SFD Lite Report

Madison, WI
United States of America

Final Report

This SFD Lite was prepared by the Bill & Melinda Gates Foundation as part of the SFD Promotion Initiative.

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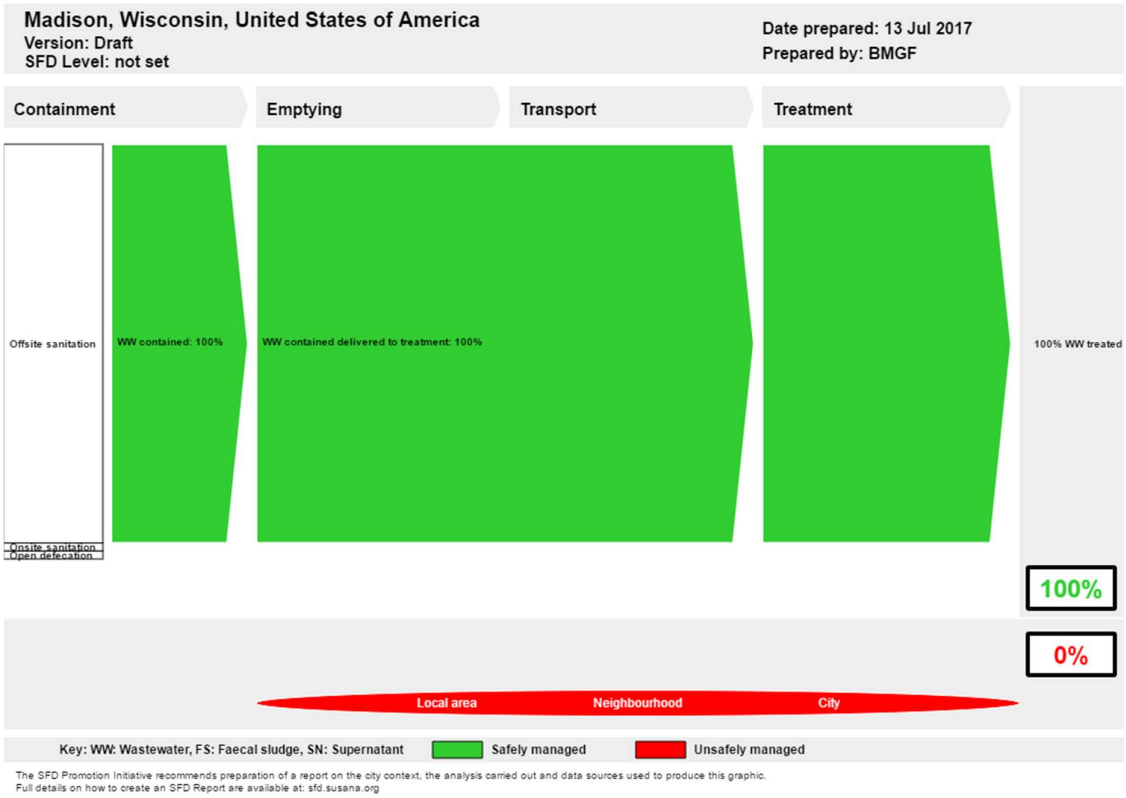
1 The SFD Graphic



2 SFD Lite information

Produced by:

The Faecal / Excreta / Shit Flow Diagram (SFD) for Madison was created using the SFD Generator tool on the SuSanA website through desk-based research by the Bill & Melinda Gates Foundation in Seattle, Washington. Secondary sources of data such as published statistics and annual reports were used to generate the diagram and this report, along with data obtained from individuals at the Madison Metropolitan Sewerage District.

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3 General city information

Madison is the capital of the state of Wisconsin and the county seat of Dane County. It lies to the west of Milwaukee and northwest of Chicago and is home to 252,551 people.

The city has a total area of 94.03 square miles, of which, 76.79 square miles is land and 17.24 square miles is water. Madison is sometimes described as The City of Four Lakes, comprising the four successive lakes of the Yahara River: Lake Mendota, Lake Monona, Lake Waubesa and Lake Kegonsa, although Waubesa and Kegonsa are not actually in Madison, but just south of it. A fifth smaller lake, Lake Wingra, is within the city as well; it is connected to the Yahara River chain by Wingra Creek. The Yahara flows into the Rock River, which in turn, flows into the Mississippi River. Downtown Madison is located on an isthmus between Lakes Mendota and Monona. The city's trademark of "Lake, City, Lake" reflects this geography.

Madison, along with the rest of the state, has a humid continental climate characterized by variable weather patterns and a large seasonal temperature variance: winter temperatures can be well below freezing, with moderate to occasionally heavy snowfall and temperatures reaching 0°F; high temperatures in summer average in the lower 80s °F, reaching 90 °F on some days, often accompanied by high humidity levels. Summer accounts for a greater proportion of annual rainfall, but winter still sees significant precipitation.

4 Service outcomes

Madison, Wisconsin, United States of America, 13 Jul 2017. SF
Population: 252551
Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%

System label	Pop	W4a	W5a
System description	Proportion of population using this type of system	Proportion of wastewater in sewer system, which is delivered to centralised treatment plants	Proportion of wastewater delivered to centralised treatment plants, which is treated
T1A1C2 User interface discharges directly to a centralised foul/separate sewer	100.0	100.0	100.0

Table 1: SFD Matrix for Madison (BMGF 2017)

It is estimated that 100% of wastewater is safely managed in Madison, WI.

