```
diary on          % begin recording

% FEMA appeal for The Town of Harpswell, Cumberland county, Maine
% TRANSECT ID: CM-124
% 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-124sta_ele_include.csv';   % file with station, elevation, include
                                   % third colunm is 0 for excluded points
imgname='logfiles/CM-124-runup';
SWEL=9.0068;  % 100-yr still water level including wave setup.
H0=4.0078;    % significant wave height at toe of structure
Tp=5.0362;    % peak period, 1/fma,
T0=Tp/1.1;

gamma_berm=0.93753;   % this may get changed automatically below
gamma_rough=0.8;
gamma_beta=1;
gamma_perm=1;

setupAtToe=-0.01648;
maxSetup=0.27738;    % only used in case of berm/shallow foreshore weighted average

plotTitle='Iterative TAW for CM-124'

plotTitle =

Iterative TAW for CM-124



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

SWEL=SWEL+setupAtToe

SWEL =

                 8.99032

SWEL_fore=SWEL+maxSetup

SWEL_fore =

                 9.2677



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

L0 =

          107.256019656912


% 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 =

                  2.97862


% 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 =

                  15.00202


% 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 =

         14.0074162679426


top_sta =

         75.7719774011299

% 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

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

top_sta =

         75.7719774011299

toe_sta

toe_sta =

         14.0074162679426



% 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 78.5 ft landward of toe of slope

ans =

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

ans =

-!!-   setup is adjusted to 0.18 feet

ans =

-!!-   SWEL is adjusted to 9.19 feet

k =

       1
       2
       3
       4
       5
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      55

```
% 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
```

```
        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 =
                    2.97862
toe_sta =
        14.0074162679426
top_sta =
        75.7719774011299
Z2 =
                    15.00202
H0 =
                     4.0078
Tp =
                     5.0362
T0 =
        4.57836363636364
R2 =
                    12.0234
Z2 =
        21.2084110080735
top_sta =
        142.187032741139
Lslope =
        128.179616473196
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 1
dh =
        5.96068600807348
rdh_sum =
        0.846413480300901
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 2
dh =
        5.90793600807348
rdh_sum =
        1.68529921251834
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 3
dh =
        5.85518600807348
rdh_sum =
        2.51651234959337
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 4
dh =
        5.80243600807348
rdh_sum =
        3.33991132389942
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 5
dh =
        5.74968600807348
rdh_sum =
        4.15535790775132
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 12
dh =
        3.71458600807348
rdh_sum =
        4.59802330632674
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 13
dh =
        3.65633600807348
rdh_sum =
        5.02936483654619
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 38
dh =
        -2.25383899192652
rdh_sum =
        5.11359008446356
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 39
dh =
        -2.31933899192652
rdh_sum =
        5.20262911248105
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 44
dh =
        -3.55743899192652
rdh_sum =
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```
                5.40352056658974
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 45
dh =
              -3.61553899192652
rdh_sum =
                5.61052875058848
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 68
dh =
              -6.56881399192652
rdh_sum =
                6.1830553769251
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 69
dh =
              -6.61666399192652
rdh_sum =
                6.7617614132431
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 70
dh =
              -6.61711399192652
rdh_sum =
                7.3405255062519
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 71
dh =
              -6.57016399192652
rdh_sum =
                7.91322663326668
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 76
dh =
              -7.32236399192652
rdh_sum =
                8.58113002076043
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 77
dh =
              -7.37871399192652
rdh_sum =
                9.2559492991577
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 78
dh =
              -7.40946399192652
rdh_sum =
                9.93452666767695
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 79
dh =
              -7.41461399192652
rdh_sum =
                10.6137323194366
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 80
dh =
              -7.41976399192652
rdh_sum =
                11.2935659299397
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 81
dh =
              -7.42491399192652
rdh_sum =
                11.9740271735523
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 82
dh =
              -7.43006399192652
rdh_sum =
                12.655115723504
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 83
dh =
              -7.43521399192652
rdh_sum =
                13.3368312518885
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 84
dh =
              -7.46481399192652
rdh_sum =
                14.0221439691922
ans =
Berm Factor Calculation: Iteration 1, Profile Segment: 85
dh =
              -7.51886399192652
rdh_sum =
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                14.7139964487974
ans =
!------- End Berm Factor Calculation, Iter: 1 ---------!
berm_width =
    25
rB =
        0.195038811067341
rdh_mean =
        0.588559857951894
gamma_berm =
        0.91975320386956
slope =
        0.176680158651386
Irb =
        0.913998742198735
gamma_berm =
        0.91975320386956
gamma_perm =
    1
gamma_beta =
    1
gamma_rough =
                    0.8
gamma =
        0.735802563095648
ans =
!!! - - Iribaren number:   0.84 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:5.7 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
        4.77074497685901
R2del =
        7.25265502314099
Z2 =
        13.9557559849325
top_sta =
        66.0577090979284
ans =
!---------------- STARTING ITERATION 2 ----------------!
Ztoe =
                2.97862
toe_sta =
        14.0074162679426
top_sta =
        66.0577090979284
Z2 =
        13.9557559849325
H0 =
                4.0078
Tp =
                5.0362
T0 =
        4.57836363636364
R2 =
        4.77074497685901
Z2 =
        13.9557559849325
top_sta =
        66.0577090979284
Lslope =
        52.0502928299858
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 1
dh =
        5.96068600807348
rdh_sum =
    1
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 2
dh =
        5.90793600807348
rdh_sum =
    2
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 3
dh =
        5.85518600807348
rdh_sum =
    3
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 4
dh =
        5.80243600807348
rdh_sum =
    4
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 5
dh =
        5.74968600807348
rdh_sum =
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        5
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
          5.44266539857542
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.87400692879487
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 38
dh =
         -2.25383899192652
rdh_sum =
          6.33075224587892
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 39
dh =
         -2.31933899192652
rdh_sum =
          6.80901652877687
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 44
dh =
         -3.55743899192652
rdh_sum =
          7.65773609552121
ans =
Berm Factor Calculation: Iteration 2, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
          8.51990634851971
ans =
!------- End Berm Factor Calculation, Iter: 2 ---------!
berm_width =
     11
rB =
          0.211334065610923
rdh_mean =
          0.774536940774519
gamma_berm =
          0.952351975048803
slope =
          0.267407008042439
Irb =
           1.38334531093653
gamma_berm =
          0.952351975048803
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                     0.8
gamma =
          0.761881580039042
ans =
!!! - - Iribaren number:   1.32 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:3.7 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          7.47648357251724
R2del =
          2.70573859565823
Z2 =
          16.6614945805907
top_sta =
          100.715903433686
ans =
!---------------- STARTING ITERATION 3 -----------------!
Ztoe =
                   2.97862
toe_sta =
          14.0074162679426
top_sta =
          100.715903433686
Z2 =
          16.6614945805907
H0 =
                    4.0078
Tp =
                    5.0362
T0 =
          4.57836363636364
R2 =
```

