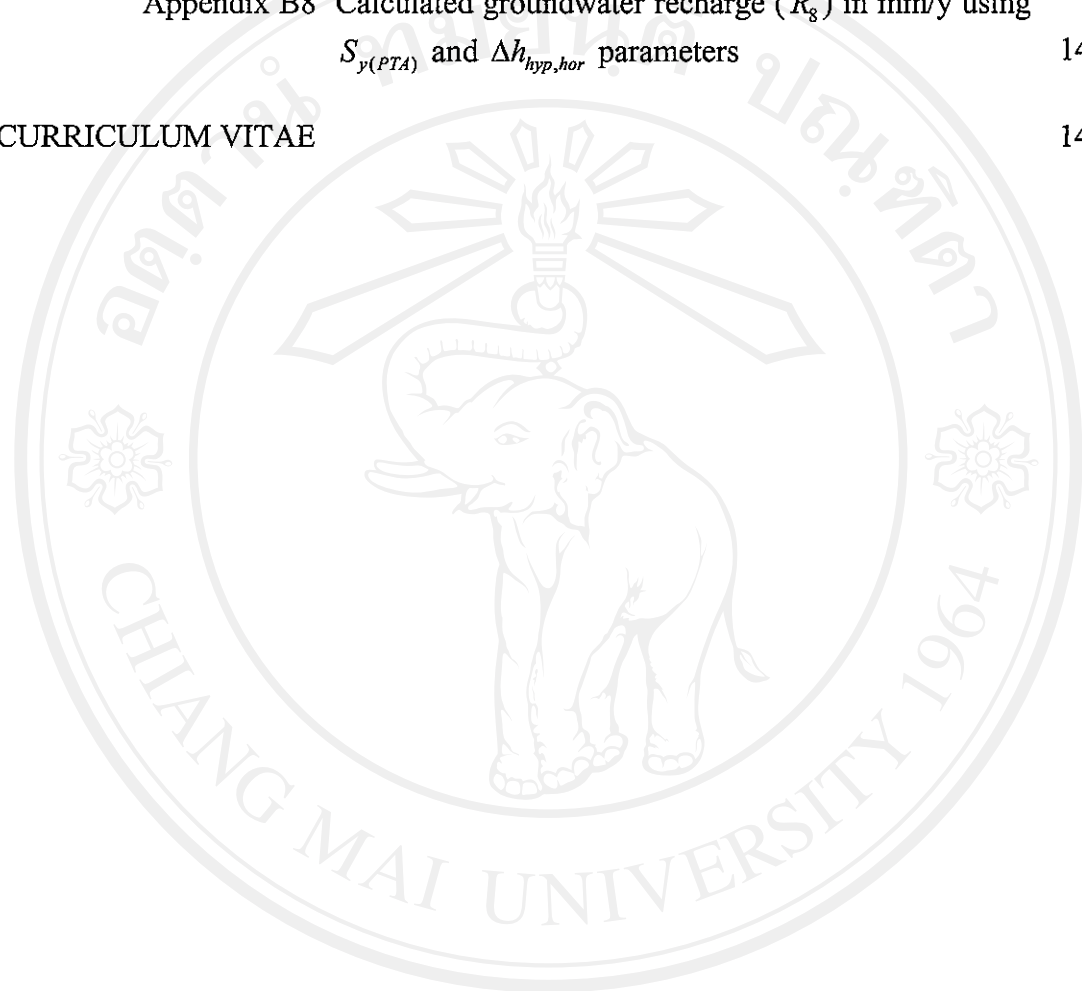


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