4.1 Containment

Per the Madison Metropolitan Sewerage District, 100% of the population in Madison relies on separate sanitary sewers for the containment of wastewater.

4.2 Emptying & Transport

All 96 square miles of sanitary sewers in Madison are connected to the centralized Nine Springs Wastewater Treatment Plant. Madison usually has no sewer overflows. However, on July 10, 2017, the District experienced a dual power failure at one of its tributary pumping stations during a peak flow event and experienced an overflow. This, while significant to the District, amounted to 0.0014% of the flow received and treated in a year.

4.3 Treatment

The Nine Springs Wastewater Treatment Plant receives 40 million gallons of wastewater per day and provides 100% advanced secondary treatment and nutrient removal to all wastewater. Phosphorus

concentrations in water leaving the plant are under 0.3 mg/l; BOD is under 6 mg/l; NH4 is under 0.3 mg/l and TSS averages under 5 mg/l.

4.4 Reuse and disposal

Once at the plant, the wastewater proceeds through an advanced treatment process that recovers three valuable resources: 1) treated effluent, 2) energy, and 3) biosolids. Treated effluent is pumped to the Badfish and Lower Badger Mill Creeks, where it supports diverse ecological environments including numerous species of fish and other aquatic life. Energy is produced via methane, a combustible gas, which is recovered during the treatment process and used to power engines that drive generators and a blower. Biosolids, also known as Metrogro, are an organic fertilizer and soil conditioner that are recycled to area farm fields in the spring and fall. The District has one of the largest liquid-only biosolids programs in the country that produces about 40 million gallons per year. The District just received a Class A biosolids' certification and is working to bring a solid Class A product to market.

5 List of data sources

- *ECFR. (2017a). Code of Federal Regulations. Acessed July 11, 2017. Part 503 - Standards for the Use or Disposal of Sewage Sludge: https://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&tpl=/ecfrbrowse/Title40/40cfr503_main_02.tpl*
- *ECFR. (2017b). Code of Federal Regulations. Acessed July 11, 2017. Part 122 - EPA ADMINISTERED PERMIT PROGRAMS: THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM: https://www.ecfr.gov/cgi-bin/text-idx?SID=fb3251957978534805da15d6af7268ea&mc=true&node=pt40.32.503&rgn=div5*
- *Lake, K. (11. July 2017). Email: Sanitation in US Cities.*
- *Madison Metropolian Sewerage. (July 31, 2017). District Sewer Ordiance. http://www.madsewer.org/Portals/0/Home/News Article Docs/Revised Sewer Use Ordinance for consideration of adoption by MMSD commission.pdf*
- *The Path Forward. (2015). Annual Report Executive Summary. Acessed July 31, 2017. http://www.madsewer.org/Portals/0/Planning/Annual%20Report%20and%20Executive%20Summary/Final%202015%20Executive%20Summary-Reduced%20File%20Size.pdf*
- *Wikipedia. (30. July 2017). Madison, Wisconsin. Acessed July 31, 2017. https://en.wikipedia.org/wiki/Madison,_Wisconsin*
- *Wisconsin State Legislature. (2017). 200.11(1)(d). Acessed July 31, 2017. https://docs.legis.wisconsin.gov/statutes/statutes/200/I/11*

6 Supplementary information

6.1 Policy & institutional roles

At the federal level, wastewater treatment in the US is regulated under the Clean Water Act (1972), which is implemented by the Environmental Protection Agency (EPA). The EPA has developed evidence-based technical standards for biosolids (ECFR, 2017a) and implements them through the issuance of permits (ECFR, 2017b)

At the state level, the Wisconsin State Legislature (Wisconsin State Legislature, 2017) confers the responsibility of wastewater management to the Metropolitan Sewerage Districts that shall plan, project, construct and maintain within the district interceptor and other main sewers for the collection and transmission of sewage as well as oversee treatment, disposal or recycling projects and developments.

At the local level, wastewater and faecal sludge management is outlined in the Madison Metropolitan Sewerage District Sewer Use Ordinance (Madison Metropolian Sewerage, 2017). This ordinance is meant to implement Wis. Stat. §§ 200.11(1)(d) and 200.13(3), which gives the District the right to "adopt

rules for the supervision, protection, management and use of the systems and facilities operated by the District."

6.2 Service provision

Madison Metropolitan Sewerage District, governed by a nine-member Commission, serves about 340,000 people in the region over a 180-square mile service area that covers five cities, seven villages and 28 sanitary / utility districts. The District's service area stretches from Dane and Morrisonville in the north to Verona and Lake Kegonsa in the south.

The Madison Metropolitan Sewerage District maintains 96 miles of gravity sewers, known as interceptors, that collect and transport wastewater from smaller sewers, owned by local municipalities, to 18 regional pumping stations operated by the District. The 18 District-owned pumping stations and the 32 miles of pressurized force mains associated with the pumping stations are required due to the relatively flat topography in the region. All wastewater flow generated in the region, approximately 40 million gallons per day, is pumped to the Nine Springs Wastewater Treatment Plant.

As a 100% of the population relies on the centralized sewer system operated by the District, the role of septic system designers, inspectors and maintenance companies is not relevant in the service provision context for Madison.