

Water Rights Solver - Restructuring the World of Accounting

LCRA Model

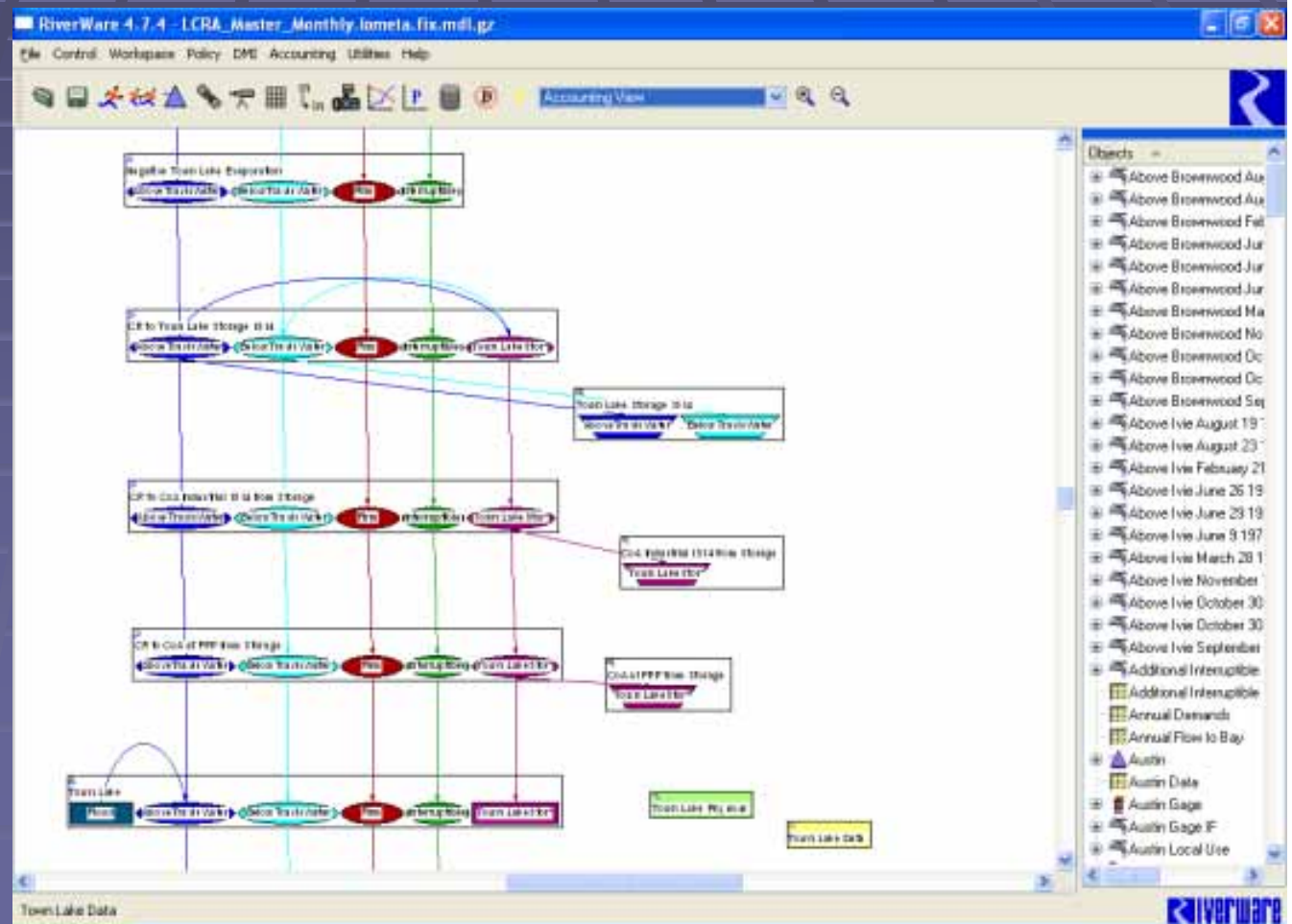
Hydrosphere Resource Consultants



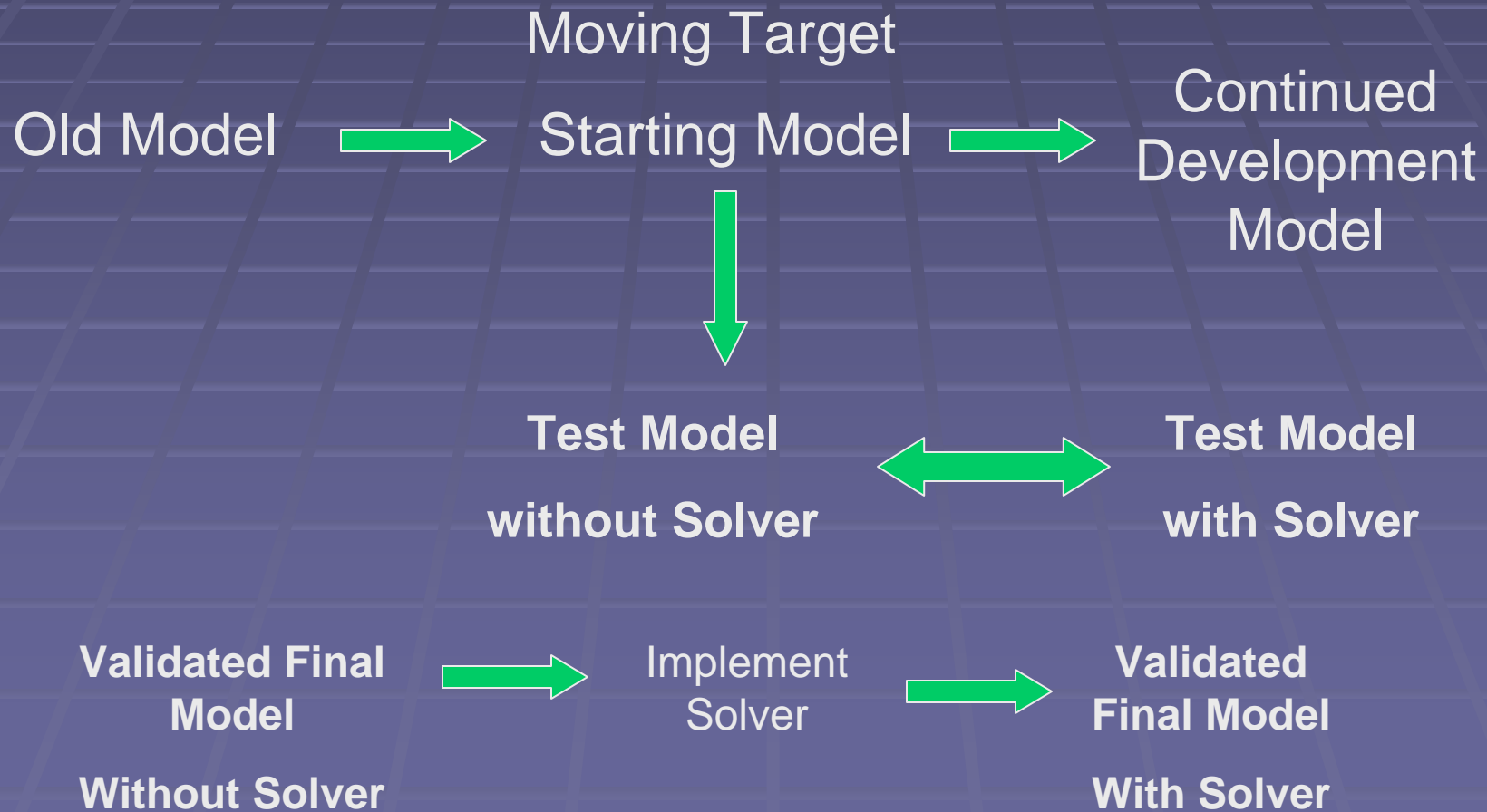
HYDROSPHERE
Resource Consultants

LCRA Model

- Water rights model
 - Daily
 - Monthly
- Replace RESPONSE and WAM
- 1800+ rules
- Run time = 30+ hours