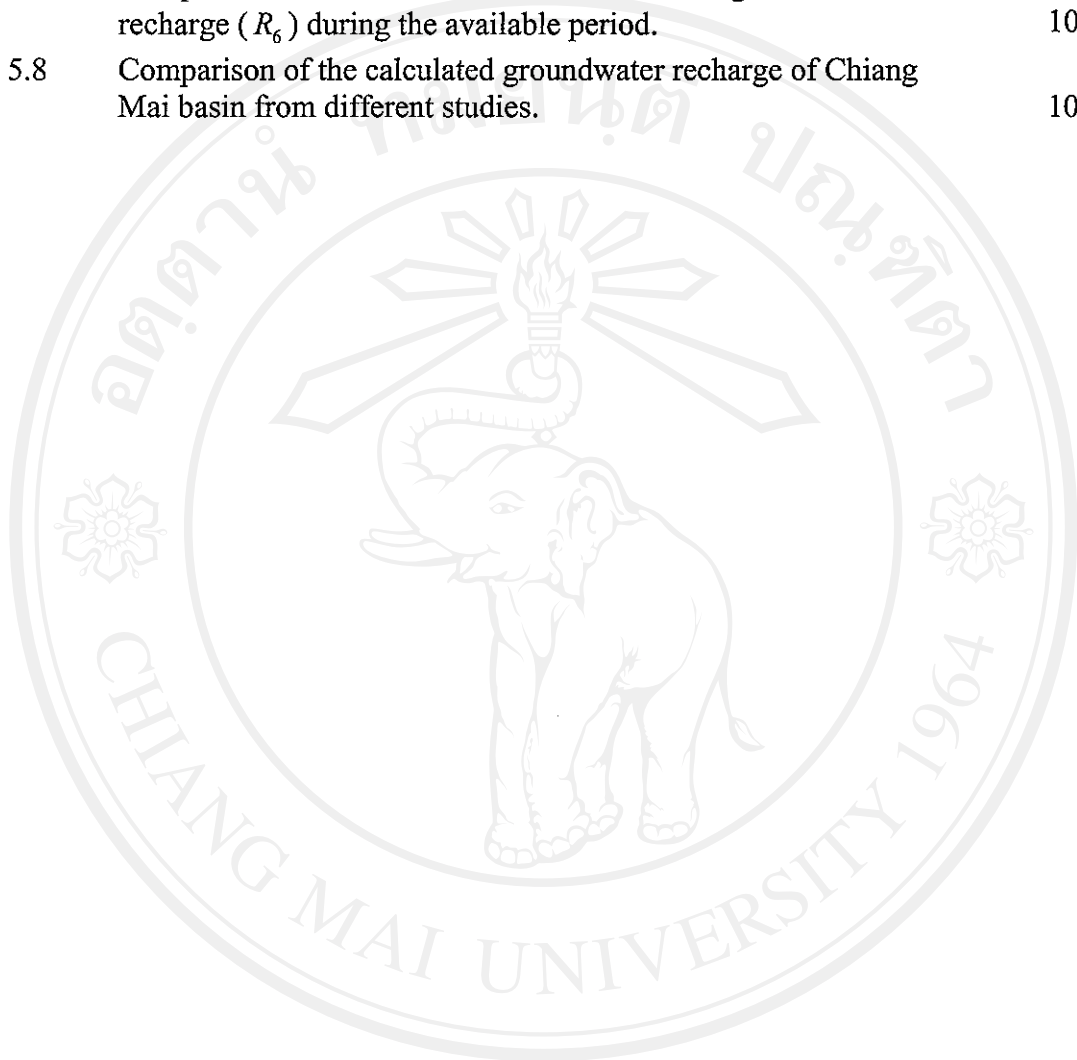


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LIST OF SYMBOLS AND ABBREVIATIONS

