```
diary on         % begin recording

% FEMA appeal for The Town of Harpswell, Cumberland county, Maine
% TRANSECT ID: CM-138
% calculation by SJH, Ransom Consulting, Inc. 20-Feb-2020
% 100-year wave runup using TAW methodology
% including berm and weighted average with foreshore if necessary
%
% chk nld 20200220
%
% This script assumes that the incident wave conditions provided
% as input in the configuration section below are the
% appropriate values located at the end of the foreshore
% or toe of the slope on which the run-up is being calculated
% the script does not attempt to apply a depth limit or any other
% transformation to the incident wave conditions other than
% conversion of the peak wave period to the spectral mean wave
% as recommended in the references below
%
% references:
%
% Van der Meer, J.W., 2002. Technical Report Wave Run-up and
% Wave Overtopping at Dikes. TAW Technical Advisory Committee on
% Flood Defence, The Netherlands.
%
% FEMA. 2007,  Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update
%
%
%

%-------------------------------------------------------------------------
% CONFIG
%-------------------------------------------------------------------------
fname='inpfiles/CM-138sta_ele_include.csv';   % file with station, elevation, include
                                    % third colunm is 0 for excluded points
imgname='logfiles/CM-138-runup';
SWEL=8.7974;  % 100-yr still water level including wave setup.
H0=8.8182;    % significant wave height at toe of structure
Tp=11.5883;    % peak period, 1/fma,
T0=Tp/1.1;

gamma_berm=0.7418;   % this may get changed automatically below
gamma_rough=0.8;
gamma_beta=1;
gamma_perm=1;

setupAtToe=0.14678;
maxSetup=1.2538;   % only used in case of berm/shallow foreshore weighted average

plotTitle='Iterative TAW for CM-138'

plotTitle =

Iterative TAW for CM-138



% END CONFIG
%------------------------------

SWEL=SWEL+setupAtToe

SWEL =

    8.94418

SWEL_fore=SWEL+maxSetup

SWEL_fore =

   10.19798



% FIND WAVELENGTH USING DEEPWATER DISPERSION RELATION
% using English units
L0=32.15/(2*pi)*T0^2

L0 =

  567.878201365222


% Find Hb (Munk, 1949)
%Hb=H0/(3.3*(H0/L0)^(1/3))
%Db=-Hb/.78+SWEL;  % depth at breaking

% The toe elevation here is only used to determine the average
% structure slope, it is not used to depth limit the wave height.
% Any depth limiting or other modification of the wave height
```

```
% to make it consitent with TAW guidance should be performed
% prior to the input of the significant wave height given above.
Ztoe=SWEL-1.5*H0

Ztoe =

                  -4.28312


% read the transect
[sta,dep,inc] = textread(fname,'%n%n%n%*[^\n]','delimiter',',','headerlines',0);

% remove unselected points
k=find(inc==0);
sta(k)=[];
dep(k)=[];

sta_org=sta;  % used for plotting purposes
dep_org=dep;


% initial guess at maximum run-up elevation to estimate slope
Z2=SWEL+1.5*H0

Z2 =

                  22.17148


% determine station at the max runup and -1.5*H0 (i.e. the toe)
top_sta=-999;
toe_sta=-999;
for kk=1:length(sta)-1
    if ((Z2 > dep(kk)) & (Z2 <= dep(kk+1)))    % here is the intersection of z2 with profile
       top_sta=interp1(dep(kk:kk+1),sta(kk:kk+1),Z2)
    end
    if  ((Ztoe > dep(kk)) & (Ztoe <= dep(kk+1)))    % here is the intersection of Ztoe with profile
       toe_sta=interp1(dep(kk:kk+1),sta(kk:kk+1),Ztoe)
    end
end

toe_sta =

         -12.6070531009323

% check to make sure we got them, if not extend the end slopes outward
S=diff(dep)./diff(sta);
if toe_sta==-999
   dy=dep(1)-Ztoe;
   toe_sta=sta(1)-dy/S(1)
end
if top_sta==-999
   dy=Z2-dep(end);
   top_sta=sta(end)+dy/S(end)
end

top_sta =

          193.621588415972


% just so the reader can tell the values aren't -999 anymore
top_sta

top_sta =

          193.621588415972

toe_sta

toe_sta =

         -12.6070531009323




% check for case where the toe of slope is below SWL-1.5*H0
% in this case interpolate setup from the setupAtToe(really setup as first station), and the max setup
% also un-include points seaward of SWL-1.5*H0
if Ztoe > dep(1)
   dd=SWEL_fore-dep;
   k=find(dd<0,1); % k is index of first land point
   staAtSWL=interp1(dep(k-1:k),sta(k-1:k),SWEL_fore);
   dsta=staAtSWL-sta(1);
   dsetup=maxSetup-setupAtToe;
   dsetdsta=dsetup/dsta;
   setup=setupAtToe+dsetdsta*(toe_sta-sta(1));
   sprintf('-!!- Location of SWEL-1.5*H0 is %4.1f ft landward of toe of slope',dsta)
   sprintf('-!!- Setup is interpolated between setup at toe of slope and max setup')
```

```
   sprintf('-!!-       setup is adjusted to %4.2f feet',setup)
   SWEL=SWEL-setupAtToe+setup;
   sprintf('-!!-       SWEL is adjusted to %4.2f feet',SWEL)
   k=find(dep < SWEL-1.5*H0)
   sta(k)=[];
   dep(k)=[];
else
   sprintf('-!!- The User has selected a starting point that is %4.2f feet above the elevation of SWEL-1.5H0\n',dep(1
   sprintf('-!!- This may be reasonable for some cases.  However the user may want to consider:\n')
   sprintf('-!!-   1) Selecting a starting point that is at or below %4.2f feet elevation, or\n', Ztoe)
   sprintf('-!!-   2) Reducing the incident wave height to a depth limited condition.\n')
end

ans =

-!!- Location of SWEL-1.5*H0 is 144.2 ft landward of toe of slope


ans =

-!!- Setup is interpolated between setup at toe of slope and max setup


ans =

-!!-       setup is adjusted to 0.19 feet


ans =

-!!-       SWEL is adjusted to 8.99 feet


k =

     1
     2
     3
     4
     5
     6



% now iterate converge on a runup elevation
tol=0.01;  % convergence criteria
R2del=999;
R2_new=3*H0; %initial guess
R2=R2_new;
iter=0;
R2_all=[];
topStaAll=[];
Berm_Segs=[];
TAW_ALWAYS_VALID=1;
while(abs(R2del) > tol && iter <= 25)
    iter=iter+1;
    sprintf ('!----------------- STARTING ITERATION %d -----------------!',iter)
    % elevation of toe of slope
    Ztoe
    % station of toe slope (relative to 0-NAVD88 shoreline
    toe_sta
    % station of top of slope/extent of 2% run-up
    top_sta
    % elevation of top of slope/extent of 2% run-up
    Z2
    % incident significant wave height
    H0
    % incident spectral peak wave period
    Tp
    % incident spectral mean wave period
    T0

    R2=R2_new
    Z2=R2+SWEL
    % determine slope for this iteration
    top_sta=-999;
    for kk=1:length(sta)-1