Order of Events



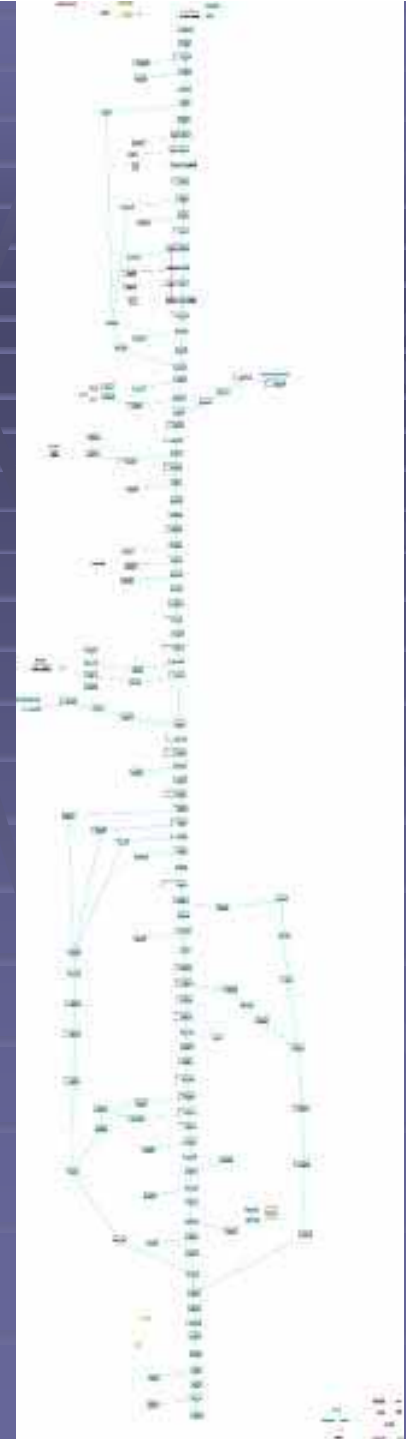
Starting Model

- 108 water users
- 14 reservoirs
- 4 supply chains
- 1800+ rules



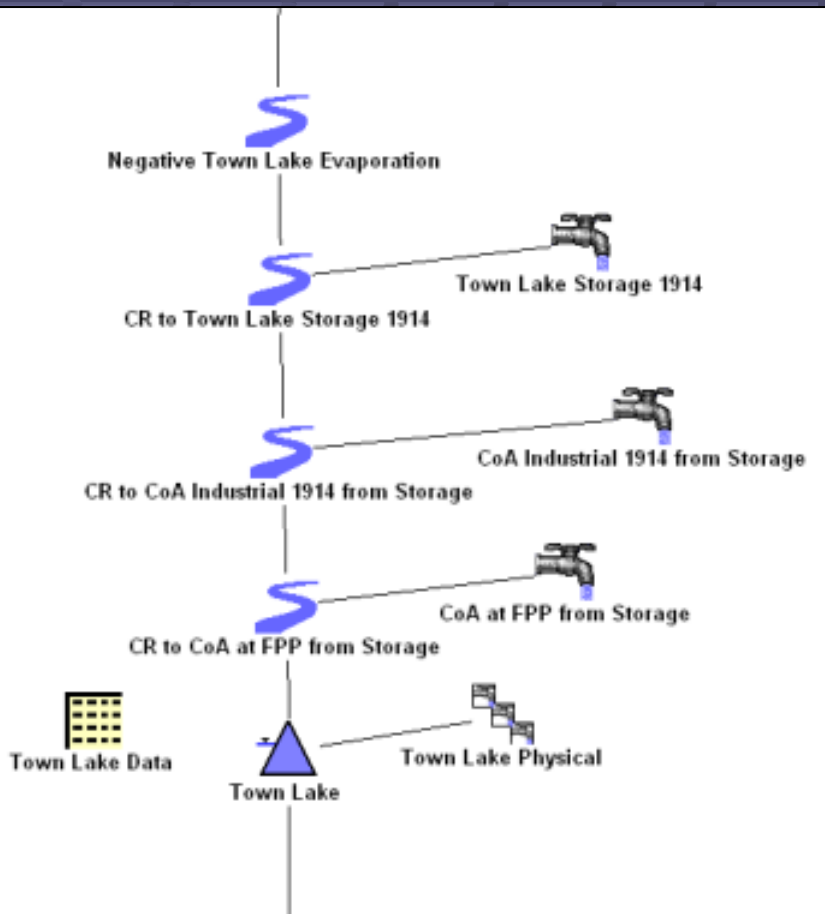
Test Model

