

Wood River Valley Model Construction Update

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These slides were presented at the Wood River Valley Modeling Technical Advisory Committee meeting Thursday, 6/5/2014, 10am-3pm at the Community Campus, Bullion Room, in Hailey. Taken outside the context of the original presentation, these slides may not provide a complete or accurate representation of the speaker's intent.

Install

If R is not already installed on your computer, download and install the latest binary distribution from [CRAN](#).

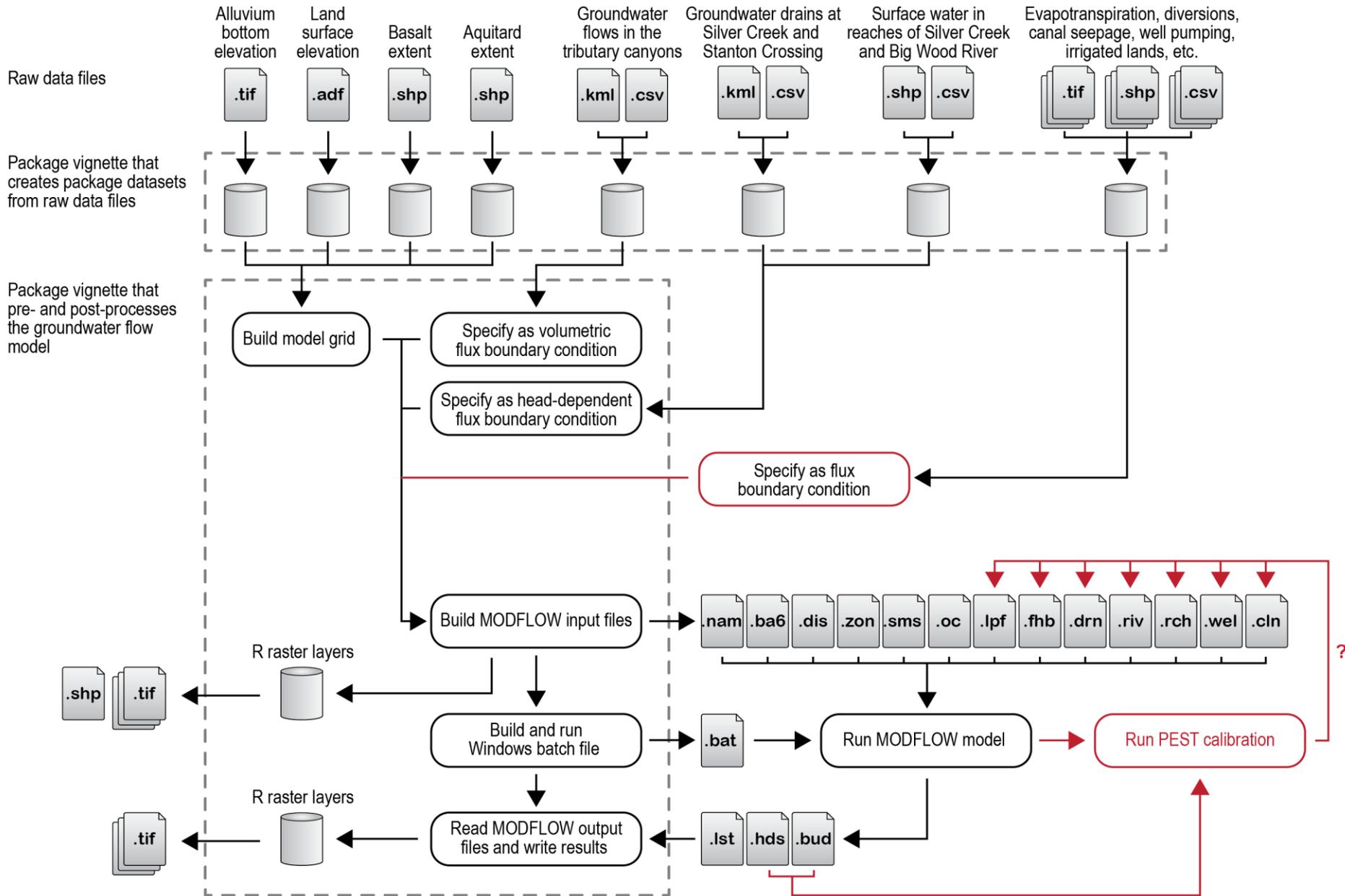
Open an R session and install the following packages from CRAN:

```
> install.packages(c("sp", "rgdal", "raster", "igraph", "rgeos", "RCurl", "png", "xtable", "gstat"))
```