       if ((Z2 > dep(kk)) & (Z2 <= dep(kk+1)))    % here is the intersection of z2 with profile
          top_sta=interp1(dep(kk:kk+1),sta(kk:kk+1),Z2)
          break;
       end
    end
    if top_sta==-999
       dy=Z2-dep(end);
       top_sta=sta(end)+dy/S(end)
    end

    % get the length of the slope (not accounting for berm)
    Lslope=top_sta-toe_sta
```

```
% loop over profile segments to determine berm factor
% re-calculate influence of depth of berm based on this run-up elevation
% check for berm, berm width, berm height
berm_width=0;
rdh_sum=0;
Berm_Segs=[];
Berm_Heights=[];
for kk=1:length(sta)-1
   ddep=dep(kk+1)-dep(kk);
   dsta=sta(kk+1)-sta(kk);
   s=ddep/dsta;
   if  (s < 1/15)     % count it as a berm if slope is flatter than 1:15 (see TAW manual)
      sprintf ('Berm Factor Calculation: Iteration %d, Profile Segment: %d',iter,kk)
      berm_width=berm_width+dsta;   % tally the width of all berm segments
      % compute the rdh for this segment and weight it by the segment length
      dh=SWEL-(dep(kk)+dep(kk+1))/2
      if  dh < 0
          chi=R2;
      else
          chi=2* H0;
      end
      if (dh <= R2 & dh >=-2*H0)
         rdh=(0.5-0.5*cos(3.14159*dh/chi)) ;
      else
         rdh=1;
      end
      rdh_sum=rdh_sum + rdh * dsta
      Berm_Segs=[Berm_Segs, kk];
      Berm_Heights=[Berm_Heights, (dep(kk)+dep(kk+1))/2];
   end
   if dep(kk) >= Z2  % jump out of loop if we reached limit of run-up for this iteration
      break
   end
end
sprintf ('!------- End Berm Factor Calculation, Iter: %d ---------!',iter)
berm_width
rB=berm_width/Lslope
if (berm_width > 0)
   rdh_mean=rdh_sum/berm_width
else
   rdh_mean=1
end
gamma_berm=1- rB * (1-rdh_mean)
if gamma_berm > 1
   gamma_berm=1
end
if gamma_berm < 0.6
   gamma_berm =0.6
end
% Iribarren number
slope=(Z2-Ztoe)/(Lslope-berm_width)
Irb=(slope/(sqrt(H0/L0)))
% runup height
gamma_berm
gamma_perm
gamma_beta
gamma_rough
gamma=gamma_berm*gamma_perm*gamma_beta*gamma_rough

% check validity
TAW_VALID=1;
if (Irb*gamma_berm < 0.5 | Irb*gamma_berm > 10 )
   sprintf('!!! - - Iribaren number: %6.2f is outside the valid range (0.5-10), TAW NOT VALID - - !!!\n', Irb*gam
   TAW_VALID=0;
else
   sprintf('!!! - - Iribaren number: %6.2f is in the valid range (0.5-10), TAW RECOMMENDED - - !!!\n', Irb*gamma_
end
islope=1/slope;
if (slope < 1/8 | slope > 1)
   sprintf('!!! - - slope: 1:%3.1f V:H is outside the valid range (1:8 - 1:1), TAW NOT VALID - - !!!\n', islope)
   TAW_VALID=0;
else
   sprintf('!!! - - slope: 1:%3.1f V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!\n', islope)
end
if TAW_VALID == 0
   TAW_ALWAYS_VALID=0;
end

if (Irb*gamma_berm < 1.8)
   R2_new=gamma*H0*1.77*Irb
else
   R2_new=gamma*H0*(4.3-(1.6/sqrt(Irb)))
end


% check to see if we need to evaluate a shallow foreshore
if berm_width > 0.25 * L0;
   disp ('!   Berm_width is greater than 1/4 wave length')
   disp ('!   Runup will be weighted average with foreshore calculation assuming depth limited wave height on ber
```

```
       % do the foreshore calculation
       fore_H0=0.78*(SWEL_fore-min(Berm_Heights))
       % get upper slope
       fore_toe_sta=-999;
       fore_toe_dep=-999;
       for kk=length(dep)-1:-1:1
          ddep=dep(kk+1)-dep(kk);
          dsta=sta(kk+1)-sta(kk);
          s=ddep/dsta;
          if s < 1/15
             break
          end
          fore_toe_sta=sta(kk);
          fore_toe_dep=dep(kk);
          upper_slope=(Z2-fore_toe_dep)/(top_sta-fore_toe_sta)
       end
       fore_Irb=upper_slope/(sqrt(fore_H0/L0));
       fore_gamma=gamma_perm*gamma_beta*gamma_rough;
       if (fore_Irb < 1.8)
          fore_R2=fore_gamma*fore_H0*1.77*fore_Irb;
       else
          fore_R2=fore_gamma*fore_H0*(4.3-(1.6/sqrt(fore_Irb)));
       end
       if berm_width >= L0
          R2_new=fore_R2
          disp ('berm is wider than one wavelength, use full shallow foreshore solution');
       else
          w2=(berm_width-0.25*L0)/(0.75*L0)
          w1=1-w2
          R2_new=w2*fore_R2 + w1*R2_new
       end
    end % end berm width check

    % convergence criterion
    R2del=abs(R2-R2_new)
    R2_all(iter)=R2_new;

    % get the new top station (for plot purposes)
    Z2=R2_new+SWEL
    top_sta=-999;
    for kk=1:length(sta)-1
       if ((Z2 > dep(kk)) & (Z2 <= dep(kk+1)))    % here is the intersection of z2 with profile
          top_sta=interp1(dep(kk:kk+1),sta(kk:kk+1),Z2)
          break;
       end
    end
    if top_sta==-999
       dy=Z2-dep(end);
       top_sta=sta(end)+dy/S(end);
    end
    topStaAll(iter)=top_sta;
end
ans =
!----------------- STARTING ITERATION 1 -----------------!
Ztoe =
                  -4.28312
toe_sta =
         -12.6070531009323
top_sta =
          193.621588415972
Z2 =
                  22.17148
H0 =
                    8.8182
Tp =
                   11.5883
T0 =
          10.5348181818182
R2 =
                   26.4546
Z2 =
          35.4401722012379
top_sta =
          310.064696807706
Lslope =
          322.671749908638
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 17
dh =
          6.29127220123795
rdh_sum =
         0.282460702628984
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 18
dh =
          6.22707220123795
rdh_sum =
         0.559787292980458
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 19
```

```
dh =
          6.16412220123795
rdh_sum =
         0.832108006534625
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 20
dh =
          6.10242220123795
rdh_sum =
          1.09955002195992
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 21
dh =
          6.09154720123795
rdh_sum =
          1.36613503247288
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 22
dh =
          6.13149720123795
rdh_sum =
          1.63587258153965
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 23
dh =
          6.25207220123795
rdh_sum =
          1.91519501158891
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 24
dh =
          6.45327220123795
rdh_sum =
          2.21073589632493
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 31
dh =
          5.76017220123795
rdh_sum =
           2.4516418958307
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 32
dh =
          5.80497220123795
rdh_sum =
          2.69596873894072