- 48 water users
- 6 reservoirs
- 1 supply chain
- 145 rules

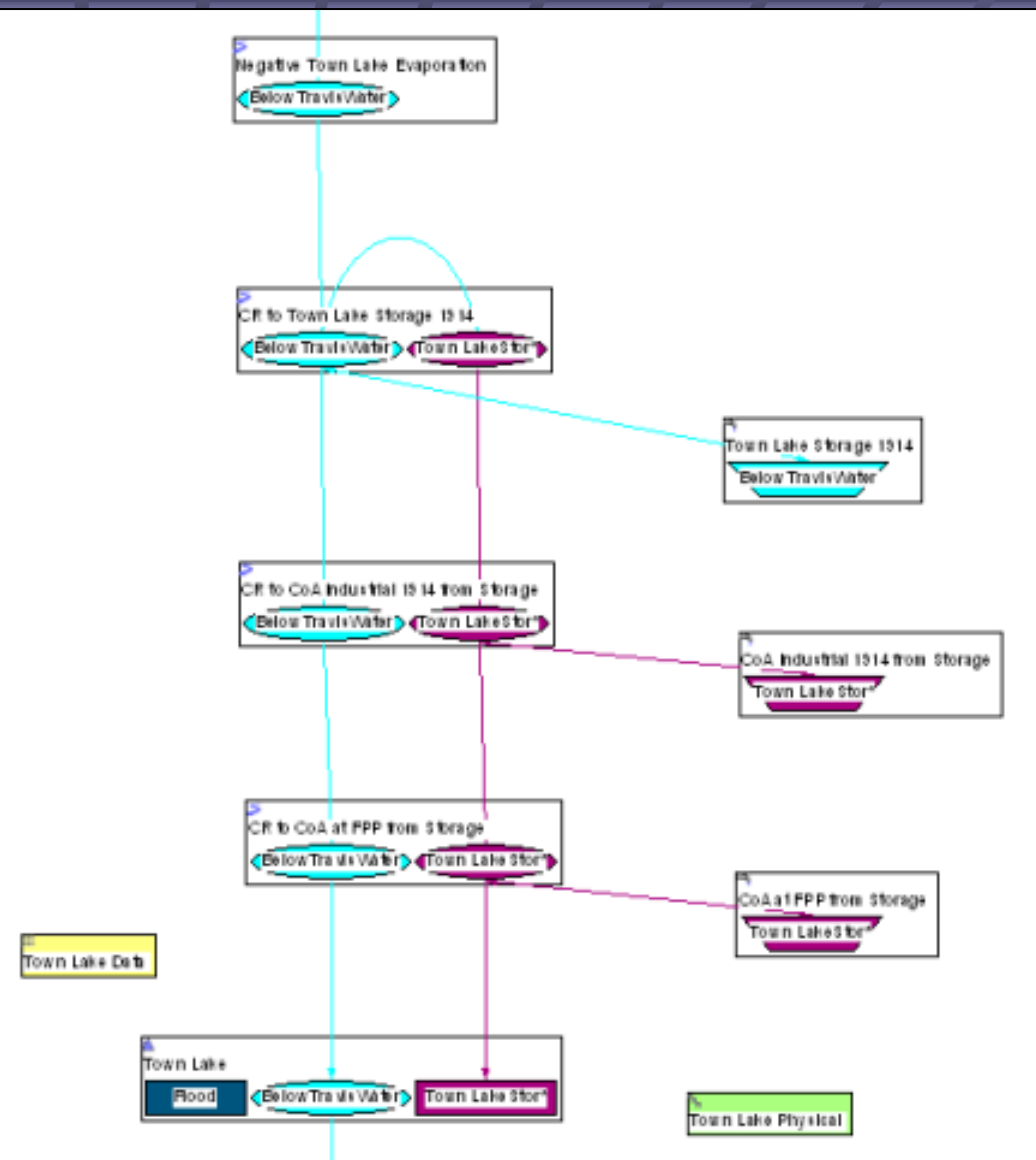


On Channel Reservoirs – How it was

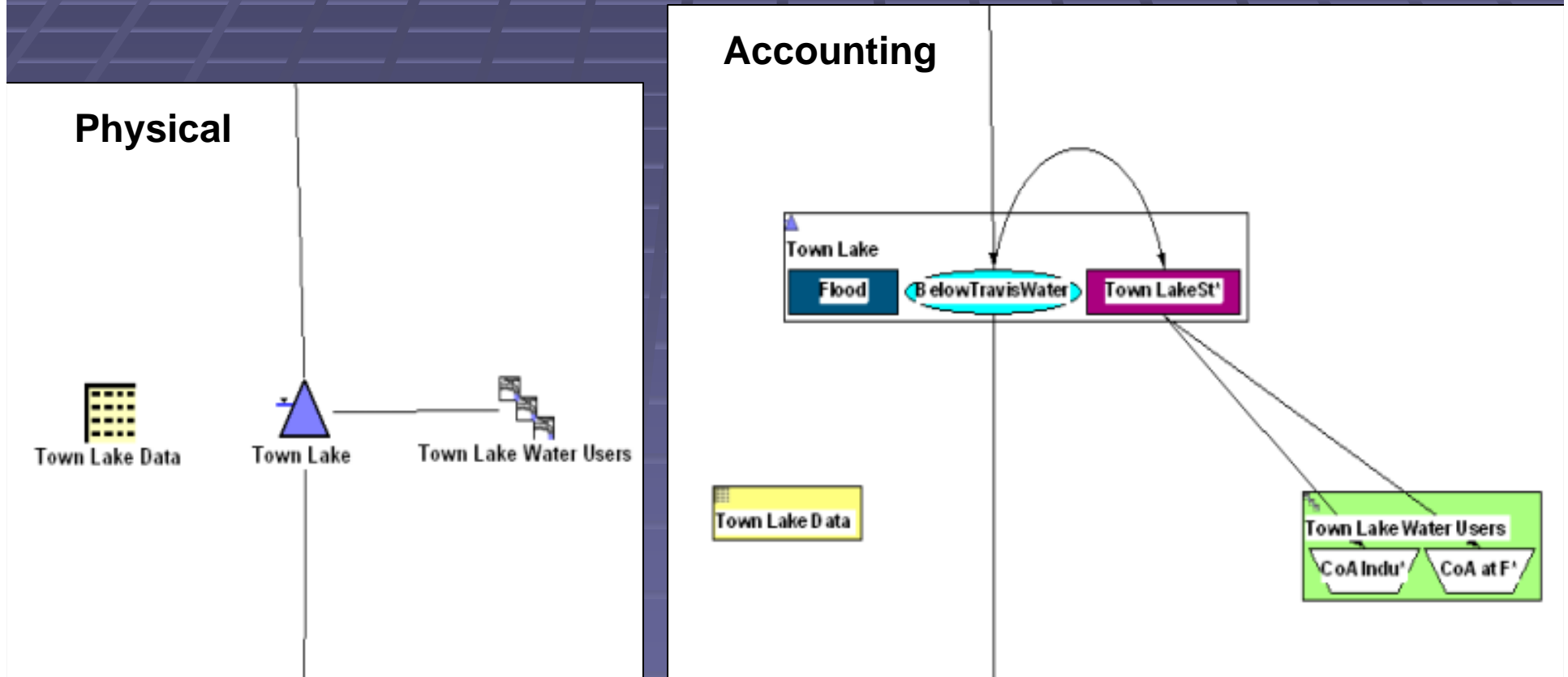
Physical