Install the **wrv** package:

```
> install.packages("wrv", repos = "<WILL BE SPECIFIED WHEN REPORT IS PUBLISHED>")
```

System requirements include the latest version of [MODFLOW-USG](#). Windows users can download and decompress the file archive in the default search path `C:/WRDAPP`.



Create Package Data Sets from Raw Data Files

By Jason C. Fisher

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Processing Instructions for the Groundwater Flow Model of the Wood River Valley, Idaho

By Jason C. Fisher

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Recharge on Non-Irrigated Lands

- Precipitation minus evapotranspiration
- Model layer 1 cells in all stress periods
- Recharge Package

Recharge on Irrigation Entities

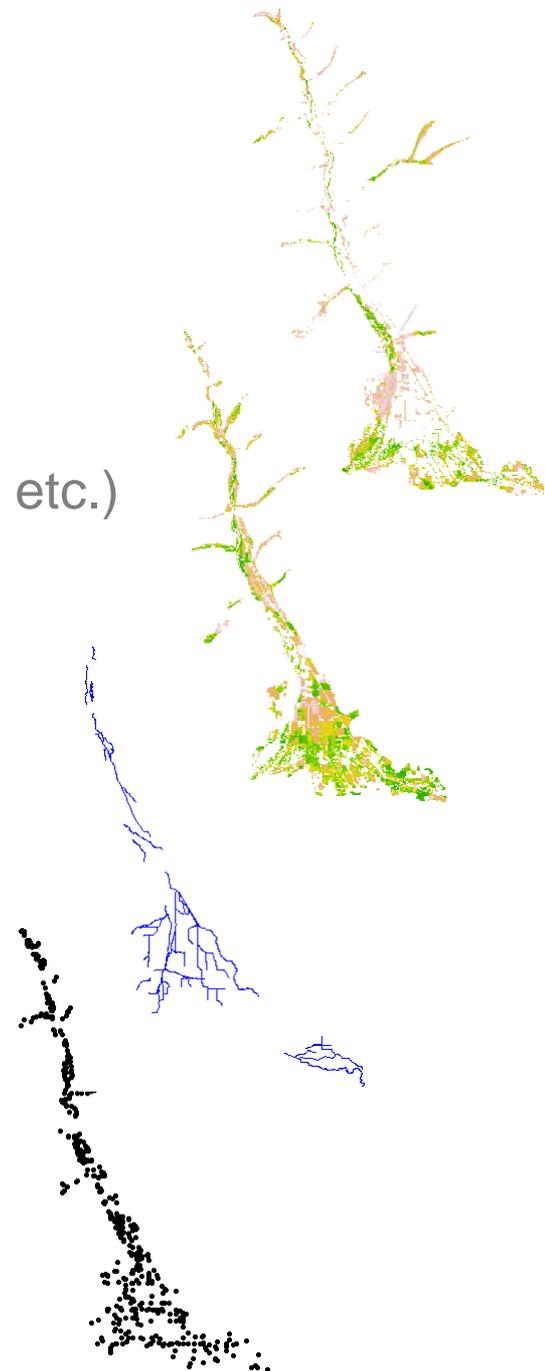
- Complex calculation (dependent on diversions, etc.)
- Model layer 1 cells, all stress periods
- Recharge Package