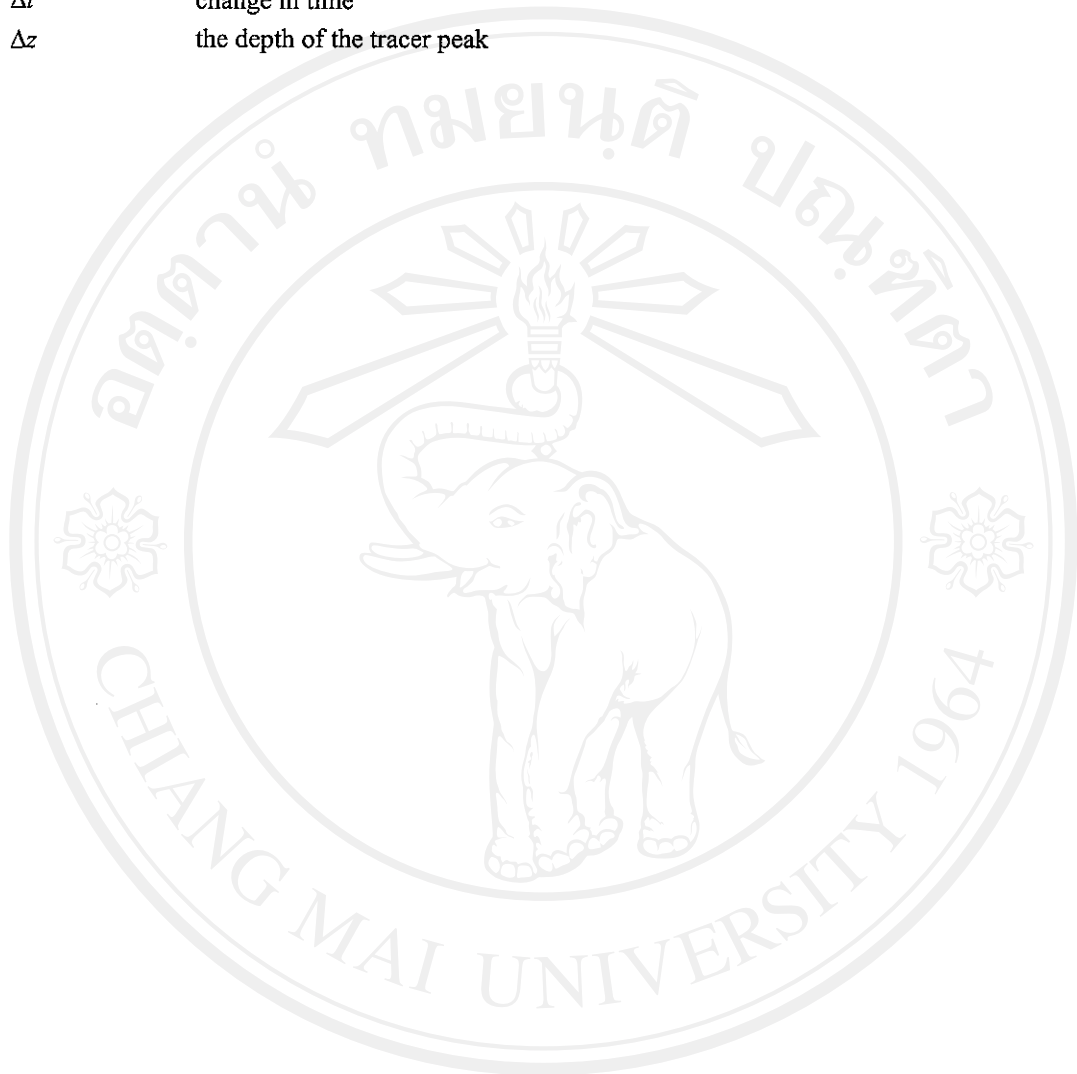
SYMBOLS

A_a	the surface area of aquifer
A_e	the effective area for groundwater recharge
A_{con}	the cross-sectional area of the container
A_d	the drainage area in square miles
A_{td}	the area that consider evapotranspiration above shallow water table
A_{rec}	the cross section area of a rectangles
A_s	the study area
a	gradient of straight line
b	value of ordinate if $P=0$
C_c	cloudiness
^{14}C	carbon-14
^{36}Cl	Chlorine-36
C_{uz}	the chloride concentration in the soil profile
C_p	the chloride concentration in precipitation
$CFCs$	Chlorofluorocarbons
$CFC-11$	Chlorofluorocarbon-11
$CFC-12$	Chlorofluorocarbon-12
Cl	Chloride
c	the recession constant for the basin
D	drainage or downward water movement below the root zone
D_z	drainage below depth z
E_a	evaporation from surface water or streambed
E_h	error of total rises in groundwater table
E_{sw}	evaporation from water surface that is powered by wind speed and the saturation
ET	evapotranspiration
ET_A	actual evapotranspiration
ET_a	additional evapotranspiration
ET_g	evapotranspiration
e_s	the saturation vapor pressure of water at the mean air temperature
e_{sd}	the actual vapor pressure at the mean air temperature (mbar)
GWR	groundwater recharge rate
GWR_{cell}	groundwater recharge rate per a unit cell of the area
3H	Tritium
3He	helium-3
$^3He_{trit}$	tritogenic
H	the net solar radiation
H_{tot}	total head
h	high