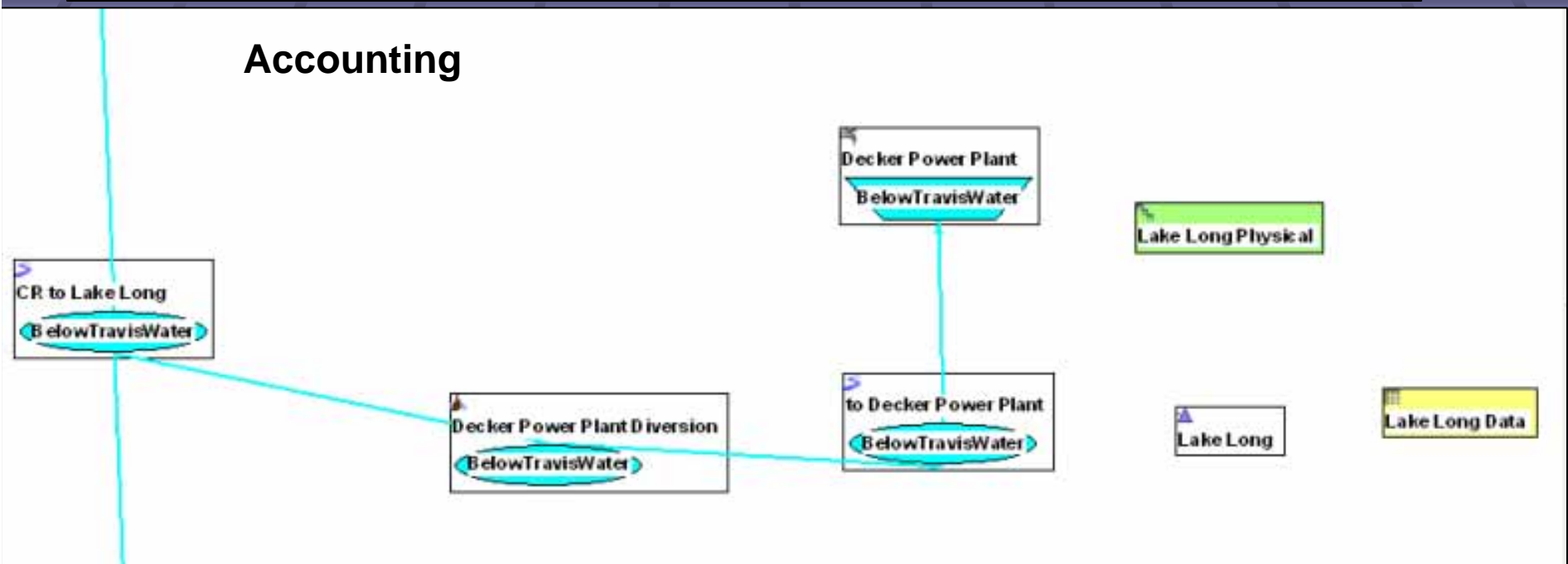
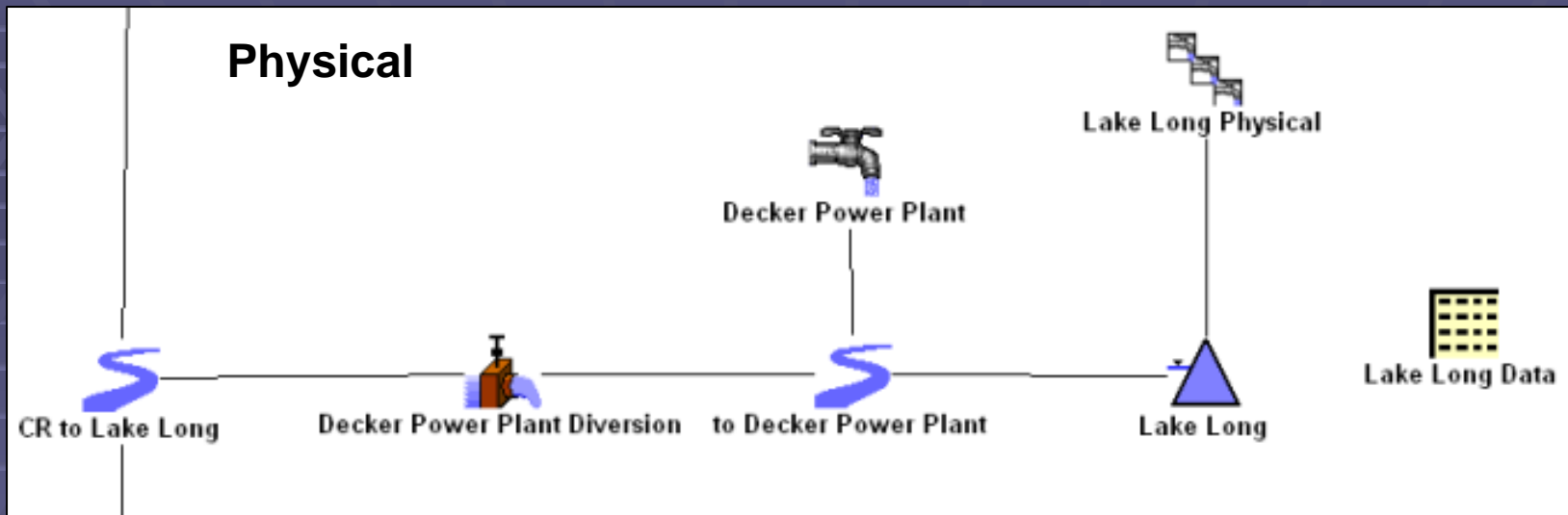
Accounting



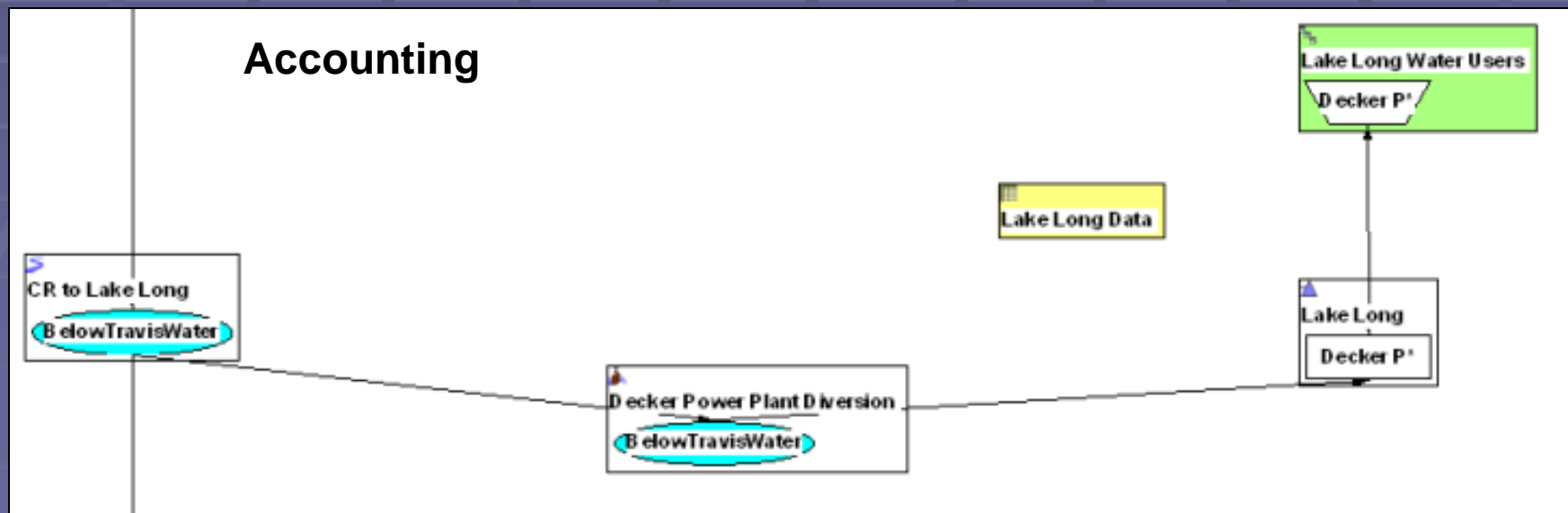
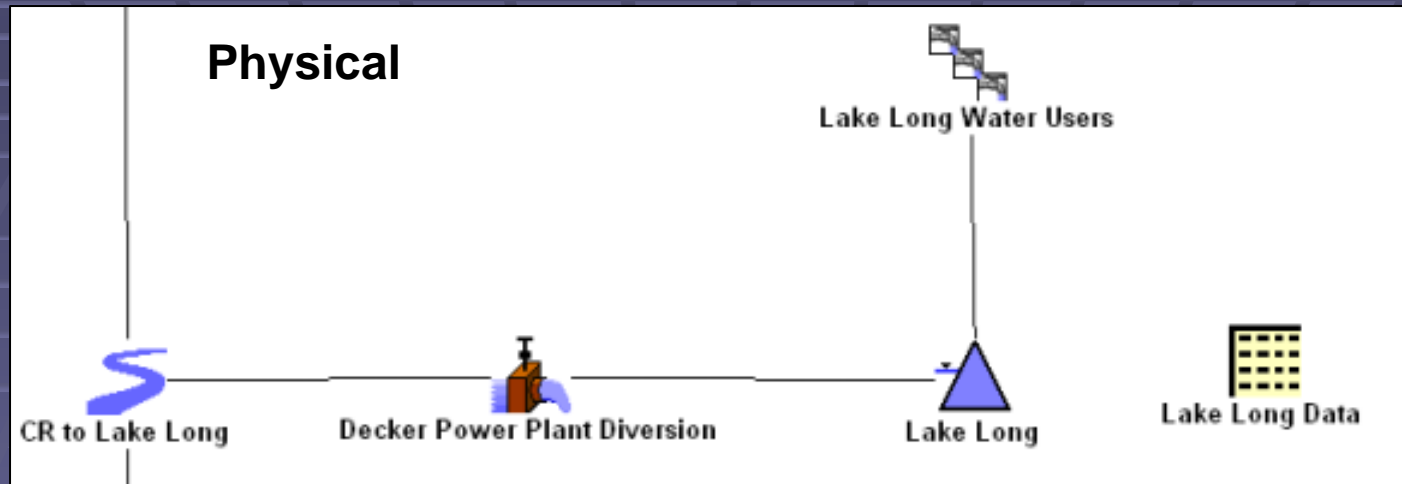
On Channel Reservoirs – How it will be