Seepage along Canals

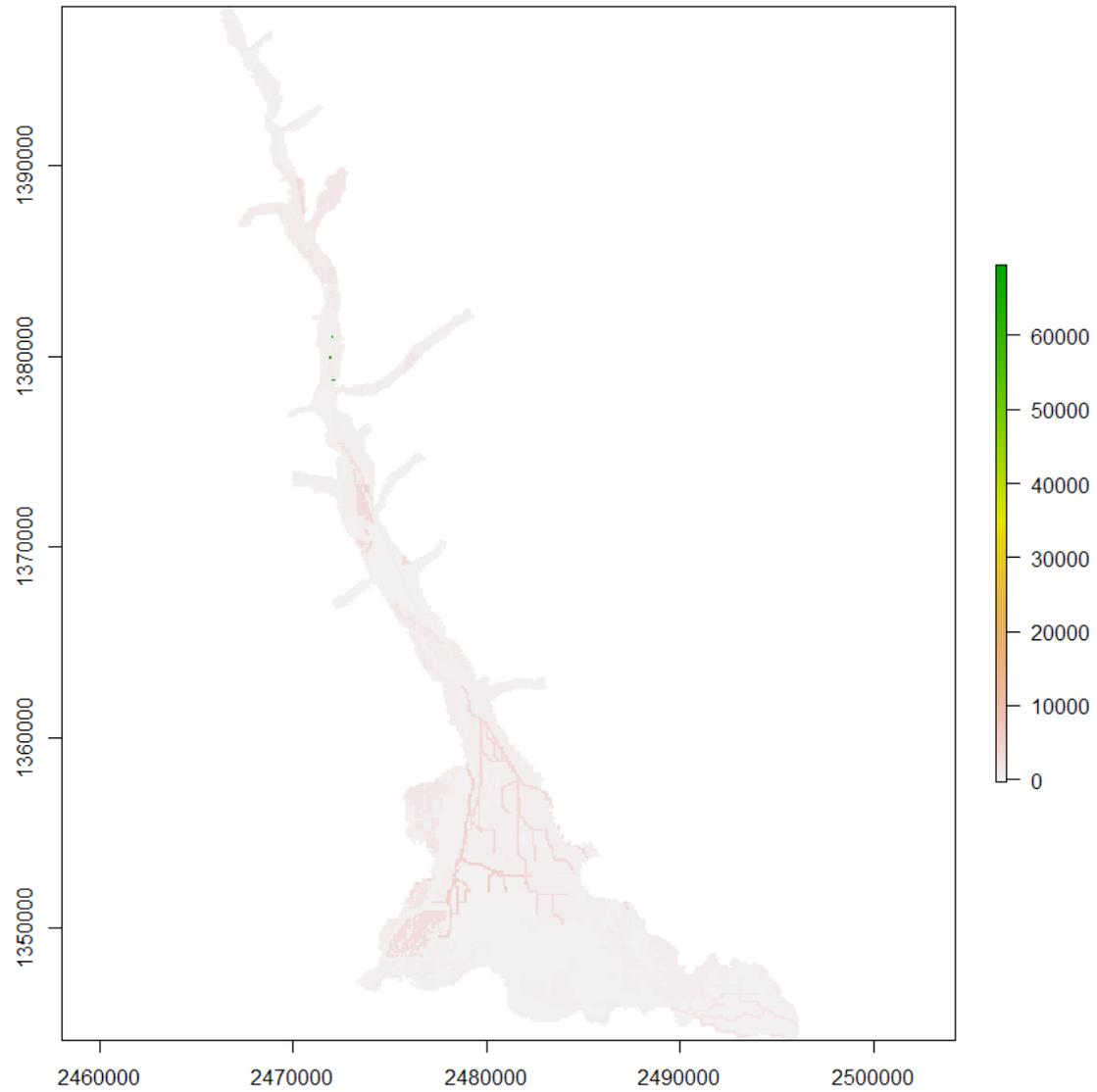
- Fraction of diversions for irrigation entities
- Model layer 1 cells, all stress periods
- Recharge Package