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 33
dh =
          5.84559720123795
rdh_sum =
          2.94341171339809
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 34
dh =
          5.88204720123795
rdh_sum =
          3.19366183842669
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 45
dh =
          4.93314720123795
rdh_sum =
          3.37460348110133
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 46
dh =
          4.87929720123795
rdh_sum =
          3.55186709163431
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 47
dh =
          4.86907220123795
rdh_sum =
          3.72843566437936
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 48
dh =
          4.90247220123795
rdh_sum =
          3.90727854035513
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 49
dh =
          4.89889720123795
rdh_sum =
          4.08587743947292
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 50
```

```
dh =
          4.85834720123795
rdh_sum =
          4.26171814024804
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 51
dh =
          4.82419720123795
rdh_sum =
          4.43524908232813
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 52
dh =
          4.79644720123795
rdh_sum =
          4.60691202718651
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 53
dh =
          4.78844720123795
rdh_sum =
          4.77803793813875
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 54
dh =
          4.80019720123795
rdh_sum =
          4.94995284723646
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 55
dh =
          4.81194720123795
rdh_sum =
          5.12265819175903
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 56
dh =
          4.82369720123795
rdh_sum =
          5.29615540552312
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 57
dh =
          4.83544720123795
rdh_sum =
          5.47044591887635
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 58
dh =
          4.84719720123795
rdh_sum =
          5.64553115869104
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 59
dh =
          4.85894720123795
rdh_sum =
          5.82141254835796
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 60
dh =
          4.87069720123795
rdh_sum =
          5.99809150778011
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 65
dh =
          4.41112220123795
rdh_sum =
          6.14466526135442
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 66
dh =
          4.35622220123795
rdh_sum =
          6.28779718957001
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 73
dh =
          3.17299720123795
rdh_sum =
          6.36555891436826
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 74
dh =
          3.24044720123795
rdh_sum =
          6.44656859367674
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 75
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```
dh =
          3.30857220123795
rdh_sum =
          6.53092012465246
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 76
dh =
          3.37737220123795
rdh_sum =
          6.61870873893987
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 77
dh =
          3.38909720123795
rdh_sum =
          6.70708929511508
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 78
dh =
          3.34374720123795
rdh_sum =
          6.79319031767134
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 87
dh =
          2.76949720123795
rdh_sum =
          6.85281072388137
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 88
dh =
          2.91034720123795
rdh_sum =
          6.91850991561035
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 89
dh =
          2.95689720123795
rdh_sum =
          6.98627840311864
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 90
dh =
          2.90914720123795
rdh_sum =
          7.05192464523216
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 91
dh =
          2.85632220123795
rdh_sum =
          7.11525970187625
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 92
dh =
          2.79842220123795
rdh_sum =
          7.17610595427901
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 93
dh =
          2.74052220123795
rdh_sum =
          7.23451011664972
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 94
dh =
          2.68262220123795
rdh_sum =
          7.29051916297073
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 95
dh =
          2.62472220123795
rdh_sum =
          7.34418032200063
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 96
dh =
          2.56682220123795
rdh_sum =
          7.39554107225041
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 97
dh =
          2.50894720123795
rdh_sum =
          7.44465009926203
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 98
```

```
dh =
          2.45109720123795
rdh_sum =
          7.49155626594893
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 103
dh =
          2.10582220123795
rdh_sum =
          7.52632301791203
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 104
dh =
          2.11492220123795
rdh_sum =
          7.56138732811712
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 105
dh =
          2.13012220123795
rdh_sum =
          7.59695138282257
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 106
dh =
          2.15142220123795
rdh_sum =
          7.63322146514012
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 107
dh =
          2.17274720123795
rdh_sum =
          7.67020509128851
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 108
dh =
          2.19409720123795
rdh_sum =
          7.70790979070597
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 109
dh =
          2.21544720123795
rdh_sum =
          7.74634224981549
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 110
dh =
          2.23679720123795
rdh_sum =
          7.78550914451404
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 111
dh =
          2.26077220123795
rdh_sum =
          7.82550871864173
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 112
dh =
          2.28737220123795
rdh_sum =
          7.86644195885277
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 113
dh =
          2.34167220123795
rdh_sum =
          7.90931311293609
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 114
