Stormwater Collection in Maricopa County

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Current Conditions

- The Colorado River is over-allocated and experiencing a structural deficit
- Arizona has been in a drought for nearly 20 years
- Average annual rainfall in Maricopa County is less than 10 inches
- Maricopa County's population is expected to increase from 4.3 to 6.7 million by 2050
- Drought and water shortage has driven water managers in the Southwest to explore new sources
- Groundwater overdraft has caused subsidence, fissures, and potential aquifer collapse

How much stormwater can be collected and conveyed from specific Flood Control District of Maricopa County structures for potential use?

Generating Insights

Flood Control District: Structure information, rain gage and discharge data

Microsoft Excel: Data compilation, analysis, and visualizations

Tableau: Data visualization

Fig. 1: Flood Control Dams evaluated in study

Study Facts and Terms

ID	Structure	Annual Rainfall
1	Cave Buttes Dam	6.3
2	New River Dam	7.4
3	McMicken Dam	5.6
4	Adobe Dam	7.3
5	Buckeye FRS 1	6.0
6	Powerline FRS	6.6
7	Vineyard FRS	8.1
8	White Tanks 3	6.2

Table 1: Structures in study

- Stream and rainfall gages record discharge, peak volume and precipitation events
- After stormwater volume reaches a certain elevation, water begins to flow through an outlet channel
- **Peak Volume** is the highest recorded volume held behind a structure during an event
- **Discharge** records the flow rate of water through a structure's principal outlet channel

Fig. 3: Typical rain gage at FCD structures

The Flood Control District mission recognizes "stormwater… as a resource for long term benefit of the community and environment"

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Calculating Stormwater Volume

Generating Continuous Data

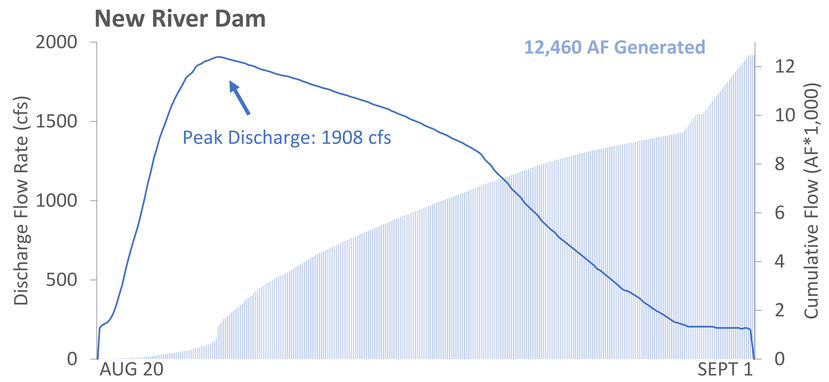

Fig. 4: New River Dam discharge and cumulative stormwater associated with a 1.5" rainfall event

Discharge flow rates from FCD structures are recorded at specific points in time. To find cumulative stormwater volume, **total stormwater discharged** between recorded flow rates must be calculated.

Raw Data	Find average flow between discrete data (a,b) $\rightarrow (\frac{a+b}{2})$
Discharge Flow Rate	Account for time between measurements $(\frac{a+b}{2})(xb - xa)$
Cumulative Flow	Sum discharge flow data $\Sigma\,(\frac{a+b}{2})(xb - xa)$

Discharge provides a more accurate stormwater volume calculation (over peak volume) due to minute time-steps, accurate unit of measurement (CFS), and continued flow after precipitation event has ended.

Total Collected Stormwater by Event

Using the formula shown above, discharge and total rainfall data for each event was captured and calculated.

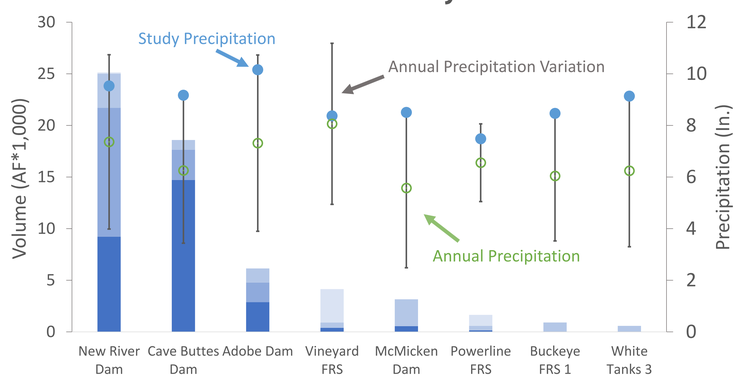

Fig 5: Stormwater Volumes at each structure according to event
NOTE: Discharge was recorded at primary outlet channels

By The Numbers

Rainfall from **4 Events** At **8 of 22 Dams** — Generated

60,305 Acre-Feet Of conveyable water

Supplying → Enough water for **286,400 Maricopa Residents**[1]

Value → **$10.1 Million**[2]

1. Consumption based on USGS GPCD for Maricopa County
2. Value of water based on CAP raw water

Considerations

Scope of. Work – Limited to eight structures over four discrete rainfall events. This study did not consider remaining district structures or other agencies' stormwater and drainage facilities.

Rainfall Data – Rainfall data is measured at the dam pool area and may not accurately reflect average precipitation over an entire catchment area.

Stormwater Data – Certain structures have multiple discharge locations, some of which are not recorded in the data.

Variables

1. **Soil infiltration data/rates**
2. **Watershed/catchment area**
3. **Structure capacity and size**
4. **Discharge: gage height and multiple discharge points**

Fig 6: Principal Outlet Structure at White Tanks 4. Stormwater is discharged via slide gates and high stage inlets

Conclusions

- Discharge flow data provides a more accurate way of identifying total stormwater (over peak volume data) and approximates real physical water available
- Stormwater can be considered for water supply augmentation
- Stormwater capture infrastructure must be developed to reap and quantify benefits
- **Increased impervious surfaces lead to increased stormwater availability**

Next Steps

- Implement instrumentation focused on determining stormwater volume
- Calculate stormwater generation for all FCD structures
- Catchment area rainfall analysis to identify stormwater generated per inch of rainfall by each structure
- Develop policy and work with water agencies to enable stormwater utilization
- Identify best use for stormwater at each structure