9	10/11/11	ISSUE RECORD
10	10/11/11	ISSUE RECORD

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CONSTRUCTION**

STANDARD NOTES
1. Verify conditions of site prior to construction, or report discrepancies to the architect or other responsible party (utility, Licensed Professional Engineer, etc.) under the control of the Designer.

DESIGNER NAME

REGISTERED IN: _____ EXIST: _____

PROJECT NAME
**STORMWATER
MANAGEMENT
PLAN**

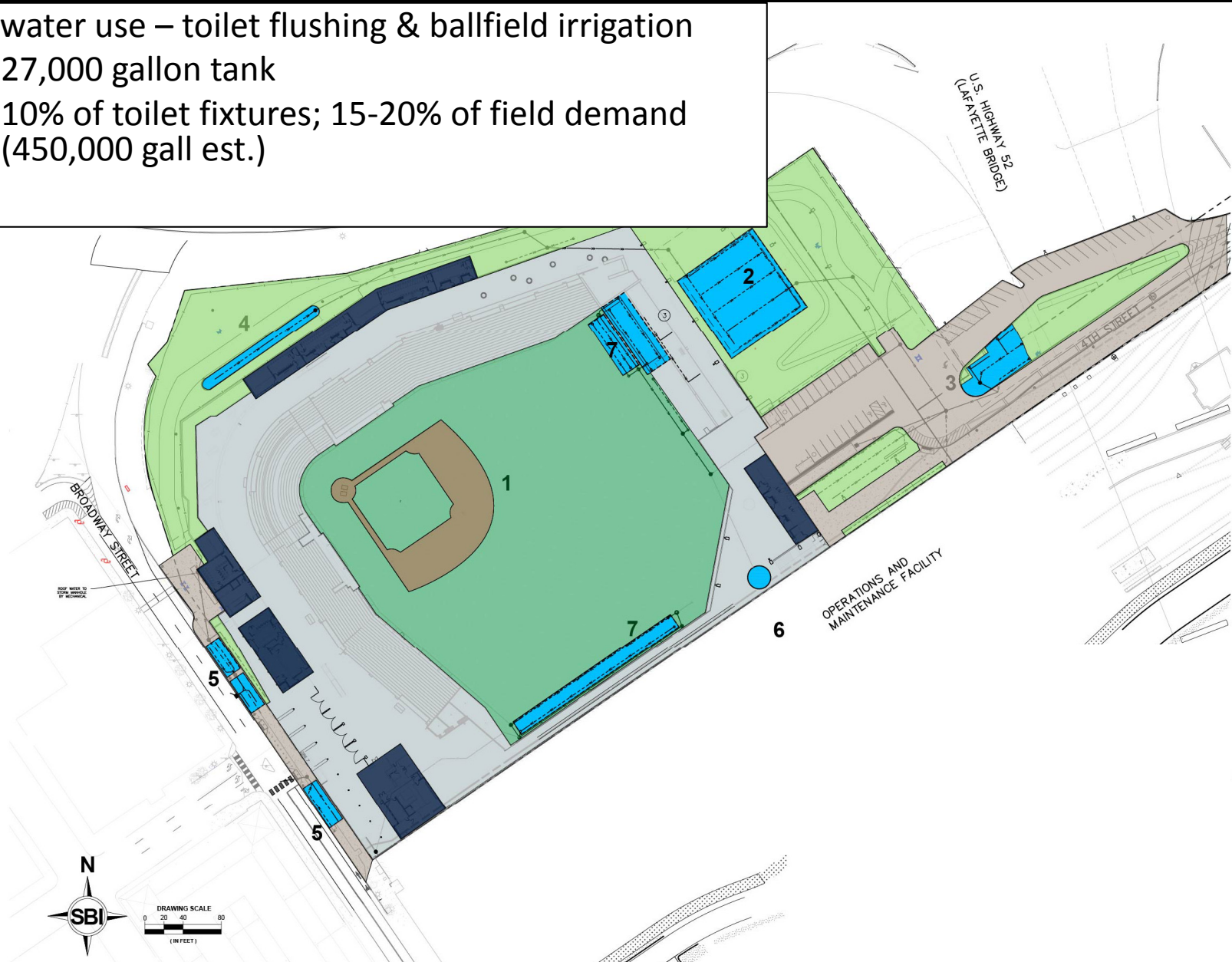
DRAWING NO.
C550

NOTE:
1. VERIFY DIMENSIONS FOR THE 1-INCH CORNER ELEMENTS (E.G. MANHOLE AND MANHOLE COVER) DIMENSIONS. THESE DIMENSIONS SHALL BE TO SELECTED BODIES ON THE ROOF DRAINAGE AREA THAT ARE PRACTICALLY BE FOUND TO BE

Preferred Alternative – Option C

Rainwater use – toilet flushing & ballfield irrigation

- 27,000 gallon tank
- 10% of toilet fixtures; 15-20% of field demand (450,000 gall est.)