Pumping at Well Sites

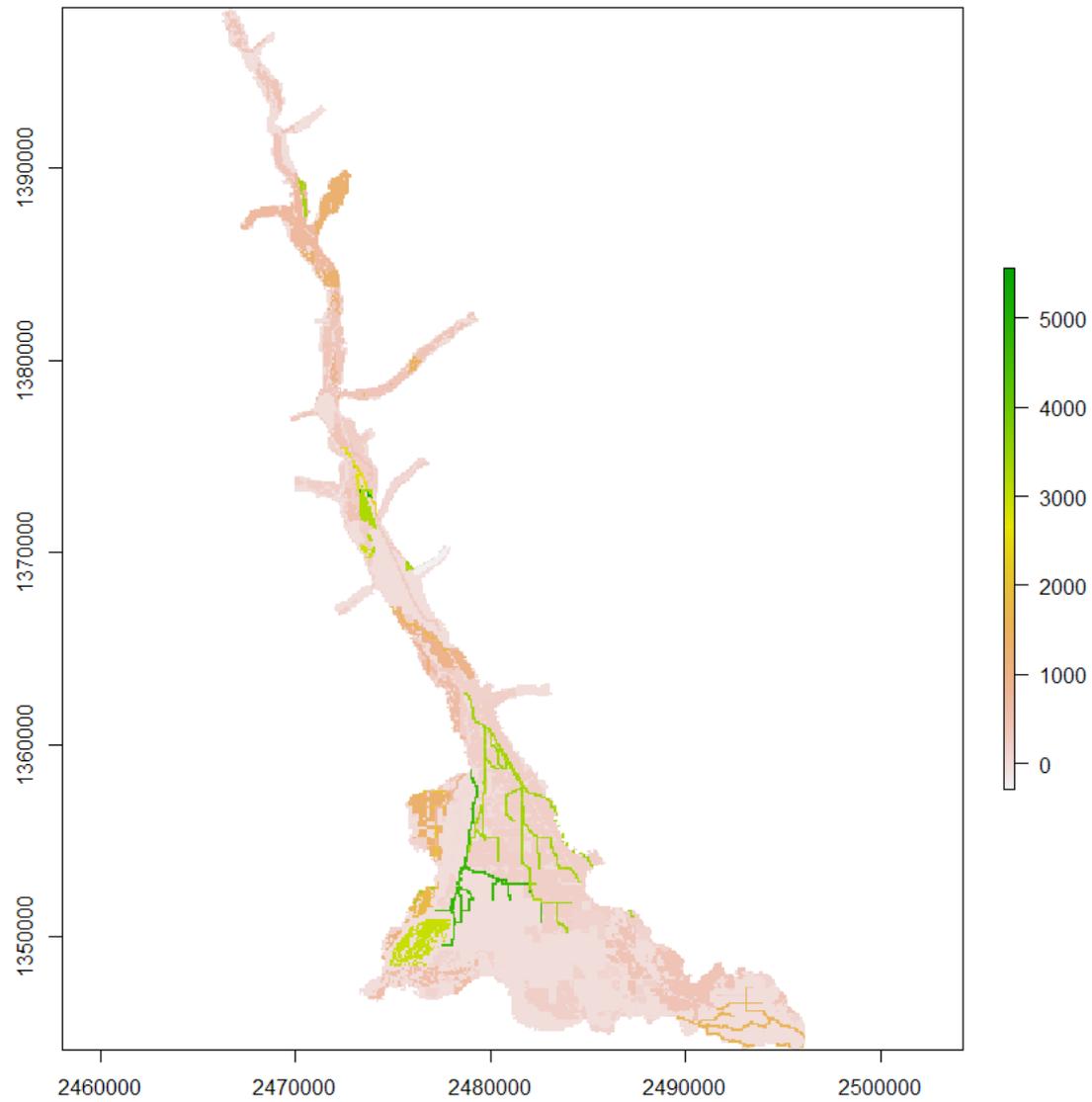
- Observed and estimated values of pumping
- Model layer(s) 1, 2, 3 cells, all stress periods
- Connected Linear Network and Well Packages