dh =
          2.42367220123795
rdh_sum =
          7.95519176489019
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 129
dh =
          1.09154720123795
rdh_sum =
          7.96461359987917
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 130
dh =
          1.06909720123795
rdh_sum =
          7.97365302009818
ans =
!------- End Berm Factor Calculation, Iter: 1 ---------!
```

```
berm_width =
    62
rB =
         0.192145733295694
rdh_mean =
         0.128607306775777
gamma_berm =
         0.832565611971922
slope =
         0.152388174841196
Irb =
          1.22289422562323
gamma_berm =
         0.832565611971922
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
         0.666052489577538
ans =
!!! - - Iribaren number:   1.02 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:6.6 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          12.7130735975359
R2del =
          13.7415264024641
Z2 =
          21.6986457987738
ans =
!----------------- STARTING ITERATION 2 -----------------!
Ztoe =
                -4.28312
toe_sta =
         -12.6070531009323
top_sta =
          189.472100033119
Z2 =
          21.6986457987738
H0 =
                   8.8182
Tp =
                  11.5883
T0 =
          10.5348181818182
R2 =
          12.7130735975359
Z2 =
          21.6986457987738
top_sta =
          189.472100033119
Lslope =
          202.079153134051
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 17
dh =
          6.29127220123795
rdh_sum =
         0.282460702628984
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 18
dh =
          6.22707220123795
rdh_sum =
         0.559787292980458
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 19
dh =
          6.16412220123795
rdh_sum =
         0.832108006534625
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 20
dh =
          6.10242220123795
rdh_sum =
          1.09955002195992
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 21
dh =
          6.09154720123795
rdh_sum =
          1.36613503247288
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 22
dh =
          6.13149720123795
```

```
rdh_sum =
          1.63587258153965
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 23
dh =
          6.25207220123795
rdh_sum =
          1.91519501158891
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 24
dh =
          6.45327220123795
rdh_sum =
          2.21073589632493
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 31
dh =
          5.76017220123795
rdh_sum =
           2.4516418958307
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 32
dh =
          5.80497220123795
rdh_sum =
          2.69596873894072
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 33
dh =
          5.84559720123795
rdh_sum =
          2.94341171339809
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 34
dh =
          5.88204720123795
rdh_sum =
          3.19366183842669
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 45
dh =
          4.93314720123795
rdh_sum =
          3.37460348110133
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 46
dh =
          4.87929720123795
rdh_sum =
          3.55186709163431
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 47
dh =
          4.86907220123795
rdh_sum =
          3.72843566437936
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 48
dh =
          4.90247220123795
rdh_sum =
          3.90727854035513
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 49
dh =
          4.89889720123795
rdh_sum =
          4.08587743947292
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 50
dh =
          4.85834720123795
rdh_sum =
          4.26171814024804
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 51
dh =
          4.82419720123795
rdh_sum =
          4.43524908232813
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 52
dh =
          4.79644720123795
rdh_sum =
          4.60691202718651
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 53
dh =
          4.78844720123795
```

```
rdh_sum =
          4.77803793813875
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 54
dh =
          4.80019720123795
rdh_sum =
          4.94995284723646
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 55
dh =
          4.81194720123795
rdh_sum =
          5.12265819175903
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 56
dh =
          4.82369720123795
rdh_sum =
          5.29615540552312
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 57
dh =
          4.83544720123795
rdh_sum =
          5.47044591887635
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 58
dh =
          4.84719720123795
rdh_sum =
          5.64553115869104
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 59
dh =
          4.85894720123795
rdh_sum =
          5.82141254835796
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 60
dh =
          4.87069720123795
rdh_sum =
          5.99809150778011
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 65
dh =
          4.41112220123795
rdh_sum =
          6.14466526135442
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 66
dh =
          4.35622220123795
rdh_sum =
          6.28779718957001
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 73
dh =
          3.17299720123795
rdh_sum =
          6.36555891436826
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 74
dh =
          3.24044720123795
rdh_sum =
          6.44656859367674
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 75
dh =
          3.30857220123795
rdh_sum =
          6.53092012465246
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 76
dh =
          3.37737220123795
rdh_sum =
          6.61870873893987
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 77
dh =
          3.38909720123795
rdh_sum =
          6.70708929511508
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 78
dh =
          3.34374720123795
```

```
rdh_sum =
          6.79319031767134
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 87
dh =
          2.76949720123795
rdh_sum =
          6.85281072388137
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 88
dh =
          2.91034720123795
rdh_sum =
          6.91850991561035
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 89
dh =