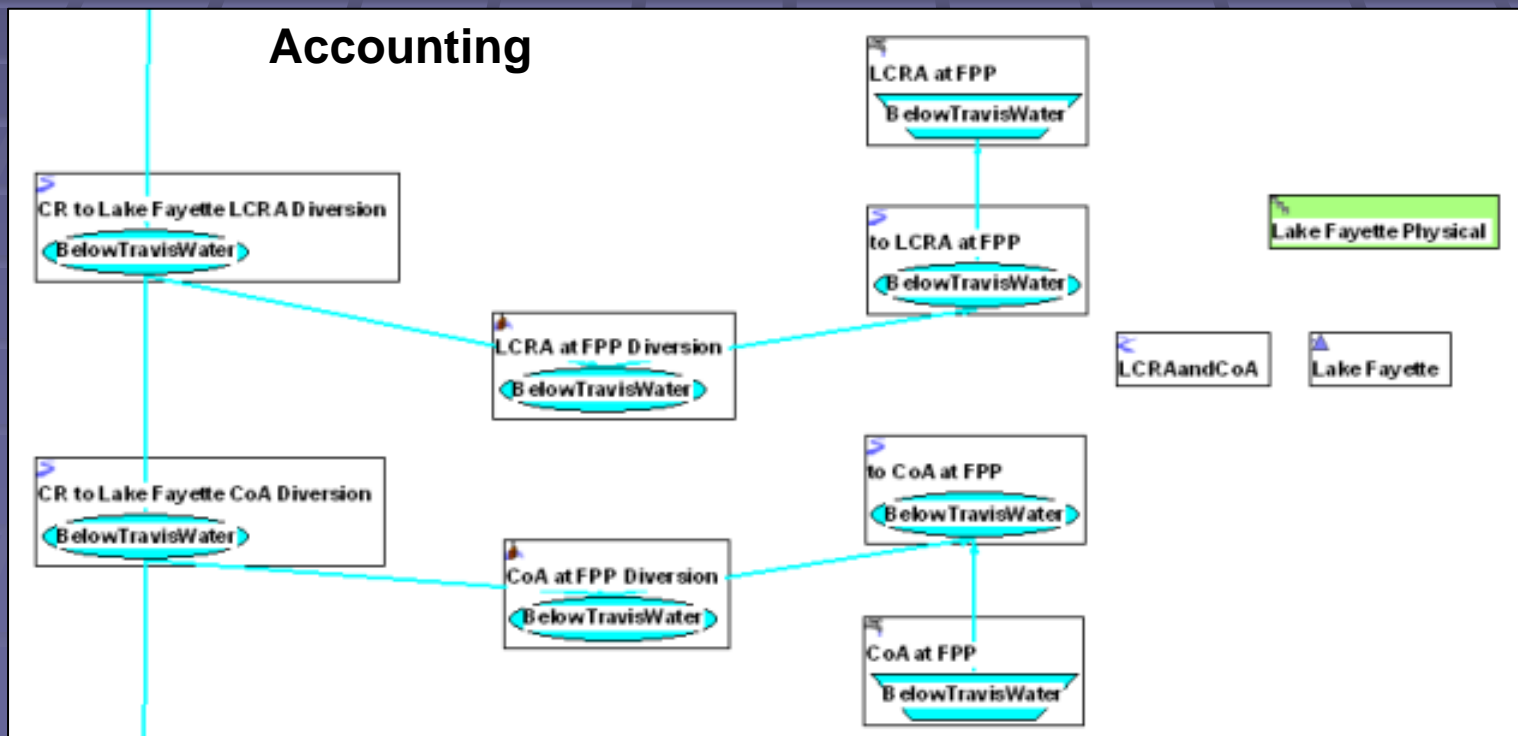
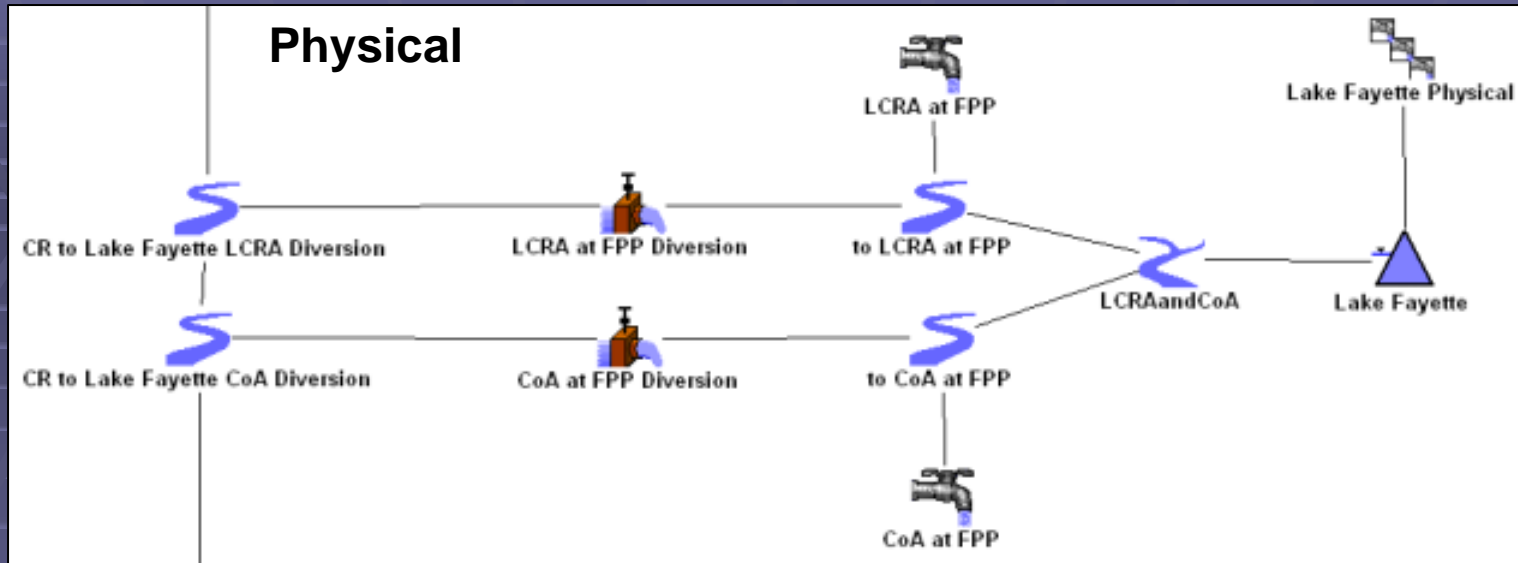
Off Channel Reservoirs (Part I) – How it was