```
              7.47648357251724
Z2 =
             16.6614945805907
top_sta =
             100.715903433686
Lslope =
             86.7084871657431
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 1
dh =
              5.96068600807348
rdh_sum =
           0.846413480300901
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 2
dh =
              5.90793600807348
rdh_sum =
              1.68529921251834
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 3
dh =
              5.85518600807348
rdh_sum =
              2.51651234959337
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 4
dh =
              5.80243600807348
rdh_sum =
              3.33991132389942
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 5
dh =
              5.74968600807348
rdh_sum =
              4.15535790775132
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 12
dh =
              3.71458600807348
rdh_sum =
              4.59802330632674
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 13
dh =
              3.65633600807348
rdh_sum =
              5.02936483654619
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 38
dh =
             -2.25383899192652
rdh_sum =
              5.23732663156932
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 39
dh =
             -2.31933899192652
rdh_sum =
              5.45656775096638
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 44
dh =
             -3.55743899192652
rdh_sum =
               5.9186172970621
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 45
dh =
             -3.61553899192652
rdh_sum =
              6.39284843086715
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 68
dh =
             -6.56881399192652
rdh_sum =
              7.35692028387383
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 69
dh =
             -6.61666399192652
rdh_sum =
              8.32464010409872
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 70
dh =
             -6.61711399192652
rdh_sum =
```