Design Refinement: U of M tour

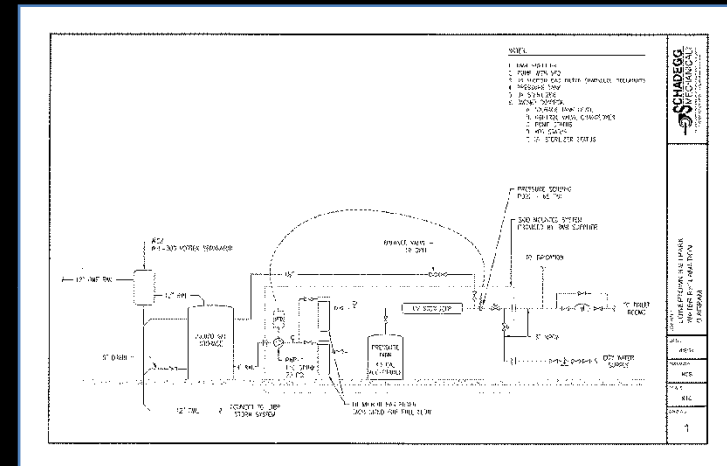


Design Refinement: U of M tour

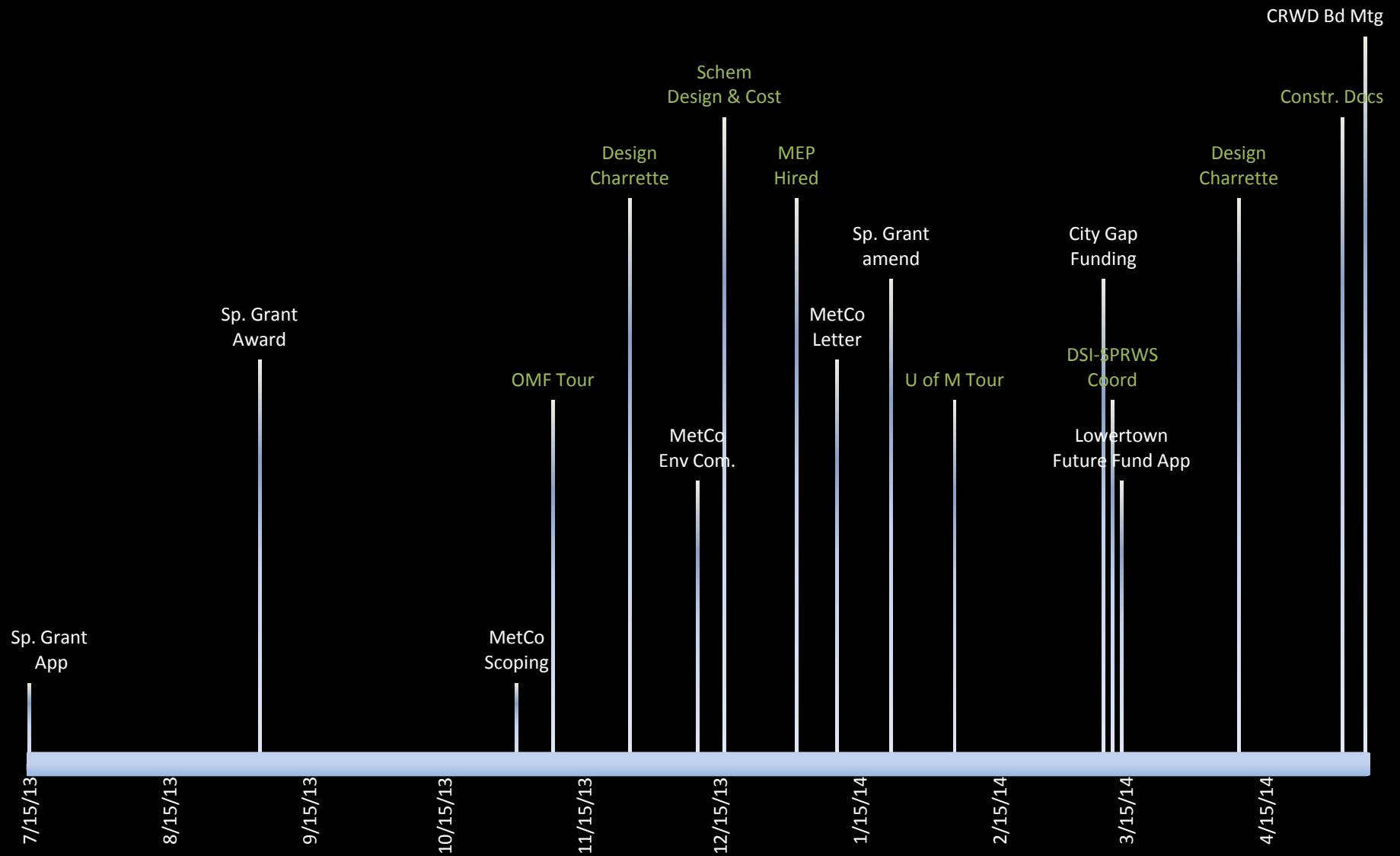


Vetting and Coordination

- State, local reviewers; funding partners; project team
- Facilitate transparency
- Receive comments, perspective, or technical input