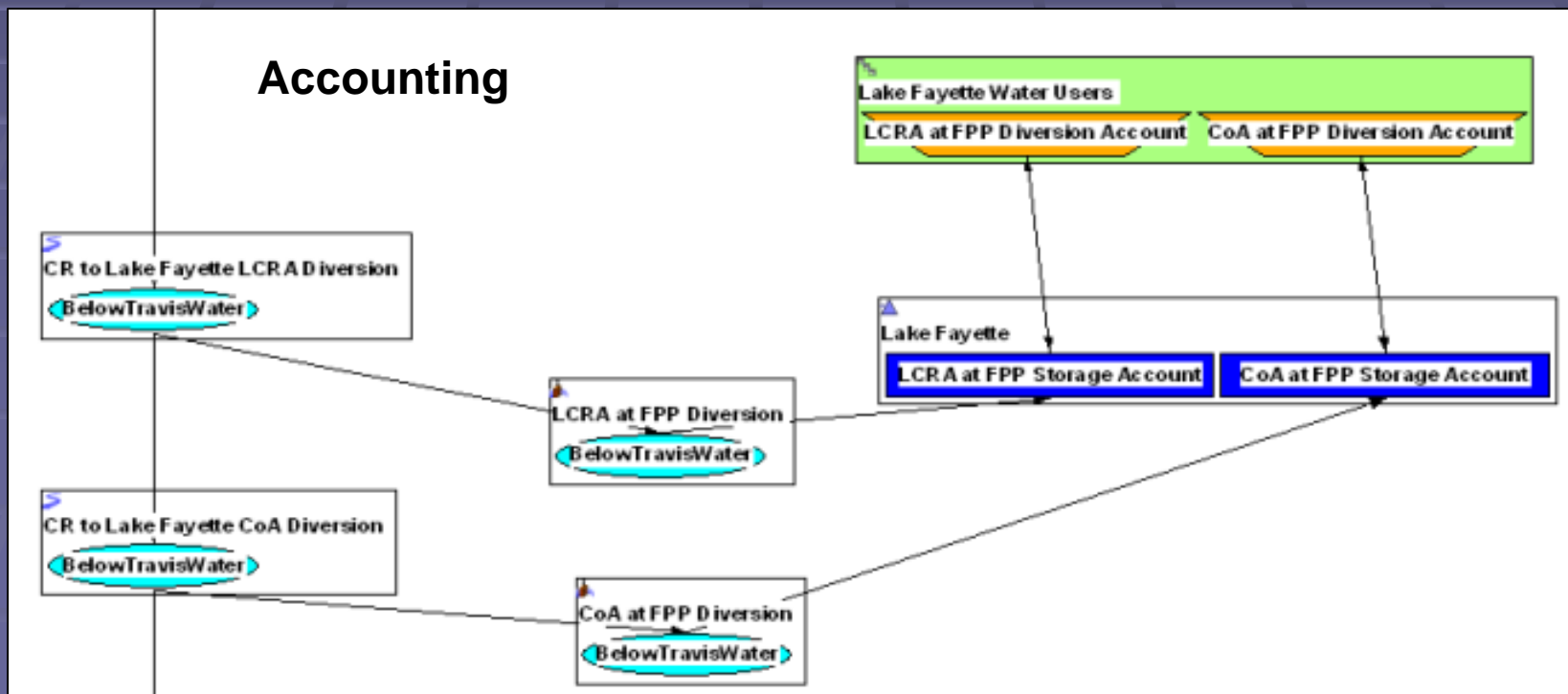
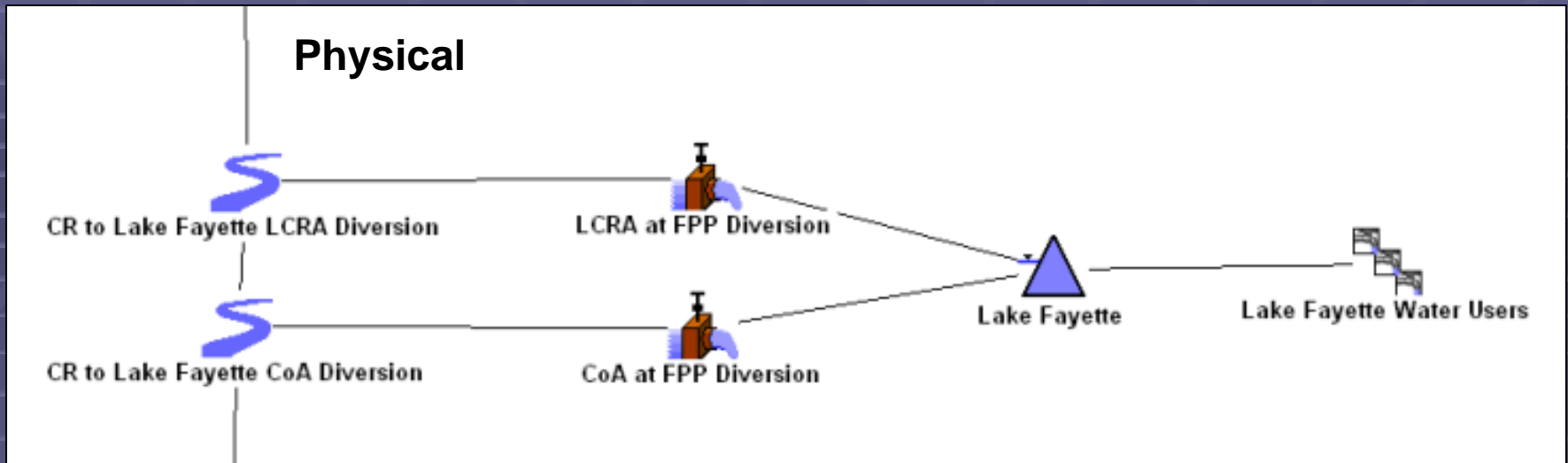
Off Channel Reservoirs (Part I) – How it will be