```
                9.2923933360374
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 71
dh =
        -6.57016399192652
rdh_sum =
         10.256570688621
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 76
dh =
        -7.32236399192652
rdh_sum =
         11.2555224897684
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 77
dh =
        -7.37871399192652
rdh_sum =
         12.2551005535862
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 78
dh =
        -7.40946399192652
rdh_sum =
         13.2549022635925
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 79
dh =
        -7.41461399192652
rdh_sum =
          14.2547332729
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 80
dh =
        -7.41976399192652
rdh_sum =
         15.2545912408303
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 81
dh =
        -7.42491399192652
rdh_sum =
         16.2544738265789
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 82
dh =
        -7.43006399192652
rdh_sum =
          17.254378689226
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 83
dh =
        -7.43521399192652
rdh_sum =
         18.2543034877474
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 84
dh =
        -7.46481399192652
rdh_sum =
         19.2542974701407
ans =
Berm Factor Calculation: Iteration 3, Profile Segment: 85
dh =
        -7.51886399192652
rdh_sum =
         20.2542182138319
ans =
!------- End Berm Factor Calculation, Iter: 3 ---------!
berm_width =
    25
rB =
        0.288322410148992
rdh_mean =
        0.810168728553277
gamma_berm =
        0.945267390294833
slope =
        0.221734079201129
Irb =
         1.14707090507153
gamma_berm =
        0.945267390294833
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                     0.8
gamma =
```

```
         0.756213912235867
ans =
!!! - - Iribaren number:   1.08 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.5 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
         6.15338706735624
R2del =
         1.32309650516099
Z2 =
         15.3383980754297
top_sta =
         79.5739895528782
ans =
!---------------- STARTING ITERATION 4 ----------------!
Ztoe =
                  2.97862
toe_sta =
         14.0074162679426
top_sta =
         79.5739895528782
Z2 =
         15.3383980754297
H0 =
                   4.0078
Tp =
                   5.0362
T0 =
         4.57836363636364
R2 =
         6.15338706735624
Z2 =
         15.3383980754297
top_sta =
         79.5739895528782
Lslope =
         65.5665732849356
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 1
dh =
         5.96068600807348
rdh_sum =
         0.846413480300901
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 2
dh =
         5.90793600807348
rdh_sum =
         1.68529921251834
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 3
dh =
         5.85518600807348
rdh_sum =
         2.51651234959337
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 4
dh =
         5.80243600807348
rdh_sum =
         3.33991132389942
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 5
dh =
         5.74968600807348
rdh_sum =
         4.15535790775132
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 12
dh =
         3.71458600807348
rdh_sum =
         4.59802330632674
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 13
dh =
         3.65633600807348
rdh_sum =
         5.02936483654619
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 38
dh =
         -2.25383899192652
rdh_sum =
         5.32543585118557
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 39
dh =
         -2.31933899192652
rdh_sum =
```

```
          5.63688451650779
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 44
dh =
         -3.55743899192652
rdh_sum =
          6.25837685704887
ans =
Berm Factor Calculation: Iteration 4, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
          6.89420052285582
ans =
!------- End Berm Factor Calculation, Iter: 4 ---------!
berm_width =
    11
rB =
          0.167768413825697
rdh_mean =
          0.626745502077802
gamma_berm =
          0.937379684930286
slope =
          0.226508232629699
Irb =
           1.17176847305021
gamma_berm =
          0.937379684930286
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
          0.749903747944229
ans =
!!! - - Iribaren number:   1.10 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
           6.2334235927585
R2del =
        0.0800365254022593
Z2 =
           15.418434600832
top_sta =
          80.4786274825549
ans =
!---------------- STARTING ITERATION 5 -----------------!
Ztoe =
                   2.97862
toe_sta =
          14.0074162679426
top_sta =
          80.4786274825549
Z2 =
           15.418434600832
H0 =
                    4.0078
Tp =
                    5.0362
T0 =
          4.57836363636364
R2 =
           6.2334235927585
Z2 =
           15.418434600832
top_sta =
          80.4786274825549
Lslope =
          66.4712112146123
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
          0.846413480300901
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
```

```
             2.51651234959337
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 4
dh =
             5.80243600807348
rdh_sum =
             3.33991132389942
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 5
dh =
             5.74968600807348
rdh_sum =
             4.15535790775132
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 12
dh =
             3.71458600807348
rdh_sum =
             4.59802330632674
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 13
dh =
             3.65633600807348
rdh_sum =
             5.02936483654619
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 38
dh =
            -2.25383899192652
rdh_sum =
             5.31871335178303
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 39
dh =
            -2.31933899192652
rdh_sum =
             5.62314327343593
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 44
dh =
            -3.55743899192652
rdh_sum =
             6.23329290303733
ans =
Berm Factor Calculation: Iteration 5, Profile Segment: 45
dh =
            -3.61553899192652
rdh_sum =
             6.85767452013856
ans =
!------- End Berm Factor Calculation, Iter: 5 ---------!
berm_width =
    11
rB =
            0.165485174694423
rdh_mean =
            0.623424956376232
gamma_berm =
            0.937682413120361
slope =
            0.224257129571295
Irb =
             1.16012310562669
gamma_berm =
            0.937682413120361
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                    0.8
gamma =
            0.750145930496289
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.5 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
             6.17346714806519
R2del =
            0.059956444693313
Z2 =
             15.3584781561387
top_sta =
             79.800883120211
ans =
!---------------- STARTING ITERATION 6 -----------------!
Ztoe =
                    2.97862
toe_sta =
```