Design Build Challenges

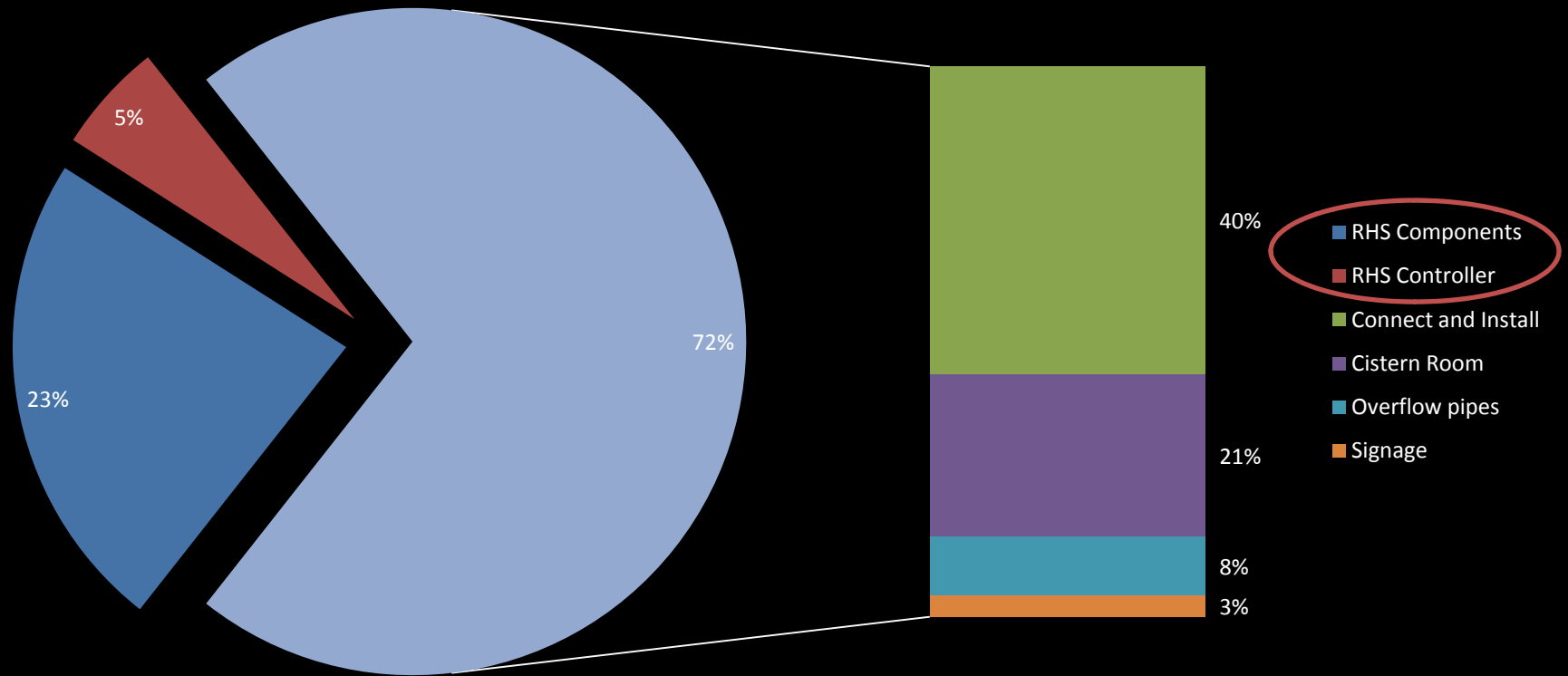


Enhanced Water Sustainability

• Total Ballpark cost	\$ 63,000,000
• Total cost*	\$ 487,000
– Rainwater harvesting system	\$ 300,000
– Enhanced stormwater items	\$ 68,000
– Design and Admin/Fees	\$ 75,000
– Contingency	\$ 44,000
• Total grants	\$425,000

*Does not include cost to re-route OMF rain leaders

Rainwater Harvesting

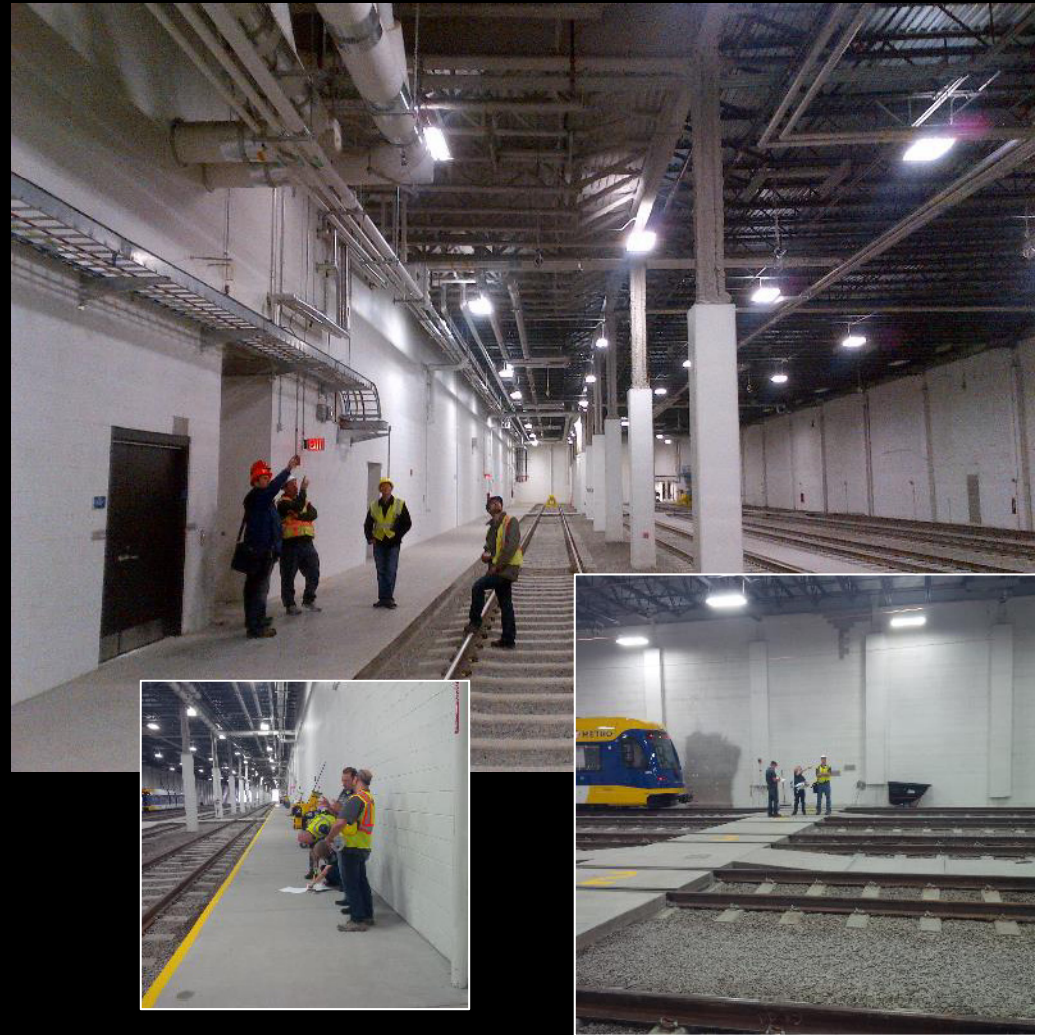


Rainwater Harvesting

Cistern size	27,000 gallons
Roof area captured	33,770 ft ² (about $\frac{3}{4}$ acre)
Maximum rainfall captured by cistern	1.3 inches
Primary uses	Irrigation and toilets
Treatment provided	Vortex filter (pre-treatment), bag filters, UV disinfection
Annual potable water reduction	An estimated 450,000 gallons
Annual savings	>\$1,600