hr	hour
h_p	the matric pressure head
K	hydraulic conductivity
$K(\theta)$	the hydraulic conductivity at the ambient water content
n_e	the effective porosity of unconsolidated sediments
n/N	the ratio of actual and possible hours of bright sunshine
N	the time in days
P_a	precipitation
P_g	groundwater recharge
$P_{w_{real}}$	real percolation water quantity
$P_{w_{pot}}$	potential percolation water quantity
PET	potential evapotranspiration
Q	flow through a cross section
Q_0	flow at the start of the recession
Q_{up}	flow rate at the upstream
Q_{down}	flow rate at the downstream
Q_{in}	tributary inflows along the reach
Q_{out}	tributary outflows along the reach
M_{eff}	the month of maximum effective rainfall
M_{peak}	the month of water level peak
T_{lag}	time-lag in month
R_1	groundwater recharge calculated by using parameters of $S_{y(WBA)}$ and $\Delta h_{act,rec}$
R_2	groundwater recharge calculated by using parameters of $S_{y(WBA)}$ and $\Delta h_{act,hor}$
R_3	groundwater recharge calculated by using parameters of $S_{y(PTA)}$ and $\Delta h_{act,rec}$
R_4	groundwater recharge calculated by using parameters of $S_{y(PTA)}$ and $\Delta h_{act,hor}$
R_5	groundwater recharge calculated by using parameters of $S_{y(WBA)}$ and $\Delta h_{hyp,rec}$
R_6	groundwater recharge calculated by using parameters of $S_{y(WBA)}$ and $\Delta h_{hyp,hor}$
R_7	groundwater recharge calculated by using parameters of $S_{y(PTA)}$ and $\Delta h_{hyp,rec}$
R_8	groundwater recharge calculated by using parameters of $S_{y(PTA)}$ and $\Delta h_{hyp,hor}$
R_{act}	actual groundwater recharge
R_g	groundwater runoff
R_{hyp}	hypothesis groundwater recharge
R_{max}	maximum calculated groundwater recharge
R_{min}	minimum calculated groundwater recharge
R_o	surface runoff including interflow
$R_{o\ cell}$	surface runoff including interflow per a unit cell of the area
R_{tot}	total runoff
R_u	stream flow
S	surface area of the recharge zone
$S_{y,d}$	specific yield in the recession period that determined by the water budget approach
$S_{y,r}$	specific yield in the rising period that determined by the water budget approach

$S_{y(PTA)}$	specific yield determined by the pumping test approach
$S_{y(WBA)}$	specific yield determined by the water budget approach
t	time since the recession began in day
t_{gw}	age of the groundwater
$Temp$	temperature
T	transmissivity
U	subsurface underflow
U_1	the average wind speed at h meters from the ground surface
U_2	the average wind speed at a height of two meters above the ground surface
Y_g	gravity yield
$W(u, r / L)$	well function for leaky artesian aquifers
z	elevation
$\frac{\Delta h}{\Delta l}$	the hydraulic gradient across the rectangle
λ	the decay constant
v	velocity
v_s	seepage velocity
%	percent
θ	water content
Δ	the slope of the saturation vapor pressure curve for water at the mean air temperature (mm Hg/°C)
γ	the psychrometric constant (0.49 mm Hg/°C)
I_0	Angot's value or the radiation received at the top of the atmosphere
r	the reflection coefficient or Albedo
σ	the Stefa-Bolzman's constant
σT^4	The theoretical terrestrial radiation which would leave the area
f	relative humidity
ΔH	changes in groundwater level
ΔH_d	groundwater table declines
ΔH_r	groundwater table rises
Δh	rises in groundwater table
$\Delta h_{act,hor}$	the total rises of groundwater table measured by the horizontal line method
$\Delta h_{hyp,hor}$	the total rises of groundwater table that respond to effective rainfall and measured by the horizontal line method
$\Delta h_{act,rec}$	the total rises of groundwater table measured by the recession curve method
$\Delta h_{hyp,rec}$	the total rises of groundwater table that respond to effective rainfall and measured by the recession curve method
ΔS	change in channel and unsaturated zone storage
ΔS_s	change in soil moisture
ΔS_g	change in groundwater storage
$\Delta S_{g,r}$	groundwater storage rises
$\Delta S_{g,d}$	groundwater storage declines
ΔS_z	water content change above depth