          2.95689720123795
rdh_sum =
          6.98627840311864
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 90
dh =
          2.90914720123795
rdh_sum =
          7.05192464523216
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 91
dh =
          2.85632220123795
rdh_sum =
          7.11525970187625
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 92
dh =
          2.79842220123795
rdh_sum =
          7.17610595427901
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 93
dh =
          2.74052220123795
rdh_sum =
          7.23451011664972
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 94
dh =
          2.68262220123795
rdh_sum =
          7.29051916297073
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 95
dh =
          2.62472220123795
rdh_sum =
          7.34418032200063
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 96
dh =
          2.56682220123795
rdh_sum =
          7.39554107225041
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 97
dh =
          2.50894720123795
rdh_sum =
          7.44465009926203
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 98
dh =
          2.45109720123795
rdh_sum =
          7.49155626594893
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 103
dh =
          2.10582220123795
rdh_sum =
          7.52632301791203
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 104
dh =
          2.11492220123795
rdh_sum =
          7.56138732811712
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 105
dh =
          2.13012220123795
```

```
rdh_sum =
          7.59695138282257
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 106
dh =
          2.15142220123795
rdh_sum =
          7.63322146514012
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 107
dh =
          2.17274720123795
rdh_sum =
          7.67020509128851
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 108
dh =
          2.19409720123795
rdh_sum =
          7.70790979070597
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 109
dh =
          2.21544720123795
rdh_sum =
          7.74634224981549
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 110
dh =
          2.23679720123795
rdh_sum =
          7.78550914451404
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 111
dh =
          2.26077220123795
rdh_sum =
          7.82550871864173
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 112
dh =
          2.28737220123795
rdh_sum =
          7.86644195885277
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 113
dh =
          2.34167220123795
rdh_sum =
          7.90931311293609
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 114
dh =
          2.42367220123795
rdh_sum =
          7.95519176489019
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 129
dh =
          1.09154720123795
rdh_sum =
          7.96461359987917
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 130
dh =
          1.06909720123795
rdh_sum =
          7.97365302009818
ans =
!------- End Berm Factor Calculation, Iter: 2 ---------!
berm_width =
    62
rB =
         0.306810470246141
rdh_mean =
         0.128607306775777
gamma_berm =
         0.732647598022825
slope =
          0.18547917529106
Irb =
          1.48844497070175
gamma_berm =
         0.732647598022825
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
```

```
gamma =
          0.58611807841826
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:5.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          13.6166762251337
R2del =
         0.903602627597804
Z2 =
          22.6022484263716
ans =
!----------------- STARTING ITERATION 3 -----------------!
Ztoe =
                  -4.28312
toe_sta =
         -12.6070531009323
top_sta =
          197.401916861533
Z2 =
          22.6022484263716
H0 =
                    8.8182
Tp =
                   11.5883
T0 =
          10.5348181818182
R2 =
          13.6166762251337
Z2 =
          22.6022484263716
top_sta =
          197.401916861533
Lslope =
          210.008969962465
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 17
dh =
          6.29127220123795
rdh_sum =
         0.282460702628984
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 18
dh =
          6.22707220123795
rdh_sum =
         0.559787292980458
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 19
dh =
          6.16412220123795
rdh_sum =
         0.832108006534625
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 20
dh =
          6.10242220123795
rdh_sum =
          1.09955002195992
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 21
dh =
          6.09154720123795
rdh_sum =
          1.36613503247288
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 22
dh =
          6.13149720123795
rdh_sum =
          1.63587258153965
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 23
dh =
          6.25207220123795
rdh_sum =
          1.91519501158891
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 24
dh =
          6.45327220123795
rdh_sum =
          2.21073589632493
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 31
dh =
          5.76017220123795
rdh_sum =
           2.4516418958307
```

```
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 32
dh =
          5.80497220123795
rdh_sum =
          2.69596873894072
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 33
dh =
          5.84559720123795
rdh_sum =
          2.94341171339809
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 34
dh =
          5.88204720123795
rdh_sum =
          3.19366183842669
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 45
dh =
          4.93314720123795
rdh_sum =
          3.37460348110133
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 46
dh =
          4.87929720123795
rdh_sum =
          3.55186709163431
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 47
dh =
          4.86907220123795
rdh_sum =
          3.72843566437936
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 48
dh =
          4.90247220123795
rdh_sum =
          3.90727854035513
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 49
dh =
          4.89889720123795
rdh_sum =
          4.08587743947292
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 50
dh =
          4.85834720123795
rdh_sum =
          4.26171814024804