Metro Transit “OMF”

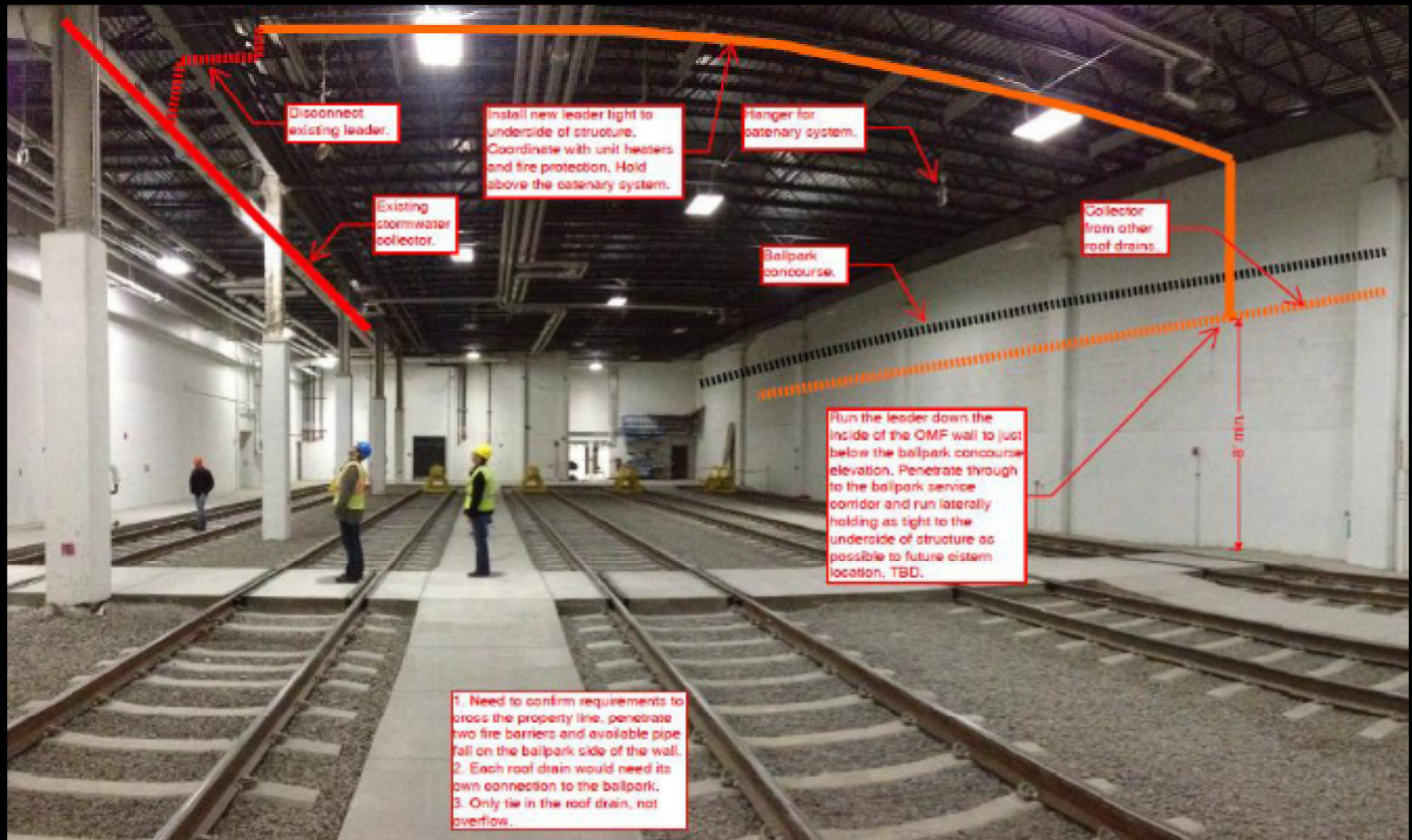
- Operation & Maintenance Facility
- 4-acre facility for storing light rail trains
- Roof drained away from CHS Field site
- Active electrical catenary near rain leaders