Off Channel Reservoirs (Part II) – How it was



Off Channel Reservoirs (Part II) – How it will be



Name: rules_Master.lometa.fix_BelowTravisWater9_stripped.rls RPL Set Not Loaded

Name	Priority
[-] Distribute BelowTravisWater	
[-] Set Offstream Diversions Depletions BelowTravisWater	37
[-] Gulf Coast Irrigation District 1987 BelowTravisWater Cutback	38
[-] Gulf Coast Irrigation District 1987 BelowTravisWater	39
[-] Lakeside Irrigation District 1987 BelowTravisWater Cutback	40
[-] Lakeside Irrigation District 1987 BelowTravisWater	41
[-] STP BelowTravisWater Cutback	42
[-] STP BelowTravisWater	43
[-] Minimum Bypass STP Bypass	44
[-] CoA Municipal 1945 BelowTravisWater Cutback	45
[-] CoA Municipal 1945 BelowTravisWater	46
[-] Decker Power Plant BelowTravisWater Cutback	47
[-] Decker Power Plant BelowTravisWater	48
[-] Misc Pass Through BelowTravisWater Cutback	49
[-] Misc Pass Through BelowTravisWater	50
[-] Initial Town Lake Negative Evaporation	51
[-] Initial Meet Town LakeStorage Demand	52
[-] Initial CoA from Town LakeStorage Demands	53
[-] Initial Transfer to Town LakeStorage AboveTravisWater	54
[-] Town Lake Storage 1914 BelowTravisWater Cutback	55
[-] Town Lake Storage 1914 BelowTravisWater	56
[-] CoA Municipal 1914 BelowTravisWater Cutback	57
[-] CoA Municipal 1914 BelowTravisWater	58
[-] CoA Industrial 1914 BelowTravisWater Cutback	59
[-] CoA Industrial 1914 BelowTravisWater	60
[-] CoA at FPP BelowTravisWater Cutback	61
[-] CoA at FPP BelowTravisWater	62
[-] Initial Austin Negative Evaporation	63
[-] Initial Meet AustinStorage Demand	64
[-] Transfer to AustinStorage BelowTravisWater	65
[-] Austin Storage 1913 BelowTravisWater Cutback	66

Name: rules_Master.lometa.fix_BelowTravisWater9_stripped.rls RPL Set Not Loaded

Name	Priority
[-] Transfer to AustinStorage BelowTravisWater	65
[-] Austin Storage 1913 BelowTravisWater Cutback	66
[-] Austin Storage 1913 BelowTravisWater	67
[-] Lakeside Irrigation District 1907 BelowTravisWater Cutback	68
[-] Lakeside Irrigation District 1907 BelowTravisWater	69
[-] Pierce Ranch Irrigation District BelowTravisWater Cutback	70
[-] Pierce Ranch Irrigation District BelowTravisWater	71
[-] Lakeside Irrigation District BelowTravisWater Cutback	72
[-] Lakeside Irrigation District BelowTravisWater	73
[-] Gulf Coast Irrigation District BelowTravisWater Cutback	74
[-] Gulf Coast Irrigation District BelowTravisWater	75
[-] CoA Municipal 1913 BelowTravisWater Cutback	76
[-] CoA Municipal 1913 BelowTravisWater	77
[-] Garwood to Corpus Christi BelowTravisWater Cutback	78
[-] Garwood to Corpus Christi BelowTravisWater	79
[-] Garwood Irrigation District BelowTravisWater Cutback	80
[-] Garwood Irrigation District BelowTravisWater	81
[+] [-] Additional Interruptible Demand	
[+] [-] Reservoir Demands	
[+] [-] STP Demands	
[+] [-] Initial Demands	
[+] [-] Interruptible Percent	
[+] [-] Regime Rules	
[+] [-] Initialization	
[+] [-] Set Up	
[+] [-] Account Lists	
[+] [-] Account Summing	
[+] [-] Boolean Functions	
[+] [-] Check Physical Release Functions	
[+] [-] Date Functions	
[+] [-] Demand Functions	

Simplified Rulesets!

RBS Ruleset Editor - "BelowTravisWater_V49_SolverImpleme..."

File Edit Ruleset View

Name: ater\4.9_Version\BelowTravisWater_V49_SolverImplemented_11.rls RPL Set Not Loaded

Name	Priority	On	Type
Cleanup and Cumulative Slots		✓	P..
Operate Reservoirs		✓	P..
Physical Diversions Depletions		✓	P..
Distribute BelowTravisWater		✗	P..
Determine Evaporation		✓	P..
Distribute BelowTravisWater_Solver		✓	P..
Set Physical Diversions for Offstream Reservoirs	112	✓	R..
Set OffStream Reservoir Accounting Diversions	113	✓	R..
Distribute BelowTravisWater Rule	114	✓	R..
Additional Interruptible Demand		✓	P..
Reservoir Demands		✓	P..
STP Demands		✓	P..
Initial Demands		✓	P..
Interruptible Percent		✓	P..
Regime Rules		✓	P..
Initialization		✓	P..
Set Up		✓	P..
Account Lists		✓	P..
Account Summing		✓	P..
Boolean Functions		✓	P..
Check Physical Release Functions		✓	P..
Date Functions		✓	P..
Demand Functions		✓	P..