```
           14.0074162679426
top_sta =
           79.800883120211
Z2 =
           15.3584781561387
H0 =
                        4.0078
Tp =
                        5.0362
T0 =
           4.57836363636364
R2 =
           6.17346714806519
Z2 =
           15.3584781561387
top_sta =
           79.800883120211
Lslope =
           65.7934668522684
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 1
dh =
           5.96068600807348
rdh_sum =
          0.846413480300901
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 2
dh =
           5.90793600807348
rdh_sum =
           1.68529921251834
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 3
dh =
           5.85518600807348
rdh_sum =
           2.51651234959337
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 4
dh =
           5.80243600807348
rdh_sum =
           3.33991132389942
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 5
dh =
           5.74968600807348
rdh_sum =
           4.15535790775132
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 12
dh =
           3.71458600807348
rdh_sum =
           4.59802330632674
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 13
dh =
           3.65633600807348
rdh_sum =
           5.02936483654619
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 38
dh =
          -2.25383899192652
rdh_sum =
           5.32372861885355
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 39
dh =
          -2.31933899192652
rdh_sum =
           5.63339508814312
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 44
dh =
          -3.55743899192652
rdh_sum =
           6.25202006380348
ans =
Berm Factor Calculation: Iteration 6, Profile Segment: 45
dh =
          -3.61553899192652
rdh_sum =
           6.8849521571759
ans =
!------- End Berm Factor Calculation, Iter: 6 ---------!
berm_width =
     11
rB =
```

```
                0.16718985218902
rdh_mean =
                0.625904741561446
gamma_berm =
                0.937455069025866
slope =
                0.225936756101173
Irb =
                  1.16881212055282
gamma_berm =
                0.937455069025866
gamma_perm =
      1
gamma_beta =
      1
gamma_rough =
                            0.8
gamma =
                0.749964055220693
ans =
!!! - - Iribaren number:   1.10 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
                  6.21819679533891
R2del =
                0.0447296472737149
Z2 =
                  15.4032078034124
top_sta =
                  80.306476013707
ans =
!---------------- STARTING ITERATION 7 -----------------!
Ztoe =
                            2.97862
toe_sta =
                  14.0074162679426
top_sta =
                  80.306476013707
Z2 =
                  15.4032078034124
H0 =
                            4.0078
Tp =
                            5.0362
T0 =
                  4.57836363636364
R2 =
                  6.21819679533891
Z2 =
                  15.4032078034124
top_sta =
                  80.306476013707
Lslope =
                  66.2990597457644
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 1
dh =
                  5.96068600807348
rdh_sum =
                0.846413480300901
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 2
dh =
                  5.90793600807348
rdh_sum =
                  1.68529921251834
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 3
dh =
                  5.85518600807348
rdh_sum =
                  2.51651234959337
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 4
dh =
                  5.80243600807348
rdh_sum =
                  3.33991132389942
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 5
dh =
                  5.74968600807348
rdh_sum =
                  4.15535790775132
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 12
dh =
                  3.71458600807348
rdh_sum =
```

```
            4.59802330632674
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 13
dh =
            3.65633600807348
rdh_sum =
            5.02936483654619
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 38
dh =
           -2.25383899192652
rdh_sum =
            5.31997549536028
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 39
dh =
           -2.31933899192652
rdh_sum =
            5.62572339697241
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 44
dh =
           -3.55743899192652
rdh_sum =
            6.23801322884716
ans =
Berm Factor Calculation: Iteration 7, Profile Segment: 45
dh =
           -3.61553899192652
rdh_sum =
            6.86455451957334
ans =
!------- End Berm Factor Calculation, Iter: 7 ---------!
berm_width =
    11
rB =
            0.165914871827466
rdh_mean =
            0.624050410870303
gamma_berm =
            0.937624372105958
slope =
            0.224679910662749
Irb =
            1.16231022945975
gamma_berm =
            0.937624372105958
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                        0.8
gamma =
            0.750099497684766
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.5 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
            6.18472283833895
R2del =
          0.0334739569999538
Z2 =
            15.3697338464124
top_sta =
            79.9280660611574
ans =
!---------------- STARTING ITERATION 8 -----------------!
Ztoe =
                    2.97862
toe_sta =
            14.0074162679426
top_sta =
            79.9280660611574
Z2 =
            15.3697338464124
H0 =
                     4.0078
Tp =
                     5.0362
T0 =
            4.57836363636364
R2 =
            6.18472283833895
Z2 =
            15.3697338464124
top_sta =
            79.9280660611574
Lslope =
```