Metro Transit OMF Roof



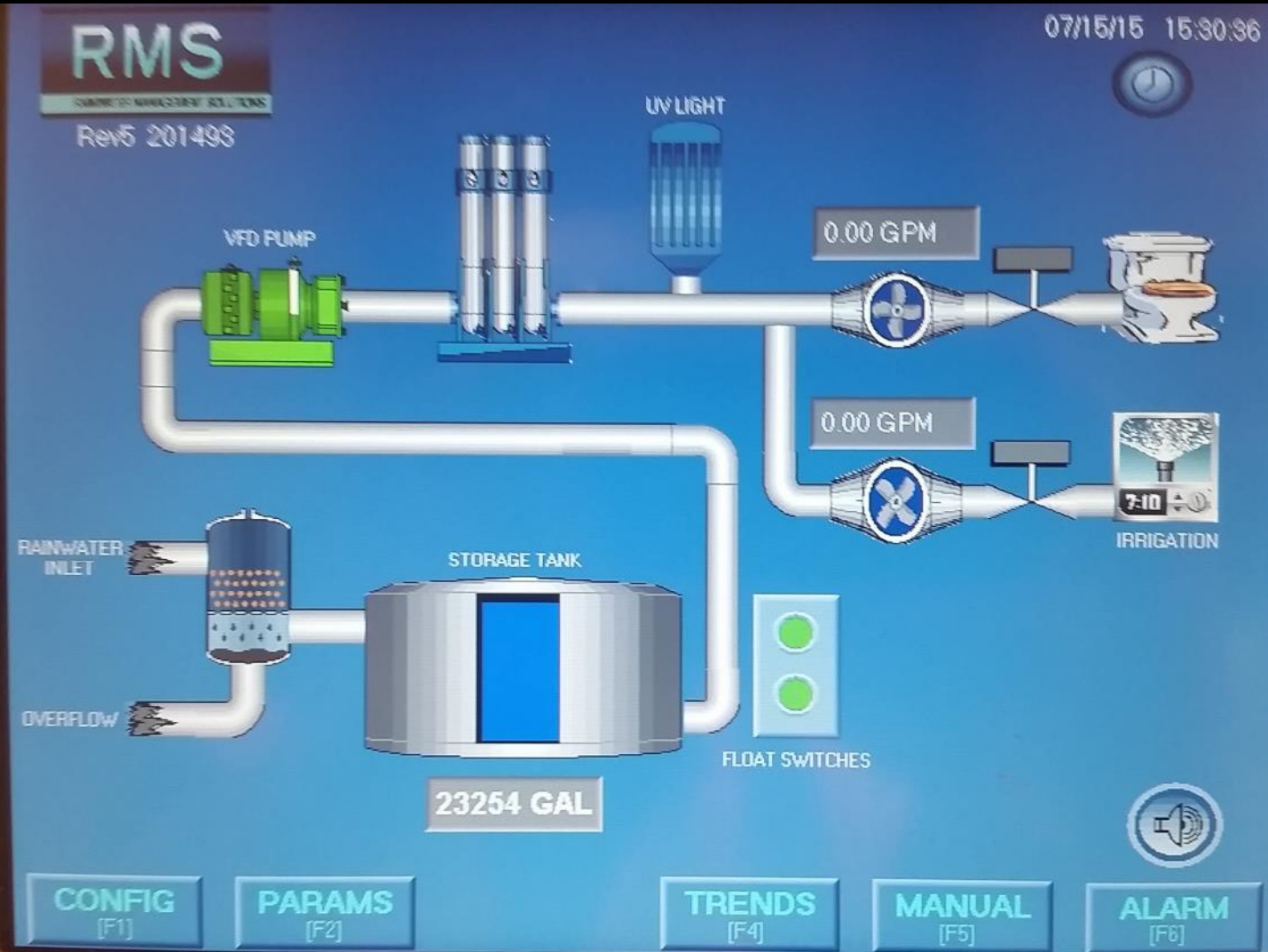
Metro Transit OMF



OMF Retrofit



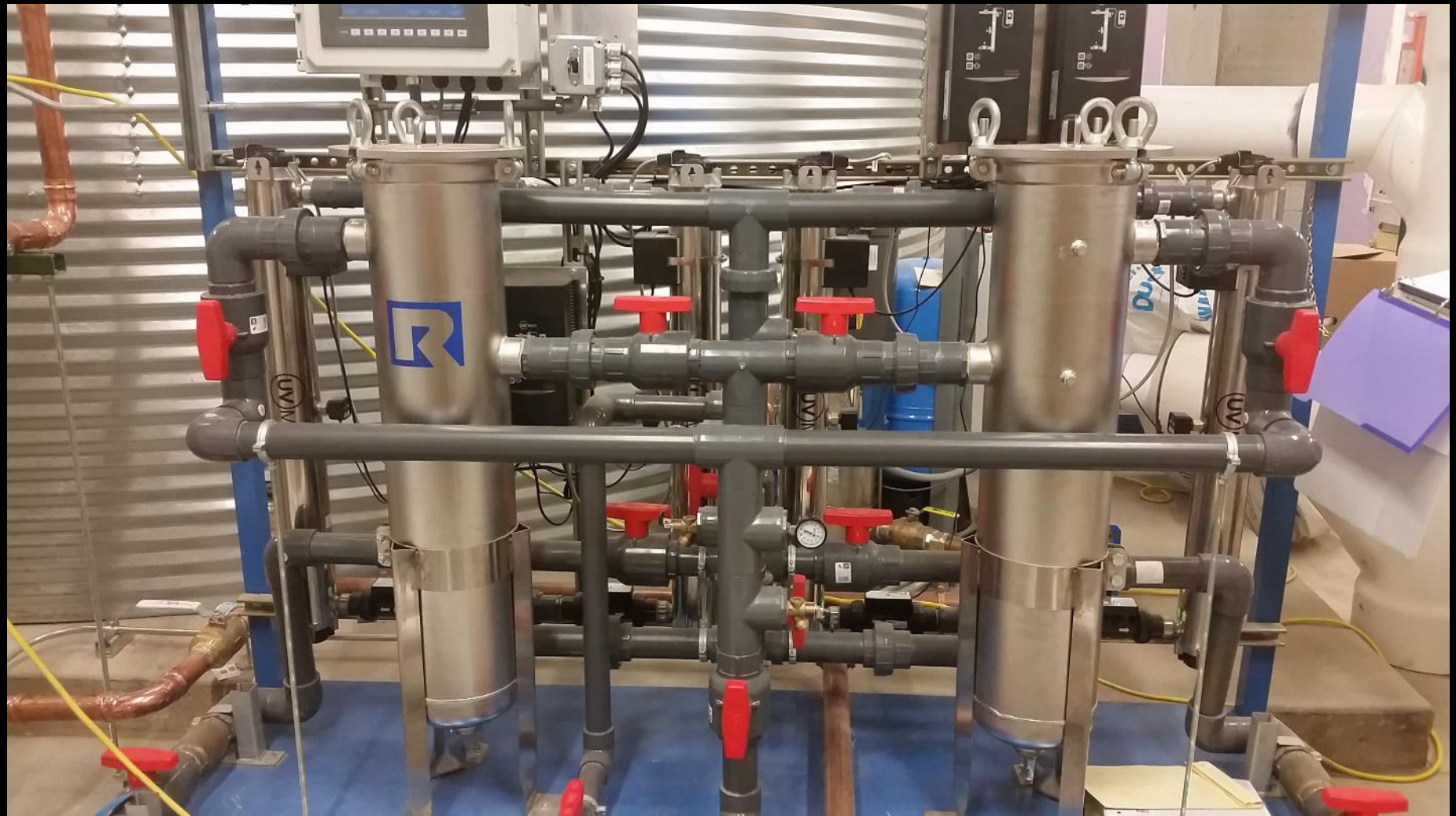
Rainwater Harvesting



Rainwater Harvesting



The "Skid"



Water Quality Goals

Parameter	Intended End-Use Quality Level
E. Coli	<2.2 MPN/100 mL
Turbidity	Less than 1 NTU
Odor	Non-offensive



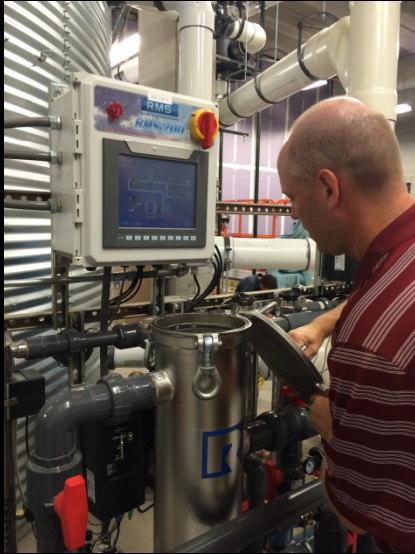
Performance Results

- Operated August - October
- Water quality standards met
- Toilet reuse: 22,500 gallons
- Irrigation reuse: 118,500+ gallons