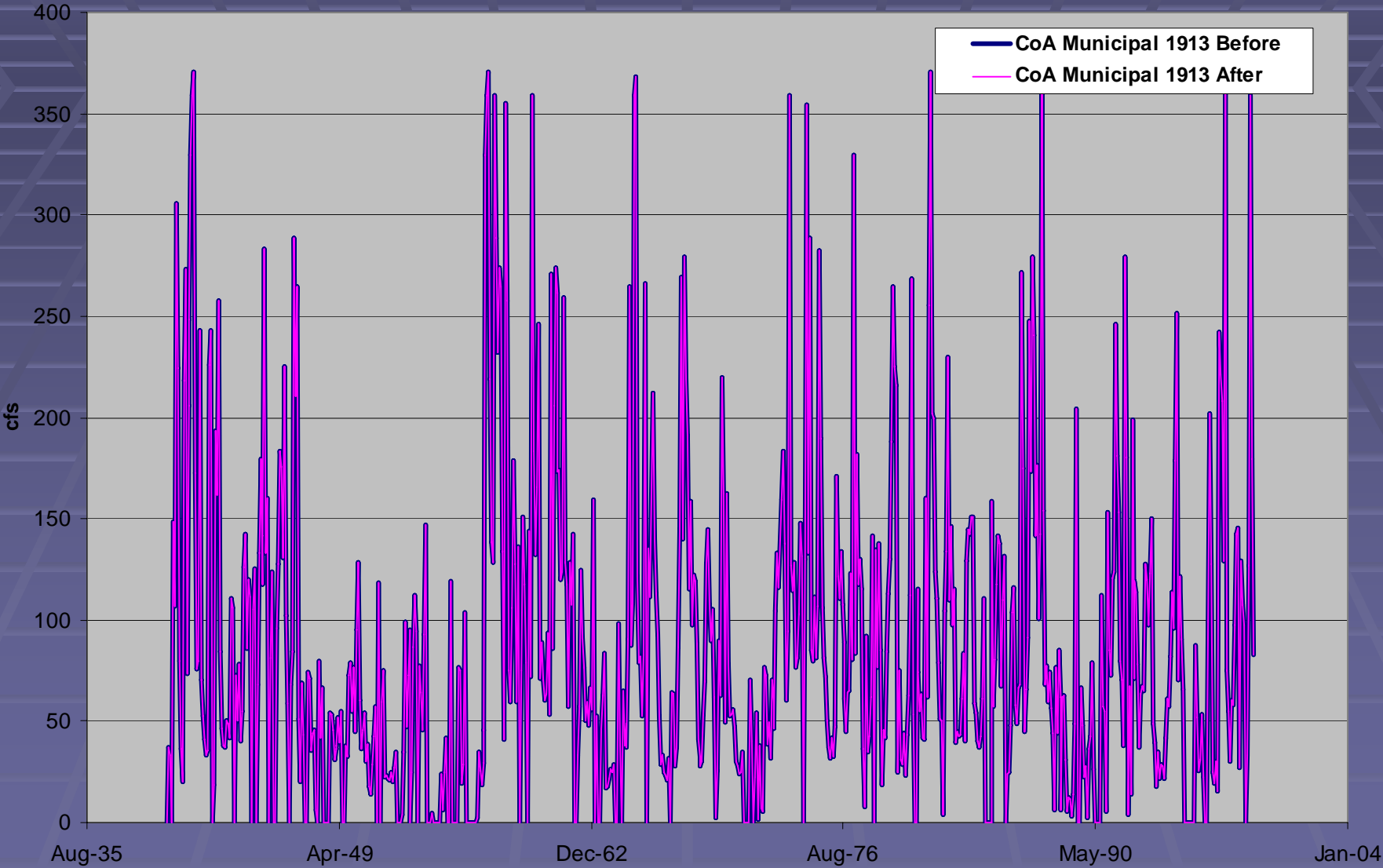
Rule Editor - "BelowTravisWater_V49_SolverImplemented_11.rls : Distribute BelowTr..."

File Edit Rule View

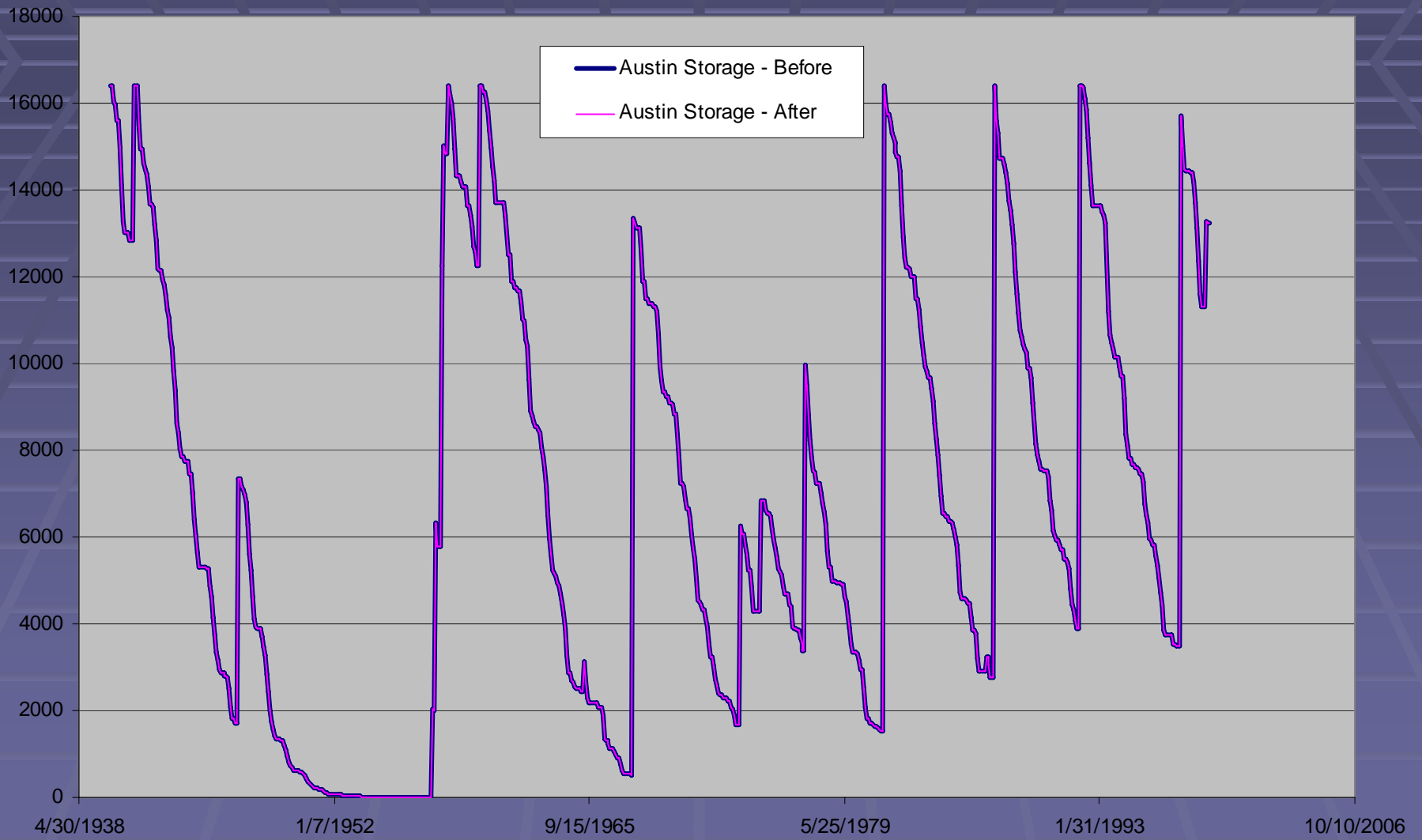
Name: Distribute BelowTravisWater Rule RPL Set Not Loaded

```
FOREACH ( LIST SlotValue IN SolveWaterRights ) DO
    ( "CompBasin" ,
      "Allocation_WaterType" ,
      @"24:00:00 January 1, 1900" ,
      @"24:00:00 January 1, 2000" )
    ( GET SLOT @INDEX 0 FROM SlotValue )[]
      = GET NUMERIC @INDEX 1 FROM SlotValue
ENDFOREACH
```

Making it Match - Depletions



Making it Match – Reservoir Storages



Next Steps

- Implement instream flow rights into test model
- Goal = One-to-one match
- Evaluate final model starting point
 - Current Validated model vs. LSWP model
- Implement solver into validated model