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 51
dh =
          4.82419720123795
rdh_sum =
          4.43524908232813
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 52
dh =
          4.79644720123795
rdh_sum =
          4.60691202718651
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 53
dh =
          4.78844720123795
rdh_sum =
          4.77803793813875
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 54
dh =
          4.80019720123795
rdh_sum =
          4.94995284723646
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 55
dh =
          4.81194720123795
rdh_sum =
          5.12265819175903
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 56
dh =
          4.82369720123795
rdh_sum =
          5.29615540552312
```

```
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 57
dh =
          4.83544720123795
rdh_sum =
          5.47044591887635
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 58
dh =
          4.84719720123795
rdh_sum =
          5.64553115869104
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 59
dh =
          4.85894720123795
rdh_sum =
          5.82141254835796
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 60
dh =
          4.87069720123795
rdh_sum =
          5.99809150778011
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 65
dh =
          4.41112220123795
rdh_sum =
          6.14466526135442
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 66
dh =
          4.35622220123795
rdh_sum =
          6.28779718957001
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 73
dh =
          3.17299720123795
rdh_sum =
          6.36555891436826
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 74
dh =
          3.24044720123795
rdh_sum =
          6.44656859367674
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 75
dh =
          3.30857220123795
rdh_sum =
          6.53092012465246
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 76
dh =
          3.37737220123795
rdh_sum =
          6.61870873893987
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 77
dh =
          3.38909720123795
rdh_sum =
          6.70708929511508
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 78
dh =
          3.34374720123795
rdh_sum =
          6.79319031767134
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 87
dh =
          2.76949720123795
rdh_sum =
          6.85281072388137
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 88
dh =
          2.91034720123795
rdh_sum =
          6.91850991561035
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 89
dh =
          2.95689720123795
rdh_sum =
          6.98627840311864
```

```
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 90
dh =
          2.90914720123795
rdh_sum =
          7.05192464523216
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 91
dh =
          2.85632220123795
rdh_sum =
          7.11525970187625
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 92
dh =
          2.79842220123795
rdh_sum =
          7.17610595427901
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 93
dh =
          2.74052220123795
rdh_sum =
          7.23451011664972
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 94
dh =
          2.68262220123795
rdh_sum =
          7.29051916297073
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 95
dh =
          2.62472220123795
rdh_sum =
          7.34418032200063
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 96
dh =
          2.56682220123795
rdh_sum =
          7.39554107225041
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 97
dh =
          2.50894720123795
rdh_sum =
          7.44465009926203
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 98
dh =
          2.45109720123795
rdh_sum =
          7.49155626594893
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 103
dh =
          2.10582220123795
rdh_sum =
          7.52632301791203
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 104
dh =
          2.11492220123795
rdh_sum =
          7.56138732811712
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 105
dh =
          2.13012220123795
rdh_sum =
          7.59695138282257
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 106
dh =
          2.15142220123795
rdh_sum =
          7.63322146514012
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 107
dh =
          2.17274720123795
rdh_sum =
          7.67020509128851
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 108
dh =
          2.19409720123795
rdh_sum =
          7.70790979070597
```

```
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 109
dh =
          2.21544720123795
rdh_sum =
          7.74634224981549
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 110
dh =
          2.23679720123795
rdh_sum =
          7.78550914451404
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 111
dh =
          2.26077220123795
rdh_sum =
          7.82550871864173
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 112
dh =
          2.28737220123795
rdh_sum =
          7.86644195885277
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 113
dh =
          2.34167220123795
rdh_sum =
          7.90931311293609
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 114
dh =
          2.42367220123795
rdh_sum =
          7.95519176489019
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 129
dh =
          1.09154720123795
rdh_sum =
          7.96461359987917
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 130
dh =
          1.06909720123795
rdh_sum =
          7.97365302009818
ans =
!------- End Berm Factor Calculation, Iter: 3 ---------!
berm_width =
    62
rB =
         0.295225484945149
rdh_mean =
         0.128607306775777
gamma_berm =
          0.74274266956522
slope =
         0.181646885544773
Irb =
          1.45769137051897
gamma_berm =
          0.74274266956522
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
         0.594194135652176
ans =
!!! - - Iribaren number:   1.08 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:5.5 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          13.5190805274369
R2del =
        0.0975956976967538
Z2 =
          22.5046527286749
ans =
!----------------- STARTING ITERATION 4 -----------------!