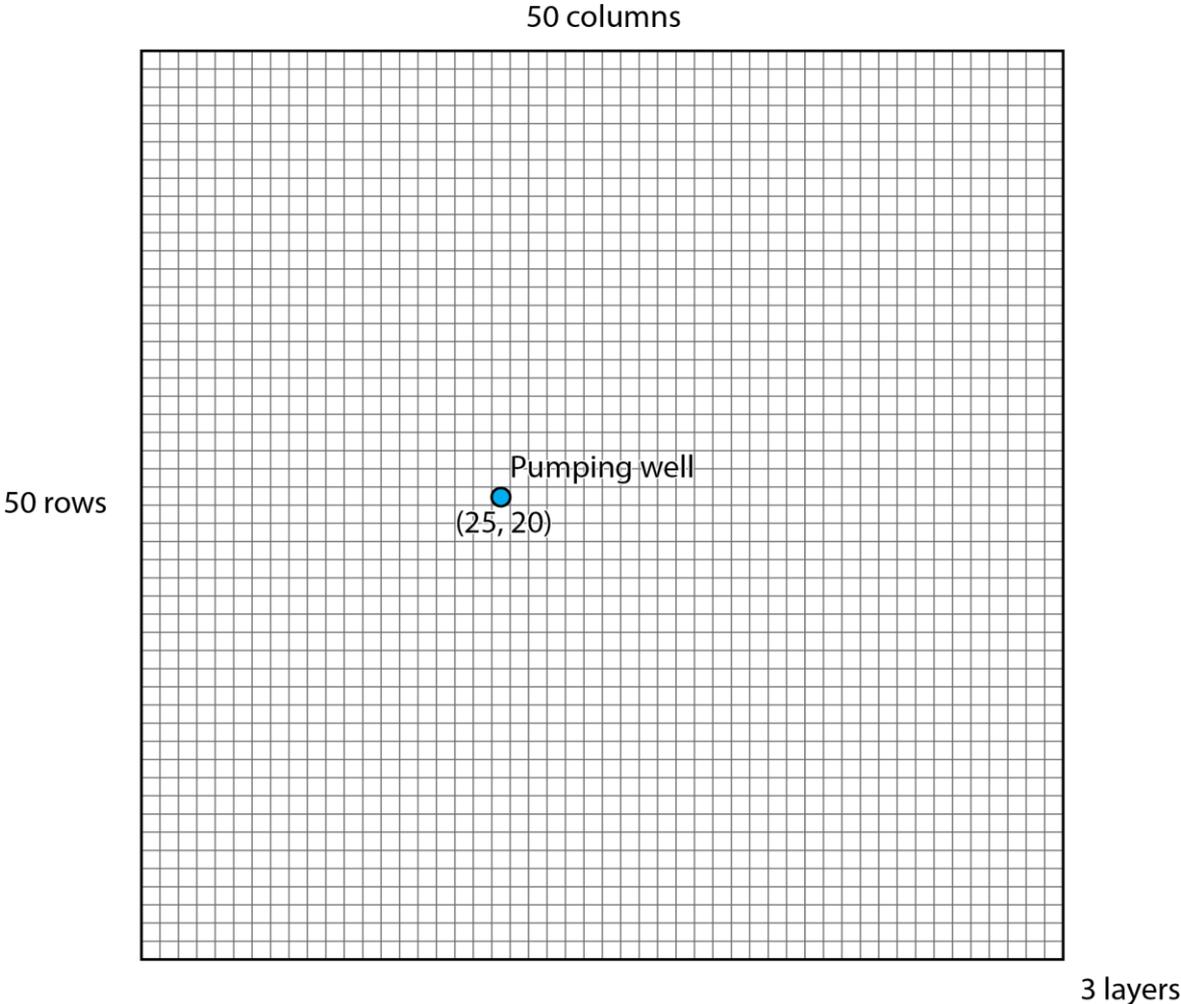
Ave recharge in cubic meters per day from Apr 2004 to Apr 2005