```
              65.9206497932148
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
        0.846413480300901
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
          4.59802330632674
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.02936483654619
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 38
dh =
         -2.25383899192652
rdh_sum =
          5.32277774503648
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 39
dh =
         -2.31933899192652
rdh_sum =
          5.63145150826817
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 44
dh =
         -3.55743899192652
rdh_sum =
          6.24847554977824
ans =
Berm Factor Calculation: Iteration 8, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
          6.87979292493756
ans =
!------- End Berm Factor Calculation, Iter: 8 ---------!
berm_width =
    11
rB =
        0.166867287177928
rdh_mean =
        0.625435720448869
gamma_berm =
        0.937497474797548
slope =
        0.225618485816664
Irb =
          1.16716565021942
gamma_berm =
        0.937497474797548
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                      0.8
gamma =
```

```
             0.74999979838038
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          6.20971829316299
R2del =
          0.024995454824043
Z2 =
          15.3947293012365
top_sta =
          80.2106195730523
ans =
!--------------- STARTING ITERATION 9 ----------------!
Ztoe =
                     2.97862
toe_sta =
          14.0074162679426
top_sta =
          80.2106195730523
Z2 =
          15.3947293012365
H0 =
                     4.0078
Tp =
                     5.0362
T0 =
          4.57836363636364
R2 =
          6.20971829316299
Z2 =
          15.3947293012365
top_sta =
          80.2106195730523
Lslope =
          66.2032033051097
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
          0.846413480300901
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
          4.59802330632674
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.02936483654619
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 38
dh =
          -2.25383899192652
rdh_sum =
          5.32068166453571
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 39
dh =
          -2.31933899192652
rdh_sum =
```

```
            5.6271669321714
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 44
dh =
         -3.55743899192652
rdh_sum =
          6.24065206866503
ans =
Berm Factor Calculation: Iteration 9, Profile Segment: 45
dh =
         -3.61553899192652
rdh_sum =
          6.86839939276392
ans =
!------- End Berm Factor Calculation, Iter: 9 ---------!
berm_width =
    11
rB =
          0.166155102031913
rdh_mean =
          0.62439994479672
gamma_berm =
          0.937592134504507
slope =
          0.224916464224228
Irb =
          1.16353396425433
gamma_berm =
          0.937592134504507
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
          0.750073707603605
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
          6.19102153664942
R2del =
        0.0186967565135712
Z2 =
          15.3760325447229
top_sta =
          79.9992377934792
ans =
!---------------- STARTING ITERATION 10 -----------------!
Ztoe =
                   2.97862
toe_sta =
          14.0074162679426
top_sta =
          79.9992377934792
Z2 =
          15.3760325447229
H0 =
                    4.0078
Tp =
                    5.0362
T0 =
          4.57836363636364
R2 =
          6.19102153664942
Z2 =
          15.3760325447229
top_sta =
          79.9992377934792
Lslope =
          65.9918215255366
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
          0.846413480300901
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
```

```
                2.51651234959337
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 4
dh =
         5.80243600807348
rdh_sum =
         3.33991132389942
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 5
dh =
         5.74968600807348
rdh_sum =
         4.15535790775132
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 12
dh =
         3.71458600807348
rdh_sum =
         4.59802330632674
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 13
dh =
         3.65633600807348
rdh_sum =
         5.02936483654619
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 38
dh =
        -2.25383899192652
rdh_sum =
         5.32224753464781
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 39
dh =
        -2.31933899192652
rdh_sum =
         5.63036773692922
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 44
dh =
        -3.55743899192652
rdh_sum =
         6.24649788064329
ans =
Berm Factor Calculation: Iteration 10, Profile Segment: 45
dh =
        -3.61553899192652
rdh_sum =
         6.87691357840472
ans =
!------- End Berm Factor Calculation, Iter: 10 ---------!
berm_width =
     11
rB =
         0.166687321939483
rdh_mean =
         0.625173961673156
gamma_berm =
         0.937521251478112
slope =
         0.225441023788709
Irb =
         1.16624760672445
gamma_berm =
         0.937521251478112
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                       0.8
gamma =
         0.75001700118249
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
         6.20499135561615
R2del =
        0.0139698189667223
Z2 =
         15.3900023636896
top_sta =
         80.1571776561857
ans =
!---------------- STARTING ITERATION 11 -----------------!
Ztoe =
                   2.97862
toe_sta =
```