Ztoe =
                  -4.28312
toe_sta =
         -12.6070531009323
top_sta =
          196.545438601798
```

```
Z2 =
          22.5046527286749
H0 =
                    8.8182
Tp =
                   11.5883
T0 =
          10.5348181818182
R2 =
          13.5190805274369
Z2 =
          22.5046527286749
top_sta =
          196.545438601798
Lslope =
          209.152491702731
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 17
dh =
          6.29127220123795
rdh_sum =
         0.282460702628984
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 18
dh =
          6.22707220123795
rdh_sum =
         0.559787292980458
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 19
dh =
          6.16412220123795
rdh_sum =
         0.832108006534625
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 20
dh =
          6.10242220123795
rdh_sum =
          1.09955002195992
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 21
dh =
          6.09154720123795
rdh_sum =
          1.36613503247288
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 22
dh =
          6.13149720123795
rdh_sum =
          1.63587258153965
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 23
dh =
          6.25207220123795
rdh_sum =
          1.91519501158891
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 24
dh =
          6.45327220123795
rdh_sum =
          2.21073589632493
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 31
dh =
          5.76017220123795
rdh_sum =
           2.4516418958307
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 32
dh =
          5.80497220123795
rdh_sum =
          2.69596873894072
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 33
dh =
          5.84559720123795
rdh_sum =
          2.94341171339809
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 34
dh =
          5.88204720123795
rdh_sum =
          3.19366183842669
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 45
```

```
dh =
          4.93314720123795
rdh_sum =
          3.37460348110133
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 46
dh =
          4.87929720123795
rdh_sum =
          3.55186709163431
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 47
dh =
          4.86907220123795
rdh_sum =
          3.72843566437936
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 48
dh =
          4.90247220123795
rdh_sum =
          3.90727854035513
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 49
dh =
          4.89889720123795
rdh_sum =
          4.08587743947292
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 50
dh =
          4.85834720123795
rdh_sum =
          4.26171814024804
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 51
dh =
          4.82419720123795
rdh_sum =
          4.43524908232813
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 52
dh =
          4.79644720123795
rdh_sum =
          4.60691202718651
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 53
dh =
          4.78844720123795
rdh_sum =
          4.77803793813875
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 54
dh =
          4.80019720123795
rdh_sum =
          4.94995284723646
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 55
dh =
          4.81194720123795
rdh_sum =
          5.12265819175903
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 56
dh =
          4.82369720123795
rdh_sum =
          5.29615540552312
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 57
dh =
          4.83544720123795
rdh_sum =
          5.47044591887635
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 58
dh =
          4.84719720123795
rdh_sum =
          5.64553115869104
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 59
dh =
          4.85894720123795
rdh_sum =
          5.82141254835796
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 60
```

```
dh =
          4.87069720123795
rdh_sum =
          5.99809150778011
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 65
dh =
          4.41112220123795
rdh_sum =
          6.14466526135442
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 66
dh =
          4.35622220123795
rdh_sum =
          6.28779718957001
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 73
dh =
          3.17299720123795
rdh_sum =
          6.36555891436826
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 74
dh =
          3.24044720123795
rdh_sum =
          6.44656859367674
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 75
dh =
          3.30857220123795
rdh_sum =
          6.53092012465246
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 76
dh =
          3.37737220123795
rdh_sum =
          6.61870873893987
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 77
dh =
          3.38909720123795
rdh_sum =
          6.70708929511508
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 78
dh =
          3.34374720123795
rdh_sum =
          6.79319031767134
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 87
dh =
          2.76949720123795
rdh_sum =
          6.85281072388137
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 88
dh =
          2.91034720123795
rdh_sum =
          6.91850991561035
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 89
dh =
          2.95689720123795
rdh_sum =
          6.98627840311864
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 90
dh =
          2.90914720123795
rdh_sum =
          7.05192464523216
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 91
dh =
          2.85632220123795
rdh_sum =
          7.11525970187625
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 92
dh =
          2.79842220123795
rdh_sum =
          7.17610595427901
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 93
```

```
dh =
          2.74052220123795
rdh_sum =
          7.23451011664972
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 94
dh =
          2.68262220123795
rdh_sum =
          7.29051916297073
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 95
dh =
          2.62472220123795
rdh_sum =
          7.34418032200063
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 96
dh =
          2.56682220123795
rdh_sum =
          7.39554107225041
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 97
dh =
          2.50894720123795
rdh_sum =
          7.44465009926203
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 98
dh =
          2.45109720123795
rdh_sum =
          7.49155626594893
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 103
dh =
          2.10582220123795
rdh_sum =
          7.52632301791203
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 104
dh =
          2.11492220123795
rdh_sum =
          7.56138732811712
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 105
dh =
          2.13012220123795
rdh_sum =
          7.59695138282257
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 106
dh =
          2.15142220123795
rdh_sum =
          7.63322146514012
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 107
dh =
          2.17274720123795
rdh_sum =
          7.67020509128851
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 108
dh =
          2.19409720123795
rdh_sum =
          7.70790979070597
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 109
dh =
          2.21544720123795
rdh_sum =
          7.74634224981549
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 110
dh =
          2.23679720123795
rdh_sum =
          7.78550914451404
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 111
dh =
          2.26077220123795
rdh_sum =
          7.82550871864173
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 112
```

```
dh =
          2.28737220123795
rdh_sum =
          7.86644195885277
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 113
dh =
          2.34167220123795
rdh_sum =
          7.90931311293609
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 114
dh =
          2.42367220123795
rdh_sum =
          7.95519176489019
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 129
dh =
          1.09154720123795
rdh_sum =
          7.96461359987917
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 130
dh =
          1.06909720123795
rdh_sum =
          7.97365302009818
ans =
!------- End Berm Factor Calculation, Iter: 4 ---------!
berm_width =
    62
rB =
         0.296434431620929
rdh_mean =
         0.128607306775777
gamma_berm =
         0.741689202265447
slope =
         0.182040904769659
Irb =
          1.46085332081728
gamma_berm =
         0.741689202265447
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
         0.593351361812358
ans =
!!! - - Iribaren number:   1.08 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:5.5 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          13.5291890836249
R2del =
        0.0101085561879799
Z2 =
          22.5147612848629
ans =
!----------------- STARTING ITERATION 5 -----------------!