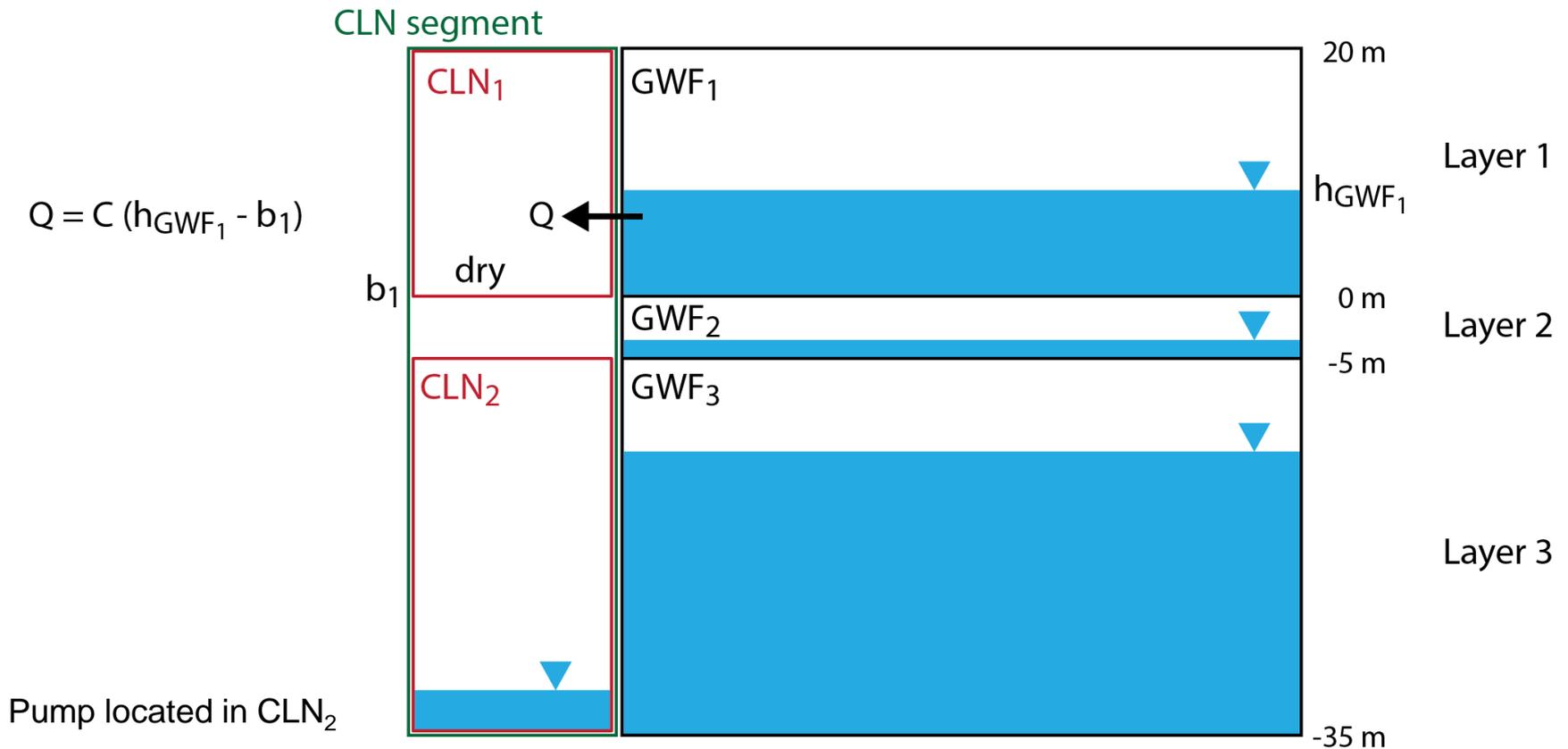
Ave recharge in cubic meters per day from Apr 2004 to Apr 2005
without Outliers