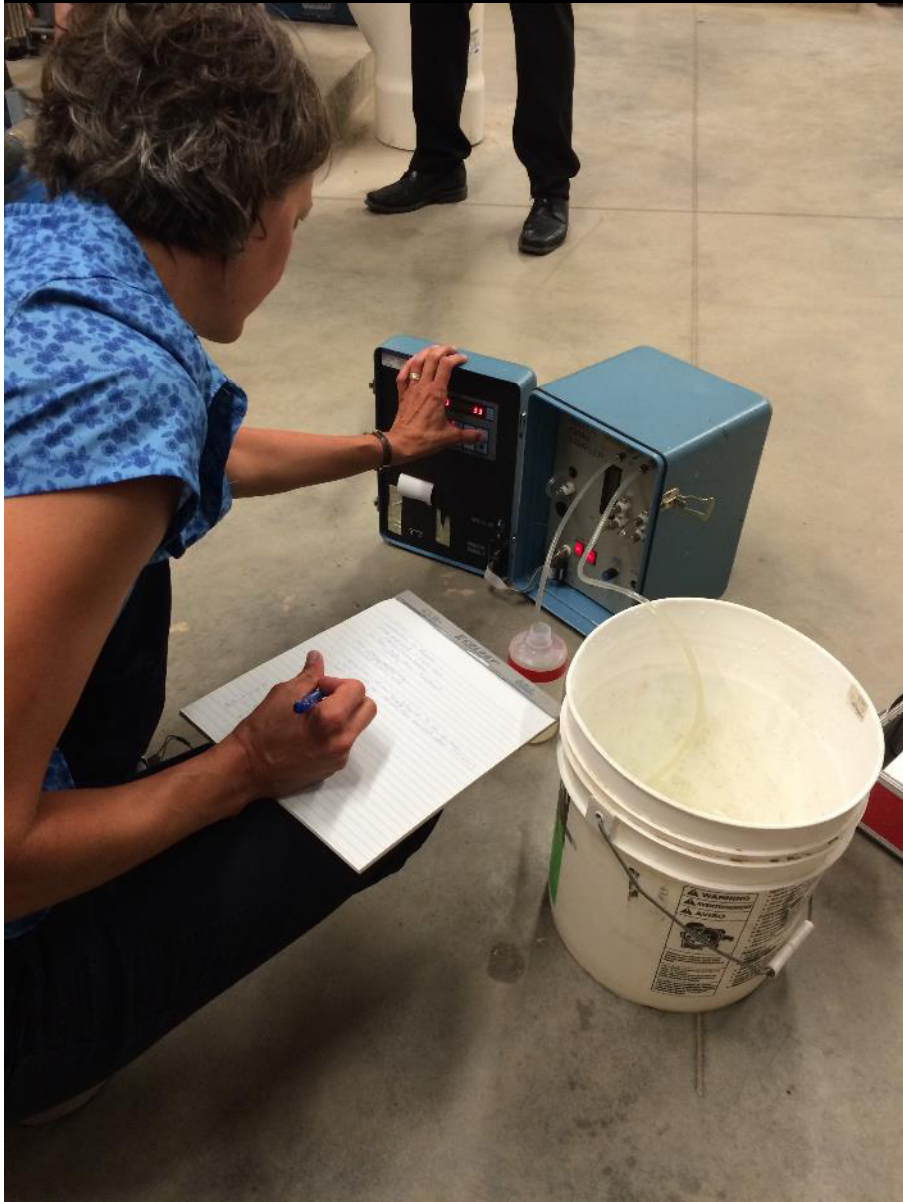


141,000 gal total (or 18,850 ft³) reused/conserved

Water Quality Testing

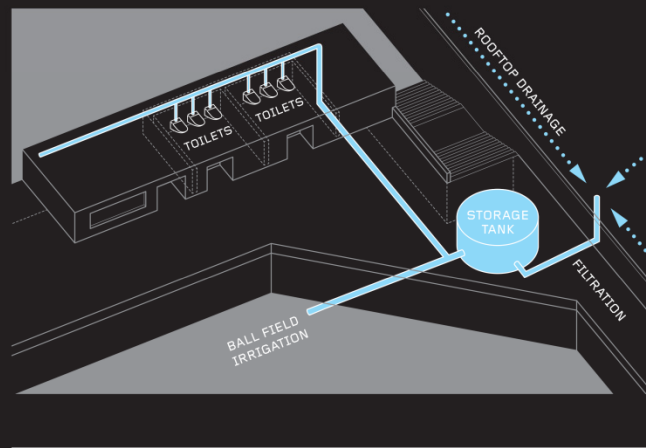
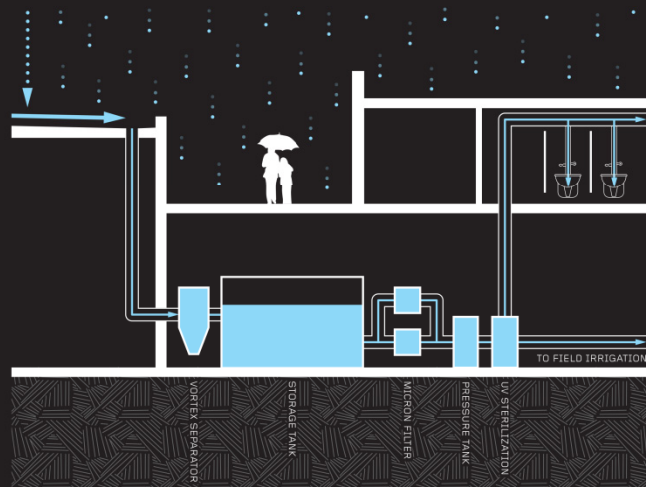


Water Quality Testing

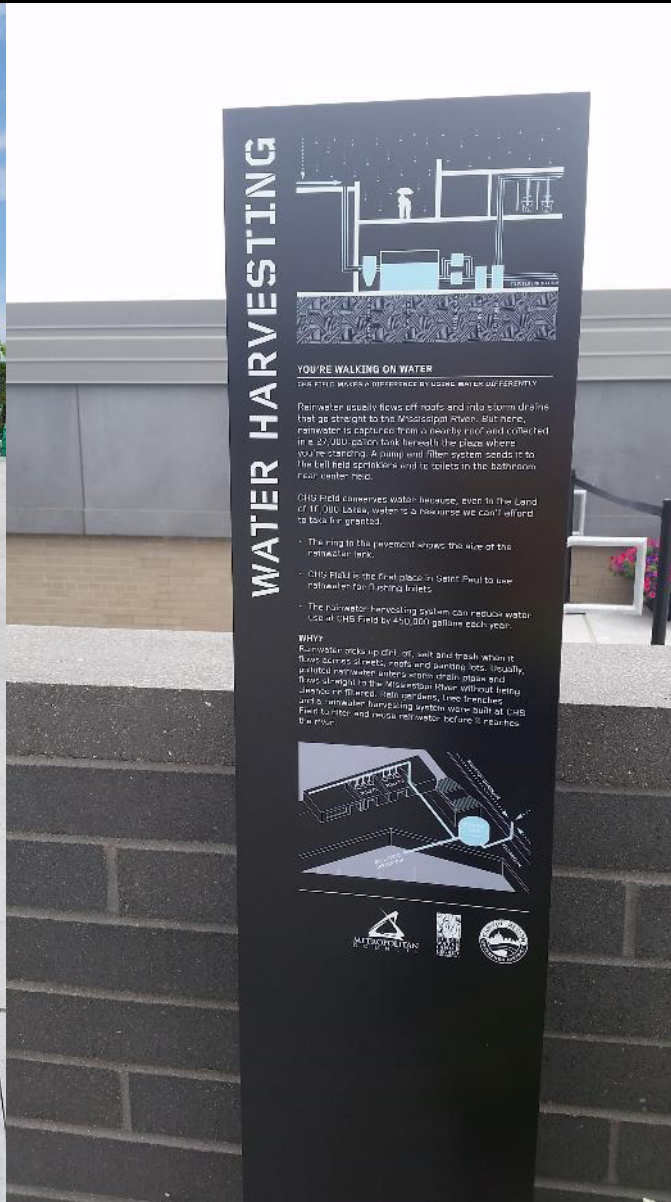


Visibility/Education

WATER HARVESTING



Promotion/Education



1st

Major sports venue to meet B3 Standards + MN SB 2030
 LEED Silver Equivalent
 - Use rainwater for toilet flushing and field irrigation

CHS FIELD: THE GREENEST BALLPARK IN AMERICA

DISTRICT ENERGY: 1.
 CHS Field connects to one of the best district energy systems for heating and cooling loads. District energy is ~35% more efficient than traditional grid supply.

RENEWABLE ENERGY: 2.
 Xcel Energy helped fund 100kW of solar arrays to supply 12.5% of the ballpark's power.

FIELD LIGHTING: 3.
 Innovative fixtures focus light on the field, reducing spill into adjacent areas and the total number of fixtures by 40% compared to Midway Stadium.

BUILDING FOOTPRINT: 4.
 80% of interior spaces are below the concourse, requiring less open space and less energy to operate.