Ztoe =
                  -4.28312
toe_sta =
         -12.6070531009323
top_sta =
          196.634149055401
Z2 =
          22.5147612848629
H0 =
                    8.8182
Tp =
                   11.5883
T0 =
          10.5348181818182
R2 =
          13.5291890836249
Z2 =
          22.5147612848629
top_sta =
          196.634149055401
Lslope =
          209.241202156333
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 17
dh =
          6.29127220123795
```

```
rdh_sum =
         0.282460702628984
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 18
dh =
          6.22707220123795
rdh_sum =
         0.559787292980458
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 19
dh =
          6.16412220123795
rdh_sum =
         0.832108006534625
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 20
dh =
          6.10242220123795
rdh_sum =
          1.09955002195992
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 21
dh =
          6.09154720123795
rdh_sum =
          1.36613503247288
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 22
dh =
          6.13149720123795
rdh_sum =
          1.63587258153965
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 23
dh =
          6.25207220123795
rdh_sum =
          1.91519501158891
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 24
dh =
          6.45327220123795
rdh_sum =
          2.21073589632493
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 31
dh =
          5.76017220123795
rdh_sum =
           2.4516418958307
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 32
dh =
          5.80497220123795
rdh_sum =
          2.69596873894072
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 33
dh =
          5.84559720123795
rdh_sum =
          2.94341171339809
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 34
dh =
          5.88204720123795
rdh_sum =
          3.19366183842669
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 45
dh =
          4.93314720123795
rdh_sum =
          3.37460348110133
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 46
dh =
          4.87929720123795
rdh_sum =
          3.55186709163431
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 47
dh =
          4.86907220123795
rdh_sum =
          3.72843566437936
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 48
dh =
          4.90247220123795
```

```
rdh_sum =
          3.90727854035513
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 49
dh =
          4.89889720123795
rdh_sum =
          4.08587743947292
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 50
dh =
          4.85834720123795
rdh_sum =
          4.26171814024804
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 51
dh =
          4.82419720123795
rdh_sum =
          4.43524908232813
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 52
dh =
          4.79644720123795
rdh_sum =
          4.60691202718651
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 53
dh =
          4.78844720123795
rdh_sum =
          4.77803793813875
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 54
dh =
          4.80019720123795
rdh_sum =
          4.94995284723646
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 55
dh =
          4.81194720123795
rdh_sum =
          5.12265819175903
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 56
dh =
          4.82369720123795
rdh_sum =
          5.29615540552312
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 57
dh =
          4.83544720123795
rdh_sum =
          5.47044591887635
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 58
dh =
          4.84719720123795
rdh_sum =
          5.64553115869104
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 59
dh =
          4.85894720123795
rdh_sum =
          5.82141254835796
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 60
dh =
          4.87069720123795
rdh_sum =
          5.99809150778011
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 65
dh =
          4.41112220123795
rdh_sum =
          6.14466526135442
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 66
dh =
          4.35622220123795
rdh_sum =
          6.28779718957001
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 73
dh =
          3.17299720123795
```

```
rdh_sum =
          6.36555891436826
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 74
dh =
          3.24044720123795
rdh_sum =
          6.44656859367674
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 75
dh =
          3.30857220123795
rdh_sum =
          6.53092012465246
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 76
dh =
          3.37737220123795
rdh_sum =
          6.61870873893987
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 77
dh =
          3.38909720123795
rdh_sum =
          6.70708929511508
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 78
dh =
          3.34374720123795
rdh_sum =
          6.79319031767134
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 87
dh =
          2.76949720123795
rdh_sum =
          6.85281072388137
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 88
dh =
          2.91034720123795
rdh_sum =
          6.91850991561035
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 89
dh =
          2.95689720123795
rdh_sum =
          6.98627840311864
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 90
dh =
          2.90914720123795
rdh_sum =
          7.05192464523216
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 91
dh =
          2.85632220123795
rdh_sum =
          7.11525970187625
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 92
dh =
          2.79842220123795
rdh_sum =
          7.17610595427901
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 93
dh =
          2.74052220123795
rdh_sum =
          7.23451011664972
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 94
dh =
          2.68262220123795
rdh_sum =
          7.29051916297073
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 95
dh =
          2.62472220123795
rdh_sum =
          7.34418032200063
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 96
dh =
          2.56682220123795
```

```
rdh_sum =
          7.39554107225041
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 97
dh =
          2.50894720123795
rdh_sum =
          7.44465009926203
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 98
dh =
          2.45109720123795
rdh_sum =
          7.49155626594893
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 103
dh =
          2.10582220123795
rdh_sum =
          7.52632301791203
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 104
dh =
          2.11492220123795
rdh_sum =
          7.56138732811712
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 105
dh =
          2.13012220123795
rdh_sum =
          7.59695138282257
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 106
dh =
          2.15142220123795
rdh_sum =
          7.63322146514012
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 107
dh =
          2.17274720123795
rdh_sum =
          7.67020509128851
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 108
dh =
          2.19409720123795
rdh_sum =
          7.70790979070597
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 109
dh =
          2.21544720123795
rdh_sum =
          7.74634224981549
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 110
dh =
          2.23679720123795
rdh_sum =
          7.78550914451404
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 111
dh =
          2.26077220123795
rdh_sum =
          7.82550871864173
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 112
dh =
          2.28737220123795
rdh_sum =
          7.86644195885277
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 113
dh =
          2.34167220123795
rdh_sum =
          7.90931311293609
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 114
dh =
          2.42367220123795
rdh_sum =
          7.95519176489019
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 129
dh =
          1.09154720123795
```

```
rdh_sum =
          7.96461359987917
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 130
dh =
          1.06909720123795
rdh_sum =
          7.97365302009818
ans =
!------- End Berm Factor Calculation, Iter: 5 ---------!
berm_width =
    62
rB =
          0.296308754495098
rdh_mean =
          0.128607306775777
gamma_berm =
          0.741798716394602
slope =
          0.181999881095852
Irb =
           1.4605241114553
gamma_berm =
          0.741798716394602
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
          0.593438973115681
ans =
!!! - - Iribaren number:   1.08 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:5.5 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          13.5281374271026
R2del =
       0.00105165652229644
Z2 =
          22.5137096283406
% final 2% runup elevation
Z2=R2_new+SWEL
Z2 =
          22.5137096283406
diary off
-1.000000e+00
-1.000000e+00
```