Δt change in time
 Δz the depth of the tracer peak

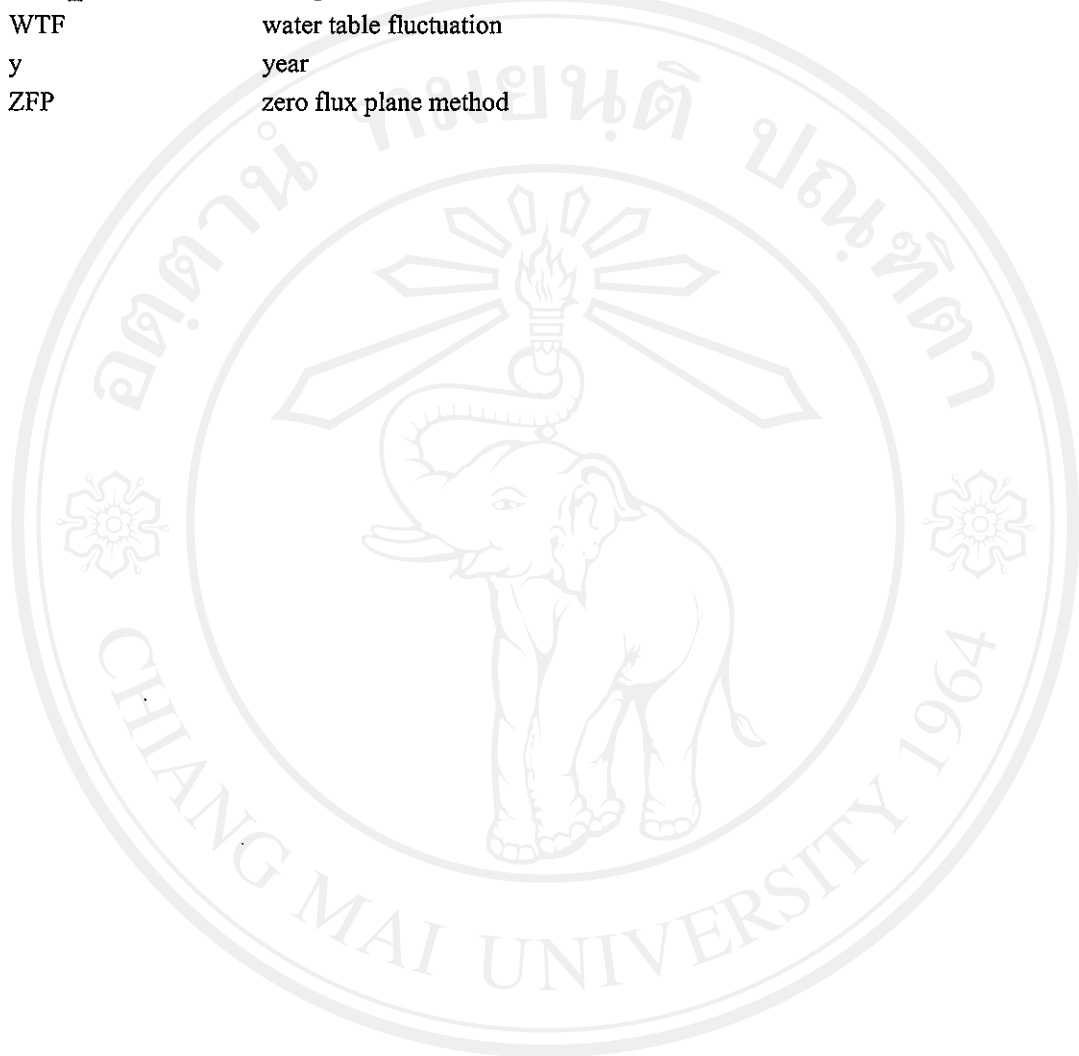


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ABBREVIATIONS

ALT	Altitude above mean sea level (m)
CMB	Chloride Mass Balance
DMR	Department of Mineral Resources
d	day
GPS	Global Positioning System
km ²	square kilometer
km/d	kilometer per day
m	meter
mb	millibar
m bgl	meter depth below ground level
m msl	meter above mean sea level
m/d	meter per day
m ²	square meter
m ³ /hr	cubic meter per hour
m ³ /s	cubic meter per second
mg/l	milligram per liter
mm	millimeter
mm/d	millimeter per day
mm/y	millimeter per year
NE	north-east
No.	Number
N-S	north-south
NW	north-west
ppm	part per million
Qa	Alluvial complex
Qcl	Colluvial deposits
Qcm	Old terrace sediments aquifer or high terrace deposits
Qcp	Alluvial sediment aquifer or Floodplain deposits
Qcr	Young terrace sediments aquifer or low terrace deposits
Qfd	Alluvial fans
Qff	Central flood plains
Qfl	Mae Ping channel
Qth	High terrace deposits
SC/Filter Length	specific well capacity per meter filter length
SE	south-east
SSC	steady state centrifuge method
SW	south-west
SWL	static water level
T.U.	tritium units
TDS	total dissolve solid
UTM_E	well position in East coordinate of GPS unit

UTM_N	well position in North coordinate of GPS unit
WTF	water table fluctuation
y	year
ZFP	zero flux plane method



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