```
          14.0074162679426
top_sta =
          80.1571776561857
Z2 =
          15.3900023636896
H0 =
                  4.0078
Tp =
                  5.0362
T0 =
          4.57836363636364
R2 =
          6.20499135561615
Z2 =
          15.3900023636896
top_sta =
          80.1571776561857
Lslope =
          66.1497613882431
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
          0.846413480300901
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
          4.59802330632674
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 13
dh =
          3.65633600807348
rdh_sum =
          5.02936483654619
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 38
dh =
          -2.25383899192652
rdh_sum =
          5.32107642585591
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 39
dh =
          -2.31933899192652
rdh_sum =
          5.62797388076203
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 44
dh =
          -3.55743899192652
rdh_sum =
          6.24212654504153
ans =
Berm Factor Calculation: Iteration 11, Profile Segment: 45
dh =
          -3.61553899192652
rdh_sum =
          6.87054734274568
ans =
!------- End Berm Factor Calculation, Iter: 11 ---------!
berm_width =
    11
rB =
```

```
              0.16628933754837
rdh_mean =
           0.62459521297688
gamma_berm =
         0.937574186654765
slope =
          0.22504870467736
Irb =
           1.16421806828024
gamma_berm =
         0.937574186654765
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                         0.8
gamma =
         0.750059349323812
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
           6.19454298901956
R2del =
         0.0104483665965871
Z2 =
            15.379553997093
top_sta =
          80.0390502780445
ans =
!---------------- STARTING ITERATION 12 ----------------!
Ztoe =
                     2.97862
toe_sta =
          14.0074162679426
top_sta =
          80.0390502780445
Z2 =
            15.379553997093
H0 =
                      4.0078
Tp =
                      5.0362
T0 =
          4.57836363636364
R2 =
           6.19454298901956
Z2 =
            15.379553997093
top_sta =
          80.0390502780445
Lslope =
          66.0316340101019
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 1
dh =
          5.96068600807348
rdh_sum =
         0.846413480300901
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 2
dh =
          5.90793600807348
rdh_sum =
          1.68529921251834
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 3
dh =
          5.85518600807348
rdh_sum =
          2.51651234959337
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 4
dh =
          5.80243600807348
rdh_sum =
          3.33991132389942
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 5
dh =
          5.74968600807348
rdh_sum =
          4.15535790775132
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 12
dh =
          3.71458600807348
rdh_sum =
```

```
           4.59802330632674
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 13
dh =
           3.65633600807348
rdh_sum =
           5.02936483654619
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 38
dh =
          -2.25383899192652
rdh_sum =
           5.32195169871213
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 39
dh =
          -2.31933899192652
rdh_sum =
           5.62976302869064
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 44
dh =
          -3.55743899192652
rdh_sum =
            6.2453940367829
ans =
Berm Factor Calculation: Iteration 12, Profile Segment: 45
dh =
          -3.61553899192652
rdh_sum =
           6.87530622910836
ans =
!------- End Berm Factor Calculation, Iter: 12 ---------!
berm_width =
    11
rB =
           0.16658682107302
rdh_mean =
          0.625027839009851
gamma_berm =
           0.93753457970977
slope =
          0.225341918701099
Irb =
           1.16573491799861
gamma_berm =
           0.93753457970977
gamma_perm =
     1
gamma_beta =
     1
gamma_rough =
                     0.8
gamma =
          0.750027663767816
ans =
!!! - - Iribaren number:   1.09 is in the valid range (0.5-10), TAW RECOMMENDED - - !!!
ans =
!!! - - slope: 1:4.4 V:H is in the valid range (1:8 - 1:1), TAW RECOMMENDED - - !!!
R2_new =
           6.20235178223583
R2del =
       0.00780879321627204
Z2 =
           15.3873627903093
top_sta =
           80.1273351080759
% final 2% runup elevation
Z2=R2_new+SWEL
Z2 =
           15.3873627903093
diary off
-1.000000e+00
-1.000000e+00
-1.000000e+00
```