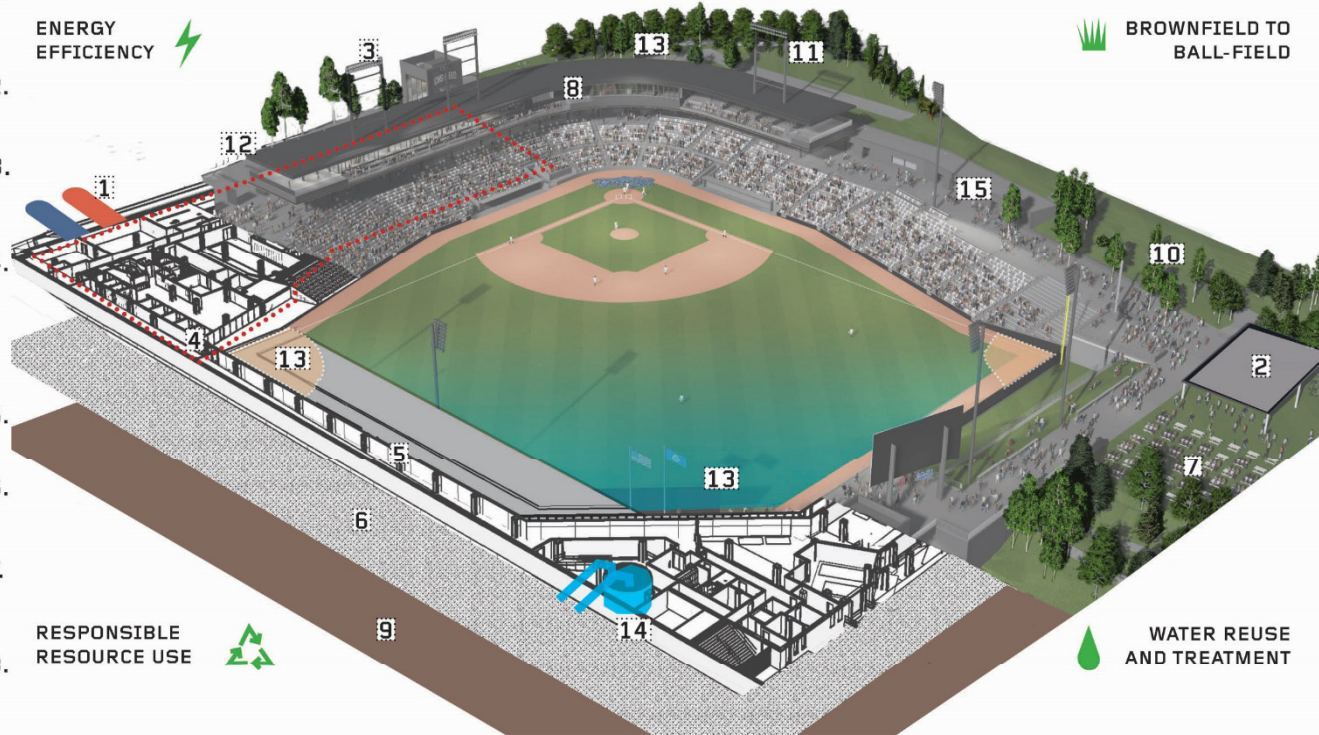
BUILDING REUSE: 5.
 230 foundation piers, 5,120 SF of concrete wall, and 168,000 SF of slab were reused in the ballpark.

RECYCLED MATERIALS: 6.
 Virtually all concrete from the existing Gillette building was crushed and used as structural fill beneath the field.

REDUCING WASTE: 7.
 Ryan diverted 98% of construction waste from landfills. The Saints are introducing composting and recycling with the goal of operating a zero-waste facility.

INDOOR ENVIRONMENTS: 8.
 Low VOC finishes and occupant-sensor lighting were used in all interior spaces. Nearly all offices and the press box have access to natural light and air flow.

ENERGY EFFICIENCY ⚡



BROWNFIELD TO BALL-FIELD 🌱

RESPONSIBLE RESOURCE USE ♻️

WATER REUSE AND TREATMENT 💧

9. SITE TRANSFORMATION:
 8.5 acres of contaminated, impervious site were transformed into almost 60% green space with an environmental cap to minimize contaminated runoff.

10. GREEN SPACES:
 135 trees and 138,800 SF of natural grass, including the playing field, will remove 22.5 tons of CO₂ from the atmosphere each year.

11. COMMUNITY CONNECTION:
 Part of the site was turned into a neighborhood dog park and rain garden featuring local artwork.

12. SUSTAINABLE TRANSIT:
 CHS Field's urban location and walk score of 88/100 encourages fans to bike, walk, or use nearby bus and LRT lines to commute to games.

13. CLEAN STORMWATER:
 Virtually all stormwater runoff is treated through sand filters, tree trenches, or rain gardens to remove pollutants before entering the Mississippi watershed.

14. WATER RECLAMATION:
 A 27,000 gallon cistern collects rainwater for reuse in toilets and field irrigation, saving up to 450,000 gal. of H₂O each year.

15. RESPONSIBLE USE:
 Metered, dual-flush, and low-flow fixtures are installed in public restrooms and locker rooms to control water waste.

BENCHMARKS

ANNUAL SAVINGS

SITE BENEFITS



1st

major sports venue to:
 - meet B3 standards + MN SB 2030
 - use rainwater for field irrigation

LEED Silver
 equivalent

~36 kWh/seat
 from renewables

~40 kWh/seat
 less operating energy

~65 gal/seat
 reused rainwater

88
 neighborhood
 walk score

~60%
 more green
 space

~22.5
 tons CO₂
 sequestered annually



Questions

Minnesota Ground
Water Association

April 20, 2016