Example problem demonstrating use of the Connected Linear Network (CLN) process with a structured grid and pumping from a single well



- A single CLN is known as a *CLN segment*
- CLN_i is a *CLN cell* at location i
- GWF_j is a groundwater flow cell (*GWF cell*) at location j
- Q is the volumetric discharge/recharge
- b_1 is the bottom elevation of model layer 1
- h_{GWF_1} is the hydraulic head in GWF_1
- C is the conductance between cells



Connected Linear Network (CLN) Package file (*.cln)

```

No. of CLN segments      Output file unit numbers      No. of conduit-geometry types
1 -1 35 36 0 0 2 1 ..... # NCLN ICLNDS ICLNCB ICLNHD ICLNDD ICLNIB NCLNGWC NCONDUITYP
                        Linear segments                        No. of connections to GWF cells
constant 2 ..... # NNDCLN (NCLN)  No. of CLN cells per CLN segment

                        CLN cell index  CLN segment orientation
1 1 0 20.0 0.0 0 0 0 ..... # IFNO IFTYP IFDIR FLENG FELEV FANGLE IFLIN ICCWADI
                        Conduit type      CLN cell vert. length
                        CLN cell bottom elev.
2 1 0 30.0 -35.0 0 0 0 ..... # IFNO IFTYP IFDIR FLENG FELEV FANGLE IFLIN ICCWADI

                        CLN cell index      Row      Thiem equation options
1 1 25 20 0 0 20.0 1.0 0 ..... # IFNOD IGWLAY IGWROW IGWFCOL IFCON FSKIN FLENGW FANISO ICGWADI
                        Layer                Column                Horiz. anisotropy
                        Leakage across skin
2 3 25 20 0 0 30.0 1.0 0 ..... # IFNOD IGWLAY IGWROW IGWFCOL IFCON FSKIN FLENGW FANISO ICGWADI
                        Conduit type      Hydraulic      Length of CLN segment
                        "cylindrical"      conductivity factor      connected to GWF cell
1 0.5 3.23e10 ..... # ICONDUITYP FRAD CONDUITK
                        Conduit radius

constant 1 ..... # IBOUND (NCLNDS)

internal 1.0 (Free) -1 ..... # STRT (NCLNDS)
                        Initial head in
                        CLN cells
10.0 30.0

```

Well (WEL) Package file (*.wel)

Max. no. of wells
in use during a
stress period

```
1 54 1 ..... # MXACTW IWELCB IWELQV  
Output file unit number
```

```
0 0 1 ..... # ITMP NP ITMPCLN  
No. of parameters in use
```

```
2 -62840.0 # Node Q
```

CLN cell index no.

No. of non-parameter wells read for
current stress period for CLN cells

Volumetric recharge rate (+ recharge and – discharge)

TODO List

- ~~1. Validate R code pertaining to processing of recharge on irrigated lands, canal seepage, and well pumping~~
- ~~2. Create and document new R datasets: precipitation, diversions, evapotranspiration, canal seepage, etc.~~
3. Integrate new processing instructions into package vignettes
- ~~4. Develop input files for the Recharge, Well, and Connected Linear Network Packages~~
5. Construct transient model run
6. Decrease run time for a MODFLOW simulation (currently at about 1 minute)
7. Collaborate on model calibration...

Questions